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وَمَنْ يُوقِ شُحَّ نَفْسِهِ فَأُولَئِكَ هُمُ الْمُفْلِحُونَ ۝

اور جو شخص نفسانی حرص سے محفوظ رہا ایسے ہی لوگ (آخرت میں) فلاح پانے والے ہیں۔ القرآن ۱۲:۶۴

## Editorial

### Ocular Surface Damage by Medication — Current Opinion

Ocular manifestations caused by the side effects of topical ophthalmic medications are often responsible for substantial discomfort to the patients, leading to discontinuation of topical treatment or unnecessary addition of adjuvant therapy, which may further aggravate the signs and symptoms.

It has been clinically proved that the topical treatment for ocular disorders can trigger a pathogenetic mechanism in predisposed patients, resulting in specific sign and symptoms with local activation of immune cells responsible for ocular surface damage, which may be the hallmark of mild to severe **Red Eye**. The detrimental effects may be solely related to eye drops with or without preservatives as clinically observed *in vitro* or *in vivo*. In fact there is a thin line between the therapeutic and toxic effects of topical therapies. It has long been hypothesized, that the preservatives used in the eye drops are responsible for deleterious effects rather than unpreserved drops. But it is now established that both kinds of eye drops can effect the ocular surface and induce alteration in the tear film.

The clinical picture of ocular surface toxicity is often variable or may be overlapping with each other causing mild to severe lid edema, blephritis, conjunctival secretions, sub-conjunctival fibrosis, superficial punctate keratitis, corneal ulcer and corneal limbal stem cell deficiency. There is hardly any specific laboratory test to evaluate correct diagnosis through identification of exact pathogenetic mechanism resulting in an increase in the number of inflammatory – mediated cells and inflammatory mediators i.e. interleukins in the conjunctiva are constantly found as well as histological changes in the corneal and conjunctival epithelium with squamous metaplasia and goblet cells alteration ranging from loss to hyperplasia. However, these findings are common to both allergy and dry eye-like reactions or direct epithelial damage caused by chronic or cumulative use of ophthalmic compounds. It is postulated that the pathogenetic process is primarily mediated by three different mechanisms:

1. Allergic reaction induced by hypersensitivities to preservatives or ophthalmic compounds.
2. Dry eye-like reaction induced by alteration of tear film.
3. Direct epithelial damage caused by a chronic or cumulative use of topical medication.

The most frequent clinical picture of ocular surface damage is an allergic reaction to preservatives or drugs contained in ophthalmic preparations. Now the sensitizing time may take minutes, hours and days to manifest. It is generally characterized by conjunctival vascular congestion, chemosis, lid edema, eczema of surrounding skin, tearing, photophobia and intense itching caused by IgE mediated (type-1 hypersensitivity) or by a delayed type (type-1V hypersensitivity). However, a careful evaluation of clinical history is mandatory prior to proper diagnosis.

We take the example of itching, conjunctival hyperemia or chemosis as the typical sign and symptoms of allergic reaction due to preservatives, but a similar response may also be elicited by hypersensitivity to chemical compounds itself. The clinical studies have also observed even different anti-allergic eye drops have different toxic effects on ocular surface. For instance, Ketotifen and Olopatidine most commonly used in our daily practice can affect epithelial cell viability *in vitro*. They also contain BAK Benzalkonium chloride, a preservative used in anti-glaucoma eye drops, may be responsible for dry eye-like symptoms of discomfort, visual disturbance, tear film instability with potential damage to ocular surface especially in elderly patients, who are at a greater risk of developing dry eyes. A typical example when these patients are undergoing poly-therapy to lower the IOP. It results in dramatic increase in dry eyes up to 78 %, even seen in younger patients. It also leads to reduction of Mucin from the goblet cells, a gel forming product, thereby reducing the lubrication of ocular surface leading to epithelial damage.

In fact, any alteration in the distribution of mucin



will affect glycosylation of dry eye which may result in damage to the surface epithelium. In this perspective it is evident how chronic therapies with BAK preservative can be detrimental to ocular surface. BAK has resulted in higher TNF- $\alpha$  expression and increased inflammatory infiltrates in the cornea of experimental animals. A recently published meta-analysis from controlled clinical trials comparing the incidence of punctate keratitis amongst 1694 patients using BAK indicate that it does not produce significant corneal toxicity if used in mono-therapy treatment, which gives an added advantage of increased permeability to drug especially in glaucoma therapy. Hence the non-preserved single unit close-vial dose limits the number of instillations thereby improving the quality of life.

Moreover, ocular surface continually offers a protective mucosal barrier to prevent damage to corneal and conjunctival epithelia. Prolonged topical therapy, dry eyes and ocular surface hypersensitivity can disrupt this mucosal barrier. Argueso et al has recently evidenced that ocular surface being far more complex in the sense that the mucin interact with carbohydrate binding proteins and a molecule of Galectin-3 to provide a further layer of protection to surface epithelium, is still harder to break. The Collaborative Initial Glaucoma Treatment Study have shown that 75% of the patients are using 2 or more drugs within 2 years of initial glaucoma treatment, have substantial disruption of epithelial barrier, resulting in significant reduction of live corneal and conjunctival epithelial cells. This pro-apoptotic effect appears to be related to increased concentration of both preservative and drugs used topically. All this aims to develop new strategies which requires lowering number of instillations to mono-therapy.

**Conclusion:** Chronic topical therapy may induce ocular surface damage through three interconnected pathways i.e., allergic reaction, dry eye-like reaction and direct epithelial damage through epithelial barrier disruption. However preservatives and various ophthalmic compounds remain the main players and detrimental factor of inflammatory cascade triggered at ocular surface, through cumulative effect related to dosage and duration of topical therapies. Hence development of preservative free topical medication will be a significant step to avoid surface damage. On the contrary, the use of preservative eye drops (*a priori*) need not to be banned altogether but can be used as a mono-therapy. However a clear understanding of the exact pathogenetic mechanism induced by ophthalmic compounds can lead to a better management of the patient in need of poly-therapy or who have already presented an ocular surface reaction to topical therapy.

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Ghayoor

## To assess the effect of Intravitreal Bevacizumab (Avastin) in the Treatment of Macular Edema Secondary to Retinal Vein Occlusion.\*

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Munira Shakir, FCPS, FRCS<sup>4</sup>, Shakir Zafar FCPS<sup>5</sup>, Muhammad Abdullah Khan FCPS<sup>6</sup>

### ABSTRACT:

**Objective:** To assess the role of intravitreal injection bevacizumab (Avastin) in the management of macular edema in Retinal Vein Occlusion.

**Study Design:** Quasi-experimental clinical study.

**Materials and Methods:** This study was carried out in the Department of Ophthalmology, Liaquat National Hospital, Karachi from 1<sup>st</sup> August 2008 to 31<sup>st</sup> July 2009. The study included 30 patients of macular edema secondary to retinal vein occlusion among which 8 (26.6%) had central retinal vein occlusion and 22 (73.33%) had branch retinal vein occlusion. Complete medical and ophthalmic history was taken. Best corrected visual acuity was checked. Slit lamp examination of the anterior segment was done. Posterior segment examination was carried out with a 90 D lens. Fundus fluorescein angiography was performed to observe leakage and to ascertain the limits of macular edema. Optical coherence tomography was done to record macular thickness.

**Results:** Out of 30 patients, 8 (26.66%) patients had central retinal vein occlusion and 22 (73.33%) had branch retinal vein occlusion. Patients received mean 2.8 injections. There was no significant improvement in best corrected visual acuity at 1<sup>st</sup> week ( $p=0.913$ ). Significant improvement in best corrected visual acuity was observed at 6<sup>th</sup> week ( $p=0.013$ ) of follow up. At 3<sup>rd</sup> month 50% had improved best corrected visual acuity ( $p=0.015$ ) and at 6<sup>th</sup> month more than 60% showed improvement in best corrected visual acuity ( $p=0.028$ ). Similarly 70% patients had complete resolution of macular edema, whereas 30% did not have complete resolution of macular edema ( $p=0.0001$ ).

**Conclusion:** Intravitreal injection of bevacizumab appears to be a safe and effective therapy in the treatment of macular edema secondary to central retinal vein occlusion.

**Keywords:** Central retinal vein occlusion, macular edema, intravitreal bevacizumab

### INTRODUCTION:

Retinal vein occlusion is the most common retinal vascular disease after diabetic retinopathy, its 10-year cumulative incidence being 1.6%<sup>1</sup>. Although the pathogenesis is still not fully understood, several risk factors have been associated with retinal vein occlusion, including advanced age, diabetes mellitus, atherosclerotic retinal vessel changes, hypertension and open angle glaucoma<sup>2</sup>. Vision loss may result from ischemic damage and/or secondary to macular dysfunction<sup>3</sup>. This is due to persistent macular edema, non-perfusion of the para-foveal capillaries and damage to the retinal pigment epithelium, attributable to extensive macular haemorrhage<sup>4</sup>. Macular edema after central retinal vein occlusion is due to disruption of the inner blood-retinal barrier and is less likely to resolve

spontaneously<sup>5</sup>. Retinal artery and vein share a common adventitious sheath so atherosclerotic changes of the artery may compress the vein and precipitate central retinal vein occlusion<sup>6</sup>. Branch retinal vein occlusion is several times more common than central retinal vein occlusion<sup>7</sup>. The most common sequelae of branch retinal vein occlusion is the development of clinically significant macular edema with a consecutive deterioration in vision. The major stimulation for the formation of macular edema and neovascularization in patients with retinal vein occlusion seems to be hypoxia-induced production of vascular endothelial growth factor (VEGF), an angiogenic factor that promotes angiogenesis and increases vascular permeability<sup>8</sup>. There is no proven gold standard therapy for macular edema associated with central retinal vein occlusion<sup>9</sup>. The only proven treatment method for eyes with macular edema secondary to branch retinal vein occlusion is macular grid photocoagulation<sup>10</sup>. The Branch Retinal Vein Occlusion Study (BVOS) recommended grid pattern laser photocoagulation for selected branch retinal vein occlusion. However, this treatment strategy is not recommended for central retinal vein occlusion. Intravitreal injections of corticosteroids have been increasingly used, but the treatment success is limited

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by ocular complications and rebound macular edema. Several surgical techniques are still controversial and have not yet been sufficiently supported by randomized clinical trials<sup>11</sup>. One possible strategy for treatment is to inhibit vascular endothelial growth factor by competitively binding it to specific neutralizing anti-VEGF antibody<sup>4</sup>. These include agents like bevacizumab (Avastin). Others are pegaptanib (Macugen) and ranibizumab (Lucentis). Avastin is a full-length humanized monoclonal antibody against VEGF. It binds and inhibits all the biologically active forms of VEGF<sup>12</sup>. Avastin is used for colorectal cancer therapy<sup>13</sup>. Intravitreal bevacizumab in humans has been previously described on an anecdotal basis for the treatment of central retinal vein occlusion and age-related macular degeneration<sup>14</sup>. Michels and associates showed that two or three infusions of intravenous bevacizumab at a dose of 5mg/kg every two weeks decreases central retinal thickness and improved vision<sup>4</sup>. In this study, we evaluated the response after intravitreal injection of 1.25 mg/ 0.05 ml of bevacizumab. The rationale of conducting this study was that although local studies are available regarding new trends in the management of macular edema in diabetic maculopathy and age-related macular degeneration, there are no local studies available to assess the role of bevacizumab in the management of retinal vein occlusion.

**Approved Indications of Bevacizumab:** Bevacizumab was approved as a treatment for cancer on 26<sup>th</sup> February 2004. It was the first drug accepted by the US FDA for the inhibition of angiogenesis in tumors by preventing metastasis forming new blood vessels; bevacizumab can prolong life when given in combination with cytostatic drugs. Bevacizumab is indicated as a first or second line treatment of patients with metastatic carcinoma of rectum and colon. Other indications include the locally advanced recurrent and metastatic non-squamous non-small cell lung cancer and human epidermal growth factor receptor-2 (HER-2)-negative breast cancer<sup>15</sup>.

**Off-label use of Bevacizumab:** Bevacizumab was initially studied for the treatment of exudative age-related macular degeneration (AMD) with intravenous delivery with promising results<sup>16</sup>. The success of anti-VEGF drugs can partly be explained by their anti-angiogenesis capabilities and partly by their anti-exudative effect, which depends on rapid sealing of endothelial cells and inter-cellular contacts. In addition, a reduction in perivascular leakage it can block the activity of choroidal neovascularization (CNV) lesion by reducing the influence of extracellular pro-inflammatory cytokines and the pro-angiogenic milieu<sup>15</sup>.

#### **MATERIALS AND METHODS:**

This study was conducted at the out-patient

department of Liaquat National hospital, Karachi from 1<sup>st</sup> August 2008 to 31<sup>st</sup> July 2009. Thirty patients were included in the study with age ranging from 45 to 75 years, with macular edema either due to central retinal vein occlusion or branch retinal vein occlusion, with no gender predilection. Those patients having previous history of pars plana vitrectomy, intraocular bevacizumab, active ocular infection, bleeding disorders were excluded from this study. Informed consent was taken from all the patients. A performa was used to record history and examination. Systemic history included history of hypertension, diabetes mellitus, malignancies, collagen vascular disorders and cigarette smoking. Ocular history included history of glaucoma, previous history of any treatment taken and previous history of intraocular surgery. Systemic examination included recording of blood pressure, cardiovascular examination and examination of peripheral pulses with special emphasis on carotid artery pulsation. Ocular examination included visual acuity (uncorrected and best corrected visual acuity), Amsler grid, photo-stress test, pupillary reflex test, anterior segment examination by slit lamp biomicroscopy, intraocular pressure by applanation tonometer and dilated fundus examination with 90D lens. Investigations included fundus fluorescein angiography and optical coherence tomography.

**Procedure Technique:** Intravitreal bevacizumab injection was injected after topical anesthesia under sterile conditions. Bevacizumab 1.25 mg/0.05 ml was injected 3.5 to 4 mm posterior to the limbus through infero-temporal pars plana with a 27 G needle. Patients were followed on first post-procedure day, 1<sup>st</sup> week, 6<sup>th</sup> week, 3<sup>rd</sup> month, 6<sup>th</sup> month to see improvement in visual acuity and macular edema clinically. Fundus fluorescein angiography was done pre-procedure and post-procedure on 6<sup>th</sup> week, and 6<sup>th</sup> month and where required after 3<sup>rd</sup> month. Re-injection of bevacizumab was considered depending on the individual response by decrease in macular thickness clinically and through fundus fluorescein angiography and/or optical coherence tomography as well as improvement in best-corrected visual acuity.

#### **RESULTS:**

A total of 30 consecutive patients with macular edema associated with central retinal vein occlusion and branch retinal vein occlusion were treated by injection of bevacizumab (Avastin) were included in this study. The average age of the patients was  $67.03 \pm 7.73$  years (95% CI:64.15-69.92). Out of the thirty patients, 21 (70%) patients were male and 9 (30%) were female with 2.3:1 male to female ratio. Right eye was affected in 16 (53.3%) patients while the left eye was affected in 14 (46.7%) patients. Central retinal vein occlusion was observed in



8 (26.7%) out of 30 patients and branch retinal vein occlusion was observed in 22 (73.3%) patients. Branch retinal vein occlusion was, therefore, more common than central retinal vein occlusion. Most common type of branch retinal vein occlusion was supero-temporal 14 (63.64%) out of 22 cases, followed by infero-temporal 7 (31.82%) out of 22 cases and macular branch vein occlusion was observed in 1 (4.55%) out of 22 cases. Similarly non-ischemic central retinal vein occlusion was observed in 6 (75%) out of 8 cases and ischemic central retinal vein occlusion in 2 (25%) out of 8 cases.

Pre- and post operative follow up best corrected visual acuity is shown in table 1. Pre-operatively 4 (13.3%) out of 30 patients had visual acuity 6/18, 4 (13.3%) out of 30 had visual acuity 6/24, 6 (20%) out of 30 had visual acuity 6/36, 6 (20%) out of 30 had visual acuity 6/60 and 10 (33.4%) out of 30 had visual acuity <6/60. None of the patients had visual acuity better than 6/12. There was no significant improvement in visual acuity at 1<sup>st</sup> week of follow up ( $p=0.913$ ), while at 6<sup>th</sup> week significant improvement was observed ( $p=0.013$ ) in best corrected visual acuity compared to the pre-treatment visual acuity. At 3<sup>rd</sup> month of follow up, 4 (13.3%) out of 30 had visual acuity 6/9, 4 (13.3%) out of 30 had visual acuity 6/12 and 5 (16.7%) out of 30 had visual acuity 6/18, while at 6<sup>th</sup> month of follow up 1 (3.3%) patient had visual acuity 6/6, 5 (16.7%) patients had visual acuity 6/9 and 5 (16.7%) patients had visual acuity 6/12.

At 3<sup>rd</sup> month 50% patients had improved visual acuity and at 6<sup>th</sup> month >60% patients had improved

visual acuity. Improvement of visual acuity was, therefore, seen progressively from 6<sup>th</sup> week onwards since there was significant improvement in visual acuity observed at the 3<sup>rd</sup> month of follow up ( $p=0.015$ ) and at 6<sup>th</sup> month of follow up ( $p=0.028$ ). The patients received a mean of 2.8 injections. 80% patients were re-injected three times while 20% patients were re-injected two times. Among the 30 patients, 21 (70%) had complete resolution of macular edema whereas, 9 (30%) patients did not show complete resolution. Significant reduction in macular edema was observed at 6<sup>th</sup> month after treatment ( $p=0.0001$ ). In 2 (6.66%) out of 30 patients, visual acuity remained the same despite progressive decrease in hemorrhage, exudation and edema.

#### DISCUSSION:

Central retinal vein occlusion (CRVO) and branch retinal vein occlusion (BRVO) are common vascular retinal disorders. Loss of visual function due to CRVO or BRVO is mainly caused by macular edema (ME)<sup>17</sup>. In retinal vein occlusion, increased intravascular pressure and reduced blood flow in the macular capillaries leads to dysfunction of the endothelial blood retinal barrier and to increased vascular permeability, resulting in macular edema<sup>18</sup>. Efforts are required to reduce macular edema as soon as possible as irreversible damage of the photo-receptors occurs as early as three months after the development of macular edema<sup>19</sup>. Treatment options include grid laser treatment, intravitreal injection of steroids, surgical procedures and most recently, off-label treatment with intravitreal anti-vascular endothelial growth factor agents<sup>20</sup>.

TABLE 1: shows pre and post-operative best corrected visual acuity (BCVA) for distance

BCVA	Pre Operative		Post Operative Follow-Up		
		1 <sup>st</sup> Week	6 <sup>th</sup> Week	3 <sup>rd</sup> Month	6 <sup>th</sup> Month
<6/60	10(33.4%)	8(26.7%)	7(23.3%)	3(10%)	2(6.7%)
6/60	6(20%)	6(20%)	3(10%)	5(16.7%)	5(16.7%)
6/36	6(20%)	6(20%)	5(16.7%)	4(13.3%)	4(13.3%)
6/24	4(13.3%)	4(13.3%)	5(16.7%)	5(16.7%)	2(6.7%)
6/18	4(13.3%)	3(10%)	4(13.3%)	5(16.7%)	6(20%)
6/12	-	3(10%)	4(13.3%)	4(13.3%)	5(16.7%)
6/9	-	-	2(6.7%)	4(13.3%)	5(16.7%)
6/6	-	-	-	-	1(3.3%)

BCVA = BEST CORRECTED VISUAL ACUITY FOR DISTANCE

#### Wilcoxon Signed Ranks Test

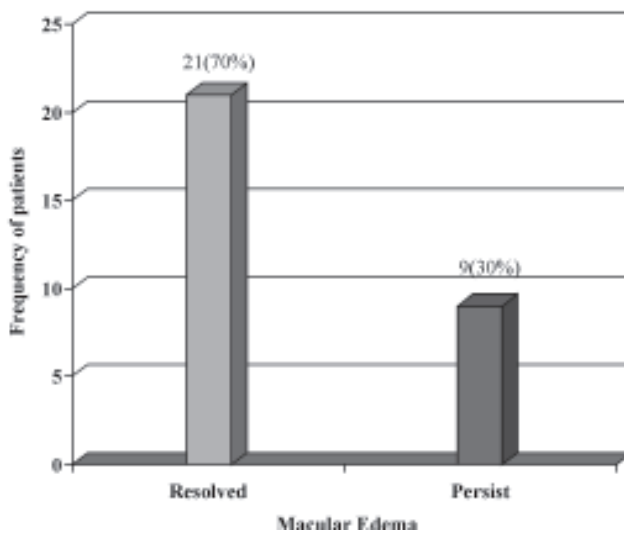
(Pre Operative vs. 1weeks;  $p=0.913$ )

(Pre Operative vs. 6<sup>th</sup> weeks;  $p=0.013^*$ )

(Pre Operative vs. 3<sup>rd</sup> Month;  $p=0.015^*$ )

(Pre Operative vs. 6<sup>th</sup> months;  $p=0.028^*$ )

Figure 1: Macular Edema after injection



Intravitreal injection of bevacizumab in macular edema due to retinal vein occlusion has been used as an effective option for improving visual acuity and reducing macular edema. There are many international studies showing its beneficial effect but so far no such local data

is available for its use in our community.

In one study 6 eyes of 5 consecutive patients with CRVO treated with intravitreal bevacizumab injection were reviewed retrospectively. The patients did not have other ocular conditions that could have compromised visual acuity. The mean baseline visual acuity was 20/428 (logMAR units, 1.33). The mean follow up period was 12 months and the number of bevacizumab injections ranged from 4 to 10. The patients showed a statistically significant decrease in optic nerve head swelling, venous tortuosity, and venous diameter, with the largest proportion of change occurring within one month of the first bevacizumab injection. The mean visual acuity at the last followup was 20/53 (logMAR units 0.42;  $P=0.035$ , as compared with the baseline)<sup>21</sup>.

In a study the response to a single bevacizumab treatment in 21 RVO was studied prospectively. Mean VA from all 21 patients increased by more than 2 lines ( $2.4 \pm 0.4$  lines;  $p < 0.01$  compared to the baseline). The improvement of VA after bevacizumab injection was concordant with a decrease in central retinal thickness. Peak VA was reached between 3 and 9 weeks after injection. Between week 6 and 9 a decrease in visual acuity was observed. This VA decrease was precipitated

Figure 2: Coloured and red-free photo of a patient with central vein occlusion (CRVO)

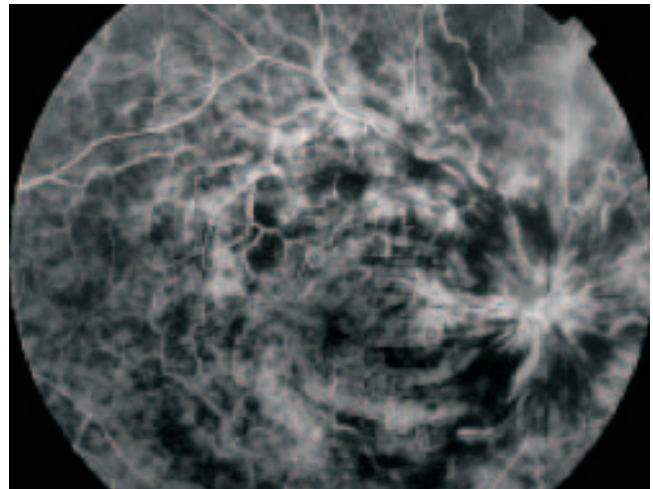
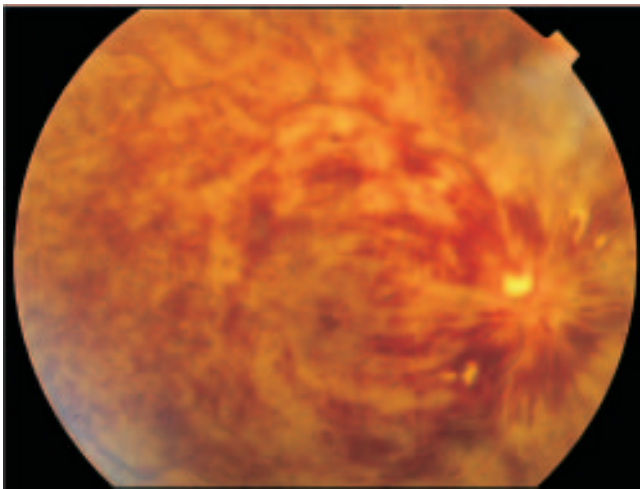


Figure 3: Optical coherence tomography image of the same patient with CRVO. It shows the retinal thickness before and after the injection bevacizumab (Avastin) was injected.

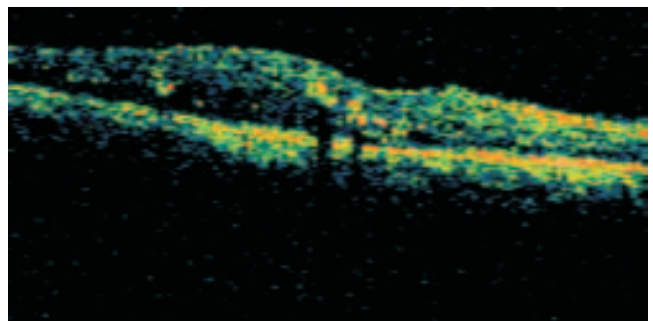
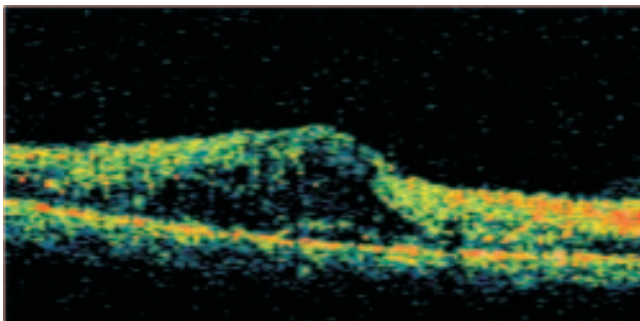


Figure 4: Coloured and red-free filter photographs of a patient with branch retinal vein occlusion (BRVO).

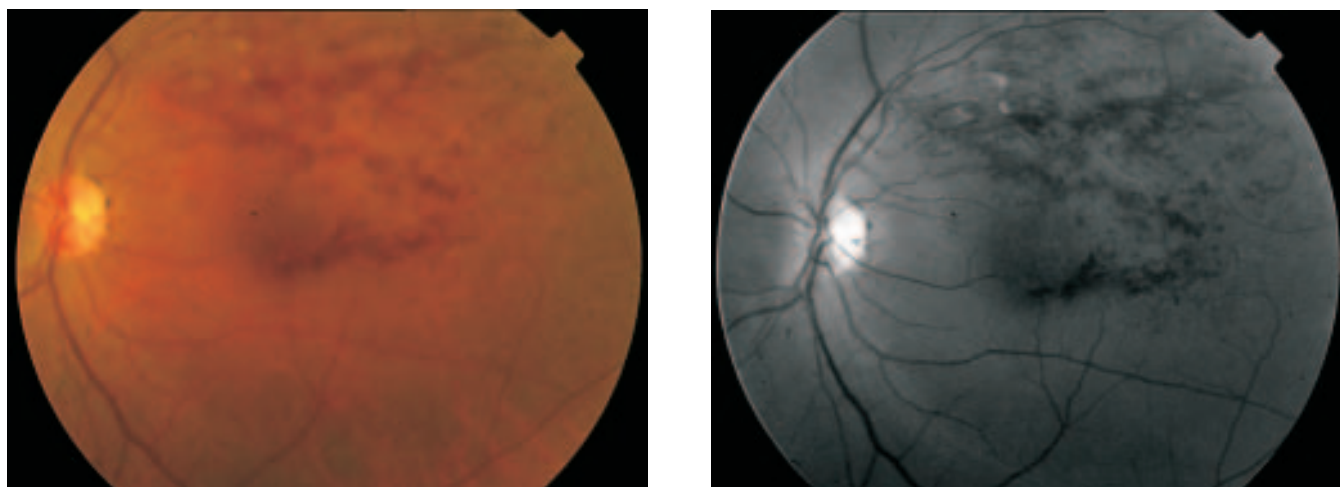
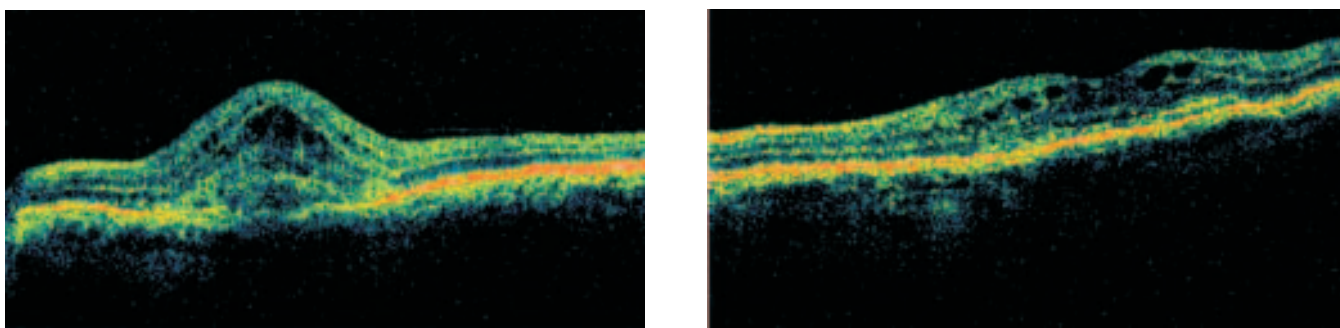


Figure 5: Optical coherence tomography image of the same patient with BRVO. It shows the retinal thickness before and after the injection bevacizumab (Avastin) was injected.



by an increase in CME between week 3 and 6. In subgroup analysis, patients receiving bevacizumab injection within the first 3 months after RVO showed an average VA gain of 4 lines (range 2-7 lines) compared to an average gain of 1.8 (range 1-3) and 2.5 (range 1-7) in patients receiving bevacizumab between 4-6 months and after more than 6 months, respectively<sup>19</sup>.

In another study sixty-one patients with a minimum followup of 25 weeks were included. Mean follow up was  $60 \pm 29$  weeks. In CRVO patients, central retinal thickness (CRT) decrease from  $748 \pm 265 \mu\text{m}$  to  $372 \pm 224 \mu\text{m}$  ( $p < 0.001$ ) and visual acuity improved by  $1.9 \pm 3.2$  lines. In BRVO patients, mean CRT decrease from  $601 \pm 206 \mu\text{m}$  to  $386 \pm 178 \mu\text{m}$  ( $p < 0.001$ ) and VA improved by  $1.8 \pm 2.6$  lines. 33% of CRVO and 15% of BRVO patients did not show a macular edema recurrence for  $\geq 25$  weeks at the last visit. 37% of the CRVO and 50% of BRVO patients suffered recurrences of macular edema within the last 25 weeks, whereas 30% of CRVO and 35% of BRVO patients did not achieve a complete resolution of macular edema at any followup visit after receiving a minimum of three injections. CRVO patients with dry

interval of  $\geq 25$  weeks at the last visit were significantly younger, had a thinner CRT at baseline and more often had complete resolution of macular edema after the first injection. In CRVO and BRVO, final visual acuity was correlated significantly with initial VA, patient's age and final CRT. Change of VA was correlated with change of CRT in BRVO<sup>20</sup>.

A retrospective analysis was performed in 32 consecutive eyes from 32 patients. Within 6 weeks after injection of bevacizumab, BCVA and CRT were determined. The mean follow up interval was  $30 \pm 11$  days. BCVA was  $0.68 \pm 0.3$  and  $0.5 \pm 0.35$  logMAR, before and after injection respectively ( $p < 0.01$ ). CRT decreases from  $454 \pm 117 \mu\text{m}$  to  $305 \pm 129 \mu\text{m}$  ( $p < 0.01$ ). 41% of all injected eyes showed as visual improvement of at least 2 lines after injection. BCVA remained unchanged in 53% and decreased by  $\geq 2$  lines in 6%. Repeated injections were performed if macular edema recurred after an initial decrease. 53% of all patients had only one injection at the time of analysis, 28% had two and 18% more than two. A mean of 1.7 injections were made per patient with an interval between injections of 92 days, range 42-306



days. Treatment was stalled when vision and CRT reached steady state, i.e. did not deteriorate more than one line (corresponding to maximally 0.3 logMAR units) and/or retina did not thicken more than 10% compared to the measures obtained six weeks after the last bevacizumab injection<sup>22</sup>.

In one study a total of 10 eyes of 10 patients with macular edema due to CRVO were studied before and after intravitreal use of bevacizumab. Before treatment visual acuity ranged from 0.05 to 0.3 logMAR and the mean visual acuity was 0.115 (SD=0.1). One month after treatment the visual acuity ranged from 0.05 to 0.5 logMAR and the mean visual acuity improved to 0.205 (SD=0.1). About three months after treatment BCVA ranged from 0.05 to 0.3 logMAR and the mean visual acuity was 0.165 (SD=0.1). No statistical significance was shown between the measurements of visual acuity at 1 and 3 months and the initial ones, either on Snellen values or logMAR equivalent. The foveal thickness measured by OCT at presentation ranged from 329 to 987  $\mu\text{m}$  with mean value of 642  $\mu\text{m}$  (SD=236.3). One month after treatment it ranged from 254 to 625  $\mu\text{m}$ , with mean value 365  $\mu\text{m}$  (SD=120). This value is 43.7% lower than before treatment ( $p<0.001$ ). Three months after injection the mean foveal thickness was 367  $\mu\text{m}$  (SD=128.2), 36.5% lower than before treatment ( $p<0.001$ )<sup>5</sup>.

In another study, fifty eyes of fifty consecutive patients treated with intravitreal bevacizumab for macular edema due to BRVO with minimum followup of 3 months were retrospectively reviewed. Patients were categorized into two groups according to the final visual acuity. Group 1 consisted of eyes with five or more ETDRS letters gain, and group 2 consisted of eyes with less than five letters improvement or which worsened at last followup visit. Comparative clinical and fluorescein angiographic characteristics were analyzed between the two groups. The baseline ETDRS score (mean  $\pm$ SD) in group 1 was 14.96  $\pm$ 13.30 (20/125) in group 1 and 9.95  $\pm$ 11.83 (20/160) in group 2 ( $p=0.172$ ) whereas the central macular thickness was 582.9  $\pm$ 149.2  $\mu\text{m}$  in group 1, and 591  $\pm$ 185.2  $\mu\text{m}$  in group 2. Within each treatment group, pair-wise comparisons revealed significant improvement in ETDRS score whereas there was a significant VA change at post-treatment 1 month only in group 2. There was significant reduction in central macular thickness at every follow up visit in both treatment groups ( $p<0.002$ ). Between group comparison revealed a significant difference in changes in ETDRS score from the baseline at every followup visit after treatment ( $p<0.001$  for all time points), but there was no significant difference in changes in central macular thickness from the baseline at any time point ( $p>0.05$ )<sup>23</sup>.

The present study with 30 patients with RVO

evaluated the course of visual acuity and macular edema after intravitreal bevacizumab. In this study the mean age of patients was 67.03 $\pm$ 7.73 years with male to female ratio of 2.3:1. Other studies have shown age ranging from 63-70 years (1-5). BRVO was observed in 73.3% and CRVO in 26.7% of patients, which is supported by literature as well<sup>24</sup>. Superotemporal BRVO occurred in 63.64%, inferotemporal in 31.82% and macular branch in 4.55% of patients. Sadaf et al. have also demonstrated that up to two-third of BRVO occur in the superotemporal quadrant and one-third develop inferotemporally<sup>24</sup>. Non-ischemic CRVO was observed in 75% and ischemic CRVO in 25%. The present data suggested that the rapid beneficial effects of Bevacizumab lasted for several months, although individual patients require repeated injections which is in accordance with other studies<sup>5,20</sup>. The findings are in agreement with published case-series showing that bevacizumab treatment leads to improved visual function and decrease in macular edema in patients suffering from BRVO<sup>4,19</sup>. Two large case-series<sup>25</sup> also came to the similar conclusion that repeated applications of bevacizumab are necessary for long lasting results on visual acuity and CRT. However, there is a great variability in injection frequencies, follow up time and treatment interval. Several authors have described the close relationship between the CRT and VA in CRVO and BRVO with simultaneous improving or worsening of retinal thickness and VA during injection therapy with bevacizumab<sup>20</sup>. The results of this support these findings by demonstrating a correlation between final VA and final CRT in CRVO and BRVO. There was significant improvement in VA at 6th week ( $p=0.013$ ), 3rd month ( $p=0.015$ ) and 6th month ( $p=0.028$ ) of follow up (table 1). Macular edema also showed significant improvement, with resolution in 70 % of patients ( $p=0.0001$ ), figure 1. Not all patients benefit equally from treatment with bevacizumab. Some patients show long-standing improvement after a certain number of injections, others suffer regular recurrences of macular edema or fail to show significant improvement. Few authors report on the number of patients who did not respond well to treatment. Chung et al retrospectively analysed 50 patients with BRVO treated with 1.25 mg bevacizumab. 44% of these patients did not show a significant VA improvement, although macular edema had significantly decreased at the last visit<sup>23</sup>. Pai et al reported no improvement in visual acuity in 23.8% of patients with retinal vein occlusion, although a reduction of macular edema was achieved after a single injection with 1.25 mg bevacizumab<sup>4</sup>. In the current study, 6.6% of patients did not show improvement in VA despite reduction in macular edema.

#### CONCLUSION:

In conclusion the findings of this study suggest

that intravitreal bevacizumab injection can reduce macular edema and improve visual acuity. Long-term followup is needed to show maintenance of beneficial effects obtained. The study further implicated that not all patients respond equally well to intravitreal bevacizumab therapy. Detailed evaluation for possible long term adverse effects of anti-vascular endothelial growth factor agents is essential even if previous studies showed no evidence of any toxicity of bevacizumab in the dosage used for ophthalmological purpose. Since currently used therapies for retinal vein occlusions have achieved only limited success and implicate complications, anti-VEGF therapy obviously seems to be a novel, innovative approach, which should be further evaluated in large, prospective, controlled clinical studies.

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## Radial Optic Neurotomy (RON) in cases of Central Retinal Vein Occlusion (CRVO).\*

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### ABSTRACT:

**Objective:** To determine the role of Radial Optic Neurotomy in cases of Central Retinal Vein Occlusion with visual acuity < 6/60.

**Study Design:** Intervention case series.

**Material and Methods:** This interventional case study was carried out in LRBT Free Base Eye Hospital during the period of January 2009 to December 2010. The study included 11 patients, out of which 6 were male, and 5 were females with vision acuity <6/60. Pre operative assessment includes base line visual acuity, intraocular pressure, fundus photography, fundus fluorescein angiography. Pars plana vitrectomy was performed; a CRVO knife (Synergetics™ Inc) was used to incise the sclera ring, cribriform plate and adjacent sclera at the nasal edge of the optic disc. Patients were followed on 1<sup>st</sup> post-operative day, and then at 1, 3, 6 and 12 month interval.

**Results:** Out of 11 patients, 7 (63.63%) patients had visual improvement by e" 3 lines, 3 (27.27%) patients had unchanged visual status, 1 (9.09%) had further deterioration in vision and developed neovascular glaucoma.

**Conclusion:** In view of the above findings, the study establishes RON as a low-risk alternative therapy, but a randomized study with a larger number of patients is necessary to establish the factors important for developing collateral circulation that allows for blood drainage beyond the occluded vessel.

**Key Words:** Radial optic neurotomy, central retinal vein occlusion, surgical decompression.

### INTRODUCTION:

Retinal vein occlusion (RVO) is the second most common retinal vascular disorder.<sup>1</sup> Central retinal vein occlusion (CRVO) is the third most common blinding vascular retinal disorder<sup>1</sup> after diabetic retinopathy and branch retinal vein occlusion. Among patients with central retinal vein occlusion, 34% develop capillary non perfusion and retinal ischemia. Iris neovascularization and neovascular glaucoma may occur in 45% to 85% of the eyes affected by ischemic central retinal vein occlusion and only in 5% of the non-ischemic eyes.<sup>2</sup> The main known risk factors of central retinal vein occlusion are hypertension and open angle glaucoma.<sup>2</sup>

The pathogenesis of central retinal vein occlusion is not yet very well understood. It is thought to be a compartment syndrome, since in a 1.5 mm diameter area, the central retinal artery, the central retinal vein, and the optic nerve coexist. Thrombotic occlusion is thought to develop as the result of an increase in the arterial

diameter, changes in the scleral ring, and the presence of anatomical anomalies and possible systemic factors, which together cause a decrease in the venous lumen, increased turbulence, and damage to endothelium and thrombus formation. This is supported by histological studies that localize the thrombus in the lamina cribrosa in most or all cases.<sup>3</sup>

In 1978, a neurologist proposed the theory of neurovascular compression at the optic nerve head in the pathogenesis of anterior ischemic optic neuropathy and suggested an external approach for relaxation of the optic nerve head for the treatment of this condition. This approach was technically difficult and therefore abandoned very soon. In 2001, Opremcak<sup>4</sup> reconsidered the same theory and suggested that the anatomy of the optic nerve head plays an important role in the pathogenesis of central retinal vein occlusion which may be also considered a "sclera outlet compartment syndrome".

Optic neurotomy has been the focus of attention by many vitreoretinal surgeons. Relieving the presumed "compartment syndrome" at the sclera outlet may improve venous outflow in an eye with central retinal vein occlusion thereby decreasing congestive macular edema and improving visual acuity.<sup>5</sup> The goal of this study to determine the visual results of patients with central retinal vein occlusion, treated with radial optic neurotomy.

### MATERIAL AND METHODS:

This interventional case study was carried out in

\*The subject was approved by the Research & Ethical Committee and allowed to be conducted at LRBT Free Base Eye Hospital.

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LRBT Free Base Eye Hospital during the period of January 2009 to December 2010. The study included 11 patients, out of which 6 (54.54%) were male, and 5 (45.45%) were females with age ranging between 35 to 65 years. All were diagnosed with central retinal vein occlusion (within two months from onset) and underwent radial optic neurotomy. **Inclusion criteria** included the presence of relative afferent pupillary defect (RAPD), visual acuity of  $< 6/60$  or worse (caused by macular edema and haemorrhages secondary to central retinal vein occlusion). **Exclusion criteria** included eyes with visual acuity  $\geq 6/36$ , eyes with retinal neovascularisation, neovascular glaucoma, areas of capillary non perfusion on angiography, history of previous laser photocoagulation and vitreous haemorrhage.

A proforma was used to record complete medical and ophthalmic history including age, gender, laterality, duration, risk factors such as hypertension, diabetes, hyperlipidaemia, open angle glaucoma, and cigarette smoking. Best corrected visual acuity was measured by snellen visual acuity method, swinging flash light was performed in each case to detect the presence of relative afferent pupillary defect, slit lamp examination of the anterior segment of the eye was done with special emphasis on iris neovascularisation, intraocular pressure was noted, gonioscopy was performed to rule out angle neovascularisation, fundus examination with indirect ophthalmoscopy and slit lamp biomicroscopy with 90 D lens were carried out. Fundus photography and fundus fluorescein angiography were performed in each case, and foveal thickness was measured with optical coherence tomography. Patients were followed on 1<sup>st</sup> post operative day, and at 1, 3, 6 and 12 month interval.

**Surgical Procedure:** After informed consent was obtained patients were booked for surgery. All procedures were performed by the same surgeon under operating microscope. Following standard three ports pars planavitreotomy, a posterior hyaloid detachment was created using a vitreous cutter in the aspiration mode. A CRVO knife (Synergetics<sup>tm</sup>inc) was used to perform radial optic neurotomy. The nasal quadrant of the optic disc was chosen in order to avoid the maculopapillary nerve fibres. The incision was fashioned parallel to the nerve fibres, radial to the optic disc, in order to split apart the nerve fibres, rather than to transect them. The tip of the CRVO knife (Synergetics<sup>tm</sup>inc) was placed at the edge of the optic disc, with the blunt end towards the optic disc and taking care to avoid all major branches and tributaries of central retinal vessels. The blade was then gently pushed posteriorly in to the optic nerve up to the mark given on the blade; the depth of penetration was 2.5 mm. The

purpose of such a stab was to make a relaxing incision at the level of the cribiform plate and adjacent to the sclera ring. If bleeding was observed, the infusion bottle was raised to stop the hemorrhage. The sclerotomy sites and conjunctiva were closed in the usual fashion.

#### RESULTS:

The study included 11 patients, out of which 6 (54.54%) were male, and 5 (45.45%) were females with age ranging between 35 to 65 years and diagnosed with central retinal vein occlusion (within two months from onset) and who underwent radial optic neurotomy. Out of 11 patients, 7 (63.63%) patients had improved vision by  $\geq 3$  lines, in 3 (27.27%) patients visual status remain unchanged and 1 (9.09%) patient had further deterioration in vision and developed neovascular glaucoma. Clinically, reduction in macular edema, decreased or resolved intraretinal haemorrhages, resolution of venous dilatation and disc edema was observed in all cases. No per-operative or devastating post-operative complications such as raised intraocular pressure, retinal detachment, and endophthalmitis were encountered in this study.

#### DISCUSSION:

Thrombus formation at the cribiform plate may be a primary or secondary event in central retinal vein occlusion.<sup>6</sup> Although central retinal vein occlusion may be caused by obstruction of the central retinal vein in the area of the lamina cribrosa, it has been proposed that a non-perfused central retinal vein occlusion is the result of compromised blood flow in the central artery and in the vein.<sup>7</sup> The unique anatomy of the outlet of the optic nerve has led to the hypothesis that central retinal vein

**Table 1:** Showing pre and post-operative visual acuity

S/NO	PRE OPERATIVE VISUAL ACUITY	POST OPERATIVE VISUAL ACUITY
1	6/60	6/18
2	C/F 2 feet	6/36
3	C/F 1 feet	6/60
4	C/F 1 feet	6/24
5	C/F 5 feet	6/18
6	6/60	6/18
7	6/60	6/24
8	C/F (5 feet)	C/F (5 feet)
9	C/F (4 feet)	C/F (4 feet)
10	HM	HM
11	C/F (3 feet)	PL +ve

C/F = Counting finger, HM = Hand movement, PL = Perception of light

Figure 1

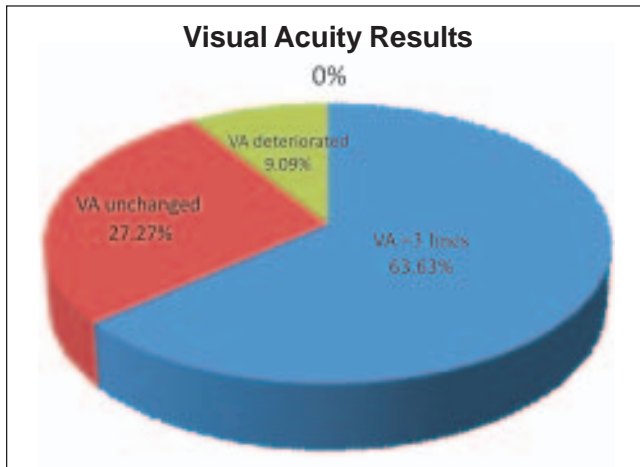


Figure 2

Pre-injection colored fundus photograph and fundus fluorescein angiograph of a patient with central retinal vein occlusion.

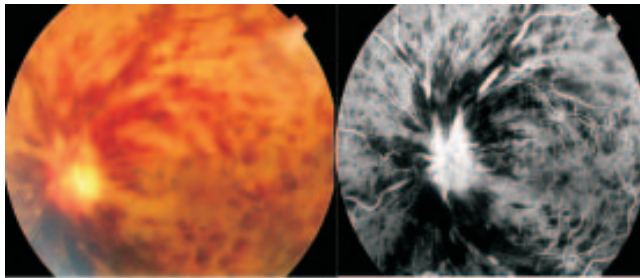
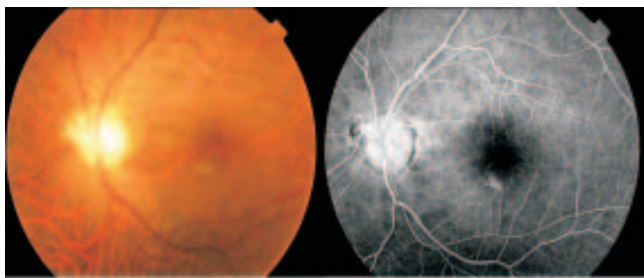


Figure 3

Post-injection colored fundus photograph and fundus fluorescein angiograph of a patient with central retinal vein occlusion at 12 month follow up.



occlusion is due to a 'compartment syndrome' in which the central retinal vein may be compressed, generating turbulence and secondary thrombosis.<sup>4</sup> Hypertension and glaucoma have been associated with central retinal vein occlusion. Histopathologic studies of eyes enucleated for the complications of CRVO have shown a thrombus at the cribriform plate.<sup>3,7</sup>

The Central Retinal Vein Occlusion Study reported the natural history and visual prognosis of CRVO. In 80% of the eyes with initial visual acuity less than 20/200, visual acuity was unchanged or decreased at the final visit. Eyes with intermediate visual acuity of 20/

50 to 20/200 at the initial visit showed only a 19% rate of visual improvement.<sup>8</sup> Panretinal photocoagulation is the preferred treatment for resultant neovascularization of the angle or iris, but it is not performed as a prophylactic measure.<sup>8</sup> Various experimental treatments for CRVO are currently being studied, including laser-induced chorioretinal venous space confined by the scleral ring containing the cribriform plate (lamina cribrosa), the central retinal artery, central retinal vein, and the optic nerve, anastomosis<sup>9</sup>, surgical-induced chorioretinal anastomosis<sup>10</sup>, intravitreal tissue plasminogen activator<sup>11</sup> and intravitreal triamcinolone acetate.<sup>12</sup> Although laser-induced chorioretinal venous anastomosis and surgical-induced chorioretinal anastomosis can improve retinal circulation, they may cause severe complications such as vitreous hemorrhage or choroidal neovascularization.<sup>9,10</sup> Radial optic neurotomy is also an experimental treatment option.<sup>4,13</sup>

According to Opremcak and associates, the purpose of RON is to promote decompression of the central retinal vein in the scleral ring and the lamina cribrosa.<sup>4</sup> If RON can relax venous compression within the sclera outlet, retinal circulation time can be induced after the procedure.<sup>4,14</sup> The scleral outlet is defined as the space confined by the scleral ring containing the cribriform plate (lamina cribrosa), the central retinal artery, central retinal vein, and the optic nerve, and theoretically, release of the pressure via RON would increase the central retinal vein lumen size and thus both increase venous blood outflow and allow for clearing of any venous thrombosis.<sup>4,14</sup>

In the present study 7 out of 11 (63.63%) patients develop adequate retinal perfusion, out of them 4 (57.14%) develop adequate retinal perfusion within two weeks. Among them, 3 out of 4 (75%) had improved vision of >3 lines of snellen chart, and 1 out of 4 (25%) had improved vision up to 3 lines of snellen chart. Remaining 3 out of 7 cases developed adequate retinal perfusion within 6 weeks and they also showed improved vision of up to 3 lines of snellen chart. Fortunato P et al showed improvement in visual acuity and retinal thickness in 10 out of 13 (77%) cases on 1 year follow up.<sup>15</sup> Aruni JG et al showed improvement of visual acuity of 1 line or more of snellen chart in 8 out of 14 (57.1%) patients, while gain in visual acuity of two lines or more was seen in 6 out of 14 (42.9%) patients. They also reported decrease in macular thickness by 282µm.<sup>16</sup> Nagpal M et al documented improvement in visual acuity of up to 3 lines in 83.33% patients, and decrease in foveal thickness of up to 290µm. They were also of the opinion that radial optic neurotomy is a better option than to let the natural course run in eyes with central retinal vein occlusion and with vision < 6/60.<sup>17</sup> Martinez-Jardon CS et al concluded that radial optic



neurotomy in ischemic central retinal vein occlusion did not improve visual function or visual acuity although macular thickness did improve.<sup>18</sup>

#### CONCLUSION:

The results of this study suggested that radial optic neurotomy is a low risk alternative therapy, and retinal perfusion and the improvement of visual acuity were caused not only by the release of central vein compression through the incision at the cribiform plate and the sclera outlet, which increased the venous outflow and retinal circulation, but also by the development of new anastomosis, which allowed the blood to drain. Further studies, including randomized clinical trials, are needed to confirm the effect of RON on anatomic and functional improvement.

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## Prevalence of Dengue Maculopathy in Patients Hospitalized for Dengue Fever\*

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### ABSTRACT:

**Objective:** Dengue fever causes numerous systemic manifestations, including maculopathy, with loss of vision. This study sought to determine the prevalence of dengue maculopathy in patients hospitalized with dengue fever.

**Design:** Cross-sectional observational study in which consecutive patients hospitalized with dengue fever during a dengue epidemic were enrolled over a 3-week period in 2 general hospitals in Singapore.

**Testing:** Patients completed a standardized questionnaire, underwent tests for near and distance visual acuity (VA), Amsler grid testing, dilated retinal examination, serum complements C3 and C4, and urinary microalbumin.

**Results:** 197 patients were enrolled, of whom 119 (60.4%) were male and 78 (39.6%) female. The patients ranged between 12 and 67 years old (mean, 32.65). 160 of 197 patients had positive dengue immunoglobulin-M serology. Dengue maculopathy was detected in 27 eyes of 16 of the seropositive patients, giving a prevalence of 10% (95% confidence interval, 6.03%–15.40%). None of the patients who were dengue immunoglobulin M negative had dengue maculopathy. Dengue maculopathy eyes were more likely to have distance acuity Snellen 6/9 or worse ( $P_{0.005}$ ) and abnormalities on Amsler grid testing ( $P_{0.001}$ ), with a greater proportion of these patients having visual complaints ( $P_{0.002}$ ) and lower mean complement C3 levels ( $P_{0.008}$ ) as compared with patients without maculopathy. Logistic regression analysis showed Amsler grid abnormalities to be the most consistent factor associated with dengue-related maculopathy ( $P_{0.001}$ ).

**Conclusion:** The prevalence of dengue maculopathy among patients hospitalized for dengue fever is 10% in our series. Amsler grid abnormalities, reduced distance VA, and the presence of visual symptoms are associated with dengue maculopathy. Low complement C3 levels in these patients suggest that this is an immune-mediated disease.

### INTRODUCTION

Dengue is a mosquito-borne viral infection, of which there are 4 serotypes *flaviviridae* viruses. It is an endemic affection of tropical and subtropical region due to *Arboviruses*. The disease is transmitted by an infected female mosquito named *Aedes aegypti*, predominantly in urban and semiurban areas. In recent years, it has become a major public health concern.<sup>1–4</sup>

The global prevalence of dengue has increased tremendously in recent decades, being endemic in more than 100 countries, and Southeast Asia is one of the most seriously affected regions in the world. Dengue is also endemic in Singapore, but the number of dengue fever cases has risen dramatically in the last few years.<sup>5</sup> In 2000, the number of cases were 673. This increased every

year, and more than 9400 were infected in 2004.<sup>6</sup> In 2005, the number of reported cases exceeded 11 000 in the first 9 months of the year.<sup>7</sup> In addition, there was a sharp increase in the number of dengue-related deaths, to 19 for the first 11 months of 2005, compared with 8 in 2004.<sup>8</sup> In the United States, dengue is mainly seen in U.S. residents returning from travel to endemic areas. In 2005, 96 travel-associated cases were diagnosed, including one death.<sup>9</sup> Dengue, however, is not a notifiable disease in the U.S.

Dengue is known to cause fever, headaches, and myalgia, as well as thrombocytopenia, resulting in bleeding manifestations. Hypotension may also occur. Dengue shock syndrome carries a high mortality rate. More recently, dengue fever has been found to affect the eyes, with resultant loss of vision.<sup>10–13</sup> This ranged from mild blurring of vision to catastrophic and severe blindness that occurred within 1 month of having dengue fever. Examination of these patients showed evidence of retinal or choroidal vasculopathy with macular swelling, hemorrhages, and yellow spots—thus the term *dengue maculopathy*. Some patients recovered spontaneously to near normal levels of vision, whereas others did not respond to treatment at all.

There are few data on dengue maculopathy in the literature, and its prevalence is unknown. The

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pathogenesis of ocular involvement has not been elucidated yet, although an immune-mediated mechanism has been postulated.<sup>13</sup> We therefore conducted a study to determine the prevalence of dengue maculopathy among patients hospitalized for dengue fever. We also sought to determine whether appropriate tools could be identified for use in screening such patients.

## MATERIALS & METHODS

**Study Design and Study Population:** This was a cross-sectional observational study of a consecutive sample of patients who had been admitted to 2 general hospitals in Singapore with the diagnosis of dengue fever. As the study was conducted during an epidemic in Singapore in 2005, all cases of dengue fever, including those diagnosed only on clinical grounds, were reported.<sup>16</sup> All such patients who consented to the study and fulfilled the inclusion criteria were enrolled in the study. Patients with the following conditions were **excluded**: (1) febrile illness from a cause other than dengue, (2) medical instability, and (3) refusal to give consent or refusal to complete the study questionnaire or ophthalmic examination.

**Sample Size:** All patients who satisfied the inclusion criteria were included in the study. 197 patients were seen in 3 weeks. Enrollment stopped there after as the dengue epidemic had come to an end.

**Data Collection:** Subjects were enrolled on admission after written informed consent was obtained. This usually fell between the sixth and ninth days after the onset of fever. A brief interview addressing the subject's ocular history and presence of ocular symptoms was conducted. All subjects then underwent the following tests: (1) distance visual acuity (VA) using a 3-m Snellen chart, (2) near VA, (3) Amsler grid, (4) pupillary light responses, and (5) dilated retinal examination with the direct and indirect ophthalmoscope. First 3 tests were performed using the patients' usual spectacle correction. All examinations were conducted at the patients' bedside, as they were thrombocytopenic and required bed rest at that time. All these examinations were performed by 2 trained ophthalmologists to confirm the diagnosis. These investigations included fundus photography, automated visual fields, fundal fluorescein angiography, indocyanine green angiography, and optical coherence tomography (OCT).

After examination, blood samples were taken to evaluate complement C3 and C4 levels, and random urine samples were collected for quantification of urinary micro-albumin by immune-turbidimetric method. They were examined 14 days after the onset of fever to confirm the absence of visual abnormalities. Subjects who reported new visual symptoms underwent a repeat

ophthalmic examination to exclude the presence of dengue maculopathy. Subjects were divided into 3 groups: (1) dengue immunoglobulin M (IgM)-positive patients with dengue maculopathy in one or both eyes, (2) dengue IgM-positive subjects without dengue maculopathy, and (3) subjects who were dengue IgM negative and did not have dengue maculopathy.

## PATHO-PHYSIOLOGY:

The patho-physiologic mechanisms responsible for dengue nervous system effects are not completely understood. **Arboviruses** have in common a tropism for small vessels and the central nervous system. Dengue fever serology was positive with a high level of immunoglobulin -M antibodies, signifying recent infection. Serologic tests for toxoplasmosis, syphilis, Lyme disease, West Nile virus, HTLV1-2, HIV1-2, rheumatic diseases (antinuclear antibodies, human leukocyte antigen typing, Latex Waaler Rose), and tuberculosis intradermal test were all negative. Biological investigations (complete blood count, platelet count, C-reactive protein, sedimentation rate, electrolytes, serum protein electrophoresis, lipid tests, urea, creatinine, liver enzymes) were normal. Cerebral magnetic resonance imaging, examination of the upper aortic arch vessels by direct Doppler ultrasonography, electrocardiogram, thorax radiography, and cerebrospinal fluid examination showed no abnormalities. There was no thrombophilic disorder (anti-phospholipid antibody syndrome or deficiencies of anticoagulants such as antithrombin III, protein C, S, resistance to activated protein C, or increased levels of clotting factors VII and XI).

According to Beral Laurence MD et al., ocular manifestations in dengue fever are uncommon. The fundus changes reported in the literature include macular and retinal hemorrhages, peripapillary hemorrhages, Roth's spot, and diffuse retinal edema, but only 3 cases of optic neuritis caused by this virus.<sup>1-5</sup> We considered other optic nerve affections, but the history, symptoms, clinical examination, and complementary examinations allowed us to rule out other causes of optic neuritis, including inflammatory diseases (multiple sclerosis, lupus, sarcoidosis, Horton disease), hereditary conditions, infectious diseases, vascular etiologies (ischemic—none of these patients had cardiovascular risk factors and cardiovascular investigations were normal), those linked to general illness, toxic causes (amiodarone, methanol, quinine), or nutritional deficiencies.

Several authors reported an interval between the systemic manifestations of dengue fever and the onset of visual symptoms. This delay is consistent with the hypothesis that the ocular manifestations could be an immune-mediated process rather than a direct viral

infection. A transient aberrant immune response may occur, leading to cytokine overproduction and CD4/CD8 ratio inversion. Finally, overproduction of interleukin-6 may trigger production of auto antibodies against platelets and endothelial cells. It is not known if autoantibodies against the retina, retinal pigment epithelium, or choroidal antigens are produced in some of these patients with ocular manifestations associated with dengue fever.

## RESULTS

Beral Laurence MD et al treated his patients with intravenous methylprednisolone boluses (1 g/day for 3 days); the VA and perimetry improved. Ophthalmoscopy revealed a residual temporal atrophy of both optic nerves in some cases. Color vision tests showed no residual abnormality.

This study was conducted over a 3-week period during a dengue epidemic that Singapore experienced in 2005. 245 patients were invited to participate in the study, and 197 patients with the clinical diagnosis of dengue fever were enrolled from the 2 study centers, giving a response rate of 80.41%. The mean interval between onset of fever and date of eye examination was 7-8 days. 119 (60.6%) of subjects were male and 78 (39.6%) were female.

Although 197 subjects with the clinical diagnosis of dengue fever were screened for the presence of dengue maculopathy, only 160 of them eventually had a positive dengue IgM, with the remaining 37 being negative. Many of the serologically negative subjects were presumed to have dengue fever because of the typical clinical picture and the proximity of their living environment to known clusters of infected individuals. We found dengue maculopathy in 27 eyes of 16 subjects, giving a prevalence of 10% among the seropositive patients, whereas none of the patients with negative dengue IgM had ocular findings consistent with dengue maculopathy. We did not find any association with age, gender, or ethnic group.

Table compares near and distance VAs and proportions of patients with Amsler grid abnormalities or visual complaints in the different groups of subjects. Distance VA was analyzed by differentiating subjects (6/8.5 or better) worse than 0.15 (6/9 or worse). Near VA was evaluated by segregating subjects with near acuity of N5 from those with N6 or worse. We found that eyes with dengue maculopathy were more likely to have distance acuity worse.

The mean laboratory values for complements C3 and C4, urinary micro-albumin, and lowest platelet

**Summary of Study Demographics and Visual and Laboratory Test Results**

Characteristics	Group 1: Dengu IgM-Positive Subjects with Dengue Maculopathy	Group 2: IgM-Positive Subjects without Dengue Maculopathy	Group 3: IgM-Negative Subjects without Dengue Maculopathy	Total	P Value
No. of subjects (%)	16 (8.1)	144 (73.1)	37 (18.8)	197 (100)	–
Male (%)	9 (5.6)	84 (70.6)	26 (21.8)	119 (100)	0.391*
Female (%)	7 (9.0)	60 (76.9)	11 (14.1)	78 (100)	–
Age range (yrs)	14–44	12–67	14–65	12–67	–
Mean age (yrs)	29.37	33.08	34.90	32.65	0.431*
Distance VA worse than logMAR (0.15) (%)	69.0	48.5	66.2	53.3	0.005*
Near VA N6 or worse (%)	27.6	15.5	17.6	16.8	0.161*
Abnormal Amsler grid (%)	27.6	3.1	10.8	6.3	0.001*
Visual complaints (%)	24.1	8.2	2.7	8.4	0.002*
Blurred vision (%)	17.2	8.2	2.7	7.9	0.043*
Scotoma (%)	6.9	–	–	–	–
Mean complement C3 (g/l)	0.8713	0.9563	1.0705	0.9713	0.008**
Mean complement C4 (g/l)	0.2563	0.3276	0.3273	0.3144	0.112**
Mean urinary microalbumin (mg/l)	50.34	120.72	181.26	126.30	0.457**
Mean lower platelet count (/l)	52.00x10 <sup>9</sup>	51.45x10 <sup>9</sup>	59.62x10 <sup>9</sup>	53.04x10 <sup>9</sup>	0.386**

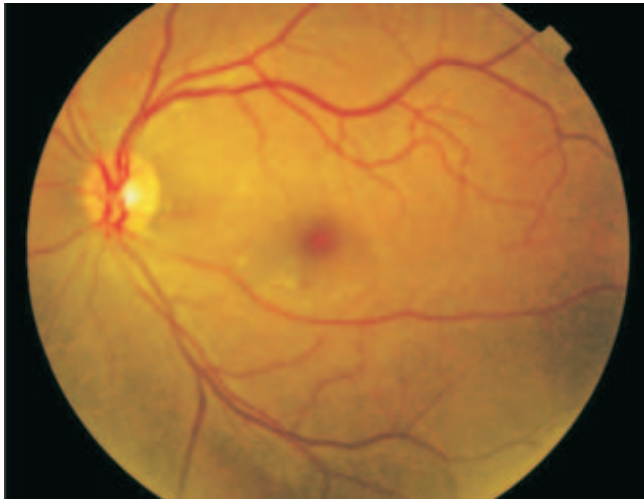
IgM = immunoglobulin M; logMAR = logarithm of the minimal angle of resolution; VA = visual acuity.

\*Chi-square test.

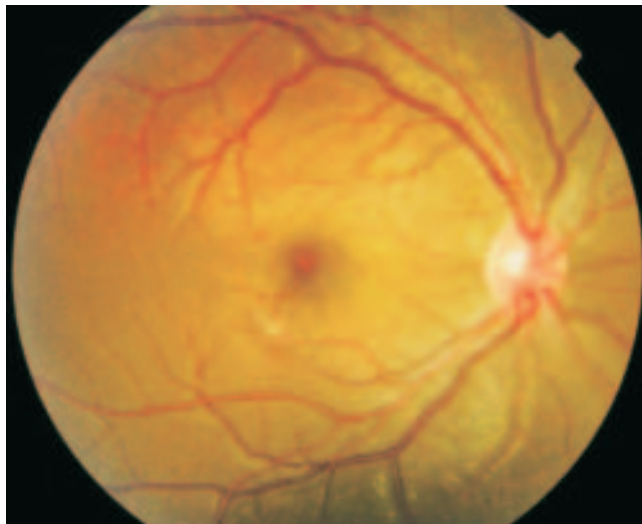
\*\*Analysis of variance test.

**Figure 1**

Fundus photograph of the right eye showing hemorrhages at the macula associated with macular swelling.

**Figure 2**

Fundus photograph of the left eye showing macular hemorrhages and white spots associated with swelling



counts of all subjects are shown in the table. The difference in mean complement C3 between the 3 groups was statistically significant ( $P=0.008$ ), with group 1 having the lowest value. Differences in complement C4, urinary micro-albumin, and lowest platelet count were not significant. Though logistic regression analysis showed that the presence of Amsler grid abnormalities is the only factor consistently associated with dengue maculopathy ( $P=0.001$ ), while all other demographic factors, visual and laboratory test results were normal. The hazard ratio of Amsler grid abnormalities was 8.669; sensitivity, 29.6%; and specificity, 95.4%.

The details of the 16 subjects found to have dengue maculopathy are worth noting that most of them were young adults and teenagers, and 11 of them were

actually asymptomatic at the time of examination or had ignored their symptoms. However, 15 of 16 of them did suffer significant visual impairment. Among patients with visual complaints, the mean interval between onset of fever and onset of symptoms was 6.8 days (range, 5–8). The mean interval between onset of fever and diagnosis of maculopathy in group 1 patients was 7.44 days (range, 6–9). The most common retinal findings in the 16 subjects were macular swelling, small white or yellow dots usually on the papillomacular bundle or close to the fovea, and intra-retinal hemorrhages at the macula. Fundal fluorescein angiography showed mild arteriolar and/or venular leakage in some eyes. Most of the white or yellow dots had no corresponding angiographic changes, though some corresponded to hypo-fluorescence in the mid and late phases of indocyanine green angiography. Optical coherence tomography showed outer neurosensory retina/retinal pigment epithelium thickening at the fovea in 1 patient.

Two subjects reported the new occurrence of blurred vision on the 15th day after onset of fever and underwent a repeat ophthalmic examination but were not found to have any clinical evidence of dengue maculopathy.

## DISCUSSION

Dengue fever is known to affect a number of organ systems, but ocular manifestations are uncommon.<sup>19,20</sup> Wen et al were the first to report a case of optic neuritis in their series of 24 cases of ocular involvement after dengue fever. Another retrospective case series of 41 patients with dengue maculopathy also included 8 eyes with disc edema and 10 eyes with disc hyperemia, presumably signs of optic nerve involvement. Similarly, 3 patients were reported with optic neuritis that occurred in Guadeloupe (French West Indies) after dengue viral infection. Our study found that 27 eyes of 16 subjects suffered from dengue maculopathy. This gave a prevalence of 10% among the 160 seropositive patients or 8.1% of all patients hospitalized for dengue fever that we screened in 2 study centers.

Although Dengue fever has afflicted mankind for centuries, the first series of cases of dengue maculopathy were reported only in the late 1980s by Laurence. Since then, several cases have been reported in the literature, and its prevalence appeared to be rising. The reason is not known, but the recent increase in dengue infections may be partially responsible. A shift in the predominant serotype circulating within a population may play an important role as well. This could trigger an aberrant immune response in susceptible individuals that eventually leads to the development of dengue maculopathy.

The main ocular findings among the subjects included macular swelling, yellow spots in the macula,

and macular hemorrhages. This is similar to what is described in other reports.<sup>10-15</sup> Although 11 patients were asymptomatic at the time of screening, 15 suffered significant morbidity with severe visual impairment. As the individuals tended to be in the second to fourth decades of life and, thus, represent a large proportion of the economically active working population, dengue maculopathy has potentially far-reaching economic consequences for the society.

Our results revealed a statistically significant association between subjects having visual complaints ( $P_{0.002}$ ), abnormalities on Amsler grid testing ( $P_{0.001}$ ), and the presence of dengue maculopathy. A normal test result would indicate that it is very unlikely that dengue maculopathy is present. The use of Amsler grid testing as a simple screening test for dengue maculopathy could be of public health importance in large epidemics to aid physicians in deciding which patients require ophthalmic consultation and treatment, thus reducing the number of unnecessary eye examinations and waste of resources.

Several dengue maculopathy patients whom we had encountered previously had abnormal levels of complements C3 and C4 and urinary micro-albumin, although the erythrocyte sedimentation rate and C-reactive protein level were within normal range, so we sought to determine if an immune mechanism was involved in the pathogenesis of this disease.<sup>17</sup> In this study, mean complement C3 levels were found to be lower in subjects with dengue maculopathy than in those without ( $P_{0.008}$ ). The appearance of maculopathy 1 week after onset of fever lends weight to the hypothesis that dengue maculopathy is the result of an immune-mediated process and not a direct consequence of viral invasion of ocular tissues.<sup>13</sup> Circulating antibodies and antigen-antibody immune complex formation that occurs approximately 1 week after the onset of dengue fever, with resultant inflammatory cascade activation, is the process most likely responsible for complement consumption, leading to lower C3 levels. However, we did not find any association between the mean complement C4 ( $P_{0.112}$ ) and urinary micro-albumin ( $P_{0.457}$ ) levels and dengue maculopathy. The difference in mean lowest platelet counts between the 3 groups is not statistically significant ( $P_{0.386}$ ), suggesting that the immune-pathological mechanism responsible for thrombocytopenia in dengue fever may differ from that causing dengue maculopathy. It also probably excludes thrombocytopenia *per se* as the cause of dengue maculopathy.

The number of subjects in our study was limited, as it included only patients with dengue fever who had been admitted to hospital for thrombocytopenia and

supportive therapy, and did not include those who did not have lifethreatening thrombocytopenia and were treated in a community setting. A study conducted on a larger number of patients that includes those treated as outpatients in addition to hospitalized patients would help to determine the true overall prevalence of maculopathy in all dengue fever patients.

#### CONCLUSION:

Our study found that the prevalence of dengue maculopathy in this series was 10% among seropositive patients hospitalized for dengue fever during an epidemic. In addition, we showed that patients with visual complaints, Amsler grid abnormalities, reduced distance VA, and low complement C3 levels were more likely to have dengue maculopathy. Our findings suggest that dengue maculopathy is an immune-mediated disease; Amsler grid testing could be used to screen for dengue maculopathy in dengue epidemics. Even if ocular complications associated with dengue fever are rare, they may result in permanent visual impairment. Therefore, we must keep in mind this etiology when evaluating patients with optic neuritis living in endemic areas.

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Dr. Fawad  
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## Short Term Efficacy of Intravitreal Bevacizumab (Avastin) in the Management of Diabetic Macular Edema\*

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### ABSTRACT

**Objective:** To assess the role of intravitreal injection Bevacizumab (Avastin) in the management of macular edema in diabetic retinopathy.

**Study Design:** Quasi-experimental clinical study.

**Material and Methods:** This study was carried out in LRBT Free Base Eye Hospital, Karachi from 1<sup>st</sup> March 2010 to 28<sup>th</sup> February 2011. The study included 35 patients; 26 (74.2%) males and 9 (25.7%) females diagnosed with macular edema secondary to non-proliferative diabetic retinopathy. Complete medical and ophthalmic history was taken. Best corrected visual acuity was recorded. Slit lamp examination of anterior segment was carried out and intraocular pressure was recorded. Posterior segment examination was performed with 78D/90D lens. Color fundus photography was taken. Fundus fluorescein angiography was performed to observe leakage pattern and to ascertain the limits of macula edema and optical coherence tomography was done to record macular thickness. All patients were treated with two injections of intravitreal Bevacizumab (Avastin) at an interval of six weeks, and final assessment was done after 3 months, based on best corrected visual acuity and macular thickness.

**Result:** Out of 35 patients, 26 (74.2%) were males and 9 (25.7%) were females. Non-Insulin dependent diabetes mellitus was found in 27 (77.1%), whereas insulin dependent diabetes mellitus was seen in 8 (22.8%). All of the patients received two doses of intravitreal bevacizumab (Avastin) at an interval of six weeks. At the end of the study, 24 (68.57%) out of 35 patients showed visual improvement of > 1 line, whereas in 8 (22.85%) out of 35 patients, visual status remain unchanged. In 3 (8.57%) out of 35 patients, there was no improvement in VA despite reduction in macular thickness. After 12 weeks, average reduction in central retinal thickness was 118 µm on optical coherence tomography, whereas 30% showed decrease in focal and diffuse leakage on fundus fluorescein angiography.

**Conclusion:** Intravitreal injection of bevacizumab (Avastin) appears to be a safe and effective therapy which improves best corrected visual acuity as well as reduces macular thickness in macular edema secondary to diabetic retinopathy.

**Key Words:** Intravitreal bevacizumab (Avastin), macular edema, diabetic retinopathy

### INTRODUCTION:

Diabetic retinopathy (DR) is a major cause of visual loss in patients with diabetes mellitus<sup>1</sup>. The prevalence of diabetic retinopathy increases with the duration and severity of diabetes<sup>2,3</sup> and the degree of hypertension and hyperlipidemia<sup>4</sup>. The hallmark of diabetic retinopathy is vascular injury. Increased vascular permeability may lead to the development of retinal hemorrhages and fluid accumulation in the macula, which is referred to as

diabetic macular edema. Macular edema within one disc diameter of the fovea is present in 9% of the diabetic population<sup>2</sup>. Although visual loss secondary to proliferative changes is more common in patients with type 1 diabetes, visual loss due to macular edema is more commonly seen in patients with type 2 diabetes<sup>5</sup>. Diabetic macular edema can occur at any stage of diabetic retinopathy<sup>6</sup>.

Many studies reveal that a variety of factors and biochemical pathways are involved in the formation of diabetic macular edema, but its pathogenesis remains unclear<sup>7</sup>. For this reason, many treatment options, such as laser photocoagulation, intravitreal or sub-tenon injection of triamcinolone acetonide, intravitreal anti-vascular endothelial growth factor (VEGF) drugs and vitrectomy have been employed for the management of macular edema<sup>8</sup>. Early Treatment Diabetic Retinopathy Study (ETDRS) has proven that focal grid laser reduces the risk of visual loss in eyes with clinically significant macular edema (CSME), but in eyes with diffuse macular edema (DME) it has limited benefit. Other treatment modalities have showed more promising results in such eyes<sup>9</sup>.

\*The subject was approved by the Research & Ethical Committee of LRBT Free Base Eye Hospital and the study was permitted to be conducted and published in the approved journal.

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Recent research has revealed that diffuse macular edema is caused by inflammatory factors such as interleukin-6 and vascular endothelial growth factor which can increase influx of fluid from the vessels into the surrounding tissue<sup>10</sup> and the severity of macular edema correlates with the level of vascular endothelial growth factor in the vitreous of patients with diffuse macular edema<sup>11</sup>. Based on these findings, anti-vascular endothelial growth factors may be considered to play a pivotal role in the prevention and treatment of diffuse macular edema. Some studies have used intravitreal injection of bevacizumab (Avastin) and have demonstrated a reduction of macular edema soon thereafter, but this effect was short-lived and recurrence of macular edema occurred in about 12 weeks<sup>12</sup>.

Bevacizumab was approved as a treatment for cancer. It was the first drug accepted by the United States FDA for the inhibition of angiogenesis in tumors by preventing metastasis forming new blood vessels. Bevacizumab is indicated as a first or second line treatment of patients with metastatic carcinoma of rectum and colon. Other indications include the locally advanced recurrent and metastatic non-squamous non-small cell lung cancer and human epidermal growth factor receptor-2 (HER-2)-negative breast cancer<sup>13</sup>. Bevacizumab was initially studied for the treatment of exudative age-related macular degeneration (AMD) with intravenous delivery with promising results<sup>14</sup>. Their mode of action can partly be explained by their anti-angiogenesis capabilities and partly by their anti-exudative effect, which depends on rapid sealing of endothelial cells and inter-cellular contacts. In addition, a reduction in perivascular leakage it can block the activity of choroidal neovascularization (CNV) lesion by reducing the influence of extracellular pro-inflammatory cytokines and the pro-angiogenic milieu<sup>13</sup>.

#### **MATERIAL AND METHODS:**

This study was carried out in L.R.B.T Free Base Eye Hospital Karachi from March 2010 to December 2010. The study included 35 patients, 26 (74.2%) males and 9 (25.7%) females, diagnosed with diabetic macular edema. A performa was designed to record relevant information. Complete medical and ophthalmic history was taken, best-corrected visual acuity was checked for distance and near, amsler grid chart was used to detect any metamorphopsia, slit lamp examination of the anterior segment was done, intraocular pressure was recorded and posterior segment examination was carried out by slit lamp biomicroscopy using 90 D lens. Colour fundus photograph was taken. Fundus fluorescein angiography was performed to observe leakage and to ascertain the limits of macular edema. Central macular thickness was assessed with optical coherence tomography. Glycosylated hemoglobin was checked to

determine diabetic control over the last three months. **Exclusion criteria** included presence of any other macular pathology like age-related macular degeneration (AMD), vascular occlusive disease affecting the macula, glaucoma, previous pan retinal photocoagulation or grid laser within the past six months, evidence of vitreomacular traction, any irregularity or widening of the foveal avascular zone (FAZ) on fundus fluorescein angiography, glycosylated hemoglobin > 8 mg/dl, uncontrolled hypertension, chronic renal failure or recent history of cerebrovascular accident.

The administration of intravitreal bevacizumab (Avastin) was approved by the hospital ethics committee. Informed consent was taken from the patients. The dose of intravitreal bevacizumab (Avastin) delivered was 1.25 mg/0.05 ml. Two injections were given at an interval of 6 weeks under strict aseptic conditions. Prophylactic antibiotics were given for 4 days after the procedure. Patients were followed on the 1<sup>st</sup> post-operative day to check for any elevation of intraocular pressure, subconjunctival hemorrhage, or any signs of infection. The next follow-up was scheduled on the 6<sup>th</sup> week to assess any improvement in best-corrected visual acuity, decrease in central macular thickness on optical coherence tomography; and extent of edema on fundus fluorescein angiography. The last follow-up was done on 12<sup>th</sup> week after the procedure and the results were tabulated.

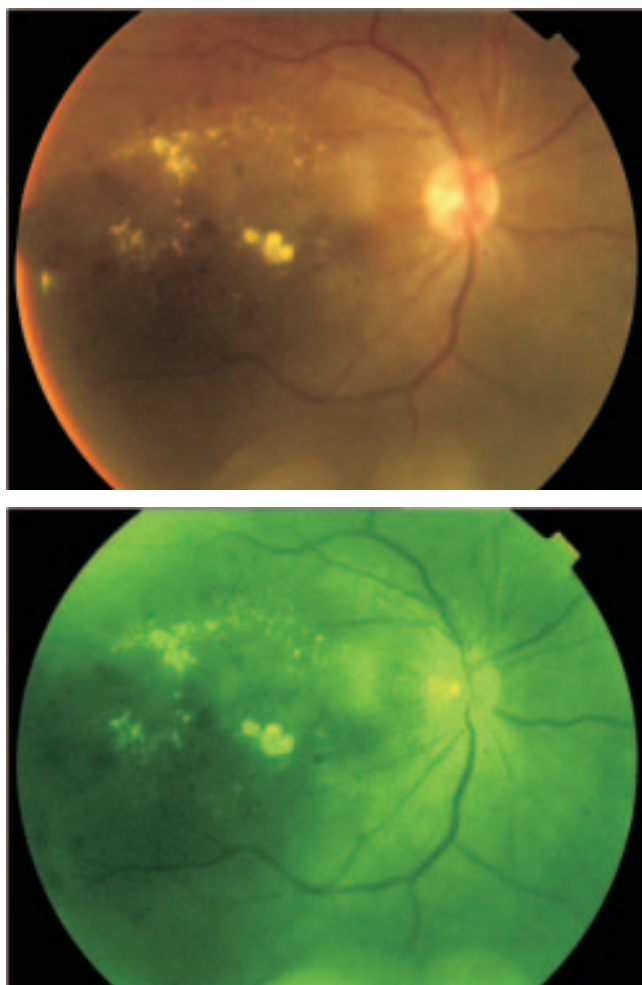
#### **RESULTS:**

Out of the 35 patients, 26 (74.2%) patients were male and 9 (25.7%) patients were female, with age ranging from 35-65 years. Among the 35 patients recruited for the study, 27 (77.1%) patients had non-insulin dependent diabetes mellitus and 8 (22.8%) had insulin dependent diabetes mellitus. All patients received two doses of intravitreal injection of 1.25 mg/0.05 ml of bevacizumab (Avastin). On the first post-operative day no complications were encountered. On the second follow up after 6 weeks of first injection, 12 (34.28%) out of 35 patients had visual improvement from 6/60 to 6/36, 6 (17.14%) out of 35 patients had visual improvement from 6/36 to 6/24, 2 (5.71%) out of 35 patients had visual improvement from 6/24 to 6/18, 2 (5.71%) out of 35 had visual improvement from 6/18 to 6/9 and 2 (5.71%) of 35 patients had visual improvement from 6/12 to 6/9. Mean average decrease in macular thickness was 71µm. On the final evaluation after 12 weeks (6 weeks after the 2<sup>nd</sup> injection), 12 (34.28%) out of 35 patients had visual improvement from 6/36 to 6/24, 6 (17.14%) out of 35 patients had visual improvement from 6/24 to 6/18, 2 (5.71%) out of 35 patients had visual improvement from 6/18 to 6/9, 2 (5.71%) out of 35 patients had visual improvement from

6/9 to 6/6 partial. Thus, overall 68.57% patients showed an improvement of 2 lines of vision whereas in 22.85% patients' visual acuity remained unchanged. In 3 (8.57%) out of 35 patients, vision deteriorated despite reduction in macular edema. Mean average decrease in

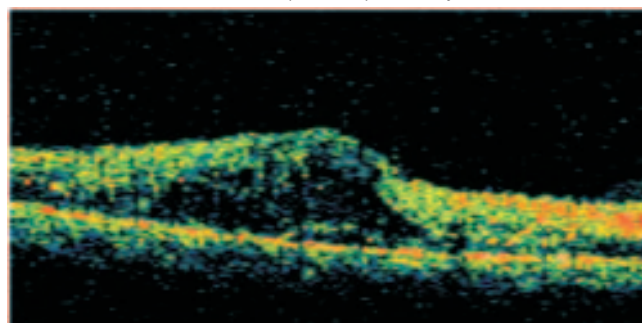
**FIGURE 1**

The coloured fundus photograph as well as the photograph taken on red-free filter of right eye of a patient with non-proliferative diabetic retinopathy and diabetic macular edema.



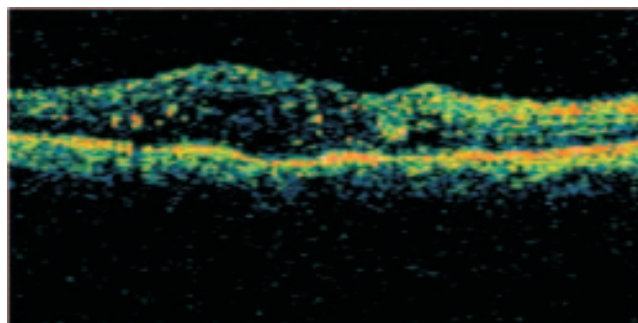
**FIGURE 2**

The optical coherence tomography image of the same patient. It shows the retinal thickness of 598µm before the injection bevacizumab (Avastin) was injected.



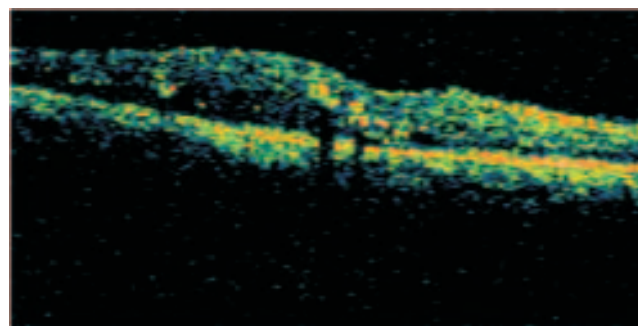
**FIGURE 3**

The follow up optical coherence tomographic image 6 weeks after the first injection of bevacizumab (Avastin). The retinal thickness decreased to 449µm.



**FIGURE 4**

The follow up optical coherence tomographic image 12 weeks later (6 weeks after the second injection of bevacizumab-Avastin). The retinal thickness decreased to 398µm.



central retinal thickness was 118µm at 12 weeks follow-up and 30 % patients showed a decrease in focal and diffuse leakage on fundus fluorescein angiography.

No severe post-injection complications like inflammation, increased intraocular pressure, retinal detachment or endophthalmitis were encountered except 9 (25.71%) patients showed sub conjunctival hemorrhage at injection site which was resolved within a week.

#### DISCUSSION:

Diabetic macular edema is a manifestation of diabetic retinopathy that produces severe visual impairment. Although several treatment modalities are under investigation, the only demonstrated means to reduce the risk of vision loss from diabetic macular edema are laser photocoagulation as shown by the Early Treatment Diabetic Retinopathy Study (ETDRS)<sup>15</sup>; intensive glycemic control as demonstrated by Diabetic Control and Complication Study (DCCT) and the United Kingdom Prospective Diabetic Study (UKPDS)<sup>16,17</sup>. However, there has been interest in other treatment modalities such as pharmacological therapy with oral protein kinase C inhibitors and the use of intravitreal corticosteroids since most of the eyes with diabetic macular edema treated with laser do not exhibit satisfactory improvement in visual acuity<sup>18</sup>. The use of



antibodies targeted at vascular endothelial growth factor (VEGF) is another treatment option that has generated considerable interest and is being under investigation<sup>19</sup>.

Retinal hypoxia and various rheological disturbances play a role in diabetic macular edema. Several studies point to leukocyte dynamics as one of the causes of diabetic retinopathy<sup>20</sup>. Leucocytes exhibit decreases deformability<sup>21</sup>, increased activation<sup>22</sup>, and increased adhesiveness to vascular endothelium in diabetes<sup>23</sup>. The levels of intercellular adhesive molecules-1 (ICAM-1) immune-reactivity were reported to be elevated in the retina of diabetic patients<sup>23</sup>. A previous study has shown that the vitreous levels intercellular adhesive molecule-1 (ICAM-1) and vascular endothelial growth factor (VEGF) were significantly higher in patients with diabetic macular edema than in control patients<sup>24</sup>. Leucocyte entrapment, which is promoted by intercellular adhesion molecule-1 expression, is considered the critical early event in the pathogenesis of diabetic retinopathy. The trapped leucocytes cause transient or permanent microcirculatory disturbances and release cytotoxic products like cytokines, free oxygen radicals or proteolytic enzymes which result in vascular endothelial cell damage and thus promote vascular permeability<sup>20,23</sup>. Long-term circulatory disturbances may lead to functional vascular obstruction, relative vascular ischemia and release of cytokines such as VEGF. In two studies Funatsu et al<sup>24,25</sup> reported that the levels of VEGF were elevated in the vitreous fluid of subjects with diabetic macular edema. Vascular endothelial growth factor causes conformational changes in the tight junctions of retinal endothelial cells and plays a major role in increasing vascular permeability and in the progression of diabetic macular edema<sup>24</sup>.

In this study, 35 patients with diabetic macular edema were treated with intravitreal bevacizumab (Avastin), which resulted in both anatomic and functional improvement. Results of this study show that bevacizumab was well-tolerated with no major side effects. Intravitreal steroids reduce macular edema and several theories have been proposed to regarding their therapeutic effect in diabetic macular edema. These include local reduction of inflammatory mediators, lower levels of VEGF, increased diffusion of fluid by an effect on calcium channels and improved blood-retinal barrier function<sup>27</sup>. However, its use remains plagued by a considerable high percentage of side-effects such as cataract progression in a number of eyes and rise in intraocular pressure (10-50%)<sup>28</sup>.

In this study, 2 injections of 1.25mg/0.05 ml of intravitreal bevacizumab (Avastin) were given at an interval of 6 weeks. The mean central macular thickness reduced to from 502µm to 384µm and visual acuity improved up to 2 lines on the snellen chart in 68.57% of

the patients at the end of the three month follow up. In a similar study conducted in India in 2007<sup>29</sup>, visual acuity improved from 20/494 to 20/295, whereas the central macular thickness reduced from 492µm to 369µm by the end of 6 months period.

Pan-American collaborative Retina Study Group<sup>30</sup> at 6 months follow-up shows final best corrected visual acuity improved  $\geq 2$  EDTRS lines in 55.1% of the patients and vision remained stable in 41.1% of the eyes. Mean central macular thickness improved from 387.0 $\pm$ 182.8µm to 275.7108.3µm. One Korean study<sup>31</sup> reveals that the final best-corrected visual acuity analysis demonstrated that 50% eyes remained stable and 40% eyes improved 2 lines on ETDRS, and the mean central retinal thickness improved from 498.9123.99µm to 421.40192.76µm by the end of 3 months.

## CONCLUSION:

Vision can be preserved in diabetic by early detection of diabetic retinopathy and prompt treatment of macular edema. Intravitreal bevacizumab appears to be a safe and well tolerated drug and has proved to result in significant improvement in best corrected visual acuity and reduction in central retinal thickness. The beneficial effect was shown to persist for up to three months. However long term results are needed to assess the safety and efficacy of this new modality, therefore, further prospective controlled clinical trials are required with scheduled re-injections and longer follow-up.

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# Video-Game Play induces Plasticity in the Visual System of Adults with Amblyopia

## Video Games Improve 'Lazy Eye' in Adults

*A pilot study suggests that playing video games may enhance  
a range of spatial vision functions in adults with amblyopia*

Dr. Roger W. Li. OD., Ph.D.<sup>1</sup>, Charlie Ngo<sup>2</sup>, Jennie Nguyen<sup>3</sup>, Dennis M. Levi<sup>4</sup>

### ABSTRACT

**Objectives:** Abnormal visual experience during a sensitive period of development disrupts neuronal circuitry in the visual cortex and results in abnormal spatial vision or amblyopia. Here we examined whether playing video games can induce plasticity in the visual system of adults with amblyopia.

**Setting:** The study took place in our research laboratory at the University of California, School of Optometry in Berkeley, California,

**Duration of Study:** December 2004 to December 2009

**Material & Methods:**

**Ethics Statement**

The experimental procedures were approved by the University Committee for the Protection of Human Subjects, and the research was conducted according to the principles expressed in the Declaration of Helsinki. Informed consent was obtained from each participant. There was no known risk involved in the experimental procedures. Specifically 20 adults with amblyopia (age 15–61 years; visual acuity: 20/25–20/48, with no manifest ocular disease or nystagmus) were recruited and allocated into three intervention groups: action videogame group ( $n = 10$ ), non-action videogame group ( $n = 3$ ), and crossover control group ( $n = 7$ ).

**Results:** Our experiments show that playing video games (both action and non-action games) for a short period of time (40–80 hours, 2 hours/day) using the amblyopic eye results in a substantial improvement in a wide range of fundamental visual functions, from low-level to high-level, including visual acuity (33%), positional acuity (16%), spatial attention (37%), and stereopsis (54%). Using a cross-over experimental design (first 20 h: occlusion therapy, and the next 40 h: videogame therapy).

**Conclusion:** We can conclude that the improvement cannot be explained simply by eye patching alone. We quantified the limits and the time course of visual plasticity induced by video-game experience. The recovery in visual acuity that we observed is at least 5-fold faster than would be expected from occlusion therapy in childhood amblyopia. We used positional noise and modeling to reveal the neural mechanisms underlying the visual improvements in terms of decreased spatial distortion (7%) and increased processing efficiency (33%). However, it is a pilot study, this work suggests that video-game play may provide important principles for treating amblyopia, and perhaps other cortical dysfunctions.

### INTRODUCTION

The most frequent cause of permanent visual loss in childhood is amblyopia 'lazy eye'<sup>1,2</sup>, a developmental disorder associated with early abnormal visual experience that disrupts neuronal circuitry in the visual cortex and results in abnormal spatial vision. It is generally believed that adult amblyopia is irreversible beyond the sensitive period of brain development. However, new studies, both in humans<sup>3,12</sup> and in

rodents<sup>13,15</sup>, suggest that the mature amblyopic brain retains a substantial degree of plasticity. In particular, human adults with long-standing amblyopia show substantial improvements in performing a visual task, following perceptual learning (extended practice) of the task.

Playing video games results in enhancement of a broad range of visual tasks in adults with normal vision, including light sensitivity contrast sensitivity, visual crowding, and visual attention. However, while it is now clear that video-game play can strengthen some aspects of normal vision, it is not clear whether video-game play can induce functional plasticity in the mature visual system following a prolonged period of abnormal development. Moreover, while video-game play improves the spatial resolution of attention in normal participants, it does not improve visual acuity (with isolated targets). Since reduced visual acuity is the *sine qua non* of amblyopia, it is crucial that video-game play can improve visual acuity if it is to be a useful tool for visual

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rehabilitation in patients with reduced spatial vision.

## MATERIAL & METHOD.

### General Experimental Design

Altogether 20 adults with amblyopia participated in three video-game experiments (age range: 15–61 y, mean age:  $31.4 \pm 3.5$  y). Thorough eye examination was carried out by an experienced optometrist. Our participant **inclusion criteria** included: (a) age >15 years; (b) all forms of amblyopia, e.g. strabismic, anisometropic, refractive, deprivative, and meridional amblyopia; and (c) interocular visual acuity difference of at least 0.1 LogMAR. **Exclusion criteria** included any ocular pathological conditions (e.g., macular abnormalities) and nystagmus. All of our participants had a difference in crowded visual acuity of two lines or more between the two eyes, and had normal vision in the sound eye ( $\sim 20/12$ – $20/16$ ). The maculae of all participants were assessed as normal, and they all had clear ocular media.

Participants were allocated into three intervention groups—two video-game treatment groups and one conventional occlusion therapy cross-over control group. The first 10 enrolled patients participated in the action video game group, the subsequently enrolled 3 patients participated in the non-action videogame group, and then another 7 patients were recruited in the cross-over intervention group of which participants were allowed to choose between the two types of video games (MOH:  $n = 4$ ; SIM:  $n = 1$ , SC1) in phase 2. The two video games used were Medal of Honor Pacific Assault and SimCity Societies (Electronic Arts, Inc.). Since there has been no previous clinical evidence indicating that video games can modify vision in adult amblyopia in any way, in this pilot trial we decided to recruit participants for the video game treatment groups in the beginning, in order to evaluate the feasibility of this treatment approach.

In the main experiments, participants were required to play the assigned video games in our research laboratory for 40 or 80 h (2 h/d) using the amblyopic eye, with the fellow eye occluded with a black eye patch. They were given full optical correction for the viewing distance. A battery of vision function tests were used to examine the effects of video-game experience on amblyopic vision. All visual stimuli were displayed on a 21 in flat Sony F520 monitor screen at  $1800 \times 1440$  resolution and 90 Hz refresh rate. Not all participants completed every visual function testing (visual acuity,  $n = 20$ ; positional acuity,  $n = 16$ ; visual counting,  $n = 14$ ; stereo-acuity,  $n = 5$ ). Those participants in the control experiment (OT group) were given a log sheet to keep track of the patching hours and the visual tasks performed during patching.

### Visual Function Assessments

**Visual acuity:** Two Bailey-LovielogMAR letter

charts (#4, #5), National Vision Research Institute of Australia 1978, were used in measuring visual acuity.

**Positional acuity:** A three-alternative, forced choice (3AFC) procedure was used to determine the position-discrimination threshold. Note that both the amblyopic eye and the fellow sound eye were tested at the same viewing distance.

**Spatial attention.** Visual counting is used to examine spatial selective attention capacity of the brain to shift the focus of attention to individuate and attend to a number of objects at different locations in the visual field.

In the present study, we aimed to assess with a small pilot group whether playing video games with an amblyopic eye can induce cortical plasticity and improve spatial vision in adults with amblyopia, well beyond the “sensitive period” of brain development. We hypothesized that the intense sensory-motor interactions while immersed in video-game play might push brain functions to the limit, enabling the amblyopic visual system to learn, on the fly, to recalibrate and adjust, providing the basis for functional plasticity. Moreover, game playing requires the allocation of spatial attention, detection, and localization of low contrast, fast moving targets, and aiming (in first-person shooter games). Thus, we speculated that video games may include several essential elements for active vision training to boost visual performance, and thus could potentially be useful in improving amblyopic vision.

We tested a range of visual functions to examine the neural alternations, if any, following video-game play in a small group of adults. These visual functions, ranging from low-level to high-level vision, included visual acuity (letter acuity), positional acuity (Vernier acuity), visual counting (spatial attention), and stereo-acuity (3-D binocular vision).

While action video games are reported to be useful in enhancing visual function in normal humans, non-action video games are not effective. Playing action video games may not be ideal for patients with amblyopia, particularly children. Our participants played video games for 40 h with their fellow eye patched. One might argue that the visual improvements, if any, might have resulted from the eye patching alone. To address this point, we used a cross-over treatment design in which a group of amblyopes first underwent occlusion therapy, i.e. patching the fellow sound eye, for a period of time before the video-game phase. With this experimental design, we can compare the efficacy of the two treatment approaches (passive patching and video-game playing).

## RESULTS

To evaluate how video-game play alters amblyopic vision, we monitored the changes, if any, in visual acuity in 10 adults with amblyopia while they played a first-

person shooter game (Medal of Honor: Pacific Assault - MOH), using their amblyopic eye, with the fellow sound eye patched with a black eye patch. Visual acuity (VA) is a standard clinical procedure to quantify spatial vision by determining the smallest letter on a chart that can be identified at a given viewing distance. In amblyopia, vision is often substantially poorer when the target letter is presented with surrounding letters than when it is presented alone, a phenomenon known as crowding. Therefore we measured both crowded line-letter acuity and uncrowded single letter acuity so as to provide a comprehensive evaluation of visual acuity. Surprisingly, playing video games rapidly reversed their amblyopia. After 40 h of video-game play (2 h/d), acuity improved, on average, by 1.6 and 1.4 lines on a LogMAR letter chart for crowded letters and single letters, respectively.

While it has been clearly demonstrated that playing action video games improves a broad array of visual functions in adults with normal vision, non-action games are not effective. For example, playing action video games resulted in enhanced crowded resolution acuity in normal vision, while playing a non-action video game did not. However, action games may not be ideal for patients with amblyopia, particularly younger patients. Therefore, in the next experiment, we asked another three amblyopic patients to play a non-action video game—(SimCity Societies (SIM)).

Interestingly, we found that similar to the action game group, all three non-action game players showed enhanced vision and one, a mild amblyope (SA6) normalized to H<sup>20</sup>/16. On average, this group was able to read 1.5 more letter-lines (28.4% improvement) for crowded-letter acuity and 0.8 more lines (15.1% improvement) for single-letter acuity. These findings suggest that non-action games share useful properties for enhancing amblyopic vision. To determine the limits of plasticity, the three players who participated in the SimCity experiments were then asked to play MOH for another 40 h (phase 2: 40<sup>th</sup> to 80<sup>th</sup> h). Additional improvements of about one letter-line (SB2 & SA5, crowded: 18%) were observed. Note that SA6's amblyopia was completely normalized at the end of phase I and no further significant improvement was observed.

Since our participants played video games with the fellow eye patched, the vision enhancement we observed could have been the result of wearing an eye patch alone. Thus, in a control experiment, another group (OT) of seven amblyopic adults wore a patch, but instead of playing video games they were required to engage in other visually demanding activities, such as watching television, reading books, knitting, and surfing the Internet, using the amblyopic eye. After 20 h, however, no significant change in acuity was observed the dashed

line in the bottom panels shows the mean data (OT20: crowded: mean improvement =  $0.4 \pm 3.0\%$ ,  $t = 0.1317$ ,  $p = 0.8995$ ; un-crowded: mean improvement =  $3.7 \pm 3.2\%$ ,  $t = 1.136$ ,  $p = 0.2991$ ). In contrast, for the same amount of time, the video-game group ( $n = 9$ ) showed a marked improvement in acuity of H<sup>20</sup>. Five of the seven participants who completed the patching experiment continued to the video-game phase for another 40 h. In this phase of the experiment, we used both action (all except SC1) and non-action (SC1) games. Although none of the five showed any significant change in acuity in the patching phase, all improved substantially in the video-game phase. From this small-scale "cross-over" experimental design, we can conclude that it is the video-game experience, and not simply the patching, that enhances amblyopic vision.

It is worthwhile noting that the recovery rate we observed here in adults is H<sup>20</sup> 5-fold faster when compared with the conventional occlusion therapy in children. It would take >200 h to obtain comparable treatment effects in children, and it would be reasonable to expect a much longer treatment course for adults.

While visual acuity represents one important limit to spatial vision, positional acuity, which represents the ability to localize visual objects, is another important aspect of spatial vision. While positional acuity is remarkably acute in normal vision (often referred to as hyper acuity), it is often severely impaired in amblyopia. To understand the neural mechanisms underlying this improvement, we introduced positional noise to mimic the spatial distortions (internal spatial noise) existing in the visual system.

Video-game play also appears to increase visual attention in amblyopia. We used a visual counting task to determine how many visual locations the brain can direct attention to in a very brief time period. Previous work has shown that some amblyopes show severe deficits in visual counting and that action game play can enhance counting in normal vision. In general, participants who initially showed the largest deficits in counting performance also showed the most improvement. Amblyopia is associated with abnormal binocular vision and reduced or absent stereopsis (binocular depth perception or 3-D). With improved monocular vision following video-game play, for some amblyopes binocular vision also recovered to a substantial extent. Five of the six anisometropic amblyopes (with straight eyes) were tested for stereopsis following the training. All five showed improved stereopsis.

## DISCUSSION

We provide evidence from a pilot study of a small number of people that video-game play can induce a substantial degree of visual plasticity in adults with

amblyopia. After a brief period of video-game play, a wide range of spatial vision functions improve very rapidly and substantially, reflecting normalization of both low-level (visual acuity, positional acuity) and high-level (spatial attention, stereoacuity) visual processing. Importantly, we provide preliminary characterization of the time course, limits, and underlying mechanisms of video-game experience dependent cortical plasticity. The findings of our “cross-over control” experiment show that the treatment effects cannot be simply explained by eye patching, suggesting that it is indeed the video-game experience which improves amblyopic vision.

Perhaps most importantly, we show that playing video games can indeed improve visual acuity and sharpen amblyopic vision. Note that visual acuity is the gold standard for examining spatial vision in clinical situations. To our knowledge, our work is the first to report that uncrowded visual acuity can be improved through video-game training. Green and Bavelier reported that 30 h of video-game play did not result in improved visual acuity in normal adults, perhaps there is little room for improvement in the normal visual system, or because 30 h is simply not long enough to improve a function as fundamental as normal visual acuity. Here we find that video-game play, both action and non-action, can result in a substantial improvement of amblyopic visual acuity. This is especially important because reduced visual acuity is the *sin qua non* (indispensable) of amblyopia.

Playing a non-action game for 30 h has been found to be ineffective in enhancing attentional performance in participants with normal vision. However, our results suggest that not only action but also non-action video games might be effective in improving amblyopic spatial vision. Although non-action games do not impose the same intense pressure on the player to respond to sudden pop-up targets from somewhere in the visual field, and to track fast moving objects, they do require the player to pay attention to find small spatial details and to different visual features in the visual scene—which may be a very demanding visual task for someone with reduced vision. In fact we noted that during game play, some deep amblyopes initially required more time than normal participants and had to get closer to the screen in order to identify targets or read instructions. In some sense, this is essentially similar to training spatial resolution. A long period of sustained attention in seeing fine visual details might play an important role in triggering neural plasticity. It is worth noting that we had fewer participants, altogether four (three from Group 2 and an extra one from the cross-over group SC1), for the non-action video game. We recognize that the treatment effects could vary from individual to individual. A much larger

sample size is necessary for future studies to investigate which type, action or non-action, is more effective in treating amblyopia.

Perceptual learning has shown to be useful in improving amblyopic vision. It is worth while noting that the visual recovery, e.g. visual acuity and positional acuity, we observed here with video-game play, although substantial, is somewhat smaller when compared with perceptual learning<sup>4</sup>. However, it is not too surprising that direct training can produce greater improvements, as it usually involves a large number of practice trials (for example, deep amblyopes might need more than 50,000 trials to reach the plateau levels in which the task difficulty is very challenging, most of the time around the observers' threshold limits. In contrast to perceptual learning, video games provide a visually enriched and stimulating environment, demanding different fundamental visual skills. Animal studies have highlighted the importance of environmental enrichment in promoting cortical plasticity. We postulate that the intense sensory-motor interactions while immersed in video-game play might push brain functions to the limit, enabling the visual system to learn, on the fly, to recalibrate and adjust, providing the basis for functional plasticity.

Treatment of adult amblyopia has recently received considerable attention ever since the introduction of perceptual learning techniques in the past few years. There have been numerous attempts to find an effective treatment for amblyopia. These attempts include subcutaneous injection of strychnine, flashing red and blue lights, and rotating gratings. Other more recent studies have attempted to use electric stimulation, direct transcranial magnetic stimulation, and pharmacological approaches to induce brain plasticity. Some of these techniques seem promising, but the others lack repeatable clinical evidence.

Before a video-game-based approach is used to treat amblyopia clinically, there are still many questions to be addressed (e.g., dose-response, prognosis for different ages of onset, types and depths of amblyopia). The current study serves as a “pilot” trial and, as such, has several design limitations: lack of randomization, small study size, and differences in numbers between arms. The lack of randomization and differences in numbers between arms may have resulted in potentially imbalanced make up of the study arms on baseline characteristics. For example, the action game group was much more likely to be male and younger than the other groups. In addition, the small number of participants (four) in the non-action game group makes it difficult to draw strong conclusions. A much larger sample size is necessary for future studies to investigate which type, action or non-action, is more effective in treating amblyopia. Specifically, a large-scale



randomized double-blind clinical trial (with equal numbers in each group) is needed to eliminate differences between people, placebo effects, and measurement differences. Despite these limitations, the present pilot study provides new insights into how video-game play sharpens visual functions in adult amblyopia and, most importantly, reveals that video-game play may provide important principles for improving treatment in amblyopia, and perhaps other clinical abnormalities.

#### **Clinical Implications:**

According to Dr. Stuart R. Dankner, MD, FAAP, FACS, University of Rochester & the Rochester Institute of Technology, New York, the research on video game therapy is still in its early stages. It is very important that patients should not try self-treating amblyopia and should consult an ophthalmologist. Response to treatment must be closely monitored to avoid possible unwanted conditions such as double vision, reverse amblyopia, eye strain, and headache, etc.

Though the video game therapy or other similar methods may be promising but is not an accepted medical protocol for treating amblyopia in older patients. More critical research involving many more patients in more well-controlled studies needs to be performed before any recommendation can be made about whether this is going to be an effective therapy or not.

If efficacy is confirmed in adults, additional studies need to be performed in amblyopic children to determine whether long-term exposure to video stimuli is safe, because health risks such as seizures have been implicated in some vulnerable children. However, they are advised to employ customized video games that are non-violent and child-friendly. Perhaps a better approach would be a new therapeutic model in which visual stimuli are created to stimulate specific areas in the brain that cause amblyopia.

When we know what suppressed areas in the brain cause amblyopia, and then formulate more specific visual stimuli that will activate these areas, then amblyopia treatment should be more effective. Still, findings from this pilot study may represent the potential for brain cells to be stimulated, and perhaps even regenerated, later in life.

#### **CONCLUSION:**

Our study had several limitations: small sample size, lack of randomization, and differences in numbers between groups. A large-scale randomized clinical study is needed to confirm the therapeutic value of video-game treatment in clinical situations. Nonetheless, taken as a pilot study, this work suggests that video-game play may help guide future treatment of amblyopia.

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## Etiology of Strabismus in Ophthalmology Department, Hayatabad Medical Complex, Peshawar. Pakistan\*

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### ABSTRACT

**Objective:** The objective of this study was to find the causes and types of strabismus presenting to Ophthalmology Department, Hayatabad Medical Complex, Peshawar. This will help us to know the magnitude of the problem and to enable us to carry further studies.

**Material and Methods:** All patients who presented with any form of ocular deviation between 1<sup>st</sup> September 2010-31<sup>st</sup> March 2011 were referred to the Orthoptic clinic. Particulars of the patient such as visual acuity, degree of deviation, family history and cause of strabismus were all noted.

**Results:** Out of the 21,260 patients seen in eye outpatients department 266 (1.25%) had strabismus. There was no gender preponderance. Hypermetropia was found to be the most common cause of the disorder accounting for 42.1%, while esotropia (76.7 %) was the most common form of presentation.

**Conclusion:** Strabismus is a common childhood problem which can have a significant effect on visual acuity, physical and psychological development. Early detection can lead to restoration of proper alignment of binocular single vision.

**Key Words:** Esotropia, Exotropia, Amblyopia, Binocular single vision.

### INTRODUCTION

Strabismus is misalignment of one eye in relation to the other resulting in failure of the two eyes to simultaneously focus on the same image, leading to loss of binocular single vision.<sup>1, 2, 3</sup> This deviation can be horizontal known as esodeviation or exodeviation, or vertical known as hyperdeviation or hypodeviation<sup>2</sup>. Strabismus has been known to have a significant genetic component<sup>5</sup>. The complexity of the molecular basis is now beginning to be clear with the identification of the genetic loci and disease causing genes<sup>6</sup>. Twenty five percent of children with childhood onset strabismus have either a parent or sibling with strabismus<sup>7</sup>. Other factors contributing to the etiology of strabismus are prematurity and low birth weight<sup>8,9</sup>, maternal cigarette smoking during pregnancy and increasing maternal age<sup>10</sup>. High refractive errors, an-isometropia is a potent cause of amblyopia resulting in strabismus. It is also common in hydrocephalus and in children with, mental

handicaps<sup>7</sup>. There are also many adults who develop strabismus as a result of injury or misaligned eyes from childhood<sup>4</sup>. Strabismus affects 2-4% of the population and can result in amblyopia which is often not discovered in time to initiate effective treatment<sup>3,11</sup>. Shaik and Aziz<sup>12</sup> in Pakistan found strabismus to be the third most common ocular disorder in children. Parents are usually worried as the associated poor cosmetic appearance may interfere with the social and psychological development<sup>6</sup>. Treatment options depend upon the type of strabismus and may include glasses, prism lenses and/or surgery<sup>4</sup>. We present 266 patients diagnosed with strabismus.

### MATERIALS AND METHODS

This study was carried out in the eye outpatients department of Hayatabad Medical Complex, Peshawar, Pakistan between 1<sup>st</sup> September 2010 and 31<sup>st</sup> March 2011. All patients diagnosed with strabismus were examined in the Orthoptic clinic. This included history of onset, previous treatment done, family history of consanguineous marriage and affected members. The eye examination included visual acuity testing using light and other objects by occlusion of one eye at a time for preverbal children, the Lea symbols for 3-5 year olds and the illiterate "E" chart for the older children and adults. Hirschberg test was done on each patient to determine the degree of deviation, followed by cover test, cover uncover test and alternate cover test, Extra ocular motility was assessed in all directions of gaze. Other tests included measurement of angle of deviation using the prism bar and loose prisms. The anterior and posterior segments of eye were examined to detect any

*\*The subject was approved by the Research & Ethical Committee of the Hospital and the study was permitted to be conducted at the Department of Ophthalmology, Hayatabad Medical Complex, Peshawar.*

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organic cause. All patients who had a difference of 1 D or more in refraction of the two eyes were grouped as anisometropes. Those who were corrected with glasses and had equal visual acuity in both eyes were grouped under refractive errors (Hypermetropia or Myopia of more than 2 diopters). Some did not have any refractive error, were not amblyopic and were grouped under idiopathic causes. Others were found to have ocular pathologies and were grouped appropriately. Strabismus in this study was classified into esodeviation for all those with esotropia and esophoria and so also into exodeviation and hyper deviation and hypo deviations.

**Exclusion Criteria:** All those who had previous squint surgery and presented with residual or consecutive strabismus were exempted from this study. In all 266 patients were diagnosed with strabismus out of 21,260 who presented to the eye outpatients department.

## RESULTS

Out of the 266 patients seen, 120 (45.11%) were males while 146 (54.88%) were females giving a male to female ratio of 1.2:1 as shown in table 1. Strabismus was seen to be more common in the age group 0-5 years (51.1%) in both sexes while the frequency decreased with increasing age.

Hypermetropia was the most common cause of strabismus seen in 112 (42.1%) of the patients (Table 2). Hypermetropia more than 6 diopters was seen in 80 patients, 4 to 6 diopters hypermetropia was seen in 30 children and 2 patients had less than 4 diopters of hypermetropia. This was followed by Anisometropia 74 (27.8%). No known clinical cause could be detected in 56 (21.05%) of the cases. Of all 14 (5.3%) patients had trauma, 6 (2.3%) had cataract and 4 (1.5%) had retinal diseases with detachment and toxoplasmosis. 194 (72.9%) patients were products of consanguineous marriages, while 72 (27.1%) of patients parents were not related. Table 3 shows the number of patients with strabismus in the family. Positive family history was present in 82 (30.8%) patients while 184 (69.2%) had no positive family history. The types of deviation seen were esodeviation in 204 (76.7%) of patients, exodeviation in 52 (19.5%), hyperdeviation in 6 (2.25%) while 4 (1.5%) patients had hypo deviation.

## DISCUSSION

Strabismus is one of the most common childhood problems which can have significant effects on visual, physical and psychological development<sup>13, 14, 15</sup>. Early detection of strabismus is essential for restoration of proper alignment of the visual axes and the establishment of binocular single vision<sup>16</sup>, though a detectable squint at any age is abnormal and should be investigated to exclude ophthalmological or systemic

diseases<sup>17</sup>. Of the 266 patients seen, 138 (51.87%) were males while there were 128 (48.1%) females showing no gender preponderance for this disorder. Dufier et al<sup>18</sup> found no significant difference as both genders in their study were equally effected. Like studies by Surrendra et al<sup>13</sup> the age group commonly effected was between 0-5 years with peak at 3 years age.

The causes of ocular misalignment are numerous<sup>15</sup>. In this study Hypermetropia was the most common cause of strabismus seen in 42.1% of cases followed by anisometropia. In another study conducted in Australia, they found that visual impairment was more common in children with strabismus and strabismus was associated with hypermetropia and anisometropia<sup>21</sup>. Other workers<sup>8, 9</sup> found prematurity and low birth weight to be the common cause. The birth history of these patients could not be established, as there were no means of getting the previous record. A study conducted in America also found that anisometropia was a separate risk factor for developing esotropia, both hypermetropia and anisometropia can not only cause esotropia but if uncorrected can deteriorate esotropia<sup>22</sup>.

Since Hippocrates first observed that strabismus could be transmitted from parent to child, ophthalmologists have been intrigued by evidence that some forms of strabismus seem to have a genetic basis<sup>2</sup>. Marriages between first cousins is a common practice in this environment and that was why 72.9% of patients in this study were products of such marriages, though only 30.8% had positive family history. There is significant hereditary component in the cause of strabismus, but its genetic sites are yet to be identified<sup>19</sup>. The horizontal deviations were the most common forms of presentation. Esodeviation occurred in 76.7%, while exodeviation in 19.5%. This compared favorably with Shaikh and Aziz's<sup>12</sup> study in Pakistan where they had esodeviation in 86.2% and divergent squint in 13.7%. In contrast, Chia et al's<sup>4</sup> study in Singapore had higher rates, 72% exodeviation and esodeviation in 28%. Similar studies in Cameroon<sup>20</sup> showed exodeviation in 62.8% while esodeviation in 37.2%. All the patients seen in this study were given various forms of treatment ranging from cycloplegic refraction, amblyopia therapy and cosmetic, psychosocial surgery.

## CONCLUSION/RECOMMENDATIONS

This study was done within a period of six months. It is important to follow-up these patients especially the children and study the effect of the modality of treatment with the aim of improving or modifying if needed. This is a clinic study and it shows the magnitudes of the problem in the larger society. The following recommendations are made:

- a. Pre-school and school screening should be done. This is aimed at identifying children with

**Table 1: Age and Sex Distribution**

Age(yrs)	Males	Females	Total	Percentage
0-5	74	62	136	51.1
6-10	14	36	50	18.8
11-15	18	16	34	12.8
16-20	16	12	28	10.5
21-25	6	0	6	2.25
26-30	2	0	2	0.75
31-35	2	0	2	0.75
36-40	0	0	0	0.0
41-45	2	0	2	0.75
46-50	0	0	0	0.0
51-55	0	0	0	0.0
56-60	0	2	2	0.75
61-65	4	0	4	1.50
>65	0	0	0	0.0
Total	138	128	266	100

**Table 2: Aetiology Of Strabismus**

Aetiology	Number	Percentage
Hypermetropia	112	42.10
Anisometropia	74	27.81
Idiopathic	56	21.05
Trauma	14	5.26
Cataract	6	2.25
Retinal diseases	4	1.50
Total	266	99.9

#### Family History of Strabismus

Family history	Number	Percentage
Positive	82	30.82
No family history	184	69.17
	266	99.99

strabismus early enough to restore vision in the amblyopic eye for binocular single vision and also to screen for refractive errors by doing cycloplegic refraction.

- b. Primary care physicians should be skilled in the evaluation of ocular motility in children. They should understand the basic patho-physiology of common strabismic disorders and be able to identify those children who are at risk.
- c. Other studies have shown low birth weight babies and prematurity to be a common cause of strabismus. There is need to examine all premature and low birth weight babies and to follow them up periodically to pick up strabismus.

- d. Another significant risk of strabismus is first degree relatives and the hereditary components of strabismus, therefore consanguineous marriages should be discouraged.

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## Clinical experience of Amniotic Membrane Transplantation in different ocular surface disorders

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### ABSTRACT:

**Objective:** To study the results of amniotic membrane transplantation in non-healing corneal ulcers and surface problems.

**Methods:** In an interventional case-series, consecutive patients with non-healing corneal ulcers underwent transplantation of preserved amniotic membrane onto the corneal ulcers. Patients were followed for at least 6 months and results were evaluated in terms of corneal integrity and complications.

**Results:** Twenty three eyes of 20 consecutive patients including 7 males and 13 females with age ranging from 20-45 years were operated for amniotic membrane transplantation due to non-healing corneal ulcers and surface disorders. There were 16 (69.56%) valid outcome results. Complications included retraction of amniotic membrane in 3 out of 23 eyes (13.04%).

**Conclusion:** Amniotic membrane is a very useful modality to maintain the integrity of ocular surface, providing a natural substrate for epithelialization and inhibition of fibrosis.

### INTRODUCTION:

Transplantation of preserved human amniotic membrane can be considered one of the major new developments in ocular surgery. Although the first ophthalmological use of amniotic membrane documented in the international literature took place almost 70 years ago, amniotic membrane transplantation has only been performed in large number of patients since 1995, with promising results.<sup>1,2</sup> The first reported use of fetal membrane as skin substitute was by Davis in Salbella who presented the first clinical report of successful use of amniotic in treatment of burns and skin ulceration.<sup>3</sup> It is now utilized as a biological dressing for burnt skin, skin wounds, and chronic ulcers of the leg,<sup>4</sup> as an adjunctive tissue in surgical reconstruction of artificial vagina<sup>5</sup> and for repairing of omphaloceles.<sup>6</sup> It has also been used to prevent tissue adhesion in surgical procedures of the abdomen, head, and pelvis.<sup>7</sup> Although human amniotic membrane has been used previously,<sup>3</sup> its use in the treatment of ocular disorders has been

popularized by Kim and Tseng.<sup>1</sup> Certain characteristics make the amniotic membrane ideally suited to its application in ocular surface reconstruction. It can be easily obtained and its availability is nearly unlimited. The tissue can be preserved at -80°C for several months, allowing sufficient time to plan surgery or consider a trial of other options. Amniotic membrane does not express HLA-A, B, or DR antigens and hence immunological rejection after its transplantation does not occur.<sup>8</sup> Amniotic membrane forms the innermost layer of placenta and consists of a thick basement membrane that promotes epithelial cell migration and adhesion and an avascular stromal matrix that reduces inflammation, fibrosis, and neovascularization. It has been used in the treatment of conjunctival disorders,<sup>9</sup> persistent corneal epithelial defects<sup>1</sup> and painful bullous keratopathy.<sup>10</sup>

Clinical trials suggest that amniotic membrane transplantation promotes epithelialization and differentiation of the epithelium of the ocular surface.<sup>11</sup> The most important growth factors that promote wound healing, which have been isolated mainly from the amniotic epithelium but also from the amniotic membrane stroma, are epidermoid growth factor and keratocyte growth factor.<sup>12</sup> Structural proteins such as laminin and type VII collagen in the amniotic basement membrane explain the observed epitheliotropic effects.<sup>12</sup> Intrinsic neurotropic substances make amniotic membrane an ideal substrate for reconstruction of the epithelium of the ocular surface.<sup>13</sup>

The normal ocular surface is covered by corneal, limbal and conjunctival epithelial cells. The limbal stem cells are felt to give rise to the corneal epithelium and therefore are especially important for maintenance of a

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smooth, clear corneal surface. These cells, together with a stable tear film, maintain the health of the ocular surface and therefore allow for good visual acuity. Damage to these cells from certain systemic inflammatory diseases or primary ocular diseases or trauma such as Stevens-Johnson syndrome, ocular cicatricial pemphigoid, rheumatoid arthritis, herpes zoster ophthalmicus, surgically induced neurotrophic keratitis, chemical or thermal injuries, infective keratitis may lead to the state of limbal stem cell deficiency. The result is breakdown of ocular surface and corneal epithelial defects that may become chronic if the normal epithelialization process fails. Conjunctival epithelium may replace corneal epithelium resulting in loss of corneal transparency. Chronic inflammation may then occur characterized by neovascularization, corneal scarring and opacification, corneal thinning and possible corneal perforation, all of which may lead to loss of visual acuity.<sup>14</sup>

In the current study, authors report their experience with the use of preserved amniotic membrane for the treatment of non healing corneal ulcers and ocular surface disorders.

#### **MATERIALS AND METHODS:**

This study was conducted in LRBT Free Base Eye Hospital, Karachi during the period of February 2008 to February 2009; amniotic membrane transplantation was performed in 23 eyes of 20 consecutive patients of diverse etiology. There were 7 males and 13 females with an age range of 20-45 years. Patients had persistent epithelial defect as a consequence of keratitis, chemical injuries, bullous keratopathy, mooren's ulcers. Performa was used to note demographic data, history of disease, and ophthalmic examination findings. Examinations included visual acuity, slit lamp examination to note extent of damage with special consideration on epithelial defect, limbal ischaemia, conjunctival involvement in the form of necrosis, lime deposits, tear film assessment by schirmertest with and without anaesthesia and fundus examination wherever possible. Informed consent was obtained after explanation of the procedure being undertaken. Preserved amniotic membrane was used in all the patients and they were followed for at least 6 months and results were evaluated in terms of corneal integrity and complications.

#### ***Surgical technique:***

At the time of surgery, the container with amniotic membrane is thawed at room temperature just before its use, and the membrane is rinsed three times in balanced salt solution. The membrane is then gently separated from the nitrocellulose paper with blunt forceps. The amniotic membrane is then gently spread on to the ocular surface and trimmed to the appropriate size and shape. In cases of corneal pathologies other than chemical injuries, the membrane is secured in place using 10-0

nylon interrupted sutures to the cornea with shiny epithelial surface placing upward. In cases of chemical injuries (corneal/limbal disease) a membrane much larger than the affected area is needed. In these cases, a combination of interrupted 10-0 nylon sutures to the conjunctiva/episclera and an 11-0 nylon continuous suture (i.e purse string bedding suture just outside the limbus) is usually required, although 10-0 vicryl suture can also be used.

A large therapeutic contact lens is routinely used, at the end of the operation, to protect and keep the amniotic membrane in place and also for comfort. Occasionally, a tarsorrhaphy may also offer additional protection. The sutures and contact lens are often removed after 2 to 4 weeks. Recommended post operative topical treatment consists of preservative free antibiotic and corticosteroid drops.

#### **RESULTS:**

Twenty three eyes of 20 consecutive patients including 7 males and 13 females with age ranging from 20-45 years were operated for amniotic membrane transplantation due to non-healing corneal ulcers and surface disorders. There were 16 (69.56%) valid outcome results: Outcomes for persistent epithelial defects was a healed and stable surface in 9 out of 11 eyes (81.8%). Among the patients with chemical injuries, healed uninflamed eyes with relatively clear cornea was seen in 3 out of 6 eyes (50%); for bullous keratopathy a pain free, stable surface without bullae was seen in 2 out of 3 eyes (66.66%) whereas for Mooren's ulcer a pain free, stable surface was observed in 2 out of 3 eyes (66.66%). Complications included retraction of amniotic membrane in 3 out of 23 eyes (13.04%).

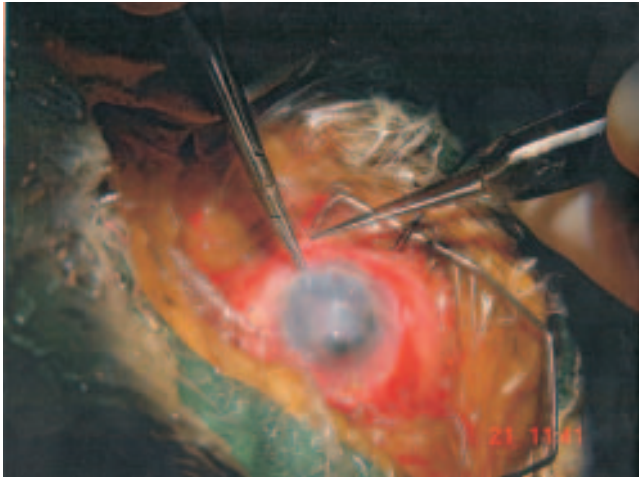
#### **DISCUSSION:**

Persistent corneal epithelial defect may progress to persistent sterile corneal ulcer and, occasionally to perforation. Common factors leading to the breakdown of the epithelial surface include infections, xerosis, trauma, and chemical injuries. Treatment of persistent epithelial defects consists of correction of the underlying cause and tissue lubrication. In refractory to medical treatment several options can be considered, including amniotic membrane transplant. Several characteristics explain why the amniotic membrane can be useful to promote epithelial healing. Amniotic membrane, the outermost portion of fetal membranes possesses anti-inflammatory,<sup>14</sup> anti scarring,<sup>15</sup> stem cell proliferating,<sup>16</sup> and epithelialization promoting effects on the ocular surface.

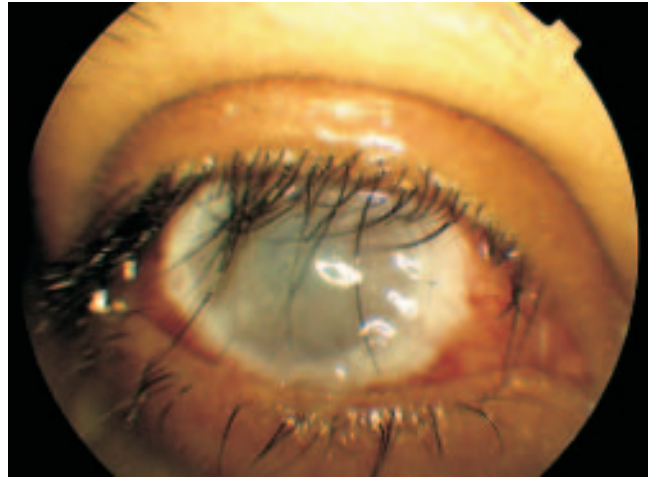
Epithelium produces various growth factors, and the basement membrane facilitates migration of epithelial cells, reinforces adhesion of basal epithelial cells, and may promote epithelial differentiation.<sup>17</sup> Lee and Tseng used amniotic membrane to treat persistent

**FIGURE 1**

Pre-operative picture of corneal amniotic membrane graft.

**FIGURE 1**

Post-operative picture of corneal amniotic membrane graft.



epithelial defects.<sup>18</sup> Epithelialization occurred in 10 of 11 consecutive patients. In this study epithelialization occurred in 9 out of 11 cases of persistent epithelial defects. Recently, Tseng et al reported that the use of amniotic membrane transplantation was beneficial to restore the ocular surface in patients with partial limbal stem cell deficiency, but in severe deficiency associated limbal and amnion transplantation was required.<sup>16</sup>

Ocular chemical burns cause extensive limbal and conjunctival cell destruction. But it is conceivable that there remain some conjunctival and corneal stem cells at the basal level, even though fluorescein depicts large ocular surface defects. Persistent inflammation with leucocyte filtration in the acute stage further leads to gradual stem cell loss. Persistent inflammation prevents epithelialization and accelerates ulceration and melting with globe perforation. It also contributes to scarring sequelae like symblepharon and mild lid shortening, tear film deficiency, and inflammatory granuloma in the chronic stage. In addition, in severe burns ischaemic changes result in anterior segment necrosis and sterile corneal ulceration at an early stage after the injury.<sup>19</sup> In this study, patients with chemical injuries, resulted in healed un-inflamed eyes with relatively clear cornea was seen in 3 out of 6 patients (50%). Arora R et al commented that in mild burns, amniotic membrane transplantation alone restores corneal and conjunctival surfaces. In moderate to severe burns, it probably reduces conjunctival scarring sequelae, but does not prevent the sequelae of limbal stem cell deficiency that requires further limbal stem cell transplantation.<sup>19</sup> Kobayashi et al also reported the usefulness of amniotic membrane patch in chemical burns.<sup>20</sup> Dua et al reported that in extremely severe burns amniotic membrane transplantation does not establish the ocular surface or

preserve the integrity of the globe.<sup>21</sup>

Ocular surface restoration with amniotic membrane transplantation has the advantage of creating an environment with reduced perilimbal inflammation; promoting healthy epithelium with reduced corneal neovascularization and may set the patient up for successful future with penetrating keratoplasty if stromal scarring remains. Notwithstanding the encouraging and successful results reported thus far it is important to caution against the over-enthusiasm in the use of amniotic membranes that is beginning to emerge of late. The beneficial effects of amniotic membrane in the management of ocular surface disorders have not always been validated with controlled clinical trials.

#### CONCLUSION:

Amniotic membrane has been used for different ocular surface diseases to promote epithelialization and to prevent excessive fibrosis during ocular surface reconstruction. The results of this study showed that corneal integrity was maintained in 69.56 % of the cases. Further controlled clinical trials are required to evaluate the efficacy of AMT in comparison with currently available alternatives.

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## Post operative Astigmatism in Extracapsular Cataract Surgery

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### ABSTRACT

**Objective:** To evaluate the pattern of astigmatism (with the rule/against the rule) by the three suturing techniques in two steps curvilinear clear corneal incision, in Extracapsular cataract extraction (ECCE) with rigid posterior chamber intraocular lens (IOL) for senile cataract.

**Study Design:** Observational and analytical

**Study period:** June'2010 to June'2011

**Place of study:** CMH Bahawalpur & CMH Lahore.

**Methodology** 100 patients (120 eyes) of both genders with mean age of 60.4 years and age range of 55-75 years, fulfilling the inclusion criteria were planned for extracapsular cataract extraction with rigid posterior chamber intraocular lens (IOL) implantation under local anesthesia. The results were studied in three groups (A, B and C) depending upon the number of 10/0 nylon sutures applied to close two stepped curvilinear clear corneal incision i.e 2, 3 interrupted and continuous respectively. Forty eyes were randomly enrolled in each group. Keratometric readings were recorded post operatively on 3<sup>rd</sup> day, 1<sup>st</sup> week, 3<sup>rd</sup> week and 8<sup>th</sup> week.

**Results:** On 3<sup>rd</sup> post operative day in Group A, 05 cases had no astigmatism ( $\leq 0.50D$ ), 11 cases had with the rule (WTR) astigmatism, and 24 cases had against the rule (ATR) astigmatism, Group B had 03 cases with no astigmatism, 17 cases WTR astigmatism and 20 cases ATR astigmatism, Group C had 03 cases with no astigmatism, 28 cases WTR astigmatism, and 09 cases ATR astigmatism. There was no significant change in astigmatism after 1 and 4 weeks postoperatively. On 8<sup>th</sup> post operative week no astigmatism was seen in 04, 02 and 02 cases, WTR astigmatism in 10, 16 and 27 cases and ATR astigmatism in 26, 22 and 11 cases in Group A, B and C respectively.

**Conclusion:** Two interrupted suture technique had the highest rate of ATR astigmatism. Continuous suturing technique showed WTR astigmatism. This study suggests that continuous suturing technique in corneal incision is the best method which gives the least ATR astigmatism. Surgically induced WTR astigmatism can be satisfactorily controlled by selective suture manipulation.

**Key words:** ECCE, WTR, ATR, cataract surgery, astigmatism, keratometry, IOLs, ECCE (extracapsular cataract extraction), WTR (with the rule), ATR (against the rule).

### INTRODUCTION

The top three causes of blindness according to 2010 WHO estimates are Cataract, Glaucoma and Age related macular degeneration. Age related cataract is responsible for 48% of world blindness which represents about 18 million people.<sup>1</sup> Cataract is defined as any congenital or acquired opacity in the lens capsule or substance irrespective of its effect on vision.<sup>2</sup> Astigmatism after extracapsular cataract surgery is one of the major problems in visual rehabilitation because of the large incision size of 10-12 mm.<sup>3</sup> Corneal incision leading to astigmatism is an inevitable sequel of cataract surgery. Surgically induced astigmatism is defined as the

difference in pre and post operative keratometric values in order to adequately evaluate the effect of surgical procedure on the central corneal shape. The principle cause of post operative astigmatism is surgically induced corneal distortion.<sup>4</sup> The amount of post-operative astigmatism is related to the size and position of the wound, type, position and tension of the sutures, type of closure, time since surgery, measures for correction of astigmatism, post operative treatment and of course the surgical technique itself.<sup>5</sup> Three suturing techniques have been used in this study in order to reduce astigmatism post operatively that are interrupted 2, 3 and continuous sutures technique. The purpose of this study is to find out various patterns of post operative astigmatism in cataract surgery using three different suturing techniques in terms of WTR/ATR astigmatism and to find out the best technique.

### METHODOLOGY

This study was conducted at Combined Military Hospital Lahore and Bahawalpur from June 2010 to June 2011 to evaluate the pattern of surgically induced astigmatism after extracapsular cataract extraction in terms of with the rule (WTR) and against the rule (ATR)

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astigmatism in patients who underwent ECCE with posterior chamber rigid IOLs.

The study design was observational analytical. 100 patients (120 eyes) were randomly selected from outpatient department. Patients having senile cataract (age 55-75yrs), normal tear film, clear cornea, patient in whom preoperative keratometry did not show more than 1.5D WTR/ATR astigmatism, and patients having regular post operative follow up were included in the study. Patients with traumatic, pre-senile, secondary or complicated cataracts, patients with any ocular pathology, extreme age, systemic illness, and patients with post. operative complications from previous surgery were excluded from this study. Patients fulfilling the inclusion criteria were recruited for the study after written consent. Data was recorded which included history, assessment of preoperative visual acuity, slit lamp examination with particular attention to lid margins, lacrimal system, conjunctiva, cornea, anterior chamber and pupillary reactions. Intraocular pressure was recorded with Goldman's tonometer. Fundus examination was done with 90 D Superfield lens after dilating the pupil with 1% Tropicamide eye drops and in cases of dense cataracts B scan was performed to rule out posterior segment pathology. Keratometry with automated Keratometer Topcon KR 8800 was done on the same machine by one individual and biometry was carried out with PAC SCAN 300A digital biometric ruler. Surgery was done by an experienced surgeon under same circumstances. Extracapsular cataract extraction using standard microsurgical cataract set was done using OM-8 operating microscope under local anesthesia using 2ml Bupivacain and 3ml 4% Lignocaine solution. Curvilinear (two step) corneal incision from 10-2 o' clock was made and after ECCE with rigid PMMA IOL implantation, wound was sutured with 10/0 Nylon using either interrupted 2, 3 or continuous suturing technique. Post operatively Moxifloxacin and Prednisolone eye drops were used. Patients were divided into three groups A, B and C. Group A in which corneal incision closure with 2-interrupted 10/0 Nylon sutures 3mm apart was done, Group B in which corneal incision closure with 3-interrupted 10/0 Nylon sutures 2mm apart and Group C where corneal wound was sutured with continuous 10/0 Nylon sutures (3 crosses).

The patients in all three groups were followed up on 3rd day, 1st week, 04th week, and 8th week. On each visit visual acuity was checked using Snellen's chart, slit lamp examination was performed and keratometric readings were recorded using Topcon KR8800 Keratometer. Total cases in each group A, B, C were further divided into three sub groups. Sub groups (A1, B1 and C1) cases with no astigmatism (astigmatism  $\leq 0.50D$ ), sub groups (A2, B2 and C2) WTR astigmatism

(steeper meridian vertically i.e near 90 degrees, between 61-120 degrees) and sub groups (A3, B3 and C3) ATR astigmatism (steeper meridian horizontally i.e close to 180 degrees between 0-30 degrees). On 8th post operative week all the eyes with WTR/ATR in each sub groups were quantitatively assessed and surgically induced astigmatism was calculated by subtraction method.

## RESULTS

The comparison in qualitative data was made using Chi-square test whereas the mean of astigmatism was compared using Kruskal Wallis H test. Total of 100 cases with 120 eyes were included in the study. Out of 100 cases 70 (70%) were males and 30 (30%) were females, with a male to female ratio of 2.33:1. The mean age of the patients was 60.4 years with a range of 55-75 years. 120 eyes were divided into three groups each comprising of 40 eyes (33.3%). The results were studied in three groups (A, B and C) depending upon the number of 10/0 nylon sutures applied to close two stepped curvilinear clear corneal incision i.e 2, 3 interrupted and continuous respectively. Forty eyes were randomly enrolled in each group. Keratometric readings were recorded post operatively on 3<sup>rd</sup> day, 1<sup>st</sup> week, 3<sup>rd</sup> week and 8<sup>th</sup> week. In this study almost 90% of patients within the period under review had some level of astigmatism demonstrable following cataract surgery.

**In Group A** on 3<sup>rd</sup> post operative day, 05 cases (12.5%) had no astigmatism, 11 cases had (27.5%) WTR astigmatism and 24 cases (60%) were having ATR astigmatism. On 1<sup>st</sup> week and 4<sup>th</sup> week post operatively there was no significant change in astigmatism. On 8<sup>th</sup> week the number of cases with no astigmatism were 04 (10%), WTR astigmatism were 10 (25%) and ATR astigmatism were 26 (65%).

**In Group B** on 3<sup>rd</sup> post operative day, 03 (7.5%) cases showed no astigmatism, 17 (42.50%) showed WTR astigmatism and 20 (50%) cases showed ATR astigmatism. On 1<sup>st</sup> week and 4<sup>th</sup> post operative week there was no change in the astigmatism. On 8<sup>th</sup> week 02 (05%) cases showed no astigmatism, 16 (40%) cases showed WTR astigmatism, and 22 (55%) cases showed ATR astigmatism.

**In Group C** on 3<sup>rd</sup> post operative day, 03 (7.5%) cases showed no astigmatism, 28 (70%) cases showed WTR astigmatism and 09 (22.5%) cases showed ATR astigmatism. There was no significant change in astigmatism on week 01 and week 04. On 8<sup>th</sup> week 02 (05%) cases showed no astigmatism, 27 (67.5%) cases showed WTR astigmatism and 11 (27.5%) cases showed ATR astigmatism. (Table No 1).

On 3<sup>rd</sup> day no astigmatism was noted in 05 cases in Group A, 03 cases in Group B and 03 cases in Group C. WTR astigmatism was noted in 11 cases in Group A, 17 cases in Group B, and 28 cases in Group C. ATR

astigmatism was noted in 24 cases in Group A, 20 cases in Group B and 09 cases in Group C. The type of astigmatism was independent of all three study group, p-value >0.05.

There was no marked change in astigmatism in all the groups during 1<sup>st</sup> and 4<sup>th</sup> week assessment, p-value >0.05. On 8<sup>th</sup> week no astigmatism was noted in 04 cases in group A, 02 cases in group B and 02 cases in group C. WTR astigmatism was noted in 10 cases in group A, 16 cases in group B and 27 cases in group C. ATR astigmatism was noted in 26 cases in group A, 22 cases in group B and 11 cases in group C. The mean astigmatism in group A was  $2.58 \pm 1.46$  in which mean astigmatism of cases WTR and ATR was  $2.75 \pm 1.6$  and

$2.5 \pm 1.4$  respectively. The mean astigmatism in group B was  $2.39 \pm 1.22$  in which mean astigmatism of cases WTR and ATR was  $2.73 \pm 1.02$  and  $2.40 \pm 1.3$  respectively. The mean astigmatism in group A was  $2.27 \pm 1.21$  in which mean astigmatism of cases WTR and ATR was  $2.30 \pm 1.21$  and  $2.20 \pm 1.21$  respectively. (Table 2)

## DISCUSSION

Extracapsular cataract extraction is still being done in many remote parts of the country and in eye camps where the facilities for phacoemulsification are not available and patients can't afford foldable IOLs. ECCE done carefully considering all the contributing factors of surgically induced astigmatism can prove to be acceptable method of cataract surgery. Corneal

**Table 1**  
Comparison of post operative astigmatism in study groups

Sub Group	Type of Astigmatism	POST OP PERIOD				p-value
		3rd Day	1st Week	4th Week	8th Week	
A1	No Astigm	05	05	05	04	p-value > 0.05
B1	No Astigm	03	03	03	02	p-value > 0.05
C1	No Astigm	03	03	03	02	p-value > 0.05
A2	WTR	11	11	11	10	p-value > 0.05
B2	WTR	17	17	17	16	p-value > 0.05
C2	WTR	28	28	28	27	p-value > 0.05
A3	ATR	24	24	24	26	p-value > 0.05
B3	ATR	20	20	20	22	p-value > 0.05
C3	ATR	09	09	09	11	p-value > 0.05

No Astigmatism: Astig  $\leq 0.50D$

**Table 2**  
Quantitative analysis of astigmatism in study groups at 08 weeks

Groups	Type of Astigmatism	Amount of Astigmatism				Mean $\pm$ S.D
		0.5-22D	2-3.5D	3.5-5D	>5D	
A	WTR	04	03	02	01	$2.75 \pm 1.6$
	ATR	12	08	04	02	$2.5 \pm 1.4$
	WTR+ATR	16	11	06	03	$2.58 \pm 1.46$
B	WTR	06	08	02	-	$2.73 \pm 1.02$
	ATR	11	06	04	01	$2.40 \pm 1.3$
	WTR+ATR	17	14	06	01	$2.39 \pm 1.22$
C	WTR	13	10	03	01	$2.30 \pm 1.23$
	ATR	06	03	02	-	$2.20 \pm 1.21$
	WTR+ATR	19	13	05	01	$2.27 \pm 1.21$

p-value > 0.05

astigmatism after cataract surgery is a well documented finding.

Incision size, location, wound construction and the most important suturing technique influence the development and amount of post operative corneal astigmatism in cataract surgery.<sup>6</sup> Wound gape causes ATR astigmatism where as wound compression by tight sutures cause WTR astigmatism. Factors that increase wound compression are deeply placed fine sutures, wide sutures, and tightly tied sutures especially continuous sutures.

Some control of astigmatism is of course possible by recognizing and avoiding accepted factors producing it.<sup>7</sup> In this study shape, length and location of incision was same, suture material was 10/0 nylon with three suturing techniques i.e interrupted 2, 3 and continuous. Use of 10/0 monofilament nylon sutures may lead to WTR astigmatism as high as 12D or more.<sup>8</sup> Our findings are consistent with the study conducted by Singh D and Kumar K, where the number but not the type of sutures used for cataract extraction affected the amount of post operative astigmatism. According to this study 3 interrupted sutures technique had the best results.<sup>9</sup>

According to this study two interrupted sutures had maximum cases against the rule astigmatism where as continuous suturing technique showed maximum cases WTR astigmatism whereas the study carried out by Sood et al in 2003 observed WTR astigmatism in majority of cases with continuous/5 interrupted sutures.<sup>10</sup> After 8 weeks there was a slight shift towards ATR astigmatism which is similar to the findings of Blue Mountains eye study.<sup>11</sup>

## CONCLUSION

Two interrupted suture technique has the highest rate of ATR astigmatism whereas continuous suturing technique showed WTR astigmatism. This study suggests that continuous suturing technique in clear corneal incision for cataract surgery is the best method which gives the least ATR astigmatism. Surgically induced WTR astigmatism can be satisfactorily treated by selective suture manipulation. There are several options for correcting astigmatism at the time of cataract surgery such as incision placement on the steeper axis

of corneal astigmatism, per operative keratometry and toric IOLs. Selective suture removal can be performed safely at 5-6 weeks post operatively with removal of a second suture if necessary in the steepest axis after 1 hour. In cases of WTR astigmatism, suture removal may reduce or neutralize the astigmatism but in cases of ATR astigmatism suture removal can increase the amount of astigmatism.

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## Post Operative IOP elevation following Triamcinolone Acetonide assisted Vitrectomy in cases of Vitreous Hemorrhage

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Zeeshan Kamil FCPS<sup>4</sup>, Fawad Rizvi FCPS<sup>5</sup>

### ABSTRACT:

**Study Design:** Interventional case series

**Material and Methods:** 80 eyes of 80 patients were operated upon, out of which 56 were males and 24 were females. A 23 gauge vitrectomy was performed for vitreous hemorrhage not resolving for more than three months. Following core vitrectomy, 0.2 ml (8mg) triamcinolone acetonide was injected over the macula to improve visualization of the transparent vitreous gel during vitrectomy and facilitate visual confirmation of separation of posterior hyaloid from the optic nerve head and posterior retina. After completion of vitrectomy, excess triamcinolone was aspirated with a back flush needle.

A pressure elevation was defined as a pressure of 22 mm Hg or higher during follow up.

**Results:** The mean pre operative baseline IOP was 13.6 mmHg  $\pm$  4.8 mmHg. 18 patients (22%) showed rise of IOP equal to or more than 22 mmHg  $\pm$  4.2 mmHg at three weeks after operation. Triamcinolone induced IOP elevation was well controlled by using anti glaucoma medication. IOP returned to baseline after 14 weeks postoperatively.

**Conclusions:** Intravitreal administration of triamcinolone acetonide can be successfully used to aid the peroperative visualization but it is associated with elevation of intraocular pressure over days to several weeks which was well controlled by topical medications.

### INTRODUCTION:

Nowadays threshold for vitrectomy has fallen and is being used to treat various vitreoretinal diseases. It is still a demanding procedure requiring a skilled and experienced surgeon, despite advances in surgical instrumentation and techniques. One major difficulty with this procedure is the transparency of vitreous. Intra-operative triamcinolone acetonide (TA) has been used to address this problem, as it can be injected in to the vitreous to visualize the posterior hyaloid or the internal limiting membrane (ILM).<sup>1</sup>

Intravitreal steroid injection has been widely used in the field of ophthalmology since intravitreal dexamethasone injection was first performed for the treatment of endophthalmitis by Graham and associates in 1974.<sup>2</sup> Among steroids, triamcinolone acetonide is hydrophobic so that its vitreous level can be maintained for up to 3 months.<sup>3</sup> Steroid-induced elevation of

intraocular pressure were first reported more than 40 years ago, when some eyes treated with topical dexamethasone were noted to manifest significant intraocular pressure responses.<sup>4</sup> Since then, steroid induced ocular hypertension has been observed after virtually every route of administration for corticosteroids.<sup>5</sup> The onset of this phenomenon is variable after initiation of corticosteroid therapy, and the magnitude of the steroid response is equally variable, ranging from a rise of a few millimeters of mercury to dramatic rises of more than 40 mmHg. Traditionally intraocular pressure lowering therapy, including topical and oral medications, laser trabeculoplasty, and incisional surgery, have all shown efficacy in lowering steroid induced elevations of intraocular pressure.<sup>6</sup> Definitive treatment consists of discontinuation of steroid therapy, although this is not always practical or possible given the nature and severity of the underlying disease process requiring corticosteroid therapy. In addition, the route of administration may also limit the ability to discontinue therapy. In the setting of topical, oral, or parenteral administration, dosing can be discontinued upon the onset of an intraocular pressure response. Depot injections, such as those administered in the sub-Tenon's space or the intravitreal cavity, are more difficult to remove and thus pose a greater clinical challenge.<sup>7</sup>

Fibroblast growth inhibition effect of triamcinolone acetonide is 21-fold more forceful than that of dexamethasone, so its range of usage has widened to

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include intraocular diseases such as exudative age related macular degeneration,<sup>8</sup> macular edema secondary to diabetes mellitus,<sup>9</sup> retinal vein occlusion,<sup>10</sup> uveitis<sup>11</sup> and pseudophakia.<sup>12</sup> The purpose of this study is to describe the incidence and characteristics of intraocular pressure elevations after intravitreal administration of triamcinolone acetonide.

#### MATERIAL AND METHODS:

This study was conducted in LRBT Free Base Eye Hospital, Karachi during the period of January 2009 to December 2009, and included 80 eyes of 80 patients, out of which 56 (70%) were males and 24 (30%) were females. Data was collected on pre designed proforma including, enquiry about previously having glaucoma and if history of glaucoma is positive then which medications were being used; ophthalmic examination including visual acuity, intraocular pressure, slit lamp examination and fundus examination. A 23 gauge vitrectomy was performed for vitreous heammorhage not resolving for more than three months. Following core vitrectomy, 0.2 ml (8mg) triamcinolone acetonide was injected over the macula in order to improve visualization of the vitreous gel during vitrectomy and to facilitate visual confirmation of separation of posterior hyaloid from the optic nerve head and posterior retina. After completion of vitrectomy, excess triamcinolone was aspirated with a back flush needle. A pressure elevation was defined as a pressure of 22 mm Hg or higher during follow up. All patients were followed for up to 24 weeks and intraocular pressure, occurrence of any adverse events and number of anti glaucoma medications if required

was noted.

#### RESULTS:

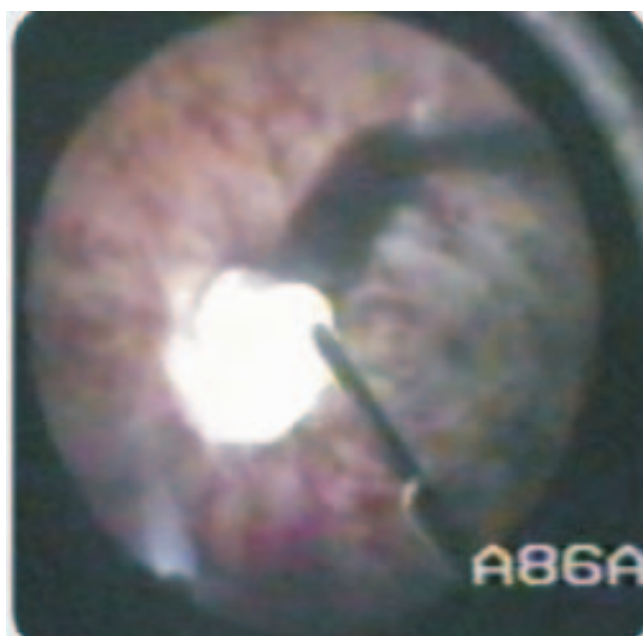
Although the intravitreal injection of triamcinolone acetonide results in dramatic improvement in visualization of vitreous gel during vitrectomy, it may raise the postoperative intraocular pressure. In this study the mean preoperative intraocular pressure was  $13.8 \text{ mmHg} \pm 4.8 \text{ mmHg}$ , 18 patients showed rise of IOP equal to or more than  $22 \text{ mmHg} \pm 4.2 \text{ mmHg}$  at three weeks after operation which was well managed by using anti glaucoma medication like topical beta blockers. Intraocular pressure returned to baseline after 12 weeks postoperatively. Only four of them showed persistently raised intraocular pressure despite full medical treatment and were ultimately managed with surgical intervention. One (1.25%) case presented with endophthalmitis on sixth postoperative day. So the incidence of raised intraocular pressure on follow up visits in this study was 22.5%.

#### DISCUSSION:

Chromovitrectomy is the use of chemicals to stain semitransparent preretinal structures as an aid in successful vitreoretinal surgery. Several different dyes have been tried, and only a few substances remain as commonplace in surgery including indocyanine green (ICG), trypan blue (TB) and recently triamcinolone acetonide (TA). ICG is water soluble dye that is used in vitrectomy because it binds to type IV collagen, allowing visualization of the internal limiting membrane. Indocyanine green is well known for its use in retinochoroidal angiography. Trypan blue is also a water

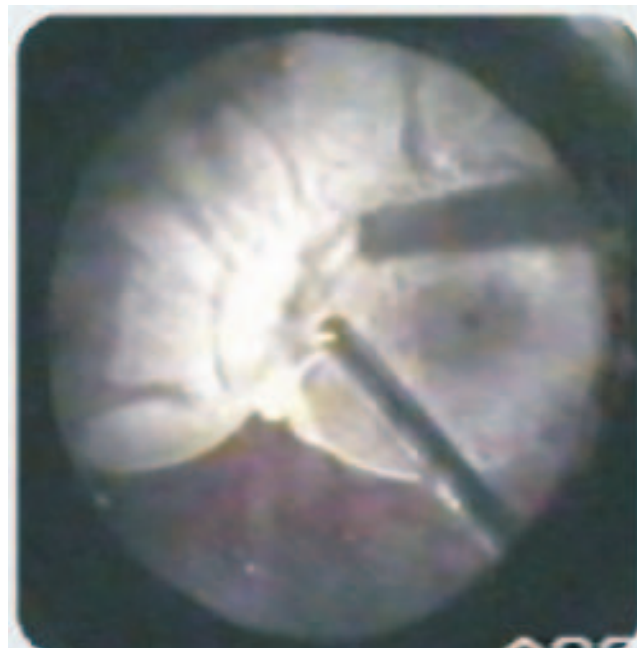
**FIGURE 1**

Intravitreal triamcinolone acetonide being injected.



**FIGURE 2**

Triamcinolone assisted vitrectomy.



soluble dye, but it has a high affinity for cellular components, which allows visualization of an epiretinal membrane.<sup>13</sup> Triamcinolone acetonide intertwines itself in collagen matrices and will therefore coat both an epiretinal membrane and internal limiting membrane.<sup>14</sup>

Corticosteroids are well known for their effectiveness in the inhibition of prostaglandin, inflammatory adhesion molecules such as ICAM-I and MHC-II, growth factors such as vascular endothelial growth factor (VEGF) and in the induction of plasminogen activator inhibitor (PAI)-1. As a result, they tighten up the blood vessels and maintain the integrity of blood-retinal barrier.<sup>15</sup> In general, inflammation is one of the important processes in wound healing and some postoperative inflammation is inevitable in any surgery. However, excessive inflammation induces unwanted pathological changes such as retinal gliosis and activation of pigment epithelial cells, which sometimes causes subsequent retinal detachment. For example, no epiretinal membrane formation occurred in the retinal wound healing without macrophage infiltration in animal study.<sup>16</sup> Therefore care should be taken to reduce the amount of postoperative inflammation as much as possible.

Triamcinolone acetonide has a strong anti inflammatory effect and has been used for various ocular inflammatory diseases in experimental studies and / or clinical treatment. Tano et al<sup>17</sup> reported that the intravitreal injection of triamcinolone significantly reduced the progression of proliferative vitreo-retinopathy in rabbits by inhibiting the inflammation, and other studies supported this result.<sup>18,19</sup> In addition, in a clinical study, Jones et al reported that the intravitreal injection of steroids clearly reduces the incidence of proliferative vitreoretinopathy after a vitrectomy.<sup>20</sup> In age related macular degeneration (AMD), the antiangiogenic effect of the intravitreal injection of steroid was shown in clinical study, and several studies reported the possible merit of the intravitreal injection of triamcinolone acetonide in inhibiting the deterioration of vision.<sup>19,21</sup> Considering these facts, the intravitreal injection of triamcinolone acetonide can have a strong inhibitory effect on inflammation after vitrectomy.

Corticosteroid is the strong inducer of intraocular pressure rise. Recent studies have revealed that intravitreal triamcinolone acetonide without vitrectomy causes a significant rise in intraocular pressure in more than 50% of eyes.<sup>22,23</sup> In comparison, the incidence of intraocular pressure was not so high after triamcinolone acetonide assisted vitrectomy, probably because triamcinolone acetonide was almost totally removed at the end of surgery. Kumagai et al reported that five out of ninety six eyes (5.2%) showed a transient intraocular pressure increase after surgery.<sup>24</sup> The largest scale

controlled trial, carried out over 1 year, showed that 23 out of 391 eyes (5.91%) had a significant intraocular pressure rise in triamcinolone assisted vitrectomy, while 13 out of 383 eyes (3.4%) had such a rise in conventional vitrectomy,<sup>25</sup> which did not reach statistical significance. Most of them were manageable with topical treatment, but some of them required filtering surgery.<sup>26</sup> In the present study eighteen out of eighty patients presented with raised intraocular pressure on follow up period, although they were well managed medically and surgically, but the incidence of raised intraocular pressure in this study was quite high as compared to above mention reports.

Corticosteroid has an immune suppressive effect and endophthalmitis has a poor visual prognosis, thus post operative infection has been the foremost concern in triamcinolone acetonide assisted vitrectomy. The incidence of acute endophthalmitis was reported to be one out of eighteen hundred and eighty six (0.053%) cases in one study,<sup>27</sup> and seven out of twenty six thousand eight hundred and nineteen (0.026%) cases in Japan national survey.<sup>28</sup> In another study incidence of endophthalmitis in triamcinolone acetonide assisted pars plana vitrectomy is 0.053%<sup>29</sup> In the present study, one (1.25%) case present with endophthalmitis on sixth postoperative day. The diagnosis of acute endophthalmitis after triamcinolone acetonide assisted vitrectomy might not be easy, because ocular pain was mild and anterior inflammation was not so strong according to anecdotal case reports.<sup>30,31</sup> This might have much to do with residual triamcinolone acetonide, which inhibits ocular inflammation. So it would be advisable to follow up an eye after triamcinolone assisted vitrectomy with greatest caution, especially after a transconjunctival small incision vitrectomy.

Intravitreal triamcinolone acetonide injection is performed more commonly across the world than triamcinolone acetonide assisted vitrectomy, the direct toxicity of triamcinolone acetonide on ocular tissue is rarely reported. Indeed, deposition of triamcinolone acetonide to an optic disc or retina did not cause serious adverse events.<sup>32</sup>

#### CONCLUSION:

This study showed that per operative use of triamcinolone acetonide actually improved the visibility of the vitreous body and residual vitreous cortex during PPV. One side effect observed was post operative increase in IOP in 22% of the cases which was managed medically in majority of the cases.

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## Subtenon Anesthesia: Comparison of Globe Akinesia using 4 ml with 3 ml of Lignocaine with Adrenaline (without Hyaluronidase) in Patients undergoing Cataract Surgery\*

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### ABSTRACT

**Objectives:** To compare 4ml with 3ml of local anesthesia via subtenon injection for globe akinesia in cataract surgery

**Study design:** This was a randomized controlled trial.

**Place and duration of study:** The study was conducted in Eye B Unit Khyber Teaching Hospital Peshawar from 1<sup>st</sup> October 2009 to 1<sup>st</sup> October 2010.

**Patients and methods:** Sixty four patients were included in the study. The patients were randomly allocated into two groups i.e. group "A" and group "B". Group "A" received 3ml of lignocaine while group "B" received 4ml of lignocaine, all by the same surgeon. All the surgeries were performed by the same surgeon. Akinesia score was recorded 10 minutes after the administration of anesthesia and categorized in two groups (1) Akinesia with a score of 0-4 (2), no akinesia with a score of 5-8.

**Results:** There were 32 patients in each group. There was no significant differences in mean age ( $p=1.00$ ) and gender distribution ( $P$  value = 0.058) of the two groups. In group "A" akinesia was present in 17 (53.12%) patients while 15 (46.87%) had no akinesia. In group "B" akinesia was present in 26 (81.3%) patients while 6 (18.7%) had no akinesia ( $P$  value = 0.03).

**Conclusion:** 4ml of local anesthetic with adrenaline (without hyaluronidase) is superior in providing globe akinesia than 3ml in subtenon anesthesia for cataract surgery.

**Key words:** Subtenon anesthesia, Lignocaine, Akinesia

### INTRODUCTION:

Cataract is the leading cause of avoidable blindness in the world and accounts for over half of the causes of avoidable blindness in Pakistan.<sup>2</sup> The prevalence of cataract surgery in Pakistan is 8% and in Khyber Pukhtonkhwa is 6.1%.<sup>2</sup> Cataract surgery can be carried out under general and local anesthesia. Due to unwanted effects of general anesthesia,<sup>3</sup> local anesthesia is preferred by most of the surgeons and patients for cataract surgery, the latter is having good analgesia and quick recovery.<sup>4</sup> There are many techniques of local anesthesia for cataract surgery. Sharp needle techniques (Peribulbar or retrobulbar) may have serious sight threatening complications such as globe perforation and life threatening complications like brainstem

depression.<sup>5,6,7</sup> Subtenon block eliminates these risks and provides both anaesthesia as well as akinesia and is less painful.<sup>8</sup> The goal of ideal local anesthesia is to obtain complete akinesia of the eye ball in order to provide optimal surgical conditions.<sup>9</sup> When akinesia and dense blocks are required, the subtenon blocks appears to be the technique of choice.<sup>10, 11</sup> One recent study<sup>12</sup> done in 2010 stated that effectiveness of subtenon anesthesia is dose dependent and optimum quantity of the anesthetic agent is yet to be confirmed and emphasized on the need to undergo clinical trials which can compare the different volumes of anesthetic agents. Hyaluronidase permits a significant 2.4-fold reduction in the median effective local anesthetic volume (MLAV) for subtenon anaesthesia.<sup>13</sup> The addition of hyaluronidase, hydrolyses part of the intracellular matrix that maintains tissue integrity, allowing the local anesthetic to disperse more extensively around the orbit, and may allow smaller volumes to be given. Most of the studies<sup>14,15,16</sup> done on the effect of different volumes on the efficacy of subtenon anesthesia had added hyaluronidase to the local anesthetic solution. However the hyaluronidase is not available in Pakistan. In this study we compared akinesia using 3ml and 4ml of local anesthetic agent without hyaluronidase in subtenon anesthesia for cataract surgery.

### MATERIALS AND METHODS:

This study was conducted over a period of one

\*The study was conducted in Eye "B" Unit, Department of Ophthalmology, Khyber Teaching Hospital, Peshawar after approval by the Hospital Ethical Review Board as well as the College of Physicians & Surgeons, Pakistan as a part of authors' dissertation for Fellowship in Ophthalmology.

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year i.e. from 1st October 2009 to 1st October 2010, in Eye "B" unit Khyber Teaching Hospital Peshawar. Patients admitted to Eye "B" unit for cataract surgery who had given informed consent and were in the age group between 50-70 years were included in the study. Patients who had hypersensitivity to lignocaine and patients who were not cooperative or not suitable for regional anesthesia were excluded from the study. Approval was taken from the ethical committee of the hospital before starting the study and written informed consent was taken from all the patients. The cases were divided into two groups as group "A" and group "B". Total sample size was 64 i.e. 32 patients in each group. Patients in group "A" received 3ml and in group "B" received 4ml of subtenon anesthetic solution (2% lignocaine with adrenaline). All procedures were performed by a single and experienced surgeon. In all patients anesthetic injection was given in the lower nasal quadrant, under operating microscope. Digital compression was started after anesthesia administration and continued for 10 minutes with interval for 10 seconds after every 2 minutes. Akinesia score was recorded 10 minutes after the administration of anesthesia. Measurements of eye movements were done in all four quadrants i.e. Inferior, superior, medial and lateral using a caliper and scored according to movements.

0 = no movements.

1 = movement of less than 2mm.

2 = movement of more than 2 mm.

The overall movement score was obtained by combining the scores of all four quadrants. And was categorized in two groups

- (1) Akinesia with a score of 0-4
- (2) No akinesia with a score of 5-8

All the statistical analysis was carried out using SPSS 11.0. Descriptive statistics like mean and standard deviation were calculated for age while frequencies and percentages were calculated for gender and akinesia. P-Value < 0.05 was considered significant.

#### Technique of injection:

**Procedure (subtenon anesthesia):** Povidone solution was used before subtenon injection. Topical anesthetic drops (proparacain 0.5%) were instilled in the eye. 3ml of 2% lignocaine with adrenaline in group A and 4ml of 2% lignocaine with adrenaline was used in group B.

All subtenon injections were given in the lower nasal quadrant. Before subtenon injection, topical anesthetic proparacain was used, then eye speculum was inserted, and then the patient was asked to look upward and temporally. Then conjunctiva along with tenon's capsule was slightly elevated from the sclera with conjunctival forcep and a single cut was made with

conjunctival scissors. The sub-tenon space was opened and sclera exposed. Specially designed blunt subtenon anesthesia canula was used. Three ml of lignocaine along with adrenaline solution was introduced into the space along the eye ball beyond the equator used in group A while 4 ml lignocaine with adrenaline solution in group B. Gauze bandage was applied to eye over closed lids and pressure given for 10 minutes with interval of 10 seconds after every 2 minutes.

#### RESULTS

Total sample size was 64 i.e. 32 patients in each group. The two groups were identical in terms of age and gender. Mean age for group "A" was  $59.93 \pm 6.66$  and for group "B" it was  $62.81 \pm 5.19$  (Table: 1). Comparing the mean age in both groups using t test P value = 1.00. In group "A" there were 15 (46.9%) female and 17 (53.1%) males and in group "B" there were 14 (43.8%) females and 18 (56.3 %) males. (Figure: 1) Comparing the gender distribution in both groups using Chi Square test P value = 0.058.

In group "A" akinesia was present in 17 (53.12%) patients while 15 (46.87%) had no akinesia. In group "B" akinesia was present in 26 (81.3%) patients while 6 (18.7%) had no akinesia as shown in figure 2. Comparing the frequencies of akinesia and no akinesia in both groups using chi square test P value = 0.03.

#### DISCUSSION:

Ophthalmic surgery is one of the most frequent

Table 1  
Mean Age of patients in Group A & B

Group	Mean age + Standard Deviation	P value
Group A	$59.93 \pm 6.66$	1.0
Group B	$62.81 \pm 5.19$	

Figure 1  
Gender distribution of Patients in group A & B

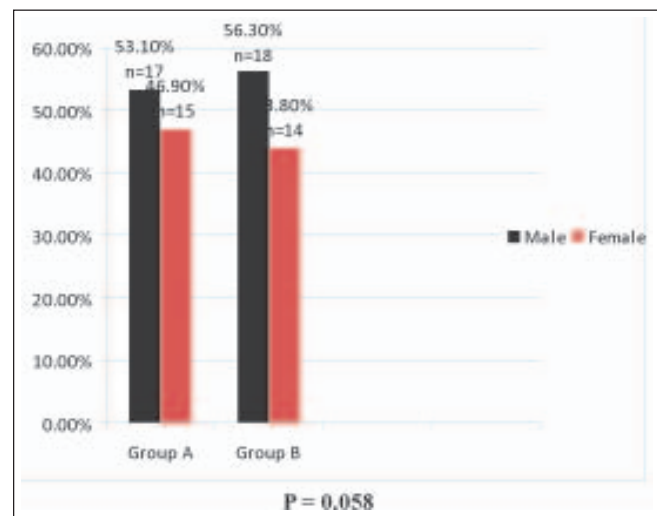
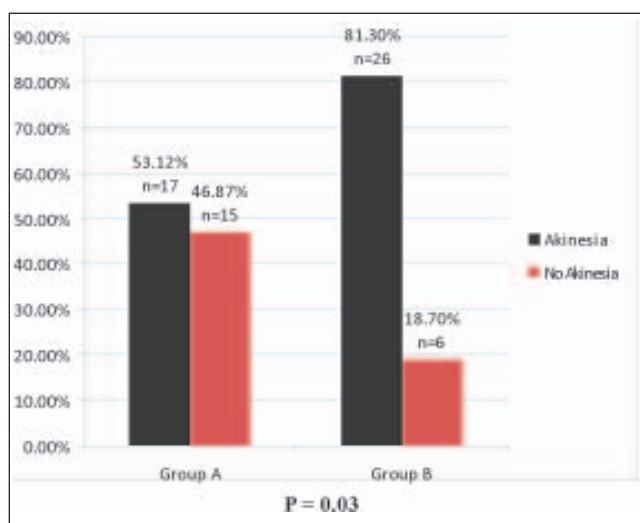


Figure 2  
Comparison of Akinesia and No Akinesia in Group A & B



surgical procedures requiring anesthesia in developed countries.<sup>17</sup> A mere decade or so ago most of the cataract surgeries used to be performed under general anesthesia.<sup>18,19</sup> Nowadays most of the ophthalmic surgeries are performed under safe and effective means of local anesthesia,<sup>20</sup> and hence the unwanted effects that were associated with general anesthesia are no more there with local anesthesia.<sup>3</sup>

Different techniques of local anesthesia are available for cataract surgery. Subtenon technique is safe, effective and painless and is a perfect block.<sup>21,22</sup> An ideal anesthetic technique must be safe from serious complications, should provide good analgesia and must be effective in terms of providing good akinesia. Maximal akinesia will develop over 5-15 min. The site of injection, its timing relative to surgery, and the composition and volume of solution administered are each very important in producing immobility of the globe.<sup>23</sup> 25% of the volume of anesthesia exits through the incision made for administration of anesthesia and the remaining stays within the subtenon space and the volume of which is closely correlated to motor block.<sup>24</sup>

Hyaluronidase improves the quality of akinesia and hence reduces the volume of local anesthetic agent required for effective akinesia<sup>13,14,15,16</sup> but this is not available in Pakistan. Setting the target score of 4 or less for akinesia and more than 4 for no akinesia, we found that more patients had akinesia in group "B" (4 ml of anesthetic solution) as compared to group "A" (3 ml of anesthetic solution). In group "A", akinesia was present in 17 (53.12%) patients while 15 (46.87%) had no akinesia and in group "B" akinesia was present in 26 (81.3%) patients while 6 (18.7%) had no akinesia so there was statistically significant difference (P value = 0.03)

between the two groups i.e. the group "B" provided akinesia in more patients than group "A". One study showed that subtenon anesthesia using 5ml of anesthetic agent was more effective than 3ml (without addition of hyaluronidase to anesthetic in both groups) in providing akinesia and also there was no significant difference in IOP elevation between the 2 groups.<sup>25</sup> Another study states that 3-5 ml volume of anesthetic is safe, when considering the associated complications.<sup>26</sup> As our study showed that 4 ml of anesthetic solution provided akinesia in significantly more number of patients (81.3%) than 3ml (53.12%) so to obtain a reliable akinesia the anesthetic volume should be not less than 4ml.

## CONCLUSION

4ml of local anesthetic with adrenaline (without hyaluronidase) is superior in providing globe akinesia than 3ml in subtenon anesthesia for cataract surgery.

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## Additional effect of Mitomycin C in reducing recurrence of Pterygium treated by Excision & Amniotic Membrane Transplantation\*

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### ABSTRACT:

**Objective:** To assess any additional effect of post operative mitomycin C in patients treated for pterygium by amniotic membrane transplantation

**Study Design:** Quasi Experimental clinical study

**Material and Method:** This experimental clinical study was conducted in LRBT Free Base Eye Hospital during the period of January 2010 to June 2011. The study included 60 patients, including 35 males and 25 females with age ranging between 20 and 50 years and diagnosed with primary pterygium (no history of previous surgical treatment). Patients were randomly allocated in two groups, 30 in each group. Group A patients underwent pterygium excision and amniotic membrane transplantation, Group B patients underwent same procedure but with postoperative instillation of mitomycin C 0.02% eye drops. Outcome measures were recurrences and complications.

**Result:** In group A, there were 5 (16.6%) recurrences with minor complications in 6 (20%) cases, where as in group B, there were 2 (6.66%) recurrences with minor complications in 2 (6.66%) cases.

**Conclusion:** Although primary pterygium excision with amniotic membrane transplantation is a safe and effective surgical technique with low recurrence rate but this study proves that there is an additional effect of postoperative mitomycin C 0.02% eye drops on further declining recurrence rate with minimal complications.

**Key Words:** Pterygium excision, mitomycin C 0.02%, amniotic membrane transplplantation.

### INTRODUCTION:

A pterygium is a fibrovascular growth of actinically damaged conjunctiva extending across the limbus and invading the cornea. It is a common external eye condition, affecting different populations especially in tropical and subtropical regions with a reported prevalence of 2% to 7% world wide.<sup>1</sup> Pterygium is thought to result primarily from ultraviolet light-induced damage to connective tissues underlying the conjunctiva. The pathological changes consist of elastoid degenerations of the collagen and appearance of sub epithelial fibrovascular tissue. The cornea shows destruction of the Bowman layer by fibrovascular in-growth, frequently with mild inflammatory changes. The overlying epithelium may be normal thick or thin and may show dysplasia.<sup>2</sup>

\*The subject was approved by the Research & Ethical Committee and the study was permitted to be conducted at LRBT Free Base Eye Hospital.

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Pterygium often invades the optical axis and may lead to irregular corneal astigmatism and corneal stromal scarring with visual impairment. The only therapy employed when it affects vision or cosmetic is surgical removal.<sup>3</sup> Other indications for surgical intervention include discomfort and irritation unresponsiveness to conservative therapy, restricted ocular motility, difficulty with contact lens wear, anticipated keratorefractive surgery and unacceptable appearance.<sup>4</sup>

Amniotic membrane has been used as a surgical material since the 1940s, and the membrane has been shown to have a strong anti-adhesive effect.<sup>5,6</sup> Amniotic membrane has a thick collagen layer and an overlying basement membrane with a single layer of epithelium. The use of amniotic membrane has been suggested as a replacement for a function substrate,<sup>5,7</sup> as the presence of normal substrate is essential for normal proliferation and differentiation of epithelial cells. This is also true in the cornea, since the corneal epithelium and the underlying stromal cells have been shown to interact intimately through various cytokines.<sup>8</sup> Kim and Tseng used preserved human amniotic membrane to supply a normal substrate in rabbit chemical burn models, and they were able to successfully reconstruct the ocular surface.<sup>9</sup>

As a natural basement membrane, amniotic membrane contains various matrix proteins which facilitate the adhesion, migration and differentiation of epithelial cells and prevent their apoptosis. Promotion of conjunctival epithelial wound healing, suppression

of fibroblasts and reduced extracellular matrix production are thought to be the major mechanisms by which amniotic membrane transplantation inhibits recurrence of pterygia.<sup>10</sup>

Many other modalities were implemented with the aim of improving the success rate, among them transplantation of the head of pterygium, conjunctival flaps, lamellar keratoplasty, mucous membrane grafts, chemotherapy by thiotepea, radiation therapy by radon bulbs, radium plaques, beta irradiation ablation with erbium YAG laser<sup>11</sup> and antimetabolite such as 5-fluorouracil and mitomycin C.<sup>12</sup>

Mitomycin C is an antineoplastic antibiotic alkylating agent isolated from fermentation filtrate of *Streptomyces caespitosus*. It selectively inhibits DNA replication by forming covalent linkages with guanosine residues in DNA, inhibits cellular RNA and protein synthesis.<sup>13</sup> Therefore, it prevents mitosis leading to cell death and interferes with collagen synthesis, thus preventing recurrence after pterygium surgery.<sup>13</sup> Complications reported with intra or post operative use of mitomycin C described are pain, iritis, secondary glaucoma, cataract, punctate keratitis, chemosis, delayed conjunctival healing, conjunctival granuloma and sclera and corneal melting.<sup>14</sup>

#### MATERIAL AND METHODS:

This experimental clinical study was carried out in LRBT Free Base Eye Hospital, Karachi during the period of January 2010 to July 2011. The study included 60 patients out of which 35 (58.33%) were males and 25 (41.66%) were females, with age ranging between 20 and 50 years and with primary pterygium (no history of previous surgical treatment). After informed consent, cases were **included** in the study with following criteria: pterygium on nasal side with 3 mm or more in size, pterygia that interfered with vision occluding visual axis or inducing astigmatism or when it was cosmetically disfiguring, whereas, **exclusion criteria** included glaucoma, ocular surface abnormalities, entropion, ectropion, ocular or adnexal infections. These patients were randomly divided in to 2 groups; Group A underwent pterygium excision followed by amniotic membrane transplantation, Group B underwent the same procedure followed by post-operative instillation of mitomycin C 0.02% eye drops four times a day for five days.

Performa was used to note down history with special enquiry about the chief complaints, occupation, duration of growth, and any previous medical or surgical treatment. Complete ocular examination including visual acuity, refraction, lid abnormalities, adnexal infections, level of tear film, color of growth, vascularization, extension on to the cornea, fluorescein staining of cornea, corneal scarring. Intraocular pressure

was checked by applanation tonometer. Fundus examination was carried out to see the macula and disc. All the procedures were performed by the same surgeon with six months follow up. All the operations were performed under microscope using topical and local subconjunctival anesthesia. No significant intraoperative complications were noted. All patients were followed up post operatively at first post operative day, fifth post operative day, two weeks, and one month interval for up to six month.

#### RESULTS:

Sixty patients were included in the study, 35(58.33%) were males and 25(41.66%) were females with an age ranging between 20 and 50 years. Patients were divided in to two groups. In group A, 30 patients were operated for pterygium excision followed with amniotic membrane transplantation, out of which recurrences were noted in 5 (16.6%) patients. In group B, 30 patients were operated for pterygium excision followed with amniotic membrane transplantation followed with postoperative mitomycin C 0.02% eye drops four times a day for five days, out of which recurrences were noted in 2 (6.66%) patients. Complications in group A included, one (3.33%) developed amniotic membrane retraction and complained of progressive photophobia, pain and foreign body sensation which did not respond to medical therapy and finally required a second amniotic membrane transplantation leading to complete resolution, conjunctival granuloma in three (10%) of patients which was later excised, one (3.33%) patient developed corneal dellen with thinning which responded to medical therapy and resolved completely, one (3.33%) patient complained of ocular irritability which later settled with instillation of steroids. In group B, one (3.33%) patient developed conjunctival granuloma which was later excised, one (3.33%) patient complained of ocular irritability which was settled with instillation of steroids. None of the patient in either group had any significant change in intraocular pressure any time during the follow-up period.

#### DISCUSSION:

A pterygium is a multifactorial degenerative

**Table 1**

Indicates the recurrence rate in the two groups

GROUP An=30	GROUP Bn=30
5 (16.6%)	2 (6.6%)

**Table 2**

Indicates the number of complications in the two groups

GROUP An=30	GROUP Bn=30
6 (20%)	2 (6.6%)

**Figure 1**

Illustrates a case of primary pterygium extending almost up to the visual axis



corneal disorder.<sup>15</sup> It is believed that surgical trauma and subsequent post operative inflammation activates subconjunctival fibroblasts, and the proliferation of fibroblasts and vascular cells, and deposition of extracellular matrix (ECM) proteins in turn contribute to the pterygium recurrence.<sup>16</sup> Alternatively, pterygium fibroblasts were reported to exhibit some characteristics of transformed cells such as hyperproliferation<sup>17</sup> and overexpression of matrix metalloproteinases,<sup>18</sup> which may partially explain the invasive nature of pterygium tissue.

As a natural basement membrane, amniotic membrane (AM) contains various proteins<sup>19</sup> which facilitate the adhesion<sup>20</sup>, migration<sup>21</sup>, differentiation<sup>22</sup>, and prevention of apoptosis of epithelial cells.<sup>23</sup> The amniotic membrane is also capable of binding growth factors which may help to promote wound healing.<sup>24</sup> However, these characteristics of amniotic membrane may not fully explain why amniotic membrane graft prevents pterygium recurrence. It has been shown that a supernatant of homogenized amniotic membrane promotes rather than inhibits proliferation of conjunctival fibroblasts.<sup>25</sup> In addition; factors contained in amniotic membrane may also change after preservation. It has been reported that after preservation at  $-80^{\circ}\text{C}$  for one month, activities of transforming growth factor  $\beta$  (TGF $\beta$ ) 1 and 2, basic fibroblast growth factor (bFGF), and hepatocyte growth factor (HGF) in amniotic membrane decreases by 50%.<sup>25</sup> However, recent findings indicate that preserved amniotic membrane suppresses the expression of TGF $\beta$ -I, TGF $\beta$ -II, TGF $\beta$ -III, TGF $\beta$  receptor type II, and myofibroblast differentiation in corneal and limbal fibroblast.<sup>26</sup> Likewise, preserved amniotic membrane also suppresses the signaling pathway of TGF $\beta$ , CD-44,  $\beta$ -1 integrin, and FGFR1/flg of pterygium fibroblasts.<sup>27</sup> Subsequently amniotic

membrane matrix inhibits extracellular matrix production and scar formation by these fibroblasts. Therefore, promotion of conjunctival epithelial wound healing and suppressing activation and extra cellular matrix production by pterygium fibroblast are thought to be the major mechanisms by which an amniotic membrane graft inhibits pterygium recurrence. Other possible mechanisms include inhibition of inflammation by inhibiting chemokines expression by fibroblasts<sup>28</sup> and interleukin-1 expression by epithelial cells,<sup>29</sup> inhibition of neovascularisation by inhibiting vascular endothelial cell growth,<sup>30</sup> presence of anti-angiogenic/anti-inflammatory protein,<sup>31</sup> and protease inhibitors.<sup>32</sup> Among various protease inhibitors, tissue inhibitors of metalloproteinase (TIMPs) are remarkable in that TIMP activity in amniotic membrane is preserved following cryopreservation.<sup>31</sup> Possibly, inhibition of postoperative inflammation and inhibition of vascular cells activation and invasion by amniotic membrane may also contribute to reduce pterygium recurrence.

The mainstay of treatment of pterygium is surgical. Various surgical procedures are used to treat pterygium. Total excision of the lesion was practiced in ancient times, which still constitutes one of the methods of treatment. The excision of the pterygium with bare sclera was widely practiced because it was believed to be safe and simple. However with time it became apparent that the recurrence rate was unacceptably high ranging from 24% to 89%.<sup>33</sup> Kenyon et al, first describe a conjunctival autograft in 1985, with reported recurrence rate of 5.3%.<sup>34</sup> Nakamura et al reported that sterilized freeze- dried amniotic membrane demonstrates excellent biocompatibility on the human ocular surface. This biomaterial may be considered as an alternative to conjunctival grafting in the treatment of pterygia.<sup>35</sup> The recurrence rate after amniotic membrane transplantation (AMT) was initially reported to be 10.9% which was higher than conjunctival autograft, but were reduced to 3% after modifying the surgical technique.<sup>36</sup>

This type of study has not been done yet. In this study we have learned whether there is an additive effect of postoperative mitomycin c eye drops on decreasing recurrence rate further, after pterygium excision following with amniotic membrane transplantation. In group A of this study, patients just underwent pterygium excision following with amniotic membrane transplantation, recurrences were observed in 5 (16.6%) patients, where as in group B of this study patients underwent pterygium excision with amniotic membrane transplantation followed by post operative mitomycin C 0.02% eye drops four times a day for five days, recurrences were observed in 2 (6.66%) patients. No untoward effect of mitomycin C was observed which might be due to low dose of mitomycin C 0.02%. Katbaab



A in 2008 reported that, they encountered 2% recurrent pterygium growth which responded to subconjunctival mitomycin C injection.<sup>15</sup>

# CONCLUSION:

Keeping in view the results of the current study, it was concluded that treatment of primary pterygium by excision and amniotic membrane transplantation, followed by topical mitomycin C 0.02% eye drops is a safe and effective treatment option with minimal post-procedure complications. Larger controlled trials are required to establish these findings.

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Dr Mushtaq

## Amblyopia in Strabismic Children \*

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### ABSTRACT

**Objective:** To find the prevalence and density of amblyopia in strabismic children

**Material and methods:** It was a retrospective case series of children with Squint presenting to Ophthalmology department HMC from September 2009 to September 2011. All those patients who had esotropia or exotropia, unilateral or alternating were included in the study. Age of the patients were four to 14 years. . Medical records were used to collect data on demographic variables, refraction, type of squint, presence / absence of amblyopia, and density of amblyopia.

**Results:** In this study 78 patients who had strabismus were analyzed. Esotropia was present in 58 cases (74.35%) and exotropia in 20 (25.64%) of these children. Fifty six (71.79%) cases had amblyopia .In esotropia the amblyopia was found to be more common and more dense while in exotropia the amblyopia was relatively less common and less dense. Most of the children with diagnosis of convergent squint (41/ 56 or 73.21%) had hypermetropia.

**Conclusion:** In summary amblyopia due to strabismus is a common problem in children in our society. It is very important to identify and treat strabismus and amblyopia during the sensitive period. A comprehensive screening programme must be devised and applied. The best time for screening may be at school or entry into the play group.

**Key Words:** Esotropia, Exotropia, Amblyopia

### INTRODUCTION:

Amblyopia is derived from the Greek word amblyos, meaning dull, and opia, meaning vision. It refers to a decrease in best-corrected visual acuity in an eye having no organic pathology.<sup>1</sup> It is the most frequent cause of monocular visual impairment in both young and adults.<sup>2</sup> Three critical periods of human visual acuity development have been determined.<sup>3,4</sup> During these time periods, vision can be affected by the various mechanisms to cause Amblyopia. These periods are as follows:

- The development of visual acuity from the 20/200 range to 20/20, which occurs from birth to age 3-5 years.
- The period of the highest risk of deprivation amblyopia, from a few months to 7 or 8 years.
- The period during which recovery from amblyopia

can be obtained, from the time of deprivation up to the teenage years or even sometimes the adult years.

Amblyopia is the single most common visual deficit affecting visual acuity (VA) in childhood, with a prevalence estimated between 1.0% and 4.0%.<sup>5</sup> Childhood squint is a common ophthalmic disorder. If untreated, squint can cause amblyopia (lazy eye) and permanent loss of vision. Studies have reported the prevalence of amblyopia to be as high as 50% in children with esotropia and 20% in children with exotropia. In most cases the treatment of squint involves correction of any refractive error and occlusion therapy to improve vision and squint surgery, if required.<sup>6,7</sup>

Despite the importance of early detection and intervention, children with squint in developing countries present late. For example, in a study conducted in Khyber Pukhtoonkhwa, Pakistan, age at presentation was more than 5 years in the majority of children with squint.<sup>8</sup> This is in sharp contrast with findings from studies conducted in Western settings where the mean age at presentation varies from 2 to 5 years.<sup>9,10</sup> In Pakistan no reliable statistical data is available up till now. We have therefore designed a study in Khyber Pukhtoonkhwa, to find out the percentage of amblyopia in strabismic patients of our population. Among the other causes of amblyopia including, anisometropia, high ametropia, and visual deprivation due to diseases like cataract, are also common. By ruling out all other causes and treating strabismus in early years of life we can prevent the child from such a grave problem, the effects of which are life long.

### MATERIAL AND METHODS

It was a retrospective case series of children with

*\*The subject was approved by the Research & Ethical Committee of the Hospital and the study was permitted to be conducted at the Department of Ophthalmology, Hayatabad Medical Complex, Peshawar.*

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squint presenting to Ophthalmology department HMC from September 2009 to September 2011. All diagnosed childhood squint cases between age four years to 14 years were included. Medical records were used to collect data on demographic variables, age at presentation, refraction, type of squint and presence/absence of amblyopia. The percentage of amblyopia in strabismic patients and the density of amblyopia in relation to the type of deviation was analysed. Density of amblyopia was classified as mild amblyopia (two lines Snellen's chart difference between the two eyes), moderate amblyopia (3 lines Snellen's chart difference between the two eyes) and severe/dense amblyopia (4 or more lines Snellen's chart difference between the two eyes).

All patients had a diagnosis of unilateral amblyopia caused by strabismus, defined as a minimum two-line interocular difference in distance visual acuity (Snellen's chart). Cycloplegic refraction and detailed Anterior and Posterior segment examination was carried out on Slit lamp and Indirect Ophthalmoscopy to rule out other causes of amblyopia like anisometropia, ametropia, cataract, and retinal pathology. All the findings were recorded in a proforma which was later used for analysis of the study.

#### RESULTS:

In this study 78 patients with strabismus were analyzed, fifty six (71.79%) cases had amblyopia. Their age group, mean age and gender distribution is shown in Table-I

Corrected visual acuity was 6/6 in each eye in 28.20% of cases (22/78), while Overall amblyopia was present in 71.79% (56/78) of children with strabismus.

All the patients were divided in two groups, Group-1 unilateral while Group-2 had alternating squint. Percentage of amblyopic patients in relation to type of squint are shown in Table-II.

Esotropia was present in 58 cases (74.35%) and exotropia in 20 (25.64%) of these children. Most of the unilateral squint had amblyopia. Density of amblyopia, mild amblyopia was seen in 23 (41.07%) cases, moderate amblyopia in 22 (39.28%) cases and severe amblyopia in 11 (19.64%) cases as shown in Table-3.

In esotropia the amblyopia is more common and more dense while in exotropia, the amblyopia is relatively less common and less dense. Most of the children with diagnosis of convergent squint (41/ 56 or 73.21%) had hypermetropia.

#### Discussion:

Amblyopia is the leading cause of visual loss in childhood. Strabismus is a significant cause of ocular morbidity leading to amblyopia and psychosocial distress<sup>1</sup>. The overall prevalence of amblyopia varies between 1.6 to 3.6% in different regions of the world<sup>2</sup>. In our study out of 78 strabismic patients 56 had some

degree of amblyopia regardless of the type of deviation. So the overall prevalence of amblyopia in strabismic population was 71.79 %. This is quite similar to the prospective cohort hospital based study of 200 children aged 4-14 years at Khyber Teaching Hospital from December 2005 to December 2006 by Sethi S et al <sup>11</sup> they found Amblyopia in 55 % cases. In a population based study by Wood Ruff et al<sup>12</sup> on 961 children with amblyopia in United Kingdom. The author found that 57% of amblyopia was due to strabismus.

It is important to note that amblyopia in unilateral squint was found to be higher (95.12 %), than alternating squint (45.94 %) . It is quite clear that those strabismic patients who develop alternation are at more than 2 times less risk of developing amblyopia than the unilateral squinters. The direction of the deviation definitely has some relation to the development of amblyopia. According to our study the prevalence of amblyopia in esotropia was higher (74.13 %) than its prevalence in exotropia( 61.90 %). Smilar figures are seen in other international research work<sup>13</sup>.

In our study it has been graded on the basis of corrected visual acuity between the two eyes in the absence of any organic reason for reduced vision. Density of amblyopia has three recognized categories, mild, moderate and severe or dense. It is mild if there is difference of two lines, moderate if difference of three lines and severe or dense if difference of four or more lines between the visual acuity of two eyes. 41.07 % of the amblyopes had mild amblyopia, majority of these had an alternating squint. 39.28 % of the cases had moderate amblyopia and it was found more common in unocular esotropia then exotropia . Remaining 19.64 %

Table I

Total number of Patients	78
Number of Amblyopes	56 (71.79%)
Age Group	
4 - 9 years	46 (58.97%)
10-14 years	32 (41.02%)
Mean Age	9 years
Male	49 (62.82%)
Female	29 (37.15%)

Table-II

Groups	Type of squint	Number/ percentage of patient	Number/ percentage of Amblyopes
Group-I	Unilateral	41(52.56%)	39 (95.12%)
Group-II	Alternating	37(47.43%)	17 (45.94%)

Table III  
Effect of type of strabismus on density of amblyopia

Type of Squint	No of Patients	No of Amblyopic Patients	Density of Amblyopia		
			Mild	Moderate	Dense
Esotropia					
Unilateral	32	30	8	15	7
Alternating	26	13	9	2	2
Exotropia					
Unilateral	9	9	3	4	2
Alternating	11	4	3	1	-
Total	78	56	23	22	11

had severe or dense amblyopia and most of it was seen in unioocular esotropia. In our study presence of strabismic amblyopia in children, the lack of treatment in early years of life be devised and applied. The best time for screening may be at school or entry into the play group.

Atropine penalisation has been shown to be as effective as occlusion therapy in the treatment of amblyopia<sup>14</sup>. These techniques can only be applied and become useful if the diagnosis of amblyopia is made early in amblyogenic or vision developing age. Early detection of amblyopia and its treatment can reduce the overall prevalence as proved by many studies indifferent parts of the world<sup>15</sup>. Early screening of visual acuity and strabismus is a real need of our country.

## CONCLUSION

In summary amblyopia due to strabismus is a common problem in children in our society. It is very important to identify and treat strabismus and amblyopia during the sensitive period. To save the future generations from this life time visual disability, an enthusiastic approach to the problem is required. A comprehensive screening programme must be devised and applied. The best time for screening may be at school or entry into the play group.

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## Efficacy of Povidone-Iodine in Treatment of Microbial Keratitis\*

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### ABSTRACT

**Objectives** The objective of this study is to know the efficacy of Povidone-Iodine in treatment of microbial Keratitis.

### Material and Methods

**Study Design:** Descriptive study

**Setting** The study was conducted at the admitted patient in Department of Ophthalmology eye-A ward, Khyber Teaching Hospital, Peshawar, Pakistan.

**Duration of Study:** One year (from December, 2007 to December, 2008) after the approval of synopsis for FCPS by the College of Physicians & Surgeons, Pakistan.

**Sample size:** At least 43 patients (could be more if available)

**Results:** In 43 patients of our study, 38 patients (88.37%) were responded well to Pyodine 2% eye drops and they were discharged without any surgical intervention, while five patients (11.63%) had surgical intervention in spite of intensive medical treatment. Out of these five patients 04 had conjunctival flaps and 01 underwent evisceration with primary orbital implant. These 5 patients were not successfully treated, because, one had full thickness corneal abscess and the other had corneal thinning at the time of admission. One patient was reluctant to stay in the ward and had very poor compliance. One patient had pseudophakia (PPK) with raised intraocular pressure (IOP) with no light perception (NPL). One patient in which evisceration was performed after an initial good response to the treatment but as he did not want to stay further in the ward and on 20<sup>th</sup> day, cornea was almost sloughed.

**CONCLUSION:** As the successful rate after Pyodine 2% eyedrop in the treatment of microbial Keratitis is 88.37%; it is concluded that pyodine is a cheap and much more effective drug in the treatment of infected corneal ulcer.

### INTRODUCTION

The use of antiseptic agents to prevent blinding disorders is not a self-evident development. It evolved over a number of years to the point that one antiseptic agent-Povidone-iodine is now used throughout the world, everyday, to prevent blindness. The possible effect of iodine on the eye was first appreciated in 1951, when a reduction in ocular flora was reported following the application of iodine solution to the skin. Idophores (an idophore is a preparation containing iodine complexes with a solvent, such as surfactant or Povidone (forming povidone-iodine) were reported to reduce skin flora around the eye in 1970, and only later was the specific combination of povidone and iodine utilized for direct ophthalmic use. Pov-I is safe, stable and fast acting chemical compound of polyvinyl-pyrrolidone (PVP) and

iodine. It is soluble in water<sup>1,2,3</sup>

It kills broad-spectrum pathogens including bacteria Gram +ve and Gram -ve, viruses, fungi, protozoa and yeasts. It is also sporocidal. It has been found that it penetrates to the epithelium, Bowman's layer and stroma of cornea. It exerts antimicrobial effects in low concentration by inhibiting enzymes essential for microbial metabolism. A 5% solution of povidone-iodine is widely used prophylactically to reduce the risk of infection during cataract surgery.<sup>4</sup> Several studies have shown that it is very effective against bacteria.<sup>5,6</sup> It has also been shown to be effective against a number of viruses, fungi and spores.<sup>7</sup> It has been used for the prophylaxis of ophthalmia neonatorum and was effective against *Neisseria gonorrhoeae*, *Chlamydia trachomatis* and *Herpes simplex II*.<sup>8</sup>

A 5% solution of Povidone-iodine has been suggested as a "*pan-anti-infective eye drop*" for the treatment of number of ophthalmic conditions in developing countries.<sup>9</sup> Corneal infection caused by the virulent strains of bacteria such as *staphylococcus aureus*, *pneumococci* and Gram-ve coliform group, are generally rapidly progressive, severe and result in considerable, if not total destruction of eye. Attempts to control these infections by the use of antibiotics have not been uniformly successful.<sup>10</sup> It has also been studied that more dilute solutions of povidone-iodine, provide faster and higher concentration of free iodine, giving it a potent antibacterial activity.<sup>11</sup> In south Asia, ocular trauma frequently leads to infective Keratitis and

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ulceration mostly corneal infections are fungal, but treatment options against these are limited due to expense and lack of available medications.<sup>12</sup> In the appropriate concentration, it is not toxic to the eye as are other iodine bearing compounds.<sup>1</sup> Removal of epithelium had no influence on penetration with the higher PVP-I solutions (5% (50mg/ml) and 10% (100mg/ml), whereas more iodine was observed in Bowman's layer and stroma with the lower PVP-I concentrations. This suggest that with increasing concentrations PVP-I the barrier function of the epithelium is destroyed.<sup>13,14</sup> Of the preoperative antiseptics used in ophthalmic surgery, PVP-I turned out to be the only one not toxic for the epithelium.<sup>15</sup>

The use of Pov-I in ophthalmic practice continues to reduce the incidence of blinding disorders in children and adults throughout the world. Also resistance by bacteria is rare. The medication turns the eye brown for a few minutes proving that it has been applied. It is widely available as a solution or powder and it is available throughout the world in some form. It is hypothesized if used as treatment for microbial Keratitis in cases when antibiotics are not available or antibiotic resistance has developed, it will be highly beneficial.<sup>16</sup> Moreover, it is important for use in developing areas and it is not expensive as well.<sup>1</sup>

#### Data Collection Procedure

All Patients were examined in ophthalmology department, eye A ward Khyber Teaching Hospital, Peshawar. All information was collected through proforma. Corneal scraping was taken for Gram staining, fungal hyphae, spores and for culture sensitivity. 2% Povidone-iodine will be used as topical eye drops one hourly.

#### Data Analysis

The collected data was analyzed by using the software SPSS version 10.

#### RESULTS

In 43 patients of our study, 38 patients (88.37%) were responded well to pyodine 2% eye drops and they were discharged without any surgical intervention, while 5 patients (11.63%) had surgical intervention in spite of intensive medical treatment. Out of these five patients 04 had conjunctival flaps and 01 underwent evisceration with primary orbital implant. These 5 patients which were not successfully treated, because one had full thickness corneal abscess and the other had corneal thinning at the time of admission. One patient was reluctant to stay in the hospital and had very poor compliance. One patient had pseudophakia (PPK) with raised intraocular pressure (IOP) and no light perception (NPL eye). One patient in which evisceration was performed after an initial good response to the treatment he did not like to stay further in the hospital

and on 20<sup>th</sup> day, cornea was almost sloughed. In our study, efficacy of PVP-I eyedrop in bacterial and fungal infections was very good and usually appeared on day 5<sup>th</sup> to 10<sup>th</sup> day in the form of decrease in size of infected site of the cornea with reduction in hypopyon size if present as shown in tables.

The average vertical size of corneal ulcer on day first is 3.07mm with a standard deviation of 1.35., The average horizontal size of corneal ulcer on day first is 3.24mm with a standard deviation of 1.45., The average vertical size of corneal ulcer on day fifth is 2.95mm with a standard deviation of 1.53., The average horizontal size of corneal ulcer on day fifth is 3.10mm with a standard deviation of 1.5., The average vertical size of corneal ulcer on day tenth is 2.52mm with a standard deviation of 1.48., The average horizontal size of corneal ulcer on day tenth is 2.90mm with a standard deviation of 1.71., The average vertical size of corneal ulcer on day fifteenth is 2.48mm with a standard deviation of 1.73., The average horizontal size of corneal ulcer on day fifteenth is 2.73mm with a standard deviation of 1.67

#### DISCUSSION

Microbial Keratitis is a serious ocular emergency, particularly bacterial keratitis.<sup>16</sup> The increasing number of the corneal surgeries and widespread use of cosmetic contact lenses are accompanied by increasing rate of the infective keratitis.<sup>17</sup> Attempts to treat these infections by antibiotic might not be uniformly successful.<sup>16</sup> PVP-I have been proved to be an effective agent in prophylaxis of post operative endophthalmitis.<sup>18, 19</sup>

It kills broad-spectrum pathogens including bacteria Gram+ve and Gram-ve, viruses, fungi, protozoa and yeasts. It is also sporocidal. It has been found that it penetrates to the epithelium, Bowman's layer and stroma

Table 1  
Descriptive Statistics of Hypopyon Level

	N	Mean in mm	Std. Deviation
A/C D1st			
8	1.60	1.09	
A/C D5th			
7	1.42	.72	
A/C D10th			
4	1.6	.94	
A/C D15th			
1	1.40		
Valid N (list wise)			
1			

Mean hypopyon level on day first was 1.6mm with standard deviation of 1.09

Mean hypopyon level on day fifth was 1.4mm with standard deviation of 0.72

Mean hypopyon level on day tenth was 1.6mm with standard deviation of 0.94

Table 2: Paired Samples Test

	Paired Differences				t	df	Sig.2 (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the difference			
				Lower Upper			
Pair 1							
A/C	.34	.75	.28	.35 1.04	1.19	6	.27
Day 1st							
-A/C							
Day 5th							

T test for the difference of means hypopyon on day first and day fifth gives a T value of 1.195 with a P value = 0.277 which shows that there is insignificant difference between the hypopyon levels on day first and day fifth.

On day tenth and day fifteenth hypopyon almost disappeared.

Table 3  
Descriptive statistics of corneal ulcer size

	Mean	Std. Deviation
Siz v on day 1st	3.07	1.35
Siz h on day 1st	3.24	1.45
Siz v on day 5th	2.95	1.53
Siz h on day 5th	3.10	1.58
Siz v on day 10th	2.52	1.48
Siz h on day 10th	2.90	1.71
Siz v on day 15th	2.48	1.73
Siz h on day 15th	2.73	1.67
Valid n (list wise)		

Table:4 Paired samples test

	T	Sig. (2-tailed)
Siz v on day 1st - siz v on day 5th	1.696	.098
Siz v on day1st – siz v on day 10th	5.440	.000*
Siz v on day1st – siz v on day 15th	3.206	.004*
Siz v on day 5th - siz v on day 10th	3.871	.000*
Siz v on day 5th - siz v on day 15th	2.380	.026*
Siz v on day 10th -siz v on day 15th	1.882	.073
Siz h on day1st – siz h on day 5th	1.266	.213
Siz h on day 1st - siz h on day 10th	3.266	.002*
Siz h on day1st – siz h on day 15th	2.652	.014*
Siz h on day 5th – siz h on day10th	2.470	.019*
Siz h on day 5th – siz h on day 15th	2.309	.030*
Siz h on day 10th – siz h on day 15th	2.714	.012*

T test for the difference between means of vertical size on day first and day fifth has a T= 1.696 with a P value = 0.098 which shows insignificant difference

of cornea. It exerts antimicrobial effects in low concentration by inhibiting enzymes essential for microbial metabolism.<sup>4, 20</sup> In many underdeveloped countries, there are no antibiotics available to treat even conjunctivitis, thus allowing it to progress to Keratitis. PVP-I is available worldwide and is very inexpensive. Now that we have demonstrated its effectiveness and lack of toxicity, treatment will be available where there was no treatment before. Povidone-iodine ophthalmic solution should be prepared locally (as it is not available commercially in 2% concentration) and considered to treat bacterial conjunctival infections, especially in underdeveloped countries where topical antibiotics are often unavailable or costly. But the fact that it does not induce bacterial resistance also makes it an attractive option in the developed world as well.<sup>21</sup>

We studied PVP-I 2% by treating 43 patients of microbial Keratitis, out of which 38 (88.37%) were successfully treated, which shows its efficacy. Nearly the same results were shown by H.R Jahadi Hussain, Shiraz Iran; who showed 91.2% result of 2% PVP-I in Iran. A 5% solution of PVP-I has been suggested as a “pan-anti infective eye drop” for the treatment of a number of ophthalmic conditions in developing countries.<sup>9</sup> While 5% concentration of

PVP-I solution showed 100% efficacy against bacterial corneal ulcers in Shiraz study.<sup>22</sup> In rural south Asia, ocular trauma frequently leads to infective ulceration of the cornea. A higher proportion of these corneal ulcers are fungal, but treatment options for fungal ulcers are limited because of the expense and lack of available medications. Even for bacterial corneal ulcers, the availability of antibiotics in such settings can be problematic, and a topical application of a medication such as PVP-I would probably be even more available and cheaper than standard antibiotic.<sup>23, 24,25,1</sup> PVP-I is a broad-spectrum microbicidal with efficacy against

bacteria, viruses and fungi.<sup>26</sup>

According to our study, efficacy of PVP-I eye drop in bacterial and fungal infections was very good and usually appeared on day 5<sup>th</sup> to day 10<sup>th</sup> in the form of decrease in size of infected site of the cornea with reduction in hypopyon size if present. It has been statistically evaluated that PVP-I not only controlled the inflammatory signs effectively but also reduced the period of morbidity proving its superiority over gentamycin sulphate for the treatment of staphylococcal coagulase corneal ulcers. Further, no side-effects or any signs of chemical irritation were noticed in any of the rabbits. Hence PVP-I can be considered for use in human beings for effective control of corneal infections.<sup>4,27</sup>

In viral, in dendritic form efficacy, was also good but slow and improvement signs appeared after 10 days with reduction in size of branches and width of branches causing fadedness of its staining with fluorescein dye, while in one female patient with stromal infiltration, response was very slow but with positive outcome. PVP-I is also active against viruses, including herpes simplex and herpetic kerato-conjunctivitis which can be an insidious infection.<sup>28</sup> PVP-I to be effective in a concentration as low as 0.1% against a challenge of 10 million plaque-forming units of herpes simplex virus type II.<sup>29</sup>

In low concentration of 0.5%, its antiviral activity increasing because of availability of more free iodine giving it a potent antimicrobial activity.<sup>30</sup>

PVP-I treatment proved to be as effective as the more costly antibiotic regimen in terms of the number of patients cured after one and two weeks.<sup>31</sup> More important, povidone is even more effective than the more expensive alternatives.<sup>32</sup> Acanthameoba Keratitis is a severe ocular infection secondary to accidental macro or microscopic trauma of cornea by contact lens. PVP-I in a concentration of 0.5 to 2.5% also has a better antibiotic activity both on trophic and cystic stages of acanthameoba spp. than does chlorhexidine (CHD).<sup>33</sup> There has been reports of the use of this agent for treatment of corneal ulcer in human eye and Hale used it in conjunction with antibiotic treatment in four cases of pseudomonas corneal ulcer.<sup>34</sup> PVP-I directly applied on to the corneal ulcers in 35 patients, 30 of whom being bacterial.<sup>35</sup>

They described favorable results in an uncontrolled trial of 40 cases of kerato-conjunctivitis. Bacterial was positive in 28 patients on the onset of the disease, but only three remained positive after 3 days of treatment with topical PVP-I solution. The patient also well tolerated the drops.<sup>19</sup> Ophthalmic surgeons have come to appreciate the possibility of reducing post-operative infections including endophthalmitis by effective preoperative preparation. To evaluate various aspects

of this preparation – to reduce the bacterial flora of the eye. By far the most effective measure was to place a drop of 5% PVP-I ophthalmic solution on the eye before surgery. Bacterial colonies were reduced by 91% and species by 50%. This decrease was significantly better than in the control group.<sup>4</sup>

The effect of 2.5% solution placed on the eye immediately at the completion of the operation was compared with the similar use of a combination antibiotic (neomycine, polymyxin B, and Gramicidin). At 24 hours after surgery, PVP-I significantly reduced the colony forming ( $P=0.035$ ), but combination of antibiotic did not ( $P=0.17$ ) produce the desired result, rather the colony counts increased in the first 24 hours in the antibiotic treated eyes ( $P=0.013$ ) but not in the PVP-I treated eyes. At 24 hours, the PVP-I treated eyes had a lower species count ( $P=0.034$ ) than the antibiotic treated eyes.<sup>36</sup> Subsequently, patients were studied who used PVP-I 2.5% or 1.25% solution compared with a similar group using the antibiotic combination eye drops three times a day for a week after ophthalmic surgery. No ocular infections occurred. While the species counts increased in both groups over the post operative week, they increased less in the PVP-I treated eyes ( $P=0.011$ ) and were lower than the untreated control group ( $P=0.01$ ). However, in the antibiotic treated group the species count was not less than the controls ( $P=0.29$ ).<sup>39</sup>

In summary, PVP-I ophthalmic solution has been proven effective before (5% solution) and after ocular surgery, (1.25%) at birth (2.5%) and for some forms of conjunctivitis (1.25%). The use of PVP-I in ophthalmic practice continues to reduce the incidence of blinding disorders in children and adults throughout the world.<sup>1</sup> In our study, one female patient with bacterial corneal infection developed povidone toxicity in the form of lids edema and more conjunctival congestion with an hourly dosage of PVP-I drop which then resolved by reducing dose to 3 hourly interval and with use of preservative free artificial tear eye drop. Another male patient with fungal Keratitis developed corneal toxicity with 2 hourly dosage of PVP-I solution on 25<sup>th</sup> day in the form of superficial punctate keratitis (SPK) while on follow up it resolved by reducing the dose to QID and with use of preservative free artificial tear drop within 2 days as cell damage increased with increasing PVP-I concentrations.<sup>16</sup> It is well tolerated and has a broad-spectrum effect than any other agent, and there has been no resistance demonstrated to date. Because it temporarily stains the eye brown, effective administration is easy to confirm.<sup>32</sup> PVP-I is safe, low cost, effective option and has the advantages of a broad-spectrum activity, ease of transport and storage, and a favorable microbial resistance pattern. To date, there really is no microbial resistance and there may not be

any possible resistance in future.

In our region no local and even regional study has conducted about the usage of pyodine as a better anti-infective agent in the treatment of corneal infections by microbes. But now it is recommended that pyodine should be used topically in the treatment of infective corneal ulceration particularly in our society in whom socio-economic conditions are deteriorating rather than improving because of various factors like political instability and terrorism etc. It is also recommended that further studies should be designed over the use of pyodine in various strengths in the treatment of infective corneal ulcer.

## CONCLUSION

As the successful rate of pyodine 2% eyedrop in the treatment of microbial Keratitis is 88.37%, so it is concluded that pyodine is a cheap and much more effective drug in infected corneal ulcers.

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### **CURRENT RESEARCH**

## **Povidone-iodine may become the gold standard for Intravitreal Injection in Endophthalmitis Prophylaxis**

Dr. Charles Wykoff, M.D.,Ph.D

*(This paper was presented on Retina sub-specialty day at the Annual Meeting of American Academy of Ophthalmology in Oct' 2011)*

Intravitreal injections have become one of the most common medical procedures in the United States, with 1.2 million injections being given under medicare alone in 2009, but there is no current gold standard for endophthalmitis prophylaxis. However, there is an evidence that the community standard is evolving toward antisepsis and away from prophylactic use of topical antibiotics. Recent data suggest that topical antibiotics either before or after intravitreal injection are unnecessary, they may be counterproductive by contributing to significant bacterial resistance. They also impose a high cost on the health care system.

Dr. Charles made a strong case for using only Povidone-iodine to prevent endophthalmitis. It has the advantages of low cost, broad-spectrum activity, widespread availability, fast bactericidal rate and absence of resistance. One disadvantage of Povidone-iodine is purported allergy, it seems to come up all the time, but it may not be a true allergic reaction. In some cases, the patients are really experiencing irritation, which occurs in about 5 percent of cases. Just make sure you wash it out properly.

Anaphylaxis to iodine does not exist, and there have been no reported cases of anaphylaxis to Povidone-iodine related to ophthalmic use, he said. Many clinicians apply additional Povidone-iodine to the conjunctiva immediately preceding insertion of the needle through the pars plana. If a small amount of Povidone-iodine is inadvertently introduced into the vitreous cavity during the injection, it is unlikely to cause any problem. Animal models have shown ocular tolerance following intravitreal injection of significant volumes of povidone-iodine.

To those who are concerned with medico-legal issues, he noted that from 2006 to 2011, OMIC states that "decisions regarding use of antimicrobial and antiseptic prophylaxis should be based on best available scientific evidence.

.....Dr. Jahanzeb Durrani, Editor (source Ophthalmic Newsnet)



Dr Alam

## Does Pregnancy affect severity of Diabetic Retinopathy? (A Study of 38 Cases)

Mohammad Alam<sup>1</sup>, Tehniyat Ishaq<sup>2</sup>, Mohammad Ishaq Khattak<sup>3</sup>

### ABSTRACT

**Objective:** To study the effects of pregnancy on severity of diabetic retinopathy.

**Materials and Methods:** This study was conducted in Satellite Hospital Pabbi, Kuwait Teaching Hospital PMC Peshawar and Khyber Teaching Hospital Peshawar from Jan, 2003 to Dec, 2006 with the objective to know the effects of pregnancy on severity of diabetic retinopathy. Total 82 women were selected. Informed consent was obtained from each woman. A proper proforma was designed for evaluation and documentation of the women regarding diabetes mellitus, onset of diabetes, diabetic retinopathy and hypertension. They were divided into two groups, A and B. Group A had 38 pregnant diabetic women with different diabetic period. Moreover both primi gravida and multi gravida were included in Group A. Group B had 44 non pregnant women control group with different diabetic age and status of fundi. Blood pressure was checked fundi were examined with direct, indirect ophthalmoscope after full dilatation and if possible with slit lamp biomicroscopy. Fundi examination was done in the first 3 months, 6 months and at 9 months.

**Results:** In Group A, in first three months normal fundi were present in 21(55.26%) women, Background diabetic retinopathy in 14(36.84%) and Proliferative diabetic retinopathy in 3(7.89%) women. Group A showing the progression of diabetic retinopathy in pregnancy at 9 months examination, normal fundi were present in 16(42.10%) women, Background diabetic retinopathy in 13(34.21%), Pre proliferative diabetic retinopathy in 7(18.42%) and Proliferative diabetic retinopathy in 2(5.26%) women.

In Group B, at three months normal fundi were present in 26(59.09%) women, Background diabetic retinopathy in 16(36.36%) and 2(4.54%) women had Pre proliferative diabetic retinopathy. At 9 months examination, normal fundi were present in 24(54.54%) women, Background diabetic retinopathy in 15(34.09%) and 5(11.36%) women had Proliferative diabetic retinopathy.

**Conclusion:** The pregnancy has worsening effects on the severity of diabetic retinopathy. Good glycemic control should be maintained. Regular antenatal checks up including ophthalmic examination are mandatory during pregnancy.

**Key words:** 1. Diabetes Mellitus (DM) 2. Background Diabetic Retinopathy (BDR) 3. Proliferative Diabetic Retinopathy (PPDR) 4. Proliferative Diabetic Retinopathy (PDR)

### INTRODUCTION:

Diabetic Retinopathy is one of the main cause of preventable blindness in developed world in those aged 24 to 64 years<sup>1</sup>. The first half of this period coincides with peak fertility and child bearing age for a proportion of diabetic women. Diabetic eye diseases may start for the first time in pregnancy and visual loss at this stage has serious implications for woman and for her family.

Multiple national and international studies have reported the effects of pregnancy on natural course of diabetic retinopathy and have concluded that deterioration of diabetic retinopathy is frequent<sup>2,3</sup>. The Diabetes in Early Pregnancy Study (DIEP) a prospective

Cohort study on 140 diabetic women who were followed from early pregnancy to delivery has shown increased rate of progression of diabetic retinopathy<sup>4</sup>. The American Academy of Ophthalmology recommends that the diabetic women should have an ophthalmological examination before conception to determine the baseline severity and then again at three months intervals till delivery<sup>5</sup>. The significance of pregnancy induced diabetic retinopathy should not be overlooked. Considering the prevalence of diabetes and diabetic eye problems in developed countries like USA, the incidence of diabetes has been found to be higher in women than men, and the age adjusted female to male ratio of blindness due to diabetes is 1.4 : 1<sup>6</sup>. Keeping in mind these statistics it is imperative that young diabetic women of child bearing age must be examined by an ophthalmologist prior to pregnancy and during gestation regular check should be done<sup>7</sup>. A Cohort study, The Diabetic Control and Complication Trial (DCCT) has shown that there is 2.48 fold greater risk of worsening diabetic retinopathy during pregnancy. This study has also reported that the greatest risk of worsening DR in pregnancy was in the second trimester and persisted as

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long as 12 months post partum period<sup>8</sup>.

Pathogenesis of worsening DR during pregnancy is still under debate. Most of the research workers are in the opinion of blood flow changes during pregnancy. Chen et al has reported retinal blood flow in pregnant women suffering from DM to be increased 14-19%<sup>9</sup>. Loukovaara S. et al study has also given higher retinal blood flow results in diabetic women during pregnancy<sup>10</sup>.

There are various factors that have been shown to affect the progression of diabetic retinopathy during pregnancy. These include the pregnancy status, diabetic age prior to conception, stage of retinopathy at the time of conception, metabolic control before and during pregnancy as well as the presence of co existing hypertension.

### MATERIALS AND METHODS

This multicentre based study with the objective to know the effects of pregnancy on severity of diabetic retinopathy was carried out in Satellite Hospital Pabbi, Kuwait Teaching Hospital PMC Peshawar and Khyber Teaching Hospital Peshawar from Jan, 2003 to Dec, 2006, spanning 4 years. 82 women suffering from DM were selected for this study. Informed consent was obtained from each woman. A proper proforma was designed for evaluation and documentation of the women diabetes status, fundi status. History was taken about the type of DM, duration of diabetes, parity, drugs taken for DM, Blood sugar level and hypertension. In this study three specialities i.e Gynae /Obs, Medicine and Ophthalmology were involved. Women diabetic age and hypertension were recorded according to the history. However it should be kept in mind that all the women were not aware of diabetic age, history and hypertension. These women were divided into two groups. Group A had 38 pregnant diabetic women and group B had 44 non pregnant diabetic women for control Table I. In Group A, Type 1 DM was found in 34(89.47%) and type 2 DM in 4(10.52%) women, while in Group B Type 1 DM was present in 41 (93.18%) and type 2 DM in 3(6.81%) women Table II.

Hypertension was present in 6(15.78%) of Group A and 9(20.45%) of Group B women Table III. All the patients were categorized according to diabetic age with 3 years range Table IV. Eyes of all the women were dilated with tropicamide eye drops and fundi were examined with direct, indirect ophthalmoscope and if possible with slit lamp biomicroscopy. Fundi examination was done in the first 3 months, 6 months and at 9 months.

### RESULTS:

In Group A pregnant women, at three months examination, normal fundi were present in 21(55.26%) women, background diabetic retinopathy in 14(36.84%) and Proliferative diabetic retinopathy in 3(7.89%)

women. At six months, normal fundi were present in 19 (50%) women, background diabetic retinopathy in 14(36.84%), Proliferative diabetic retinopathy in 4(10.52%) women and 1(2.63%) had PDR. At 9 months, normal fundi were present in 16(42.10%) women, Background diabetic retinopathy in 13(34.21%), preproliferative diabetic retinopathy in 7(18.42%) and Proliferative diabetic retinopathy in 2(5.26%) women Table V.

In Group B, non pregnant Diabetic control group, at three months normal fundi were present in 26(59.09%) women, background diabetic retinopathy in 16(36.36%) and 2(4.54%) women had preproliferative diabetic retinopathy. At six months, normal fundi were present in 26 (59.04%) women, background diabetic retinopathy in 15(34.09%) and 3(6.81%) women had preproliferative diabetic retinopathy. At 9 months examination, normal fundi were present in 24(54.54%) women, background diabetic retinopathy in 15(34.09%) and 5(11.36%) women had Proliferative diabetic retinopathy Table VI.

### DISCUSSION:

This study was based on effects of pregnancy on severity of diabetic retinopathy. During study due to emotional stress it was concluded that the pregnant women were very much conscious about glycemic control as compared to the control group women. At every visit and check up the pregnant women blood glucose level was to some extent more controlled as compared to the non pregnant women. In spite of all these care and precautions, it is clear from our study that the pregnancy has worsened the severity of diabetic retinopathy one step further in a good proportion of women. As evident from this study at first three months examination normal fundi were present in Group A was in 55.26% women which dropped down to 42.10% at 9 months. PPDR shifted over to 18.42% at 9 months from 7.89% at 3 months. Moreover PDR increased from 0% at three months to 5.26% at 9 months and nearly the same proportion increase in next step severity in all examination visits. But the same transition in Group B non pregnant women was not so, even with poor glycemic control.

There are many national and international studies which support that pregnancy does affect the severity of diabetic retinopathy. Klein BE, Moss SE, Klein R. has concluded in their study the worsening effects of pregnancy on progression of diabetic retinopathy<sup>11</sup>. Cross sectional analytical study of Irfan S, Arian TM, Shaikat A, Shahid A has reported that all the pregnant women had DR showing acceleration of this disorder in pregnancy<sup>12</sup>.

According to a study there is two fold increase in progression of DR in pregnancy and pregnant women

Table I showing number of women. Total 82

Type of Women	Number	% age
Pregnant	38	46.34%
Non pregnant control	44	53.65%

Table II showing Type of DM

Group	DM Type 1	DM Type 2
Pregnant Group	34(89.47%)	4(10.52%)
Non pregnant Group	41(93.18%)	3(6.81%)

Table III showing coexisting hypertension

Type of Woman	Normotensive women	Hypertensive women
Pregnant	32(84.21%)	6(15.78%)
Non pregnant control	35(79.54%)	9(20.45%)

Table IV showing Diabetic age

Diabetic age group	Pregnant women=38	Non pregnant women=44
Up to 3 years	6(15.78%)	9(20.45%)
> 3 – 6 years	11(28.94%)	13(29.54%)
>6 – 9 years	17(44.73%)	15(34.09%)
>9 years	4(10.52%)	7(15.90%)

Table V showing Group A women having DR =38

Status of Fundi	3 months	6 months	9 months
Normal Fundi	21(55.26%)	19(50%)	16(42.10%)
BDR	14(36.84%)	14(36.84%)	13(34.21%)
PPDR	3(7.89%)	4(10.52%)	7(18.42%)
PDR	———	1(2.63%)	2(5.26%)

Table VI showing Group B women DR =44

Status of Fundi	3 months	6 months	9 months
Normal Fundi	26(59.09%)	26(59.09%)	24(54.54%)
BDR	16(36.36%)	15(34.09%)	15(34.09%)
PPDR	2(4.54%)	3(6.81%)	5(11.36%)
PDR	———	———	———

may develop retinopathy for the first time during pregnancy. The result is increased with poor metabolic control, hypertension, renal diseases, anemia and the severity of baseline retinopathy<sup>13</sup>. Jawad Maayah, et al has reported DR in 58% pregnant women and in 30% in control group. They have also reported close association of pregnancy effects on severity of diabetic retinopathy<sup>14</sup>.

Axer Siegel R, Hod M, Fink Cohen S, et al has reported that in diabetic pregnant women, progression of DR occurred in 77.5% women and there was close correlation of pregnancy with severity of diabetic retinopathy<sup>15</sup>. Progression of DR in pregnancy depends upon some factors like severity of retinopathy at conception, adequacy of treatment, diabetic age, good metabolic control and management of hypertension and pregnancy by itself also directly affects severity of DR<sup>16</sup>. The diabetes in Early Pregnancy study assessed the progression of diabetic retinopathy in 10% women of those who have none to start with, and in 50% of those who had baseline moderate to severe NPDR<sup>17</sup>. Temple RC, Aldridge VA et al has reported in their study about pregnancy effects on DR and there was 2.2% progression to PDR and progression of DR had also strong correlation with diabetes duration<sup>18</sup>. R Guerrero, MA Martinez Brocca, et al has reported in their study pregnancy effects on diabetic retinopathy in 17.6% pregnant women and progression of diabetic retinopathy was seen in 0.32% women and severity was also closely related to the duration of diabetes<sup>19</sup>.

#### CONCLUSION:

The study has revealed that severity of diabetic retinopathy becomes worse with gestation. Therefore antenatal examination is mandatory. Blood glucose level should be properly monitored. Opinion of physician is of utmost importance. Every antenatal visit must have ophthalmological examination for diabetic retinopathy.

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Dr Naseer

## Conservative Management of Congenital Nasolacrimal Duct Obstruction (CNLDO) (Study of 110 patients)

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### ABSTRACT

**Objective:** To know the success rate of conservative management of Congenital Nasolacrimal Duct Obstruction.

**Materials and Methods:** This prospective and comparative study was conducted on patients suffering from CNLDO from July 2008 to Oct, 2010 in a private center. Total 110 patients were selected. Informed consents were obtained from their parents. They were documented on proper proforma for management and follow up results. They were divided into two groups, based on the age of the patients. Group A contained 73 patients with age range up to 6 months. Group B had 37 patients with age range more than 6 months to one year. Patients in both the groups were treated conservatively with lacrimal sac massage and topical antibiotics if needed. Parents were properly educated about technique of massage. 10 to 20 strokes four times a day were advised. Follow up was done for four months.

**Results:** Conservative treatment for CNLDO in group A was successful in 70(95.89%) patients and failed in 3(4.11%) patients. Group B patients showed success rate in 31(83.78%) and in 6(16.21%), it was failed.

**Conclusion:** Conservative treatment for CNLDO should be the first step and its success rate decline with increase in age.

**Key words:** Congenital Nasolacrimal Duct Obstruction (CNLDO)

### INTRODUCTION:

Epiphora is a Greek word meaning down pour being referred to outflow of tears down the face, which is due to obstruction of lacrimal passages. CNLDO is a frequent entity in pediatric age group of diseases<sup>1,2,3</sup>. Most common outcome of this disease is spontaneous resolution but some time it may need probing which is a type of minor surgical intervention<sup>4</sup>. This condition occurs when there is failure of opening of connection between the Nasolacrimal duct and the nose (valve of Hasner). Tears normally flow from puncta through canaliculi into the lacrimal sac down the lacrimal duct and into the nose. During gestational age of development the last part of the lacrimal passage system is to canalize the connections to the surface at the lid margin and in the nose. Symptomatic CNLDO is generally documented to be present in 1.5 to 6% infants<sup>5</sup>. But study of Mac Ewen and Young reported its incidence in 20% infants<sup>6</sup>. There are various studies according to which spontaneous resolution of CNLDO occurs in up to 95% patients up to one year of age<sup>7,8</sup>. Autocanalisation if for some reason does not occur, then surgical intervention

may be needed.

Lacrimal sac massage is thought to be useful management step for CNLDO. If there is infection then topical antibiotics are given as supplements along with sac massage. Patients should be properly educated to perform massage technique. It is advisable to place fore finger over the medial canthal area on the inferior part of anterior lacrimal crest and slide the finger in inferior direction, applying moderate pressure over the lacrimal sac and Nasolacrimal duct. About 10-20 strokes should be given four times a day. Conservative treatment is continued until epiphora resolves up to one year, if there is no other complications like acute dacrocystitis etc. Repeated course of topical and some time systemic antibiotics are used to treat the discharge associated with CNLDO<sup>9,10</sup>. All the patients under one year of age with CNLDO should be conservatively treated with massage before surgical intervention, with the hope of spontaneous resolution and to get patency of duct by applying hydrostatic pressure<sup>11,12</sup>.

### MATERIALS AND METHODS:

This prospective and comparative study was conducted on patients suffering from CNLDO from July, 2008 to Oct, 2010 in private centers. A proper proforma was made for record and follow up of patients. Informed consents were obtained from their parents. CNLDO diagnosis was made on clinical examination and sac regurgitation test. Total 110 patients were included in the study comprising of 67(60.90%) male and 43(39.09%) female Table I.

Based upon involvement, 102 (92.72%) patients

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had unilateral involvement while in 8(7.27%) patients, both eyes were involved Table II.

Patients were divided into two groups based upon the age of the patients. Group A contained 73(66.36%) patients with age range up to 6 months .Group B had 37(33.63%) patients with age range more than 6 months to one year Table III.

Conservative treatment with lacrimal sac massage and antibiotic topical drops/ointment were advised to each patient with the regimen of 10-20 strokes of massage four times a day after demonstration to the parents the proper technique. Follow up was done for 4 months.

#### RESULTS:

All those patients were considered properly treated conservatively who were symptom free and no regurgitation was present. Conservative treatment for CNLDO in group A was successful in 70(95.89%) patients and failed in 3(4.11%) patients.

In Group B conservative treatment was successful in 31(83.78%) and failed in 6(16.21%) patients, Table IV.

#### DISCUSSION:

This prospective and comparative study was based to know the success rate of conservative treatment in CNLDO and to know influence of age on results of this treatment modality. This study has revealed that success

rate up to 6 months age was 95.89% while in patients above 6 months to one year it was 75.67%. The study has also shown that success rate declines when the age of the patient increases. Various national and international studies have been conducted regarding the management of CNLDO addressing merits and demerits of every modality with the standard management procedure and the first step is to commence with conservative treatment with lacrimal sac massage and topical antibiotics. If this management fails then probing should be taken into consideration<sup>13,14</sup>. Revised literature has shown that spontaneous resolution with conservative management usually takes place at the age of six months. Study of Basel T Baarah, MD.etal has shown that with conservative treatment there was 77.1% success in CNLDO which has similarities to our study with group B patients<sup>15</sup>. Gholam Hossein Yaghoubi, MD et al has reported 100% success rate in CNLDO with conservative treatment with lacrimal sac massage and antibiotics<sup>16</sup>. Study conducted by Jamshed Nasir, Mueen Mohyuddin, Shahid A Bhatti has reported 90% success rate with conservative treatment of CNLDO ,which is in comparison to our study<sup>17</sup>. One national study conducted by Faridullah et al has reported on conservative treatment of CNLDO. They have shown 93% success rate within one year ages<sup>18</sup>. Roob R has reported bilateral CNLDO in 15.4% patients while in our study it was present in 7.27% patients. More over they have reported spontaneous resolution with conservative management in 92.96% patients<sup>19</sup>. The high rate of spontaneous resolution with in the first year is a strong argument for conservative management. However the decrease in spontaneous resolution after this time with the documented decrease in effectiveness of probing would seem to suggest to wait past the age of one year may put the patient at risk for future complications. Study of Rose K. Hughes, O.D et al has concluded that although surgical intervention may be needed at times, a conservative approach is often better<sup>20</sup>. Study of Rajat Maheshwari et al has reported the success rate of conservative treatment of CNLDO to be 96% which is better than our study<sup>21</sup>. Our study has strong variation of results in Group B patients with national and international study. This variation may be due to improper lacrimal sac massage in CNLDO. Qasem Hammory et al has reported in their study, success rate of 82.5% with conservative treatment of CNLDO<sup>22</sup>. The variations in results with other studies may be due to lack of education of the parents regarding lacrimal sac massage or sample size divided into two groups in relation to age in our study. But in other studies usually the research workers have not divided the patients on age variable but have taken as a whole.

#### CONCLUSION:

CNLDO is the common ocular disease in infants.

Table I showing gender distribution. Total 110

Gender	No of Patients	% age
Male	67	60.90%
Female	43	39.09%
Total	110	100%

Table II showing Ocular involvement

Involvement	No	Percentage
Unilateral	102	92.72%
Bilateral	8	7.27%

Table III showing group with age distribution

Group	Age	No	Percentage
Group A	Up to 6 months	73	66.36%
Group B	> 6 month-1 year	37	33.63%

Table IV showing results

Group	Success		Failure	
	No	Percentage	No	Percentage
Group A	70	95.89%	3	4.10%
Group B	31	83.78%	6	(16.21%)

Unilateral involvement is more. Results of conservative management with lacrimal sac massage and topical antibiotics are promising. Success rate declines with increase in age. Parents should be properly educated regarding the technique, which should be demonstrated to them. Probing should not be carried out early until there is no hope of remedy with conservative treatment.

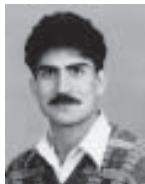
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**(Note: In order to encourage the budding ophthalmologist/postgraduate trainees, the Editorial Board of Ophthalmology update is accepting those original articles/review articles/part of the dissertation for FCPS Examination for publication which have been peer-reviewed as well as approved by the hospital Ethical Committee or head of the respective departments to undertake the prospective study under proper supervision and guidance.....Chief Editor)**

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Dr Hamza

## Comparison of Distant Visual Acuity before & after Neodymium: Yag Laser Posterior Capsulotomy in cases of Posterior Capsular Opacification\*

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Sher Akbar<sup>4</sup>, Zaman Shah<sup>5</sup> FCPS

### ABSTRACT

**Objectives:** The objective of this study is to compare distant visual acuity before and after Nd: YAG laser posterior capsulotomy. v

### MATERIAL & METHODS

**Study Design:** Quasi experimental study design was used

**Setting:** The study was conducted at the out patient department of ophthalmology, Khyber Teaching Hospital, Peshawar, Pakistan.

**Duration of Study:** This study was completed in 6 months after the approval of synopsis. (From August 12, 2010 to February 12, 2011)

**Sample Size:** Sample size was 98 patients.

**Results:** There were 98 patients involved in the study with mean age of  $54.78 \pm 13.51$  years. Minimum age was 31 years while maximum age was 80 years. Out of total 98 patients, 62 (63.3%) were males and 36 (36.7%) were females in the sample. The mean duration between the cataract surgery and Nd: YAG laser treatment was found to be  $3.138 \pm 1.282$  years. 53 (54.1%) patients had posterior capsule opacification in the right eye while 45 (45.9%) patients had posterior capsule opacification in the left eye after extracapsular cataract extraction and phacoemulsification with posterior chamber intraocular lens implantation. The pre-treatment distant visual acuity of the patients was 6/12 in 12 (12.2%) patients, 6/18 in 12 (12.2%) patients, 6/24 in 21 (21.4%) patients, 6/36 in 35 (35.7%) patients and 6/60 in 18 (18.4%) patients. The post-treatment distant visual acuity of the patients was 6/06 in 12 (12.2%) patients, 6/09 in 15 (15.3%) patients, 6/12 in 33 (33.7%) patients, 6/18 in 32 (32.7%) patients, 6/24 in 3 (3.1%) patients and 6/36 in 3 (3.1%) patients. Frequency of improvement was also very high. 89 (90.8%) of patients showed improvement of minimum of two line positive change on Snellen's distant acuity scoring system while only 9 (9.2%) patients did not show any improvement.

**Conclusion:** It is concluded that visual acuity in patients who develop secondary posterior capsule opacification after cataract extraction with intraocular lens implantation is better after Neodymium: YAG Laser posterior capsulotomy than the visual acuity before the use of Neodymium: YAG Laser, (p-value < 0.05).

### INTRODUCTION

Visual impairment is a world health problem<sup>1</sup> and cataract is responsible for 50% of blindness worldwide.<sup>2</sup> Couching and intracapsular cataract extraction has become the history,<sup>3</sup> where as extracapsular extraction and phacoemulsification are the procedures widely practiced today for the treatment of cataract in many parts of the world.<sup>4</sup> These procedure also not free of complications.<sup>5</sup> Posterior capsule opacification (PCO)

is the most common long term complication of cataract surgery.<sup>6</sup> and its incidence is about 10-50% when followed for 2 years postoperatively.<sup>7</sup> it is a manifestation of proliferation of equatorial epithelial cells across the posterior capsule.<sup>8</sup> It causes reduction in visual acuity (VA).<sup>9-11</sup> Before the Neodymium- Yttrium- Aluminium- Garnet (Nd: YAG) laser use, the treatment of PCO was surgical capsulotomy, which is not free from drastic complications such as endophthalmitis. Today PCO is treated with Nd: YAG laser, which is safer, more effective and an out-patient procedure. The decreased rate of complications and faster recovery has made Nd: YAG laser capsulotomy popular approach for the treatment of PCO.<sup>13</sup> It is used to disrupt the posterior capsule to create an opening.<sup>14</sup> This study has been designed to determine improvement in VA by Nd: YAG laser capsulotomy in patients with PCO.

### DATA COLLECTION PROCEDURE

Permission for conducting this study was taken from the hospital ethical committee while written informed consent, for being included in this study was taken from the patient. Detailed ocular and systemic

\*The topic is a part of the principal authors' dissertation for FCPS and is duly approved by the College of Physicians & Surgeons, Pakistan. The study was undertaken at the Department of Ophthalmology, Khyber Teaching Hospital, Peshawar. KPK

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history, including present, past and personal was taken. A thorough physical examination of the ocular system was conducted, including best corrected snellen visual acuity for documenting pre Nd: YAG Laser distant visual acuity, Slit-lamp biomicroscopy for detecting any infection, inflammation and applanation Tonometry to measure the intraocular pressure. If the inclusion and exclusion criteria were fulfilled, all such patients who were diagnosed by the consultants as having posterior capsular opacification in the OPD and referred by them to the Nd: YAG Laser room for capsulotomy were enrolled for the study.

Topical proparacaine hydrochloride 0.5%, one drop was instilled, few minutes before laser application for topical anesthesia. Abraham YAG laser capsulotomy contact lens (by ocular instruments inc. USA) was applied and Nd: YAG laser posterior capsulotomy was done with a Q-switched Nd: YAG laser machine (model VISULAS YAG II, by ZEISS, Germany). Our intention was to create an opening of about 2-3 mm in the centre of the opacified capsule using minimum amount of total laser energy

After capsulotomy, all the patients were given levobunolol, one drop twice a day and a combination of Tobramycin 0.3% and Dexamethasone 0.1%, one drop four times a day for the next one week. Patients were followed for assessment of best corrected Snellen visual acuity, one week after laser capsulotomy. The same surgeon assessed the patients. All such data was recorded in a pre-designed proforma.

#### DATA ANALYSIS

The collected data was analyzed by using the software SPSS version 10. Visual Acuity was converted to a logMAR Scale for statistical analysis.<sup>15,16</sup> Mean  $\pm$  standard deviation was computed for quantitative variables including age, time interval between cataract surgery and capsulotomy and visual acuity before and after Nd:YAG laser. Frequency and percentage was computed for gender. Paired T test was used to generate P-value to compare visual acuity before and after Nd: YAG laser capsulotomy. P-value of  $< 0.05$  was considered as significant.

#### RESULTS

There were 98 patients involved in the study with mean age of  $54.78 \pm 13.51$  years. Minimum age was 31 years while maximum age was 80 years. (Tab: 1). Out of total 98 patients, 62 (63.3%) were males and 36 (36.7%) were females in the sample. (Tab :2). The mean duration between the cataract surgery and Nd: YAG laser treatment was found to be  $3.138 \pm 1.282$  years. (Tab: 3). There were 53 (54.1%) patients had posterior capsular opacification in the right eye while 45 (45.9%) patients had posterior capsular opacification in the left eye after extracapsular cataract extraction in phacoemulsification

with posterior chamber intraocular lens implantation. (Tab :4). The pre-treatment distant visual acuity of the patients was 6/12 in 12 (12.2%) patients, 6/18 in 12 (12.2%) patients, 6/24 in 21 (21.4%) patients, 6/36 in 35 (35.7%) patients and 6/60 in 18 (18.4%) patients. (Tab: 5). The post-treatment distant visual acuity of the patients was 6/06 in 12 (12.2%) patients, 6/09 in 15 (15.3%) patients, 6/12 in 33 (33.7%) patients, 6/18 in 32 (32.7%) patients, 6/24 in 3 (3.1%) patients and 6/36 in 3 (3.1%) patients. (Tab: 6). Frequency of improvement is also very high. 89 (90.8%) of patients showed improvement of minimum of two line positive change on Snellen's distant acuity scoring system while only 9 (9.2%) patients did not show any improvement. (Table: 7)

#### DISCUSSION

Table 1  
Descriptive Statistics of age of Patients  
Age (Years)

Mean	54.78
Standard Deviation (SD)	13.51
Minimum	31
Maximum	80
Range	49

Table 2  
Frequency Distribution of Gender

Gender	Frequency	Percentage
Male	62	63.3%
Female	36	36.7%
Total	98	100%

Table 3  
Descriptive Statistics of Duration between Cataract Surgery  
and Nd: Yag Laser Treatment  
Duration (years)

Mean	3.138
Std. Deviation	1.282
Minimum	1.0
Maximum	5.0
Range	4.0

Table 4  
Frequency Distribution of Eyes Side Involved

Eyes side involved	Frequency	Percent
Right	53	54.1%
Left	45	45.9%
Total	98	100.0%

Table 5  
Frequency Distribution of Pre-Treatment Distant Visual Acuity

Pre-treatment Distant Visual Acuity	Frequency	Percent
6/12	12	12.2%
6/18	12	12.2%
6/24	21	21.4%
6/36	35	35.7%
6/60	18	18.4%
Total	98	100.0%

Table 6  
Frequency Distribution of Post-Treatment Distant Visual Acuity

Post-treatment Distant Visual Acuity	Frequency	Percent
6/06	12	12.2%
6/09	15	15.3%
6/12	33	33.7%
6/18	32	32.7%
6/24	3	3.1%
6/36	3	3.1%
Total	98	100.0%

There were 98 patients involved in the study with mean age range of  $54.78 \pm 13.51$  years. Such patients in one of the study done in Manchester Eye Hospital, UK was 75.2 years.<sup>45</sup> while in another study the mean age range was  $65.08 \pm 10.47$ .<sup>58</sup> This is because all patients had age-related cataract which were operated and they developed PCO. Out of total 98 patients, 62 (63.3%) were male and 36 (36.7%) were female in our study. There were 14 (53.8%) females and 12 (46.2%) males in a study done in UK.<sup>45</sup> There were 19 (55.9%) male and 15 (44.1%) females in study done in Greece.<sup>58</sup> And 46% male and 54% females in study done in an Eye Hospital Hyderabad.<sup>59</sup>

According to our study the mean duration between the cataract surgery and Nd: YAG laser treatment was found to be  $3.138 \pm 1.282$  years. In another study it was found to be 10 months to 15 months.<sup>58</sup> In a study of 500 cases, the average time from cataract surgery to Nd: YAG laser capsulotomy was 2.06 years, the minimum 3 months and the maximum more than 4 years. The majority of patients (46%) had PCO between 3 months to 12 months post-operatively.<sup>59</sup> Apple DJ has noted the incidence of PCO up to 50% by two years postoperatively,<sup>60</sup> while other authors have reported the incidence of PCO up to 43% in five years duration after extra capsular cataract extraction and in another study of 369 eyes, the frequency of PCO in 1.6%, 12.3% and 26.5% after cataract surgery in the duration of 1, 2 and 3 years was noted respectively. There were 53 (54.1%) patients had posterior lens capsule opacification in the right eye while 45

(45.9%) patients had posterior lens capsule opacification in the left eye after extracapsular cataract extraction and phacoemulsification with posterior chamber intraocular lens implantation.

The pre-treatment distant visual acuity of the patients was 6/12 in 12 (12.2%) patients, 6/18 in 12 (12.2%) patients, 6/24 in 21 (21.4%) patients, 6/36 in 35 (35.7%) patients and 6/60 in 18 (18.4%) patients. While study of Greece 2.9% patients had VA 20/32 and 20/60 while 20.6% had VA 20/40, 14.7% had 20/50 and 20/63, 17.6% had VA 20/80 and 26.6% had VA 20/100.<sup>58</sup> While in study of Hyderabad, 80.4% of patients had pre-Laser VA >20/30, among them 52.4% had VA above 6/60.<sup>59</sup>

According to our study the post-treatment distant visual acuity of the patients was 6/06 in 12 (12.2%) patients, 6/09 in 15 (15.3%) patients, 6/12 in 33 (33.7%) patients, 6/18 in 32 (32.7%) patients, 6/24 in 3 (3.1%) patients and 6/36 in 3 (3.1%) patients. The study of Greece showed that out of 34 patients, only 1 (2.9%) patient had post treatment VA 20/80 while other patients (85.3%) recover well and had VA less than 20/60 and concluded that Nd:YAG capsulotomy seems to be a safe and effective procedure for eyes that have previously undergone combined phacoemulsification and vitrectomy surgery.<sup>58</sup> The study of Hyderabad showed that there were no patients that had VA 6/6-6/12 pre-treatment but after treatment there were 372 (74.4%) had VA 6/6-6/12.<sup>59</sup>

This hypothesis is proved that visual acuity had improved after

Nd: YAG laser capsulotomy in patients with extracapsular cataract extraction and phacoemulsification with posterior chamber intraocular lens implantation.

Frequency of improvement is also very high as 89 (90.8%) of patients showed improvement of minimum of two line positive change on Snellen distant acuity scoring system while only 9 (9.2%) patients did not show any improvement in our study. Similar results were seen in study done in Hyderabad. Researchers found 93.9% had improved visual acuity (more than 2 line improvement in Snellen's lines).

## CONCLUSION

Thus it is concluded that visual acuity in patients who develop secondary posterior lens capsule opacification after cataract extraction with intraocular lens implantation is better after Neodymium: YAG Laser posterior capsulotomy than the visual acuity before the use of Neodymium: YAG Laser, (p-value < 0.05).

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## **CURRENT RESEARCH**

### **Femtosecond Laser-Mediated Cataract Emulsification a Major advance (American Academy of Ophthalmology Annual Meeting Oct'2011)**

William Culbertson, MD  
Bascom Palmer Eye Institute, University of Miami, Florida.

A new study has provided strong evidence of the increased safety and effectiveness of laser-mediated emulsification of cataracts, compared with the current method of Phacoemulsification. The study was presented here at the American Academy of Ophthalmology 2011 Annual Meeting in Oct'2011.

In clinical practice, surgeons expect safer, faster cataract surgery when laser pretreatment is performed before cataract removal. The combination of precision and simplification that is possible with the femtosecond laser represents a major advance over ultrasonic associated Phaco-emulsification. The approach uses femtosecond laser technology, which delivers near-infrared light to create precise subsurface cuts at depths that are greater than are possible using conventional approaches. Although it is approved by the US Food and Drug Administration, the procedure is not widely used in the United States.

Dr. Culbertson and colleagues investigated how the use of the femtosecond laser influenced the subsequent use of ultrasound to soften cataracts, enabling their suction removal. The study was driven by the need to lessen the use of ultrasound, given that ultrasound-associated complications can hinder recovery and/or cause cornea problems. The prospective randomized controlled trial examined 29 patients who received femtosecond laser cataract surgery in one eye, which involved laser capsulotomy, laser lens fragmentation by ultrasound emulsification, and aspiration of the emulsate. The other eye of each patient was treated using the standard phacoemulsification procedure, which involved manual incision, ultrasound emulsification, and aspiration.

The laser-treated eyes required 45% less ultrasound energy to achieve cataract removal than the conventionally treated eyes. Also, surgical manipulation, assessed by determining the number of "active phaco steps," was reduced in the laser-treated eyes, compared with the eyes receiving conventional phacoemulsification. This reduction led to the use of less ultrasound energy. The laser was used to make horizontal and vertical cuts. Although this prolongs the procedure, it can be advantageous because it fractures the cataract into segments, which are more readily removed, making the surgery safer. One limitation of the study, is that it only involved cataracts graded 1 to 4. The results are therefore not applicable to less commonly encountered cataracts making "the single-most significant advancement in cataract surgery in the last 40 years."

..... Dr. Madiha Durrani FRCS, Editor (source *Ophthalmic Newsnet*)



Dr Alam

## Phacoemulsification Vs Sutureless Manual Small Incision Cataract Surgery (MSICS) (Visual Acuity in 100 Patients)

Mohammad Alam<sup>1</sup>, Sardar Ali<sup>2</sup>, Naseer Ahmad<sup>3</sup>

### ABSTRACT

**Objective:** To compare the visual acuity in Phacoemulsification with Manual Small Incision Cataract Surgery (MSICS) with PC/ IOL .

**Materials and Methods:** This study was conducted in the Department of Ophthalmology, Khyber Teaching Hospital Peshawar, from Jan, 2006 to June, 2007. 100 patients suffering from age-related cataract with age range from 45 to 75 years were selected, in which 57 (57%) were male and 43 (43%) were female. Informed consent was obtained from each patient. The patients were divided into two groups, A and B each, comprising of 50 patients. A proper proforma was designed for evaluation and documentation of patients. Anterior segment and if possible posterior segment examination was done with direct, indirect ophthalmoscope and slit lamp biomicroscopy. Biometry and viral profile was done. Group A patients were operated by Phacoemulsification and PMMA IOL were implanted in the posterior chamber. Group B patients were operated by sutureless manual small incision cataract technique (MSICS) and posterior chamber PMMA lens were implanted. Visual acuity was checked on 1<sup>st</sup> post operative day, at 1<sup>st</sup> week and best corrected visual acuity (BCVA) at the end of first month.

**Results:** On first post operative day, in Group A, 68% patients had VA of 6/6 - 6/12, 30% patients had 6/18 - 6/24, 2% patients had VA 6/36 - 6/60, while in Group B, 62% patients had VA of 6/6 - 6/12, 22% patients had 6/18 - 6/24, 12% patients had VA 6/36 - 6/60 while 4% patients had VA less than 6/60. After 1<sup>st</sup> week of operation in Group A, 74% patients had VA of 6/6 - 6/12, 24% patients had 6/18 - 6/24, 2% patients had VA 6/36 - 6/60 while in Group B, 72% patients had VA of 6/6 - 6/12, 18% patients had 6/18 - 6/24, 10% patients had VA 6/36 - 6/60. At the end of 1<sup>st</sup> month, in Group A the best corrected visual acuity (BCVA) 6/6 - 6/12 was present in 94% patients and 6% patients had 6/18 - 6/24, while in Group B, 90% patients had best corrected visual acuity (BCVA) of 6/6 - 6/12 and 10% patients had 6/18 - 6/24.

**Conclusion:** Although Phacoemulsification is an advanced technique but it has some limitations and it cannot be performed in dense/hard cataracts. At the end of 1<sup>st</sup> month, the best corrected visual acuity (BCVA) is comparable in both techniques.

**Key words:** Visual acuity (VA), Best corrected visual acuity (BCVA), Intraocular Lens (IOL), Posterior Chamber (PC), Manual small incision cataract surgery (MSICS), Polymethyl methacrylate (PMMA).

### INTRODUCTION

Among the ocular ailments, a large backlog of cataract blindness exists in the developing countries and cataract is the most common cause of reversible blindness<sup>1</sup>. This ocular morbidity is the leading cause of blindness in the world and about 18 million people are being affected by cataract<sup>2,3</sup>. The underprivileged population of the world fails to avail eye care services and the most important barriers are insufficient financial resources, lack of awareness about existing eye care facilities and inaccessibility<sup>4,5,6</sup>. Cataract surgery has been in evolutionary phase from couching in the ancient times

by Susruta to reaching at the dawn of Kelman method of surgery who is the pioneer of recent advanced technique of Phacoemulsification and launched it in 1967. Despite what modern technology has done to advance the treatment of cataract, the greatest challenge in our field continues to be the large and increasing backlog of cataract blindness in the developing countries<sup>7</sup>. In developed countries like USA, Europe, the main focus of cataract management research has been directed at exciting but expensive, new intraocular lens (IOLs) and Phacoemulsification technology. Best surgical centers in the developing world adopt this recent technology for those people who can afford it. At the same time the underprivileged population in the developing countries with reversible blindness due to mature cataract go untreated. If services continued to be skewed towards the privileged and affordable population in the world, then the number of people who will be blind from cataract will be twice of the current figure by the year 2020<sup>8</sup>.

Although Phacoemulsification technology is the important innovation in the cataract management, the machine is very expensive to be purchased and

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maintained. Foldable IOLs are cost prohibitive for poor people. It has difficult learning curve. More- over Phaco is not applicable in brunescient hard cataract and hypermature cataract which is the most probable presenting cataract of poor and unaware population. Alternative method to Phaco is sutureless manual small incision cataract surgery (MSICS) which needs low technology, low cost and significant success in rehabilitation of visual acuity after cataract surgery<sup>9</sup>.

There are many centers of excellence for MSICS who carry out this technique routinely and the results recorded by these centers are comparable with Phacoemulsification.

Some studies have shown that MSICS is more cost effective than the alternative procedures<sup>10,11</sup>. We have conducted this study to compare the visual acuity in phaco with MSICS with PC/IOL in our setup, where most of the people are poor and cannot afford the phaco procedure.

#### MATERIALS AND METHODS:

This comparative study was conducted in department of Ophthalmology Khyber Teaching Hospital Peshawar from Jan 2006 to June 2007. 100 patients suffering from age related cataract with age range from 45 to 75 years were selected for the study, in which 57(57%) were male and 43 (43%) were female Table I. Pre operative visual acuity was checked Table II.

Anterior segment and if possible posterior segment examination was done with direct, indirect ophthalmoscope and with slit lamp biomicroscopy. Biometry was done by a single observer. Informed consent was obtained from each patient. The patients were divided into two groups A and B, each comprising of 50 patients. Diabetics, hypertensive, glaucomatous and co-ocular morbidity patients were excluded from the study. The pupils of the patients were dilated with tropicamide eye drops and phenylephrine eye drops.

Group A patients underwent Phacoemulsification and PMMA intraocular lens were implanted in the posterior chamber by a single surgeon to avoid study bias. Group B patients were operated by other single surgeon by sutureless manual small incision cataract surgery (MSICS) technique and posterior chamber PMMA lens were implanted. All the surgeries were done under peribulbar local anesthesia. Visual acuity was recorded on 1<sup>st</sup> post operative day, after 1<sup>st</sup> week and best corrected visual acuity at the end of first month.

#### RESULTS

On first post operative day in Group A, 34(68%) patients had VA of 6/6-6/12, 15(30%) patients had 6/18 - 6/24, 1(2%) patients had VA 6/36 - 6/60. While in Group B, 31(62%) patients had VA of 6/6 - 6/12, 11(22%) patients had 6/18 - 6/24, 6(12%) patients had VA 6/36 - 6/60 while 2(4%) patients had VA less than 6/60,

Table III. After 1<sup>st</sup> week of operation in Group A, 37(74%) patients had VA of 6/6 - 6/12, 12(24%) patients had 6/18 - 6/24, 1(2%) patients had VA 6/36 - 6/60 while in Group B, 36(72%) patients had VA of 6/6 - 6/12, 9(18%) patients had 6/18 - 6/24, 5(10%) patients had VA 6/36 - 6/60, Table IV. At the end of 1<sup>st</sup> month, the best corrected visual acuity in Group A, 47(94%) patients had VA of 6/6 - 6/12 and 3(6%) patients had 6/18 - 6/24, while in Group B, 45(90%) patients had best corrected visual acuity of 6/6 - 6/12 and 5(10%) patients had 6/18 - 6/24, Table V.

Table I showing gender distribution. Total 100

Gender	No of Patients	% age
Male	57	57%
Female	43	43%

Table II showing Pre operative visual acuity

VA	Group A		Group B	
6/36	7	14%	4	8%
6/60	23	46%	15	30%
CF	20	40%	17	34%
HM	0	0	6	12%
PL	0	0	9	18%

Table III showing 1<sup>st</sup> post operative day visual acuity

VA	Group A		Group B	
6/6 - 6/12	34	68%	31	62%
6/18 - 6/24	15	30%	11	22%
6/36 - 6/60	1	2%	6	12%
< 6/60	0	0	2	4%

Table IV showing 1<sup>st</sup> week post operative visual acuity

VA	Group A		Group B	
6/6 - 6/12	37	74%	36	72%
6/18 - 6/24	12	24%	9	18%
6/36 - 6/60	1	2%	5	10%
< 6/60	0	0	0	0%

Table V showing 1<sup>st</sup> month post operative best corrected visual acuity

VA	Group A		Group B	
6/6 - 6/12	47	94%	45	90%
6/18 - 6/24	3	6%	5	10%
6/36 - 6/60	0	0%	0	0%
< 6/60	0	0	0	0%

## DISCUSSION:

This comparative study has shown that at the end of 1<sup>st</sup> month, visual acuity was comparable in both the techniques. Although as already mentioned phaco has some limitations in its practice. It can not be practiced in all types of cataract like hard nucleus and brunescant cataract while MSICS is applicable in all types of cataract and has edge over phaco as evident from preoperative visual acuity and severity of cataract as shown in Table II. From this table it is evident that phaco cannot be exercised in hard and dense cataract. WHO defined visual impairment as vision worse than 6/18<sup>12</sup>. With use of this standard of better than or equal to 6/18, both techniques in our study has shown remarkable results. The differences in two techniques were cost effectiveness, time consumption, affordability and instrumentations which are more correlated with phaco as compared to MSICS.

There are multiple national and international studies showing comparable results of best corrected visual acuity in the two techniques. Study conducted by Sanduk Ruit MD, Geoffery Tabin MD, et al has shown no significant difference in visual acuity in both the techniques<sup>13</sup>. This study has shown that MSICS is more faster, less expensive and less technology dependent than Phacoemulsification. Study of Singh SK, Winter I, Surin L. demonstrates 1<sup>st</sup> post operative visual acuity in phaco of 6/6 -6/18 in 68% patients and in MSICS in 77.7% patients. Our study has edge over this study in both the groups. More over in the above mentioned study, only immature cataracts were included while in our study all types of cataracts were included<sup>14</sup>. AKM Shahidur Rahman Tarafder, M Anwarul Kader and SM Rezaul Karim study has reported best corrected visual acuity of 6/6 - 6/12 in 97% patients at the end of 6 weeks. This study has variation with our study<sup>15</sup>. Study of Dr Akand has shown best corrected visual acuity of 6/6 - 6/12 in 98% patients operated with MSICS<sup>16</sup>.

Rengaraj Venkatesh MD et al has reported the comparative analysis of visual acuity in phaco vs. MSICS with PCIOL in his centre of excellence for cataract surgery. According to his study the 1st post operative day VA in both groups was comparable. Visual acuity after 6 weeks was 6/6 -6/18 in 87.6% in phaco group while in 82% patients in MSICS group and they have concluded that both techniques have excellent outcome<sup>17</sup>. Gogate PM, Kulkarni S, Krishnaiah S, et al had demonstrated visual acuity comparison in phaco with MSICS with PCIOL. According to this study visual acuity in phaco of e" 6/18 was present in 81.1% patients while in MSICS, it was present in 71.1% patients. They also suggested that MSICS is as effective as phaco s<sup>9</sup>.

Due to cost effectiveness, affordability and less time consumption, MSICS is the surgery of choice in many

developing countries with good visual outcome. Study of Henning and co-authors have reported visual acuity of 6/6 -6/18 in 96.2% patients<sup>18</sup>. Another study conducted by Dr Zaman.M et al demonstrated visual acuity of 6/6 -6/18 in MSICS in 93.4% of patients<sup>19</sup>. From these data it is evident that our study is comparable with national and international studies.

## CONCLUSION:

Phacoemulsification is the state of the art technology and recent advancement in cataract surgical management. It gives good visual results with early rehabilitation. But at the same time, it is expensive, high cost machine and beyond the approach of every patient. Moreover it has limitations in hard nucleus and hypermature cataract. Goods alternative of phaco is MSICS, which gives comparable visual outcome results with phaco. It is cost effective and can be done every where.

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Dr Saber

## Factors responsible for Traumatic Cataract & its affects on Visual Acuity

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### ABSTRACT

**Objectives:** To study the causative agents responsible for traumatic cataract, current treatment options, post-operative complications and final visual out come of traumatic cataract.

**Materials and Methods:** The study was conducted in Ophthalmology Department eye A unit Khyber Teaching Hospital Peshawar from January, 2009 to January, 2011. Detailed history with reference to age, sex, mode of injury, causes and circumstances of trauma were recorded. All patients had B scans pre-operatively to evaluate the posterior segment and were operated under general anesthesia. They were followed up to 6 months.

**Results:** We studied 60 patients with traumatic cataract comprising 48 were male and 12 were female, about half the patients were between 5-15 years of age. Commonest trauma was sport related in 22 (36.6%) cases, out of which blunt trauma with stone in 15 (25%) cases and penetrating trauma with thorn in 9 (15%) cases. In 56 patients (93.33%) presenting visual acuity was less then 6/60. Fifty three patients (88.33%) had visual acuity of 6/9-6/18 while only three patients (5%) had a final visual acuity of <3/60.

**Conclusion:** Traumatic cataract is mainly responsible for visual loss after trauma. Males are affected more than females. Nearly more than half of the patients affected were children under the age of 16. Taking necessary precautions for sports and work can prevent nearly 54% of cataracts. Most common causative agents was blunt trauma with stone, sharp instruments and wooden sticks

### INTRODUCTION

The most common cause of monocular blindness and ocular morbidity almost all over the world is ocular trauma particularly in younger age group and it has always been a professional challenge to the ophthalmologist.<sup>1</sup> Approximately 75% of people with trauma induced visual impairment are monocularly blind<sup>2</sup>. The incidence of ocular injuries varies in different parts of the world. A study from India on ocular trauma by Panda<sup>3</sup> revealed an incidence of 20.53% and from Pakistan by Khan MD et al<sup>4</sup> an incidence of 12.9%. Cataract may be an early or late manifestation of ocular trauma<sup>5</sup>. The two basic types of trauma related lens

abnormalities are loss of transparency and loss of position<sup>6</sup>. Traumatic cataract is not uncommon in ocular trauma<sup>7</sup>.

Unilateral traumatic cataract, if left alone leads to unilateral visual loss, leucocoria and a psychological burden on the child and the parents. Moreover, it has been an added risk of developing squint in the traumatic eye. Early rather than late removal of lens by aspiration, followed by aphakic correction with IOL or contact lenses was usually recommended, but the results are not uniformly good because of poor compliance. Intraocular lens (IOL) implantation in the young patients with unilateral and as well as bilateral cataracts is an excellent way of overcoming the above mentioned problem and enhancing their chance of developing binocular single vision. Stegmann believed that the prognosis for a traumatic cataract could be the same as for routine senile cataract if handled appropriately, excluding those cases with damage to the posterior segment<sup>8</sup>. The greatest benefit of primary cataract removal is that it allows the surgeons to see posterior segment, otherwise blocked by the lenticular opacity. In general primary cataract removal is recommended if the lens is fragmented, swollen or if blocking the pupil<sup>9</sup>. Majority of the patients with traumatic cataract can be safely rehabilitated with posterior chamber lens implantation<sup>10</sup>. Aim of the study was to assess causative agents responsible for traumatic cataract, current treatment options, post-operative

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complications and final visual outcome of trauma related cataract.

## MATERIALS AND METHODS

The study was conducted in the Ophthalmology Department (A unit) Khyber Teaching Hospital Peshawar from January, 2009 to January, 2011. Sixty patients were analyzed in this study. After admission in the ward, detailed history was taken with particular reference to age, sex, and mode of injury, causes and circumstances of trauma. Detailed examination was performed including visual acuity tested by Snellens' chart. Slit lamp biomicroscopy was done in all cases. Cornea was examined for any pathology related to trauma. The anterior chamber was examined for hyphema, reaction, lens matter or vitreous. Iris and pupils were examined for any synechiae and reaction to light. Pupils were dilated routinely and morphology of cataract noted. Intraocular pressure was checked by Goldmann applanation tonometer. When intra ocular pressure (IOP) was elevated, gonioscopy was performed to look for angle recession. B scan was performed to exclude any posterior segment co-morbidity. In suspicious cases, x-rays orbit (AP and lateral views) were performed to detect and localize any foreign body.

All patients with trauma induced inflammation were treated with topical corticosteroids, antibiotics and mydriatic/cycloplegic eye drops preoperatively. The selection criteria for surgery was traumatic cataract with normal posterior segment on B scan (ultrasonography). Intraocular lens (IOL) power was determined by a scan and keratometry readings were obtained by using SRK regression formula. Average IOL power was 21.5 Dioptres with range from 14.50 to 29 dioptres. The standard surgical procedure performed was conventional extra capsular cataract surgery incision, anterior capsulotomy, lens matter aspiration and posterior chamber IOL implantation. The standard procedure was combined with other surgical procedures depending upon the need in individual cases. All patients were examined on the first post-operative day. Routine slit lamp examination was carried out and the condition of cornea, anterior chamber reaction, pupillary reflexes, IOP measurement by applanation tonometer, status of IOL and posterior capsule was noted. All patients were given Tobramycin+dexamethasone eye drops postoperatively. The dosage and frequency was adjusted individually depending on postoperative findings of the anterior chamber.

After discharge from the hospital, all patients were examined at regular intervals of 10 days, 1 month and 6 months. At each visit visual acuity was recorded. Detailed anterior and posterior segment examinations were performed with slit lamp and indirect ophthalmoscope after pupil dilatation. Final refraction

was done on 4<sup>th</sup> post operative visit i.e. after 3 months. Topical medications were tapered off gradually and stopped on 3<sup>rd</sup> postoperative visit. (40 days). Visual outcome was graded as good (6/9-6/12), fair (6/18-6/24), satisfactory (6/36-6/60) and poor (less than 3/60).

## RESULTS:

Out of the 60 patients studied, 48 (80%) were male patients where as 12 (20%) were female patients. Thirty patients (50%) were between 5-15 years of age, followed by 25 patients (41.6%) between 16-40 years and 5 patients (8.3%) were in the 41 to 60 years age group. Patients with closed globe injury were 38 (63.3%) and open globe injury 22 (36.6%). Circumstances of events causing traumatic cataract are shown in the table 1. Causative agents of blunt and penetrating trauma are given in table 2 & 3. The morphology of traumatic cataract was cortical in 45% of the patients, ruptured anterior capsule in 20%, posterior sub capsular in 15%, partially absorbed cataract in 11.6% and rosette cataract in 8.3% of the cases. In 49 patients (81.6%) presenting visual acuity was less than 6/60 and only 11 patients (18.3%) had visual acuity of 6/60.

The interval between trauma and surgery was less than 2 months in 15 cases (25%), 2-4 month in 25 cases (41.6%), 4-6 months in 06 cases (10%), 7-12 month in 14 cases (23.3%). Cataract surgery was performed on all patients. A number of intraoperative and postoperative (early and late) complications were noted. Vitreous was lost in 8 (10.32%) cases. Among these cases, one patient had traumatic posterior capsular rupture diagnosed preoperatively and in seven patients vitreous loss occurred while separating the adherent flaps of anterior and posterior capsules of partially absorbed cataracts. In all these cases vitreous loss was managed by anterior sponge vitrectomy and successful posterior chamber IOL implantation, was achieved. In the early postoperative period, severe anterior chamber reaction was noted in 25 cases (41.6%), posterior capsular opacity in 07 cases (11.6%), corneal oedema in 10 cases (3.89%), cortical lens matter seen in periphery in 05 cases (8.3%), raised intraocular pressure in 05 cases (8.3%) and traumatic mydriasis in 7 cases (11.6). Endophthalmitis was noted in only one case (1.6%).

The late postoperative complications included posterior capsular opacity in 20 cases (33.3%), posterior synechia in 8 cases (13.3%) and decentered IOL in 5 cases (8.3%). In patients with significant posterior capsule opacification, the visual acuity improved to 6/9-6/12 after YAG lesser capsulotomy. The average interval between laser capsulotomy and surgery was 6 months. 35 (58.3%) patients had postoperative refractive error of +/-2.0 dioptres and 7 (11.6%) had postoperative refractive error of more than +/-3.0 dioptres. Results of final corrected visual acuity are shown in table 4.

**DISCUSSION:**

In this study, we divided the patients with traumatic cataract into two distinct groups. Patients with open globe injury were 38.33% (23 patients) with closed globe injury were 61.66% (37 patients). Other studies support our findings that closed globe injuries are more common than open globe injuries<sup>11</sup>. Males are affected

**Table 1**  
**Circumstances of Trauma**

Activity	No. of cases n=60	percentage
Sports related	22	36.6%
Accidental	20	33.3%
Occupational	8	13.3%
Fight/Assault	10	16.6%

**Table 2**  
**Causative agents of blunt trauma (N=38)**

Agent	No. of cases	Percentage
Stone	13	21.66%
Wood	06	10%
Stick	05	8.33%
Wire/Metal wire	03	5%
Catapult	03	5%
Toy pistol	03	5%
Gulidanda	01	1.66%
Flying object	01	1.66%
Fire cracker	01	1.66%
Fist	01	1.66%
Sugarcane	01	1.66%

**Table 3**  
**Causative Agents of Penetrating Trauma (n=22)**

Agent	No. of Cases	Percentage
Thorn	07	11.66%
Stone	03	5%
Wood	02	3.33%
Stick	02	3.33%
Bomb blast injury	01	1.66%
Metal wire	03	5%
Disposable syringes	02	3.33%
Fire cracker	02	3.33%
Battery explosion	00	00%

**Table 4**  
**Results of Final Corrected Visual Acuity (n=60)**

Visual Acuity	No. of patients	%age	Remarks
6/9-6/12	43	71.66%	Good
6/18-6/24	08	13.33%	Fair
6/36-6/60	06	10%	Satisfactory
Less than 6/60	03	5%	Poor

more than females with a ratio of 8:1. The incidence among male is reported in many other studies<sup>12-14</sup>. The age distribution range from 5-15 years in 30 patients (50.64%), 16-40 years in 25 patients (42.85%) and 41-60 years in 5 patients (6.49%). Jan S in his study reported that 60.75% of ocular trauma occurred in below 20 years of age<sup>15</sup>. Sports related injuries were more common i.e. 53.33% (32 patients), followed by injuries related to accidents 46.66% (28 patients).

Children were the main victims as they are engaged in different type of high risk sports activities without the supervision of adults with complete disregard for any protective mechanism. Thomson CJ in his study reported that most of the ocular trauma occurred in children in home sitting especially in unsupervised children<sup>16</sup>. The next major group of injuries i.e. 30% (18 patients) were related to occupational work and fights. This is again due to lack of awareness about risk factors and not employing any protection while at work. The objects responsible for ocular injuries were stone, wood, thorns, metallic wires, toy pistols, used syringes and fire crackers. The more common causes of injuries were stone (21.66%), wood (10%) and stick (3.33%). In a study conducted by Gradin D<sup>17</sup>, the most common causes of injuries were stick (36.3%) and thorn (10.7%). Morphologically most of the traumatic cataracts were cortical (45.45%), followed by ruptured interior capsule (25.97%) and posterior sub-capsular cataracts (11.68%). In the study by TY Wong<sup>18</sup>, the morphology of the cataract was cortical in 45% of the cases and posterior sub-capsular cataract in 15% of the cases.

All patients were operated with intraocular lenses; the type of intraocular lens used was Polymethylmethacrylate (PMMA). Trivedi in his study used both PMMA and acrylic and found satisfactory results<sup>19</sup>. Chuang reported significant improvement after prompt surgical intervention and intraocular lens implantation<sup>20</sup>. The visual prognosis, after management, remains satisfactory in our study. Assessment of final visual acuity was 6/9 to 6/12 in 71.66% (43 patients), 6/18 to 6/36 in 13.33% (8 patients) and 6/60 to CF in 15% (9 patients). The post operative visual acuity recorded by Akhter and Waheed<sup>21</sup> was 6/12 or better in



30% of the eyes, 6/24 to 6/12 in 33% of cases, 6/60 to 6/24 in 15% and less than 6/60 in 22% of cases.

The most common post-operative complication was posterior capsular opacification (33.33%) and severe reaction/exudative membrane (41.66%). In the study by cheema R A<sup>22</sup>, the most common post-operative complication was fibrinous uveitis (25%). In the study by Eckstein M<sup>23</sup>, Posterior capsule opacity was almost universal i.e. 92%. With the availability of new microsurgical techniques, fine sutures, viscoelastics, IOLs and effective antibiotics, the visual outcome of these have improved considerably<sup>24</sup>. Factors adversely affecting visual outcome are complex trauma, delay in referral, inadequate post operative correction of aphakia with contact lens or implants and inadequate management of amblyopia.

Ocular trauma is also responsible for major economic losses. In USA, the annual economic toll for the management of ocular trauma is reported as 1.3 billion US Dollars<sup>23</sup>. In our society the cost is going to be even higher. Blindness from injury can at best be prevented by removing the cause of injury but once the injury has occurred, the prevention of blindness depends upon early and efficient management techniques.

#### CONCLUSION:

Traumatic cataract resulting from ocular trauma is a common cause of ocular morbidity, especially in young population. Most of the cases occur in playgrounds (36.6%), while occupational trauma accounts for another 13.3% cases. Serious efforts are required to prevent trauma at home, playground and at work place by creating awareness through public health education, laws enforcement and development of trauma centers with full expertise and technological back up.

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## Role of Optical Coherence Tomography (OCT) in the Diagnosis of Central Serous Retinopathy (CSR)\*

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### ABSTRACT

**Objectives:** To evaluate and study the role of Optical Coherence Tomography OCT in the diagnosis of Central Serous Retinopathy (CSR).

### MATERIAL AND METHODS

**Study design:** A retrospective, cross sectional, observational study.

**Setting:** This study was carried out at Said Anwar Medical Centre Dabgari Garden, Peshawar (KPK) from 1<sup>st</sup> February to 30 September 2011.

**Duration of study:** Eight months.

**Material and Methods:** All the patients were included in the study, who were clinically diagnosed as CSR on slit lamp examination. The following features could be documented with the OCT scan images: size and location of serous detachment, foveal involvement and presence, size, location, and number of PED. Only those patients without other secondary causes for serous retinal detachment like intraocular inflammation, vascular disorders like eclampsia, exudative age related macular degeneration, polypoidal choroidal vasculopathy, pathological myopia and intra-ocular tumors were included. The patients were divided into two groups: acute, chronic.

**Results:** Total 30 eyes of 25 patients were included in our study. Male to female ratio was 20:5. Mean age of the patient was 35.5 years. Acute CSR present in 20 patients while in 5 patients there was chronic CSR. Acute CSR was further divided into active and inactive CSR. Active CSR presented in 16 (80%) patients (four patients had bilateral CSR and 12 had unilateral involvement) while in 4 (20%) patients there was inactive CSR (one is bilateral and 3 are unilateral cases). In active cases foveal involvement present in 13 (81.25%) patients while in 3 (13.75%) cases the CSR present outside of the fovea near the vascular arcade. In active CSR, bullous neurosensory detachment presented in 10 (62.5%) patients while in 6 (37.5%) patients there was mild neurosensory detachment. In active CSR, pigment epithelial detachment presented in 7 (43.75%) patients while in 9 (56.25%) patients there was no pigment epithelial detachment.

**Conclusions:** Optical coherence tomography is potentially useful as a new, noninvasive diagnostic technique for quantitative examination of patients with central serous chorioretinopathy and objectively monitoring the clinical course of the serous retinal detachment in this disease.

**Key words:** Optical coherence tomography, Central serous retinopathy.

### INTRODUCTION:

Central serous chorioretinopathy is a retinal disorder which affects the macula. It was first described in ophthalmology more than one hundred years ago. Essentially, it is an "idiopathic disorder" and the precise cause is unknown<sup>1</sup>. Central serous retinopathy is associated with an elevation (detachment) of the macula due to leakage of fluid from the choroidal circulation into the subretinal space due to a defect in retinal pigment epithelium. The retinal pigment epithelium is a single-celled layer that lies between the retina and the choroid<sup>2</sup>. This tissue layer normally serves

to prevent fluid from the choroidal circulation from leaking under the retina. In central serous retinopathy, fluid equilibrium is disturbed leading to leakage beneath the retina which elevates it to produce a macular detachment with distorted vision<sup>2,3</sup>. CSR is a clinical diagnosis. However various invasive investigational and diagnostic tools such as fluorescein and indocyanine green angiography had used for the diagnosis of CSR<sup>4</sup>. Optical coherence tomography is a non-invasive technique which is used for the diagnosis of CSR. Optical coherence tomography (OCT) has also provided additional data about central macular detachments, development of retinal atrophy, and the correlation with visual acuity in resolved central serous chorioretinopathy. In this paper, our aim has been to diagnosed and document the OCT findings observed in patients with CSR<sup>5</sup>. To our knowledge, this is the first study, in which the OCT was used for the diagnosis of central serous retinopathy in Khyber Pakhtoon Khwa, previously only FFA was used for the diagnosis of CSR.

### MATERIAL AND METHODS:

Patients diagnosed with CSR were examined with an OCT ophthalmoscope between February 2011 to

\*The study was carried out at Said Anwar Medical Centre Dabgari Garden, Peshawar.

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September 2011 at the Said Anwer Medical Centre, Peshawar. CSR was defined as an idiopathic serous detachment of the neurosensory retina in the macular area as seen by slit lamp examination. All the patients were included in the study, which were clinically diagnosed as CSR.

The following features could be documented with the OCT C-scan images: size and location of serous detachment, foveal involvement and presence, size, location, and Pigment Epithelial Detachment (PED). Only those patients without other secondary causes for serous retinal detachment like intraocular inflammation, vascular disorders like eclampsia, exudative age related macular degeneration, polypoidal choroidal vasculopathy, pathological myopia and intra-ocular tumors were excluded. The patients were divided into two groups: acute, chronic.

Acute CSR was defined as presence of serous retinal detachment found on ophthalmic examination along with presence of symptoms < 6 months. Chronic CSR was defined as presence of serous retinal detachment found on ophthalmic examination with or without RPE pigment mottling or atrophy and presence of symptoms > 6 months.

## RESULTS

Total 30 eyes of 25 patients were included in our study. Male to female ratio is 20:5. Age of the patients range from 20 to 51 years, with a mean age of 35.5 years. In twenty five patients 20 (75%) have unilateral central serous retinopathy and 5 (25%) have bilateral involvement of eyes. In unilateral cases, the right eye is affected in 8 patients and left eye is affected in 12 patients.

Acute CSR present in 20 patients while in 5 patients (unilateral) there is chronic CSR. Acute CSR is further divided into active and inactive CSR. Active CSR present in 16 (80%) patients while inactive CSR in 4 (20%) cases. Laterality of the acute CSR is given in table I. Inactive CSR, was defined as the absence of angiographic leakage and no visible neurosensory detachment on slit lamp biomicroscopy. Features of the active CSR is given in table II.

In active cases, foveal involvement present in 13 (81.25%) patients while in 3 (13.75%) cases the CSR present outside of the fovea near the vascular arcade. In active CSR, bullous neurosensory detachment present in 10 (62.5%) patients while in six (37.5%) patients there is mild neurosensory detachment.

In active CSR, pigment epithelial detachment present in 7 (43.75%) patients while in 9 (56.25%) patients there is no pigment epithelial detachment. PEDs were identified on the OCT C-scans as a circular dark, well defined area, caused by a change in surface reflectivity.

Compared to a serous retinal detachment, the dark zone is more homogeneous and its border is better

Table I: Laterality in acute CSR (N= 20)

	Unilateral	Bilateral	Total
Active CSR	12	4	16 (80%)
Inactive CSR	3	1	4 (20%)
Total	15	5	20 (100%)

N= Number of patients

Table II: characteristics of active CSR (N=16)

	YES	NO
Foveal involvement	13 (81.25%)	3 (13.75%)
PED	7 (43.75%)	9 (56.25%)
Bullous detachment	10 (62.5%)	6 (37.5%)

N= number of patients, PED= Pigment epithelial detachment

defined. The border of the PED was seen as a very distinct, sharply reflective circular line, corresponding to the RPE. A macular cyst is also present with CSR in one eye which is outside of the fovea.

## DISCUSSION

Central serous retinopathy is a common acquired maculopathy. Primary pathology of acute central serous retinopathy is thought to begin with the disruption of the choroidal circulation. The RPE decompensate and allows exudation from the choroidal vasculature to pass into the subretinal space<sup>2</sup>. These hypothesis and diagnosis of CSR are based on FFA and indocyanine green angiography. Both of them are invasive procedures. But optical coherence tomography gives a non-invasive diagnosis, documentation and follow up of the patients. On OCT, central serous retinopathy appears as an elevation of the full-thickness neurosensory retinal layer from the highly reflective RPE layer, separated by an optically empty zone<sup>4</sup>.

The average age, bilateralism and predominance of male patients in our study were not different from the previous epidemic reports. In my study, males are affected more commonly than females with a ratio of 16:4. This was almost similar to the other studies. In Kim YY and Flaxel CJ study, male were involved more than female with a ratio of 22:2<sup>6</sup>. While in Iida T et al study, the gender distribution was 19 male and four females<sup>7</sup>. Similarly CSR was also common in male according to Cornut PL et al study<sup>8</sup>. CSR is more common in male than female. Type A personality in male (competitive drive, sense of urgency, aggressive nature, and hostile temperament) may be a risk factor for its development. In my study unilateral (75%) involvement is more common than bilateral (25%). While in van Velthoven ME et al study, Twenty six patients had unilateral disease and six patients had bilateral CSR.<sup>9</sup>

In eyes with active CSR (80%), the OCT ophthalmoscope allowed several distinct features to be identified. The most common feature was a large serous neurosensory detachment. When scanning the patient antero-posteriorly, the dome of the neurosensory detachment became visible. In van Velthoven ME et al study, active CSR present in 22 cases while inactive CSR present in nine cases<sup>10</sup>. In active CSR, Foveal involvement present in 81% cases as in our study. In Roisman L et al study showed that foveal neurosensory detachment occurred in 58.8% cases<sup>11</sup>.

In active CSR, The pigment epithelial detachment present in 35% cases. While in van Velthoven ME et al study, pigment epithelial detachment was present in 51.7% cases<sup>10</sup>. In Cornut PL et al study, PED was present in 10% patients<sup>8</sup>. While it was present in 36% cases in Hiram Y et al study<sup>12</sup>. OCT provide a non-invasive confirmation of CSR. It shows that it is often diffuse in nature in both the acute and chronic stages. The OCT ophthalmoscope provides additional information on the extent of the area involved, and is comparable to the information provided by the FFA<sup>13</sup>. It also allows measurement of the height of the serous detachment, which is potentially useful for follow-up, and may also demonstrate small CSR lesions which are not visible directly. It also obviates the need for fluorescein angiography, unless the CSR lesion fails to resolve spontaneously and laser treatment may be indicated. In our view, the OCT is a good alternative in the diagnosis and follow up of patients with CSR, and obviates the need for contrast enhanced imaging<sup>14</sup>.

#### CONCLUSION:

Optical coherence tomography is potentially useful as a new, noninvasive diagnostic technique for quantitative examination of patients with central serous chorioretinopathy and objectively monitoring the clinical course of the serous retinal detachment in this disease.

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Dr Nuzhat  
Rahil

## Comparison of Posterior Capsular Opacification in Paediatric Cataract Surgery with Polymethyl Methacrylate & Acrylic Hydrophobic IOL\*

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### Abstract

**Objectives:** The objective of the study was to compare the frequency of posterior capsular opacification in paediatric cataract surgery with PMMA and Acrylic hydrophobic posterior chamber lenses.

**Material And Methods:** This was a non-randomized controlled trial conducted in Eye unit of PGMI / Lady Reading Hospital, Peshawar in year 2010. The study included 26 consecutive pediatric eyes having congenital or traumatic cataract. A total of 26 eyes were divided into 2 equal groups. In group A, 13 eyes were observed in which Acrylic hydrophobic IOL was implanted while group B included 13 eyes in which PMMA IOL was implanted. The frequency of posterior capsular opacification (PCO) was observed after one, three and six months follow up.

**Results:** In this study, mean age in group A was 5 years with standard deviation as  $\pm 12.3$  while in group B mean age was 4 years with standard deviation as  $\pm 11.2$ . In Group A, 54% patients were male and 46% patients were female while in Group B, 62% patients were male and 38% patients were female. In Group A visually significant PCO was not found in any case at one month follow up. After three months one patient had PCO and after six months two patients had visually significant PCO. In Group B, 3(23%) patients had PCO at one month, 4(31%) patients had PCO at three months and 4(31%) patients had PCO at six months follow up.

**Conclusion:** Incidence of PCO is significantly less with acrylic hydrophobic lenses than PMMA IOL and therefore are safe to use in pediatric cataract surgeries.

**Keywords:** Pediatric cataract, posterior capsular opacification, acrylic intraocular lenses, polymethyl methacrylate lenses.

### INTRODUCTION

Cataract is defined as "any congenital or acquired opacity in the lens substance or capsule irrespective of the effect on vision". Paediatric cataract may be congenital or acquired. Congenital cataracts occur in about 3-15: 10,000 live births. Two-third of the cases are bilateral<sup>1</sup>. The cause of cataract can be identified in about half of the cases with bilateral opacities.<sup>1</sup> Most important cause of congenital cataract is genetic mutation while other causes are rubella, galactosemia and Lowe syndrome. Acquired causes are trauma, steroid use and exposure to radiation<sup>1</sup>.

The treatment of paediatric cataract, which significantly interferes with vision, includes surgical removal of cataract with or without intraocular lens (IOL)

*\*The study was conducted in the eye department of Lady Reading Hospital, Peshawar (KPK) after due permission from the Ethical Committee of the said hospital.*

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implantation. Posterior chamber IOL are preferred intraocular lenses (IOLs) for children<sup>2,3</sup>. Implantation of IOLs in children under 2 years is controversial.

Polymethyl Methacrylate (PMMA) IOLs are rigid and require larger incision than the diameter of the optics for insertion. They are commonly used in developing world<sup>4</sup> as they are cheap and plentiful while Acrylic IOLs are flexible which can be folded and inserted through much smaller incision.

Posterior capsular opacification (PCO) is the most frequent complication of pediatric cataract surgery<sup>5</sup>. A local study showed that about 51.72% of paediatric patients developed PCO after cataract surgery. A comparative study showed that PCO formation after paediatric cataract surgery with acrylic and PMMA IOLs is 21% and 75% of patient's respectively<sup>6</sup>. PCO is the commonest cause of glare and reduced visual acuity after cataract surgery<sup>7</sup>.

The purpose of this study was to compare the frequency of PCO after cataract surgery with both type of IOLs.

### MATERIAL AND METHODS:

This was a non-randomized controlled trial conducted in Eye unit of PGMI / Lady Reading Hospital, Peshawar in year 2010. The study included 26 consecutive pediatric eyes having congenital or traumatic cataract. The study sample size was

calculated by using 90% confidence co-efficient, 21% and 75% prevalence of PCO with acrylic and PMMA IOLs respectively, with 5% level of significance.

**Inclusion criteria:** All congenital and traumatic cataracts of both male and female patients above the age of 2 years and less than 18 years with intact zonules and posterior capsule.

**Exclusion criteria:** 1. All children who were less than 2 years as insertion of IOL below 2 years is controversial. 2: All patients with complicated cataract such as drug induced or radiation induced cataract. 3: All the patients in whom posterior capsule was deficient as PCO would not form in these cases. 4: All patients with posterior capsular plaque observed peroperatively because it is a form of PCO.

After taking the permission to conduct the study from hospital ethical committee, a total of 26 eyes of paediatric patients requiring cataract surgery, throughout patient department were admitted in Ophthalmology Unit, Khyber Institute of Ophthalmic Medical Sciences, PGMI Lady Reading Hospital, Peshawar. After admission, parents of the patient were briefed about the treatment plans. Written informed consents were taken from parents for inclusion in the study and merits and demerits of the both treatments were discussed with the parents. All the patients were discussed after examination with pediatrician for systemic features.

After history taking and systemic examination, complete ocular examination was done including visual acuity, slit lamp examination, intra-ocular pressure, macular function tests and fundus examination. Where needed examination was done with general anesthesia under the operating microscope.

Twenty six eyes of paediatric patients were divided into two equal groups of 13 eyes in each group. Group A consists of 13 eyes which were implanted with acrylic IOL after performing lens aspiration using phaco technique through a superior limbal incision. Group B consists of 13 eyes which were implanted with polymethyl-methacrylate (PMMA) IOL, after performing lens aspiration using phaco technique through superior limbal incision. After implantation of lens, 10/0 Nylon monofilament sutures was placed before subconjunctival steroid and intracameral cefuroxime injections.

Patients were monitored for the PCO formation during the follow up period after one month, 3 months and 6 months postoperatively. Bias was controlled by strictly following the inclusion and exclusion criterion and by proper follow up. All information was entered into a proforma especially designed for this purpose. All the data was analyzed in SPSS 10. Frequency and percentages were computed for all the qualitative variables like gender, type of procedure, type of cataract and complication like posterior capsular opacification.

Mean and standard deviation was calculated for quantitative variable like age. Chi square test was applied to find the correlation of postoperative complication of PCO of between two groups. P value < 0.05 was considered as significant value.

## RESULTS

Twenty six eyes of paediatric patients were divided into two equal groups of 13 eyes in each group. Group A consists of 13 eyes which were implanted with Acrylic IOL after performing lens aspiration through a superior limbal incision. Group B consists of 13 eyes which were implanted with polymethyl-methacrylate (PMMA) IOL, after performing lens aspiration through superior limbal incision.

Age distribution between two groups was analyzed as in Group A most of the patients 8(61%) were in age group 2-5 years followed by 4(31%) patients were in age group 6-10 years and one patient was in age group 11-17 years. Mean age was 5 years with standard deviation as  $\pm 12.3$ . Where as in Group B most of the patients 9(69%) were in age group 2-5 years followed by 4(31%) patients were in age group 6-10 years. Mean age was 4 years with standard deviation as  $\pm 11.2$  as shown in Table.1.

Gender distribution was analyzed as among 26 patients as 11(42%) patients were male and 15(58%) patients were female. Type of surgery among two groups was analyzed as in Group A, phacoemulsification with PC IOL was performed in all the 13 patients. Where as in Group B lens aspiration with phacoemulsification was performed in all the 13 patients.

PCO status after one, three and six months follow up was analyzed as in Group A PCO was not found in any case at one month follow up but after three months one patient had PCO and after six months two patients had PCO while in Group B 3(23%) patients had PCO at one month, 4(31%) patients had PCO at three months and n=4(31%) patients had PCO at six months follow up. ( shown in table No. 2)

## DISCUSSION

This study was conducted on 26 eyes to compare the frequency of posterior capsular opacification in paediatric cataract surgery with polymethyl methacrylate and acrylic hydrophobic posterior chamber lenses.

Our study showed that the occurrence of PCO is more in age range 2-5 years because in both the groups most of the patients 61% and 69% respectively were in age group 2-5 years. Similar results were found in a study done by Lambert SR.<sup>8</sup>

Our study showed that the incidence of PCO was slightly higher in male children's as compare to female patients like in both groups most of the patients 54% and 62% were male. Similar results were found in a

TABLE 1. Age Distribution (n=26)

AGE DISTRIBUTION	Groups Acrylic hydrophobic Group	Polymethyl Methacrylate Group	Total
2- 5 Years	8(61%)	9(69%)	17
6-10 Years	4(31%)	4(31%)	8
11-17 Years	1(8%)	00	1
Total	13	13	26
	Mean age was 5 years with SD $\pm$ 12.3	Mean age was 4 years with SD $\pm$ 11.2	

TABLE 2  
PCO status after one, three and six month follow up (n=14)

PCO Status	Groups Acrylic hydrophobic Group	Polymethyl Methacrylate Group	Total
One month	0(24%)	3(23%)	3
Three months	1(40%)	4(31%)	5
Six months	2(40%)	4(31%)	6
Total	3	11	14

Chi square test was applied in which p- value was 0.03

study done by Lambert SR and Knight Nanan D.<sup>8,9</sup>

Several factors related to the IOL design help in reducing PCO.<sup>10,11</sup> The IOL material also plays a role. In a study by Tromans<sup>12</sup> 11.75% adult patients with acrylic lenses developed PCO, compared to 43.65% and 33.5% with PMMA and silicone lenses, respectively. Experimental studies have shown that there is a significantly greater adhesion of the capsule to acrylic IOLs, due to its tacky surface. The exact mechanism by which the IOL material influences the behavior of these cells, is not known. It is claimed that the acrylic IOL may have bioactive properties.<sup>12</sup>

Most of the reports in literature compare the efficacy of IOLs of different materials on the reduction of PCO in adult populations and only 2 describe the outcome in children.<sup>13</sup> At the end of a 3 year follow up, NG DT and Plager DA<sup>14,15</sup> demonstrated that none of the patients with acrylic IOLs needed a Nd:YAG laser capsulotomy, compared to 26% with PMMA and 14% with silicone IOLs. More extensive PCO was associated with the PMMA lens, than the acrylic or the silicone IOL.

The incidence of clinically significant PCO was 21.1% in the group with acrylic IOLs. In the group with PMMA IOLs, 12 (75%) eyes developed a PCO, which was obscuring vision. Kaplan Meier curves distinctly

demonstrate that in patients with acrylic IOLs, the posterior capsule remained clearer for a greater period of time, compared to the group with PMMA IOLs. In patients over 4 years old, with more than 2 years follow up, the incidence of visually significant PCO following acrylic IOL implantation, was 50% (13 of 26 eyes).<sup>16</sup> In another study comparing 2 groups with acrylic and PMMA IOLs implanted, there were less complications in the group with acrylic IOLs, though there was no difference in the incidence of PCO between groups.<sup>11</sup> Our data show that in pediatric eyes with acrylic IOLs implanted, the incidence of clinically significant PCO was lesser than with PMMA lenses. This is the first study in this age group, wherein acrylic and PMMA IOLs have been compared in the same patient.

Acrylic IOLs have a higher degree of biocompatibility in the eye, as evidenced by the lesser amount of cellular reaction on the IOL surface and may have a role to play in those patients with a jeopardized blood-aqueous barrier. A significant finding amongst our patients was that, none of the eyes with an acrylic IOL experienced any postoperative uveal inflammation, unlike 26.1% of the eyes with a PMMA IOL. All of the eyes with PMMA also developed clinically significant PCO. Thus the IOL biocompatibility, associated uveal inflammation and development of PCO, are inter-related. However, the long-term effects of acrylic IOLs in children whose life expectancy is much more, are yet to be assessed.

The major limitations of this study was the small sample size, short duration of follow up, lack of randomization and masking of the observers, which limit our ability to draw convincing conclusions from this data. However, the acrylic IOLs appear to cause less visually significant PCO and are more biocompatible compared to PMMA IOLs. This needs to be substantiated by further studies.<sup>14,16</sup>

## CONCLUSION

In conclusion, although none of the IOL materials reached the visual quality of clear phakic eyes, acrylic hydrophobic IOLs gave the best results in preventing posterior capsular opacification in paediatric cataract surgeries. We have the opinion that in addition to small corneal incision, less astigmatism, and better contrast sensitivity, less rate of PCO formation is also an advantage of acrylic hydrophobic IOLs over PMMA IOLs. However, they need to be compared with other types of foldable lenses in regard to visual qualities.

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***“The Management of Ophthalmology Update is encouraging the young ophthalmologists by publishing their short- term research work, provided their studies are approved by the hospital ethical committee as is the case of this article.”***

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Dr Fatima Afzal

## Ophthalmic Manifestation of Dengue Fever\*

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Amna Adil FCPS<sup>4</sup>, Amber Zahid FCPS<sup>5</sup>, Prof. M Tayyib FRCS, FRCOphth<sup>6</sup>

### ABSTRACT

**Purpose of study:** To evaluate the ocular manifestations associated with dengue fever.

**Material & Methods:** Fifty patients admitted in dengue ward who were diagnosed dengue fever with typical symptoms and confirmed by detection of dengue specific IgM antibody and thrombocytopenia, underwent complete history and ophthalmic examination in department of Ophthalmology SIMS & Services Hospital and Ittefaq Hospital Trust Lahore. Fundus photographs of all the patients were taken.

**Results:** 4 patients had subconjunctival haemorrhages, one patient presented with bilateral periorbital ecchymosis. Another patient had retinal haemorrhages, cotton wool and Roth spots bilaterally. A patient developed unilateral ptosis secondary to anterior supratemporal orbital hematoma. One patient had retrobulbar orbital haemorrhage leading to proptosis and exposure keratitis.

**Conclusion:** Although ocular manifestation of dengue fever are rare but physicians and ophthalmologists should be aware of the possibilities of ophthalmic complications in the management of patients with dengue fever.

**Key Words:** Dengue Fever, Ophthalmic Manifestation

### INTRODUCTION

Dengue fever is the most prevalent form of flavivirus infection in humans. Born by Aedes mosquito, it has become a major international public health concern in recent decades. Dengue is found in tropical and sub tropical regions around the world, predominantly in urban and semi-urban areas. In Pakistan, the incidence has increased dramatically in last few years. The disease is caused by four antigenically distinct serotypes of dengue virus of genus *flavivirus*. In Pakistan, the first major outbreak was reported in Karachi in 1994<sup>1</sup>. The peak incidence of dengue fever was reported to occur from August to October in Pakistan.<sup>2</sup>

Ophthalmic manifestation in dengue fever were previously not well described but now can be seen with increasing frequency in recent literature<sup>3-7</sup>. Isolated case reports of dengue related retinal hemorrhages and maculopathy were described first time in 1979 among tourist who had returned from dengue endemic countries.<sup>8</sup> The main ocular manifestation of dengue

fever include conjunctival hemorrhages, macular edema and retinal hemorrhages. Less common features include exudative retinal detachment, anterior uveitis, periphlebitis, branch retinal vein occlusion and vitreous hemorrhage. A majority of patients were reported to have residual visual impairment secondary to maculopathy and optic neuropathy.<sup>4-5,9</sup>

The broad spectrum of ophthalmologic manifestation of dengue fever would suggest that several pathophysiologic mechanisms are involved. The thrombocytopenia in dengue infection predisposes the patients to increased incidence of hemorrhage. These hemorrhages manifest as subconjunctival and blot retinal hemorrhages in macula and periphery. The presence of periphlebitis, anterior uveitis, macular edema and other ocular features usually present around the 5<sup>th</sup>-7<sup>th</sup> day after the onset of their viral febrile illness which supports an immune mediated mechanism rather than direct viral infection.<sup>9,10</sup> This study was carried out to evaluate the ophthalmic manifestations associated with dengue fever.

### MATERIALS & METHODS

This prospective, observational case series was conducted at department of ophthalmology; SIMS & Services Hospital and Ittefaq Hospital Trust, Lahore from 1<sup>st</sup> October 2011 to 30<sup>th</sup> November 2011. 50 patients admitted in the dengue ward with a diagnosis of dengue fever based on characteristic clinical symptoms, signs and confirmed by the gradually increasing thrombocytopenia and IgM positive on dengue serology were enrolled in the study. Informed consent by the patients was obtained. The patients with a history of diabetes mellitus, hypertension and anemia were **excluded** from the study. A detailed history with systemic

\*The study was conducted at Department of Ophthalmology, Services Institute of Medical Sciences, Services Hospital, Lahore & Ittefaq Hospital Trust, Lahore.

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features, laboratory findings, blood transfusions, visual complaints and ophthalmic features was recorded in the proforma. All patients were examined in the eye department, where best corrected visual acuity was measured with Snellens' chart. All of them underwent detailed slit lamp examination as well as dilated fundus examination. Fundus photographs were taken at the end of examination with fundus camera. Patients with positive ophthalmic complications were followed on weekly basis thereafter.

## RESULTS

There were 37 (74%) males and 13 (26%) females (Graph 1) with ages ranging between 10–75 years with mean of 35 years and 8 months (Graph 2). All the patients presented with fever, 88% had headache, 82% patients had body aches and 64% had vomiting. Other common presenting symptoms were retro-bulbar pain 56 %, restlessness 48%, joint pains 46% and bleeding in 36% (Graph 3).

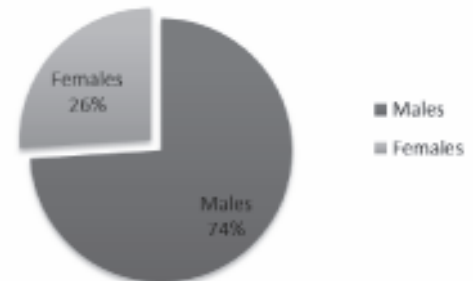
Marked thrombocytopenia (platelet count less than 50000/ $\mu$ l) was present in 80% patients (Graph 4) and 18% patients had platelet transfusion prior to their eye examination. Patients with ocular complications had 40000/ $\mu$ l maximum platelet count with a range from 13000-40000/ $\mu$ l.

Ocular findings were present in 16% of the patients (Graph 5). The presentation of ocular features was between 5<sup>th</sup> to 10<sup>th</sup> days from the start of fever with a mean of 7 days. Subconjunctival hemorrhage, the commonest eye finding was seen in 8% patients (one bilateral and 3 unilateral). Of these one patient had petechial hemorrhage and other 3 had diffuse hemorrhage. One patient had bilateral periorbital ecchymosis significantly worse on the right side, the platelet count in this patient was 17000/ $\mu$ l. One patient presented with unilateral ptosis secondary to anterior orbital hematoma which was confirmed on CT scan. Another patient had bilateral retinopathy with retinal hemorrhages, cotton wool and Roth spots. The macula was however spared on both sides. One patient had unilateral orbital retrobulbar hemorrhage followed by proptosis, exposure keratopathy and corneal perforation leading to endophthalmitis. The vision in this eye was not salvaged despite topical and intravitreal therapy. The subconjunctival, periorbital, retinal hemorrhage and anterior orbital hemorrhages resolved between 3 to 6 weeks in all patients.

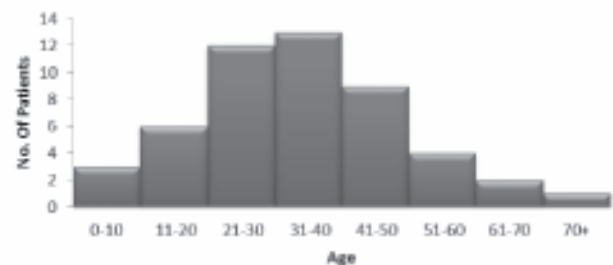
## DISCUSSION

Dengue fever, now a global challenge, is the most important mosquito borne viral disease affecting humans with an estimated 100 million cases per year and more than 2.5 billion people at risk worldwide<sup>11</sup>. Although there are case reports but very few case series reported in literature about the ophthalmic manifestation of

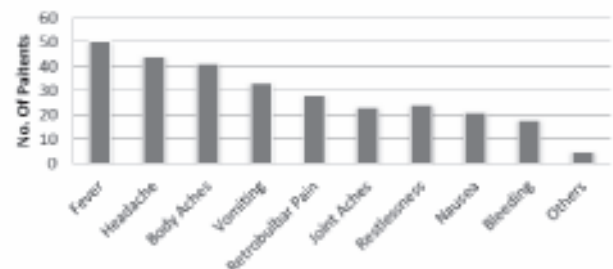
**Graph 1**  
**Gender Distribution**



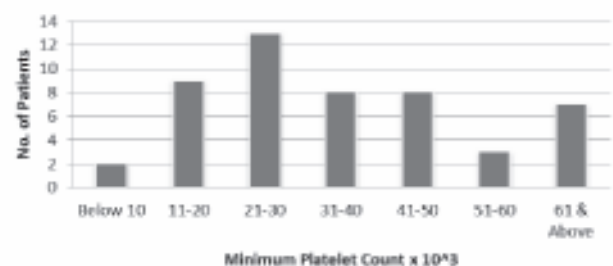
**Graph 2**  
**Age Distribution of Patients**

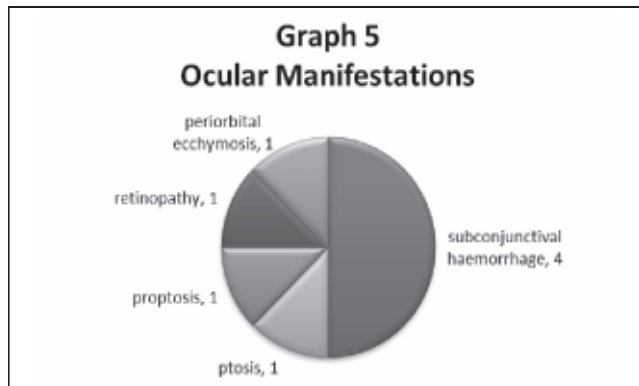


**Graph 3**  
**Systemic Complaints**



**Graph 4**  
**Minimum Platelet Count**





dengue fever during the last decade. Ocular manifestation reported to be associated with dengue infection are mostly posterior segment like macular edema, vascular occlusion, vitreous hemorrhage, optic neuropathy, chorioretinitis, vasculitis with retinal hemorrhage or cotton wool spots<sup>3,4,9,12,13</sup>. Anterior segment manifestation has been mostly reported in the form of subconjunctival hemorrhage and anterior uveitis<sup>14,15</sup>. Other very rare associations are ptosis and periorbital ecchymosis<sup>16,17</sup>.

Regarding gender distribution, 74% were male in our study which is similar to study by Kapoor et al who also found male preponderance in their study 63.4%<sup>14</sup>. Ahmed et al, have also reported the incidence of dengue more in males than females<sup>18</sup>. This suggests that viral transmission may occur more outside the home. The mean age of the dengue population in this study was 35 years and 8 months which is almost similar to the other studies<sup>14, 19</sup>. The most systemic features of the patients were fever, headache, body ache, vomiting and retrobulbar pain in our patients. 100% of our patients who had ocular complications had platelet count less than 50000/ $\mu$ l as compared with the study conducted by Kapoor in which 90.7% has similar association<sup>14</sup> and ocular signs were observed on the day 5-10 (mean 7 day) after the onset of their viral febrile illness which is similar to the series by Wen et al (mean 7.26 days) and it correlates with nadir of thrombocytopenia.

The most common ocular finding in our patients was subconjunctival hemorrhage followed by bilateral retinopathy consisting of retinal hemorrhage and Roth and cotton wool spots. One patient presented with bilateral periorbital ecchymosis. The other two patients presented with unilateral ptosis and proptosis, secondary to anterior orbital and retrobulbar hemorrhage respectively. Subconjunctival hemorrhage was also commonest finding described by Kapoor et al<sup>14</sup> in their study while in other studies macular edema and macular hemorrhages were the commonest findings<sup>5,9</sup>. This difference of commonest ocular finding among the studies is due to disparity in study designs as studies

revealing the macular edema as the most common ocular finding are the one in whom only those patients were recruited who have the visual complaint secondary to dengue fever and were referred to the ophthalmologist. While in the study by Kapoor et al, the patients with Dengue fever were enrolled for ophthalmic examination randomly like in our study and in our opinion the commonest ocular finding in dengue fever is subconjunctival haemorrhage which can be petechial or diffuse.

As the number of cases enrolled in this series is relatively small and represents a limitation to the results of this report, further prospective studies are necessary to be conducted to determine the range of ocular manifestations of dengue fever. As we expect an increase in incidence of dengue fever in the coming years in the country, similarly we can expect to see the increased incidence of dengue related ophthalmic complications. It is very important to create the awareness among the clinician involved in the care of dengue patients which will help them to refer the patients to the ophthalmologists.

## CONCLUSION

Dengue fever, considered to be rarely associated with ocular manifestations in the past, can result in a wide spectrum of ophthalmic complications from subconjunctival hemorrhages and orbital hematoma to retinal involvement.

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## 200 cases of Extracapsular Cataract Extraction under Topical Anaesthesia

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### ABSTRACT

**Purpose:** The purpose of study was to evaluate the efficacy and safety of topical anesthesia for routine uncomplicated conventional extra capsular cataract extraction with intra-ocular lens implantation.

**Material and methods:** 200 patients listed for routine cataract surgery were operated under topical anesthesia. Patients received 5 doses of 3 drops of 0.5percent proparacaine eye drops. A pain visual analogue scoring system was used to score pain just after completion of surgery. Intra-operative and early post-operative complications and surgeon difficulties during operations were recorded.

**Results:** The pain scoring on instillation of drops (Table 1) was zero to 1 (no pain) in 162 patients (81%), 02-05 (mild pain) in 37 patients (18.5%) and a pain score of 6-8 (moderate pain) in 1 patient (0.5%). On the other hand pain score during surgery (Table 1) was zero to 1 (no pain) in 158 patients (79%), 2 to 5 (mild pain) in 34 patients (17 %) and 6 to 8 (moderate pain) in 7 patients (3.5%) and 9 to 10 in One patient (0.5%). There was one patient with subconjunctival bupivacaine injection above superior limbus and one case was converted to retrobulbar anaesthesia.

**Conclusion:** Topical anesthesia is safe and effective technique.

**Keywords:** Topical anaesthesia, Extracapsular cataract extraction, pain scoring

### INTRODUCTION

According to WHO estimates of global data on blindness, there are an estimated 38 million blind people worldwide. Age related cataract accounts for nearly half of these individual, and cataract is particularly common in developing countries. WHO reports that there is a backlog cataract of approximately 15.8million, with an annual increase of over 2 million cataract blind patients.<sup>1</sup> Blind rate in Pakistan is unacceptably high 1.78% of the total population of which 66.7% are blind because of cataract<sup>2</sup>.

Cataract surgery is one of the most common elective surgical procedures performed in the UK<sup>3</sup> and rest of the world. Phacoemulcification is now standard technique for cataract extraction but owing to expenses of equipment and consumables and high proportion of eyes with densely mature cataract, phacoemulcification has had a limited role for solving cataract backlog in many developing countries including Pakistan.

Local anesthesia is the preferred anesthetic technique for the procedure as is revealed in a survey conducted by the Royal College of ophthalmologist<sup>4</sup>. There are several local anesthetic techniques for cataract surgery including retrobulbar<sup>5</sup>, peribulbar<sup>6</sup>, subtenon.<sup>7,8</sup>,

subconjunctival<sup>9</sup> and topical anaesthesia<sup>10</sup>. Fichman<sup>10</sup> first described a novel technique of topical anesthesia. Since its introduction, topical anesthesia has been increasingly popular as indicated by the annual survey of the practice styles preferences of members of the American Society of Cataract and Refractive Surgery. The use of topical anesthesia increased from 8% in 1995 to 63% in 1998 for high volume cataract surgeons<sup>11</sup>. There have been several reports of its safety and efficacy.<sup>12-15</sup>

Topical anesthesia for cataract surgery has several advantages compared with regional anesthesia. Akinesia is absent in topical anesthesia but full ocular motility may also be advantageous during surgery by improving surgical access. It eliminate the risk of complication associated with regional anesthesia including globe perforation<sup>16-17</sup>, retrobulbar haemorrhage<sup>18</sup>, diplopa/ptosis<sup>19</sup>, central retinal vein and artery occlusion<sup>20</sup>, brainstem anaesthesia<sup>21</sup>, optic nerve trauma<sup>22</sup>. The subtenon and subconjunctival anaesthesia are associated with high incidence of chemosis and subconjunctival haemorrhage.

### MATERIAL AND METHODS

From June 2008 to December 2009, 200 patients having age related cataract underwent conventional extra capsular cataract extraction (ECCE) with posterior chamber Intra ocular lens (IOL) implantation using topical anesthesia. All patients gave informed consent to participate in the study. 5 doses of 03 drops of proparacaine hydrochloride 0.5% were used in total. During each dose one drop was instilled on the cornea and one each in the superior and inferior conjunctival fornix. This was repeated every 2 minutes till 5 doses were complete. The patient was asked to close his eyes

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after instillation of drops.

The break through pain during surgery allowed an additional 2 doses of 0.5 % proparacaine drops. If this was not effective, then 3 drops of 50% diluted 1/200000 xylocaine were used intra-camerally. If this was not effective within 2 minutes, the patient received a sub conjunctival injection 0.1 – 0.2 ml of .75% bupivacaine.

During surgery the patient was asked to look just below the light of microscope to minimize the eye movements. The surgeon was in continuous verbal contact with patient and warned the patient before performing certain irritating steps like expression of lens, irrigation and aspiration of cortical lens matter and IOL implantation.

Routine extra capsular surgery was performed including superior limbal incision, Capsulotomy by can opener or continuous curvilinear capsulorhexis with 2 radial cuts, expression of nucleus, aspiration of the remaining cortical lens matter, implantation of 6.5 mm PMMA IOL and thorough wash of viscoelastic substance from anterior chamber. The wound was sutured by 10/0 nylon. Post operatively each patient received a combination of Dexamethasone and Tobramycine eye drops at 4 hours interval for 1 months and tapered off on post operative visits.

A visual analogue pain scale as described by Stevens<sup>7</sup> with numerical and descriptive rating was used. This pain scale ranges from 0 – 1 (no pain to slight stinging), 2-5 (mild pain), 6-8 (moderate pain) and 9 – 10 (severe pain). It was shown to every patient to rate their pain. Patients were educated and advised to use this pain scale to rate the level of pain felt preoperatively and 20 minutes after operation.

#### RESULTS:

The pain scoring on instillation of drops (Table 1) was zero to 1 (no pain) in 162 patients (81%), 02-05 (mild pain) in 37 patients (18.5%) and a pain score of 6-8 (moderate pain) in 1 patient (0.5%). On the other hand pain score during surgery (Table 1) was zero to 1 (no pain) in 158 patients (79%), 2 to 5 (mild pain) in 34 patients (17 %) and 6 to 8 (moderate pain) in 7 patients (3.5%) and 9 to 10 in One patient (0.5%). There was one patient with subconjunctival bupivacaine injection above superior limbus and one case was converted to retrobulbar anaesthesia. Most commonly the patients

felt pain and discomfort on iris manipulation, anterior chamber distension and insertion of IOL in bag or sulcus.

In majority of cases the surgeon did not have any significant difficulty (grade 0 to slight difficulty grade 1). 07 cases were moderately difficult and we had supplemented with subconjunctival anesthesia and these patients experienced pain mostly on iris manipulation. 01 case was markedly difficult who experienced severe pain on touching the conjunctiva with tooth forces and a partial thickness corneal incision hence topical anesthesia was changed to retrobulbar anesthesia.

Cornel edema and striate keratopathy was seen in 15 patients which resolved in 1 week time, aqueous reaction was the second most frequent complication in 8 patients and were treated by frequent use of topical corticosteroid application. A transient increase in IOP occurred in 5 patients.

#### DISCUSSION

Fichman was first to describe topical anesthesia in cataract surgery and IOL implantation. Topical anesthesia has become increasingly popular since its introduction as indicated by the annual survey of the practice styles and preferences of members of the American Society of Cataract & Refractive Surgery. According to this survey, the use of topical anesthesia increased from 8% in 1995 to 63% for high volume cataract surgeon in 1998 and the increased is due to patient demand<sup>11</sup>.

In recent years, topical anesthesia for cataract surgery has gained popularity as safe and non-traumatic technique<sup>23</sup>. There are several studies showing safety and efficacy of topical anesthesia. Fukasaku and Marror<sup>24</sup>, comparing topical and peribulbar anesthesia Patel & colleagues<sup>25</sup>, comparing topical and retrobulbar anesthesia. The benefit of topical over retrobulbar anaesthesia are, no rise in ocular pressure, no risk of globe perforation, the analgesia is immediate, no need of globe compression is required and no preoperative sedation is necessary, but more operative pain reported with topical anesthesia. The advantages of topical over sub conjunctival and sub-tenon's are absence of chemosis and sub conjunctival haemorrhage.

The administration of topical anesthesia was painless in majority of patients and only 37 patients

**Table 1** (pain scoring)

	0-1	2-5	6-8	9-10
	No pain	Mild pain	Moderate pain	Severe pain
Pain on installation of drops	162 (81%)	37 (18.5%)	01 (0.5%)	0
Pain during surgery	158 (79%)	34 (17%)	08 (3.5%)	1 (0.5%)

(18.5%) experienced slight stinging sensation on instillation of 1<sup>st</sup> drop. Different people have tried different methods of improving the pain scores. Lignocaine gel, instead of drops provides low pain score due to prolonged contact time and better penetration<sup>26-29</sup>. Many surgeons use intra cameral anesthesia along with topical anesthesia as we did in all our patients but no significant benefit was documented<sup>30-31</sup>

Chitterdon & Colleagues,<sup>32</sup> Manners & Burten<sup>33</sup> recommended topical anesthesia only if surgery was performed through a clear corneal incision as we have in our study. The topical anesthesia in our study was very effective 158 patients felt no pain during surgery, 34 felt mild pain, 7 patients felt moderate pain and was supplemented with sub conjunctival anesthesia and 1 patient reported severe pain and was converted to retrobulbar anesthesia. Kinesia is the major drawback of the topical anesthesia but this can also occur in other local anesthesia technique like peribulbar, retrobulbar, subtenon and subconjunctival. Roman et al<sup>15</sup> and Tsuneoka et al<sup>34</sup> reported in their studies that non of their patients had complete akinesia after sub tenon anesthesia and 37.6% had complete eye movement.

Experienced surgeons have no difficulties during surgeries with lack of akinesia. Unwanted movements can be controlled by forceps fixation using both hands. Ocular movements can be reduced by asking the patients to look in a particular direction to expose a desired area.

In our study no complication occurred because of ocular motility alone. Only in one case posterior capsule ruptured because the patients was very worried and had sever pain on irrigation and aspiration along with ocular movements. The IOL was postponed for secondary anterior chamber IOL.

## CONCLUSIONS

Topical anesthesia is safe, simple and non-traumatic technique for ECCE with no serious complications. It is a painless technique and a good and safe alternative to local anesthesia. It is a method of choice in hypertensive and cardiac patients due to its safety.

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## Low Socio-economic Status & Incidence of Retinoblastoma: A Painful Correlation\*

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### ABSTRACT

**Objectives:** To find out correlation between the socioeconomic status of the parents of the children with retinoblastoma.

**Methods:** It was a cross-sectional analytical case series study on all consecutive patients with diagnosis of retinoblastoma who were admitted and treated in year 2009 and 2010 at department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences (KIOMS), Lady Reading Hospital, Peshawar. The socioeconomic status (SES) was obtained from parents of 67 children registered with retinoblastoma. Correlations between SES and incidence rates were investigated.

**Results:** Out of these 67 patients, 35 were female and 32 were male children. Most of them belonged to FATA that is 18 (26.86%) patients, 11 (16.4%) patients belonged to Peshawar. It was revealed by the results that the fathers of 15 (22.38%) children were laborer, 14 of patients fathers were jobless while 5 fathers were working in Middle East. 67.14% fathers were uneducated.

According to the results 72.13% of the patients belonged to low socioeconomic group.

**Conclusion:** Our study indicates the limitations in access to facilities of treatment were because of poverty. There is a cost attached to treatment and most of the families affected are of poor socioeconomic background.

**Key Words:** Retinoblastoma, socioeconomic status

### INTRODUCTION

Retinoblastoma is the most common malignant ocular tumor in childhood and affects approximately 1 in 18,000 children <5 years of age in the U.S<sup>1</sup>. The incidence is higher in developing countries, and in some countries in Central and South America retinoblastoma is one of the most common solid tumor malignancies in children<sup>2</sup>. The reason for this higher incidence is not clear. Lower socioeconomic status and the presence of human papilloma virus sequences in the retinoblastoma tissue have been implicated<sup>3</sup>.

The question arises how we define and relate a disease to a socioeconomic status and what effect it has on the disease. To answer these questions we have to know that. Socioeconomic status (SES) is an economic and sociological combined with a measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education, and occupation. When analyzing

a family's SES, the household income, earners' education, and occupation are examined, as well as combined income, versus with an individual, when their own attributes are assessed<sup>4</sup>.

Socioeconomic status is typically broken into three categories, high SES, middle SES, and low SES to describe the three areas a family or an individual may fall into. There is an association between the socioeconomic indicators of a country's development with the chances of survival and treatment adherence.<sup>5</sup>

The survival of retinoblastoma patients in developing countries is lower than in the most affluent ones. Late diagnosis, poor treatment compliance and limitations for treatment are the major causes for these poor results. Abandonment is a very real problem all across the developing world.

As little has been reported on socioeconomic (SES) patterns of risk for most forms of childhood cancer so our objective in this study was to evaluate the correlation of retinoblastoma with socioeconomic status (SES) in KPK.

### MATERIALS AND METHODS

It was a case series study of 67 children with the diagnosis of retinoblastoma registered in year 2009 and 2010 at Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences (KIOMS), Lady Reading Hospital, Peshawar. After Permission from ethical committee of PGMI Peshawar and written informed consent from the patients parents were taken. The detailed history was taken of all symptoms, duration prior treatment, family history and socioeconomic history which included the three variables income,

\*The study was conducted in the Department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences (KIOMS), Lady Reading Hospital, Peshawar (KPK) after due permission from the Ethical Committee of the said Hospital.

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education, and occupation. The detailed history to evaluate the socioeconomic status of the patients' father included their education, per month income, structure of the house and the total number of dependent persons on the sole earner. Socioeconomic status is typically broken into three categories, high SES, middle SES, and low SES to describe the three areas a family or an individual may fall into. According to the Socio-Economic Classification (SEC), the urban households are classified into different classes on the basis on the education and the occupation of the chief wage earner of the house. The chief wage earner of the house is not necessarily the head of the household but the person who contributes the most in the household budget.

Whereas, for the rural population, the same classification is based on the two indicators, education of the head of the household and the structure of the house; structure of the house is like mud house or bricks house or mixture of the same, and with a kitchen separate toilet, etc. Nominal data of all the patients was recorded on a data collection performa. After completion of data collection, the data was analyzed using SPSS version 10.0.

## RESULTS

This study included 67 patients with diagnosis of retinoblastoma from all over KPK and Afghanistan. Out of these 67 patients 35 (52.23%) were female and 32(47.76%) were male children. Most of them belonged to FATA that is 18 (26.86%) patients, 11(16.4%) patients belonged to Peshawar and 10(14.9%) patients came from Afghanistan .The rest of the district including Swat, Kohat and Bannu, Mardan and Nowshera and they were a total of 23 (34.32%) patients. On evaluation of socioeconomic status it was revealed that out of these 67 patients the fathers of 15 (22.38%) children were laborer by profession, 14 (20.89%) of patients's fathers were jobless and were not earning regularly, they were dependent on mostly zakat and Khairat.The fathers of 6(8.9%) were farmers but only 2 of them had their own cultivational lands. Only 6 (8.9%) fathers were on different low category govt. jobs including 3 were clerks and 3 were in Army as soldiers. The father of 6 (8.9%) children were shopkeeper, 4 owned their own shop while 2 were working as salesman. 5(7.4%) fathers were working in Middle East as drivers and laborers while the middle class included 7 (10.44%) were doing different types of businesses, 4(5.9%) were school teachers and 2 were lawyers and only 1 was a doctor by profession. As far as the education level is concerned 67.14% were uneducated, 22.41% had received only primary education and10.44% of fathers have done graduation. When we classified them according to the socioeconomic status depending on the per month income, the total depended family members and on the

house hold it was revealed that 72.13% of the patients belonged to low socioeconomic group and 22.87% belonged to middle class. None of the patients belonged to high class.

## DISCUSSION

Retinoblastoma is the most common intraocular malignancy in children, with a reported incidence ranging from 1 in 15,000 to 1 in 18,000 live births<sup>1</sup>. It is more common with poor prognosis in developing countries. The total number of patients who were registered in year 2009 and 2010 were 67 in our department. The total number of female children was 32 and male were 35 .According to a study by Lawan et al<sup>6</sup> There were 42 patients, 15 males and 27 females.

In this study we wanted to analyze the socioeconomic status of the patients so we focused on the education, income and other determiners of SES as, here is ample evidence that poorer socioeconomic circumstances are linked to poorer health<sup>7</sup>.Although Socioeconomic status (SES) is complex, incorporating aspects of both availability of resources (education, income and wealth) and standing in the hierarchy of a society.

In this study 67.14% of fathers were uneducated .Education is as one of the determiners of the SES, it has got a great impact on the disease process and its management. According to a study conducted in US Population-based case-control data from epidemiological studies of childhood cancer conducted in five US states were pooled and associations of maternal, paternal and household educational attainment with childhood cancers were analysed<sup>8</sup>. According to another study by Stiller et al there was a significantly raised odds ratio for non-hereditary tumors among children whose mothers had never attended high school, again pointing towards an association with poor socioeconomic conditions<sup>9</sup>.In and study by. Carozza et al<sup>10</sup> concluded that Parental educational attainment as an indicator of socioeconomic status and risk of childhood cancers.

In our study we analyzed that the 72.13% of victims of retinoblastoma belonged to low socioeconomic group which is quite high but not contrary to the other studies. Accordingly to a study conducted in Brazil non-hereditary retinoblastoma is more common among populations of low socioeconomic status and in tropical climates. In another study the possible role of parental SES in childhood cancers has been investigated for childhood leukaemias, but without conclusive results. Poverty has also been associated with incidence of retinoblastoma in New York City in Latin America, and in the geographic distribution of worldwide <sup>11</sup>.

Again we analyzed in our study that because of illiteracy, low socioeconomic status and poverty the presentation of the retinoblastoma is very late in our study

more than 40% of patient presented with proptosis, fungating mass and hyphaema. According to Lawan Abdu<sup>6</sup>, Socioeconomic and cultural reasons contribute to children presenting late with advanced disease in low income countries. The commonest mode of presentation was fungating orbital mass in his study which is similar to the pattern in Nepal where 40% presented with orbital mass.<sup>12</sup>

In neglected or untreated cases, retinoblastoma can demonstrate extraocular spread primarily through optic nerve and also through the sclera. Though it is a rare clinical presentation in developed countries, ranging from 6.3 to 7.6%, it is not an unusual feature in developing and underdeveloped world. Leal-Leal *et al.*<sup>13</sup> reported an incidence of 18% in a large multicenter study from Mexico. Kao *et al.*<sup>14</sup> from Taiwan reported the incidence of orbital retinoblastoma to be 36% in a large study. The incidence is even higher (around 40%) from Nepal where Badhu *et al.*<sup>15</sup> reported proptosis to be the most common presenting feature of retinoblastoma.

The 5-year survival rates of orbital retinoblastoma has been reported to be 88% from the United Kingdom, 91% from Japan and 93% from the United States. However, the mortality in developing countries is still high owing to late presentations compounded by socioeconomic factors, with the mortality reported as high as 50-90%.<sup>16</sup>

## CONCLUSION & RECOMMENDATION

Our study indicates the limitations in access to facilities where children with retinoblastoma can be assessed early and treated promptly. There is cost attached to treatment and most of the families affected are of poor socioeconomic background. There is need to raise public awareness of this tumor and encourage funding of treatment by government another support groups so that affected children are successfully treated.

These study results should be viewed as exploratory because of the broad nature of the SES assessment, but they give some indication that childhood cancer studies might benefit from a more thorough

assessment of SES.

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Dr Mumtaz  
Alam

## Comparison of Intraocular Pressure Lowering effect of twice daily 0.5% Timolol & once daily 0.5% Levobunolol in Open Angle Glaucoma\*

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### ABSTRACT

**Objectives:** To compare the intraocular pressure lowering effect of twice daily 0.5% timolol and once daily 0.5% levobunolol in open angle glaucoma.

**Study design:** It was a randomized control trial.

**Place and duration of study:** The study was conducted over a period one year, from February 2010 to February 2011, in Eye B Ward, Khyber Teaching Hospital Peshawar.

**Materials and Methods:** Detailed history was taken from all the patients followed by complete ocular examination. The patients were divided into two groups labeled as Group "A" and Group "B". Patients of Group "A" were given 0.5% timolol eye drops twice daily. Patients of Group "B" were given 0.5% levobunolol eye drops once daily. Follow up was done at 2, 4 and 6 weeks. At each follow up visit, intraocular pressure was checked. All the data was recorded in a proforma.

**Results:** Total number of patients were 74, including 42 male and 32 female. 48 patients had primary and 26 patients had secondary open angle glaucoma. At 2, 4 and 6 weeks, the intraocular pressure reduction was 32.07%, 31.97% and 32.07% respectively in Group "A" and 32.02%, 31.31% and 31.82% respectively in Group "B" (P value = 0.717, 0.191 and 0.472 respectively), i.e. there was no significant difference in the intraocular pressure lowering effect of once daily 0.5% levobunolol and twice daily 0.5% timolol.

**Conclusion:** 0.5% levobunolol in once daily dose is equally effective to 0.5% timolol in twice daily dose in open angle glaucoma.

**Key Words:** Glaucoma, Intraocular pressure, Timolol, Levobunolol

### INTRODUCTION

Glaucoma is characterized by slow progressive degeneration of the retinal ganglion cells and the optic nerve axons, leading to increasing deterioration of the visual field. If untreated, the condition can lead to irreversible blindness.<sup>1</sup> Glaucoma is the second leading cause of blindness worldwide. Prevalence of glaucoma was estimated to be 60.5 million in year 2010, which will increase up to 79.6 million in year 2020.<sup>2</sup> The prevalence of glaucoma is high in our country as well. It is the fourth leading cause of blindness in Pakistan (7.1% of all cases of blindness).<sup>3</sup> Primary open angle glaucoma (POAG) is the most prevalent type of glaucoma, affecting 1 in 100 of general population over 40 years.<sup>4</sup> Although elevated intraocular pressure (IOP) is the major risk factor for glaucoma, other factors such as increased glutamate levels, alterations in nitric oxide (NO)

metabolism, vascular alterations and oxidative damage caused by reactive oxygen are also involved.<sup>5</sup>

Currently IOP is the only modifiable risk factor that can be used to prevent progressive optic neuropathy. Therefore to prevent glaucoma progression and to preserve vision, mean IOP should be decreased. The target pressure depends on a number of factors, including age of patient, baseline IOP at which the damage occurred, structural damage (status of optic disc and retinal nerve fiber layer), functional damage (assessed on perimetry) and the presence of additional risk factors for glaucomatous damage.<sup>6</sup> Topical beta blockers are commonly used to decrease intraocular pressure in glaucoma.<sup>6</sup> They do so by decreasing aqueous secretion and are useful in all types of glaucoma.<sup>7</sup>

They can cause cardiovascular, respiratory and metabolic side effects. Timolol, a non-selective beta blocker, was introduced in 1978 and is the most widely used intraocular pressure lowering agent.<sup>8</sup> It is very effective during waking hours but causes less IOP reduction during night.<sup>9</sup> Levobunolol is also a non-selective beta blocker. Levobunolol could be a better alternative to timolol, as it has a longer duration of action with IOP control for 24 hours after a single instillation and can be used once daily with a better safety profile.<sup>8</sup> The purpose of our study was to compare the intraocular pressure lowering effect of twice daily 0.5% timolol and once daily 0.5% levobunolol in open angle glaucoma.

*\*The study has been approved by the Hospital Ethical Committee, to be conducted in Khyber Teaching Hospital, Peshawar, and is approved by the College of Physicians & Surgeons, Pakistan as a part of principal authors' dissertation for FCPS.*

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## MATERIAL AND METHODS

It was a randomized controlled trial. The study was conducted at the Department of Ophthalmology, Khyber Teaching Hospital Peshawar, from February 2010 to February 2011. Sample size was 74, with 37 patients in each group. Sample size was calculated by WHO software for sample size calculation using 95% confidence interval (2-sided), 80% power of the study and difference of mean reduction of IOP for both drugs of 1 mm of Hg for a population variance of 2.3.

The sampling technique was non-probability consecutive sampling. Patients with newly diagnosed primary or secondary open angle glaucoma were included in the study. Open angle glaucoma was defined by the presence of baseline IOP >21mm, vertical cup-disc ratio > 0.3 with visual field defects and grade 2 (20°) angle for >180° with no peripheral anterior synechiae on gonioscopy.

Patients who have advanced disease requiring more aggressive treatment, patients in whom beta blockers are contraindicated, patients already on anti-glaucoma medications or on systemic beta blockers and patients in whom Goldmann applanation tonometry was not possible (bed ridden or uncooperative patients) were **excluded** from the study.

Before starting study approval was taken from the hospital's ethical committee. Written informed consent was taken from each patient. The patients were divided into two groups labeled as group "A" and group "B". Patients of group "A" were given 0.5% timolol eye drops twice daily and patients of group "B" were given 0.5% levobunolol eye drops once daily. All the patients were followed up at 2, 4 and 6 weeks. At each visit IOP was recorded with Goldmann applanation tonometer. All measurements were done by the same person, before instilling the drops in the morning. All the relevant data was recorded in a pre-designed printed proforma. SPSS-10 was used for data analysis. Mean  $\pm$  standard deviation and range were calculated for quantitative variables (age and IOP); percentage and proportion were calculated for qualitative variables (gender and type of glaucoma). P-Value was generated using t-test for comparison of means of the quantitative variables. P value  $\leq$  0.05 was considered statistically significant.

## RESULTS

There were 37 patients in group "A" and 37 patients in group "B". The mean age of all the patients was  $53.78 \pm 13.94$  with a range of 16-84 years. The mean age in group "A" was  $53.72 \pm 14.42$  years and in group "B" it was  $53.83 \pm 13.65$  years. Overall there were 42 male and 32 female patients. Gender distribution of patients is shown in Figure I. No patient in any group was withdrawn from the study. 48 patients had primary open angle glaucoma and 26 patients had secondary

open angle glaucoma. Figure II shows the causes of glaucoma in all the patients. Pre-treatment IOP ranged from 24 to 30 in both groups with a mean of  $27.05 \pm 1.84$  mmHg in group "A" and  $26.67 \pm 2.00$  mmHg in group "B". At 2 weeks IOP ranged from 14 to 22 in both groups with a mean of  $18.37 \pm 2.09$  mmHg in group "A" and  $18.13 \pm 2.07$  mmHg in group "B". At 4 weeks IOP ranged from 15 to 22 in both groups with a mean of  $18.40 \pm 1.73$  mmHg in group "A" and  $18.32 \pm 1.88$  mmHg in group "B". At 6 weeks in group "A" IOP ranged from 14 to 22 with a mean of  $18.37 \pm 1.93$  mmHg and in group "B" IOP ranged from 14 to 21 with  $18.18 \pm 1.89$  mmHg. Table I shows mean IOP at each visit in both groups and Table II shows the reduction in IOP in both groups at 2, 4 and 6 weeks.

## DISCUSSION

Glaucoma is a silent killer of vision and remains asymptomatic until it is very advanced. A number of treatment modalities for glaucoma are available but medical treatment is the mainstay of glaucoma management, particularly of open angle glaucoma. A number of IOP lowering drugs are available which act either by decreasing aqueous secretion or by enhancing the aqueous outflow. The goal of medical treatment is to obtain 24-hour IOP control with the minimum

Figure I: Gender distribution of patients

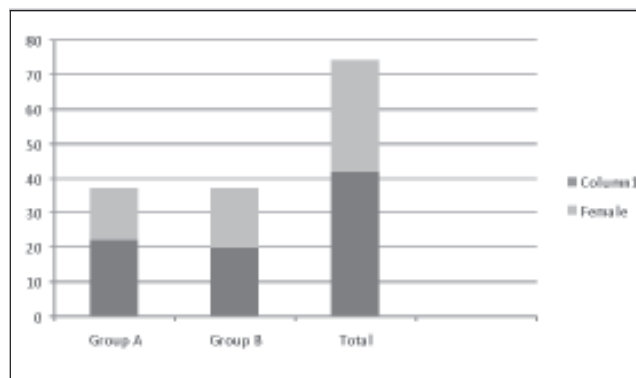
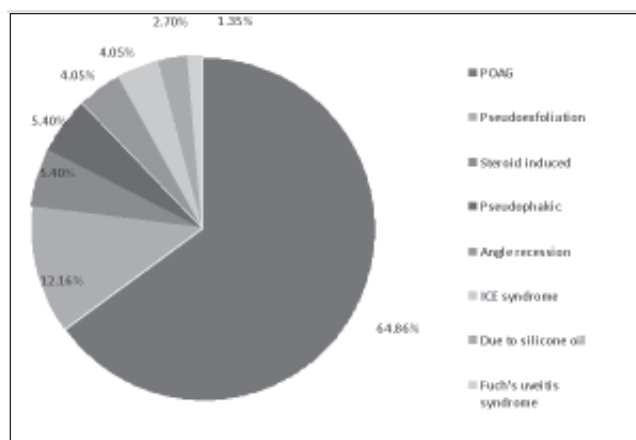


Figure II: Causes of glaucoma



**Table I:** IOP in both groups at each visit

	Timolol	Levobunolol
<b>Baseline</b>		
Mean	27.05 mm	26.67 mm
Std. Deviation	Hg1.8401	2Hg2.0008
<b>At 2 weeks</b>		
Mean	18.37 mm Hg2.0996	18.13 mm
Std. Deviation	Hg2.0996	Hg2.0705
<b>At 4 weeks</b>		
Mean	18.40 mm	18.32 mm
Std. Deviation	Hg1.7394	Hg1.8864
<b>At 6 weeks</b>		
Mean	18.37 mm	18.18 mm
Std. Deviation	1Hg1.9344	Hg1.8979

**Table II:** Reduction in IOP from baseline in both groups

	Timolol	Levobunolol
<b>At 2 weeks</b>		
Mean $\pm$ SD	8.67 $\pm$ 1.5821mm	8.54 $\pm$ 1.6089
Percentage (%)	Hg32.07%	Hg32.02%
<b>At 4 weeks</b>		
Mean $\pm$ SD	8.64 $\pm$ 1.0857 mm	8.35 $\pm$ 1.0598
Percentage (%)	Hg31.97%	Hg 31.31%
<b>At 6 weeks</b>		
Mean $\pm$ SD	8.67 $\pm$ 1.2705 mm	8.48 $\pm$ 0.9609 mm
Percentage (%)	Hg 32.07%	Hg31.82%

concentration and number of medications, as well as minimal side effects.<sup>6</sup> We compared the IOP lowering effect of twice daily use of 0.5% timolol and once daily 0.5% levobunolol in open angle glaucoma. Our study included 37 patients in each group. 48 patients (64.86%) had primary open angle glaucoma and 26 patients (35.13%) had secondary open angle glaucoma. The two groups were almost similar in terms of age and gender distribution. Pre-treatment IOP ranged from 24 to 30 in both groups with a mean of  $27.05 \pm 1.8401$  in group "A" and  $26.67 \pm 2.0008$  in group "B" (P value = 0.40). Follow up was done at 2, 4 and 6 weeks. IOP was recorded at each follow up visit. At 2, 4 and 6 weeks the IOP was much reduced. The P value for difference in the mean IOP between the two groups at 2, 4 and 6 weeks was 0.617, 0.848 and 0.672 respectively, which is statistically not significant. The difference in the mean reduction of IOP between the two groups at 2, 4 and 6 weeks was also not statistically significant (P value = 0.717, 0.191 and 0.472 respectively)

These results show that at 2, 4 and 6 weeks there was no statistically significant difference in the IOP lowering effect of 0.5% levobunolol administered once daily and 0.5% timolol administered twice daily. In one study twice daily administration of timolol and levobunolol decreased IOP by  $13.05 \pm 1.53$  and  $14.05 \pm 1.47$  mm of Hg respectively at 6 weeks and by  $16.12 \pm 1.67$  and  $16.28 \pm 1.85$  mm of Hg respectively at 16 weeks. There was no significant difference in the IOP lowering effect of both drugs (P value > 0.05).<sup>8</sup>

A few studies demonstrated greater IOP reduction with 0.5% levobunolol than 0.5% timolol.<sup>10-12</sup> Wandel et

al<sup>10</sup> used 0.5 % levobunolol and 0.5% timolol as once daily instillation (in the morning) and the IOP was measured before the instillation of drug at each follow up visit. They reported greater IOP reduction with levobunolol than timolol as levobunolol is a longer acting drug with better IOP control for 24 hours after instillation.

West et al compared the effects of levobunolol and timolol on IOP in post-operative patients. As levobunolol has major metabolite "Dihydro-levobunolol", which is equipotent to levobunolol, so it produced greater reduction in IOP than timolol.<sup>11,12</sup> It has been suggested that levobunolol could be a better alternative to timolol, as it has a longer duration of action with IOP control for 24 hours after a single instillation and can be used once daily with a better safety profile.<sup>8,10</sup> Therefore, we compared the IOP lowering effect of twice daily 0.5% timolol and once daily 0.5% levobunolol. No significant difference was noted in the IOP lowering effect of the two groups at 2, 4 and 6 weeks.

## CONCLUSION

Once daily administration of 0.5% levobunolol is a safe and effective alternative to twice daily administration of 0.5% timolol for reducing intraocular pressure in open angle glaucoma. Further studies with longer follow up are recommended to determine their long term IOP lowering effect.

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Dr Junaid

## Gender Differences & Reasons of Delay in Presentation of Childhood Squint\*

Junaid Sethi<sup>1</sup>, Ayat Shah<sup>2</sup>, Rahil Malik<sup>3</sup>, Nuzhat Rahil<sup>4</sup>

### ABSTRACT

**Objective:** To screen out gender differences and reasons for delay in presentation of childhood squint.

**Material and Methods:** This study was conducted in the department of Ophthalmology, Khyber Institute of Ophthalmic Medical Sciences (KIOMS) Peshawar from 14<sup>th</sup> May 2010 to 14<sup>th</sup> Oct 2010. A total of 94 patients were included in the study fulfilling the inclusion criteria. All the patients were examined according to the protocol set in the proforma.

**Results:** A total of 94 children with squint visited eye OPD. Out of those, 37 patients (39.36%) presented late because of different factors. Among these 37 patients, 20 (54.06%) were male and 17 (45.94%) were female. Their delayed presentation was due to different reasons including poor referral system in 11 (29.73%) children, 11 (29.73%) were due to parents unawareness, 3 (8.12%) were due to gender preference, 5 (13.52%) due to economic problems and 7 (18.92%) were due to poor health facilities in their town.

**Conclusion:** Our study shows that there was a significant gender differences in presentation but no significant gender preference of delay presentation in childhood squint. The common causes of delayed presentation of childhood squint were our poor referral system, parents unawareness and poor availability of proper facility to people of backward areas of KPK.

**Key Words:** Squint, Gender.

### INTRODUCTION:

Childhood squint is a common ophthalmic disorder. If left untreated, it can cause amblyopia and permanent loss of vision. Studies have reported the prevalence of amblyopia to be as high as 50% in children with esotropia<sup>1</sup> and 20% in children with exotropia.<sup>2-3</sup> In most cases the treatment of squint involved the correction of refractive error and occlusion therapy to improve vision and squint surgery, later on if required.

Despite the importance of early detection and intervention, children with squint in developing countries present late. In a study conducted by Shah MA et al, the age of presentation was more than 5 years in majority of children with squint<sup>4</sup> but in western setting, the mean age of presentation varies from 2 to 5 years.<sup>2-5</sup> <sup>6</sup> Strabismus is the main cause of Amblyopia. In Tunisia 58% of all children with squint were found to have Amblyopia.<sup>7</sup> In alternating strabismus an equal number of impulses driven from the right and left eyes<sup>8</sup>.

### MATERIAL AND METHODS:

\*The study was conducted in the Department of Ophthalmology, Khyber institute of Ophthalmic Medical Sciences (KIOMS) Peshawar

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This study was conducted in the department of Ophthalmology, Khyber Institute of Medical Sciences, Peshawar from 14<sup>th</sup> May 2010 to 14<sup>th</sup> Oct 2010. The study include 94 patients and all the patients were examined in detail. Those patients having onset of strabismus at age more than six months and all those patient who have not received any treatment and this was their first visit were **included** in the study. Mentally retarded patients, children with media opacities and children above 16 years were **excluded** from the study.

### RESULTS:

During the study period of six months, of all the patients who visited eye department 2.8% presented with strabismus. Among those with delayed presentation i.e 37 patients, 20 (54.06%) were male and were in greater proportion than female 17 (45.94%) as shown in Fig:1. During the six month survey 37 delayed presenting squint patients of different age group were examined according to the inclusion criteria. The delayed presentation was due to different reasons, like poor referral system in 11 patients (29.73%), gender preference in 3 patients (8.12%), parents unawareness in 11 patients (29.73%), economic problems in 5 patients (13.52%), out of reach facility in 7 patients (18.92%). According to the study the mean age at presentation varied from 3 to 5 years in male and 4 to 7 years in female.

### DISCUSSION:

In our study 37 patients had delayed presentation (39.36%), 25 patients were having esotropia (68%), 12 patients were having exotropia (32%). Out of 37 patients, 20 Patients were male (54.05%) and 17 patients were female (45.94%). In these, 11 patients (29.73%) had

delayed presentation due to poor referral system, 11 patients (29.73%) due to parents unawareness, 7 patients (18.92%) due to out of reach facilities, 5 patients (13.52%) due to economic problems and 3 patients (8.12%) due to gender preference. Overall amblyopia was 24% (9/37). The burden of amblyopia in female was more as compared to male. These patient with the diagnosis of amblyopia were thoroughly investigated including anterior segment examination, detailed fundus examination and cycloplegic refraction. After the establishment of amblyopia, all 9 patients were given amblyopia therapy.

Figure 1

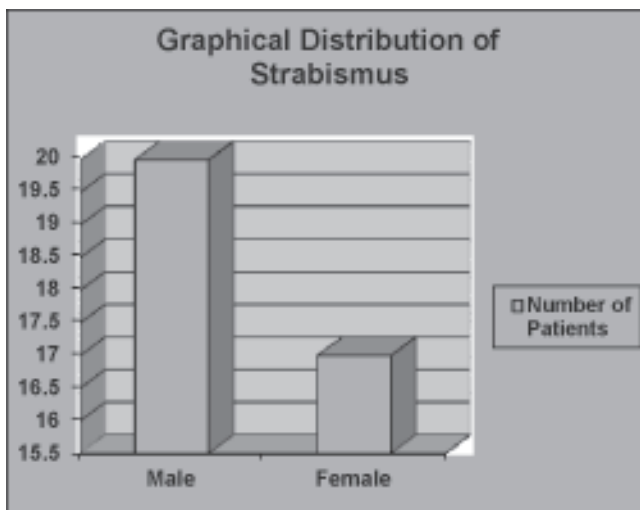


Figure 2

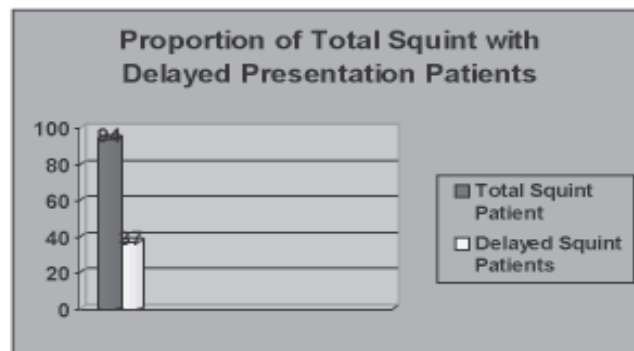


Fig No. 3

Causes of delayed presentation

Cause	Number of Patients
Poor Referral System	11
Parents unawareness	11
Gender Preference	03
Economic Problems	05
Out of reach facilities	07

A study in Agha Khan University Hospital, showed that 52.4% girls presented late with age difference 3-5 years and 48.6% male presented with age differences 2-3 years. Overall, Amblyopia was present in 25.3% patients. Girls also had a higher burden of amblyopia as compared to their male counterparts.<sup>9</sup> A study was conducted in Singapore which shows the prevalence of amblyopia due to refractive error 85% and amblyopia due to strabismus 15%.<sup>10-11</sup> the ratio between the exotropia and esotropia in this study were 7:1.<sup>10-11</sup>

According to a study done at the out patient department of Khyber Teaching Hospital Peshawar, showed that strabismic amblyopia was 55%, in isometropic amblyopia was 21%.<sup>12</sup> The finding of another study done by wood Rufeet in United Kingdom the cause of amblyopia was 57% strabismus and 17% were anisometropia.<sup>13</sup>

Another Study done by Roy W.Beck North in America, the cause of amblyopia was 38% strabismus and 37% anisometropia.<sup>14</sup> The previous study has reported the prevalence of amblyopia to be as 50% in children with esotropia and 20%<sup>1</sup> in children with exotropia.<sup>2-3</sup>

A study was done in London, where 334 children with strabismus (5.08%) had neuro-developmental/ neurological disorders, giving a total weighted prevalence of 2.1 % ( 95% confidence interval, 1.8%-2.4%). In multivariable analysis, the risk of isolated strabismus was reduced in children of nonwhite maternal ethnicity and was increased in those born after an assisted or cesarean delivery and in those who were of low birth weight and preterm (in particular, late preterm).<sup>15</sup>

Our study show the prevalence of squint in patients who visited this department having strabismus is 2.8%, considering inclusion criteria. The delay presentation of Strabismic children has been proven to be the most common cause of amblyopia. Early detection of strabismus and institution of appropriate therapy is of immense value towards preventing prevalence of life long visual morbidity.

#### CONCLUSION:

Our study showed that there was significant gender differences at presentation but no significant gender preference of delayed presentation in childhood squint. The common causes of delay presentation of childhood squint were our poor referral system, parents unawareness and poor availability of proper facility to people of backward and remote areas of KPK.

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Dr Naeem

## Epidemiology of Pediatric Ocular Trauma: A retrospective Study\*

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### ABSTRACT

**Objectives:** To evaluate pattern, circumstances and causes of pediatric ocular trauma.

### Material and Methods

**Study design:** A retrospective, cross sectional, observational study.

**Setting:** This study was conducted at Eye Unit, Hayatabad Medical Complex, Peshawar from 1<sup>st</sup> February 2009 to 31 January 2011.

**Duration of study:** Two years

**Data Collection Procedure:** This retrospective study included all the admitted cases who present with ocular trauma, and the data was collected with the help of proforma which included all the points relevant to the study and included complete history regarding the age, sex, cause of injury, circumstances of injury, type of injury, unilateral or bilateral injury, interval between injury and presentation and history regarding any prior intervention. Patient was then thoroughly examined, all relevant investigations were done including x-ray orbit and B-scan.

**Results:** In this study we evaluated 130 eyes of 125 patients, who presented with ocular trauma. All of the patients were less than sixteen years of age. In which male were 90 (72%) and female were 35 (28%). Unilateral trauma was found in ninety six percent (96%) and bilateral trauma was found in four percent (4%) cases. Open globe injury was found in 71.54% eyes while closed globe injury was present in 28.46% eyes. The injuries occurred most commonly in the street (41.6%), followed by home (37.6%), school (12.8%), and at work (8%). These different types of trauma were caused by various objects. The most common cause of injury was wood (24%), followed by flying object (20%), while the least common cause was syringe, needle and *gollidanda* (a popular street game) which was 4% respectively.

**Conclusion:** In hospitalized cases of ocular trauma, open globe injury (71.54%) was more common than closed globe injury (28.46%). Males were affected more commonly than female. Street trauma (41.6%) was more common in children. While the most common cause of trauma was wooden objects.

### INTRODUCTION

Eye injuries are an important cause of ocular morbidity in children, being a leading cause of non-congenital unilateral blindness in this age group<sup>1</sup>. Such injuries cannot always be prevented, but by identifying any underlying factors in the aetiology of serious injuries, it may be possible to determine the most effective methods of reducing the incidence of visually damaging trauma. In population-based surveys, the percentage of monocular blindness due to trauma ranged from 20%–50% and of bilateral blindness from 3.2%–5.5%<sup>2</sup>. Hospital-based studies of eye trauma indicate that about two-thirds of those affected are males, predominantly children and young adults<sup>3</sup>. In recent years, the home has replaced the workplace as the most common setting for serious eye injuries, thereby increasing risk for ocular trauma to the general population, particularly children<sup>2,3,4</sup>.

Ocular injury occurs in three forms: open globe, closed globe, and chemical injuries. Open globe injuries are one of the common emergencies in ophthalmologic clinics and require immediate action<sup>5</sup>. Nearly 90% of eye injuries can be prevented by relatively simple measures such as better education, appropriate use of safety eye wear, and removal of common and dangerous risk factors<sup>6</sup>. The purposes of this study is to analyze the epidemiological factors, causes, and the outcome of pediatric ocular trauma at Hayatabad Medical Complex, Peshawar, KPK.

### MATERIAL AND METHODS

This retrospective study included all the admitted cases presented with ocular trauma. All the data was collected with the help of proforma. This proforma included relevant points to the study and included complete history regarding the age, sex, cause of injury, circumstances of injury, type of injury, unilateral or bilateral injury, interval between injury and presentation and history regarding any prior intervention. Patient was then thoroughly examined. Visual acuity was checked. Eye lid, adnexa and orbit was examined. Anterior segment was examined using slit lamp biomicroscopy. While fundus was examined using indirect and direct ophthalmoscope and biomicroscopy with 78 / 90 D lens. All relevant investigations were done including x-ray orbit and B-scan.

\*The study was conducted at Eye Unit Hayatabad Medical Complex, Peshawar

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**RESULTS:**

In this study we evaluated 130 eyes of 125 patients with ocular trauma. All of the patients were less than sixteen years of age. In which male were 90 (72%) and female were 35 (28%). Unilateral trauma was found in ninety six percent (96%) and bilateral trauma was found in four percent (4%) cases. Classification of open and closed globe injury was given in table I. in which. Open globe injury was found in 71.54% eyes while closed globe injury was present in 28.46% eyes.

All the patients received trauma in various circumstances. This is shown in table II. The injuries occurred most commonly in the street (41.6%), at home (37.6%), school (12.8%), and at work (8%). These different types of trauma were caused by various objects. Which is given in table IV. The most common cause of injury were wooden objects (24%), followed by flying object (20%), while the least common cause was syringe, needle and *gullidanda* (tipcat) which was 4% respectively.

**DISCUSSION:**

Though many reports are available on ocular injuries,<sup>7</sup> only scanty literature is available on ocular injuries in children in our country. As the epidemiology of ocular injuries varies from community to community and region to region, the present retro-spective study was undertaken on the epidemiology of ocular injuries in children under the age of sixteen years in the province of Khyber Pakhtunkhwa.

Many studies have shown that boys tend to be affected more commonly than girls, male-female ratio varying from 2:1 to 4:1<sup>8</sup>. While in Yaya G et al study, 59% were males and 41% were females<sup>9</sup>. In our study we found that male were 72% and female were 28%. These data are presumably due to the great physical contact, more adventurous or aggressive behavior of young boys, mostly in leisure activities. The school age group was more susceptible than other groups. It is believed that children in this age group are more independent than the younger but more immature than the older, which may make them more vulnerable<sup>10</sup>. The lower incidence of ocular trauma in infants (under 2 years old) can be explained by the parents' greater protection, the children's less independence and risk situations.

In our study, the most common type of pediatric eye injury resulting in hospitalization was open-globe injuries. This finding is similar to previous studies conducted in the United States, Jordan and Turkey<sup>11</sup>. Open globe injury also common then closed globe injury in a local study by Samina et al and Jan et al, which was 76% and 77.3% respectively. This is because closed globe injuries usually don't need hospitalization and can be treated on outdoor basis<sup>12,13</sup>.

Children engaged in playing sports in street frequently experience ocular trauma is more common in

**Table I**  
**Mechanism of injury**  
**(n= 125)**

	Number of eyes	%
OGL	93	71.54%
CGI	37	28.46%
Total	130	100

N= number of patients, %= percentage, OGL= open globe injury, CGI= closed globe injury

**Table II**  
**Place of injury**  
**(n= 125)**

	No of eyes	%
Home	47	37.6%
School	16	12.8%
Street	52	41.6%
Work	10	8%
Total	125	100%

N= number of patients, %= percentage

**Table III**  
**Causes of injury**  
**(n= 125)**

	Number	Percentage
Fall	15	12%
Wood	30	24%
Stone	10	8%
Toy gun	10	8%
Flying object	25	20%
Pencils	5	4%
Syringe	5	4%
Knife	3	2.4%
Gollidanda	5	4%
Others	17	13.6%
Total	125	100%

N= number of patients, %= percentage

our study which is about 41.6% followed by home injury (37.6%). while Kaimbo et al study, stated that street- and home-related injuries accounted 54% of all ocular injuries, while work-related injuries have been reported as 13%–18% of total eye trauma cases<sup>14</sup>. Therefore self-protection should be taught to children to prevent possible ocular injuries. For example, children should be told to avoid dangerous games, such as throwing objects, playing with BB guns or lighting firework. Also, safety goggles should be offered to children who engage in sports with possible body contact or when using

sharp kitchen items<sup>6</sup>.

In general, children are more susceptible to eye injuries because of their immature motor skills, limited common sense and natural curiosity. The causes of eye injuries, therefore, are highly related to physical and psychosocial development<sup>6</sup>. In our study wood (24%) and flying object (20%) are more common causes of ocular injury. While in Bejiga. A study, the most common causes of perforating ocular injuries were wooden articles, metal and stone objects in 67 (32.8%), 58 (28.4%) and 29 (14.2%) respectively<sup>15</sup>.

Many eye injuries in children are preventable. Parental awareness, supervision and education emphasizing avoidance of specific hazards remain a priority in order to reduce the incidence of ocular trauma. For ophthalmologists, pediatricians and other professionals involved in the health care of children, understanding the fundamentals of eye trauma will help decrease associated ocular morbidity and visual loss. Also, it is the physician's responsibility to disclose any obscure factors, such as preceding ocular disease, coexisting systemic disease or child abuse, related to the ocular trauma<sup>6</sup>.

## CONCLUSION

In hospitalized cases of ocular trauma, open globe injury (71.54%) was more common than closed globe injury (28.46%). Males were affected more commonly than females, as street trauma (41.6%) were more common in children. While the most common cause of trauma was wooden objects.

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