بِسْمِ اللَّهِ رَحْمَاتِ ۝ وَلَطِيْبَةِ اخْتِلَافِهِ
Clinical Approach To Refractive Errors

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Learning objectives

By the end of this lecture the students would be able to;

• Correlate optics with the various types of refractive errors
• Describe the clinical presentation of refractive errors
• Describe the clinical protocol for the assessment of refractive errors
The Eye as an Optical Device

• Structures in the eye bend light rays
• Light rays converge on the retina at a single focal point
• Light bending structures (refractory media)
  – The lens, cornea, and humors
• Accommodation – curvature of the lens is adjustable
  – Allows for focusing on nearby objects
Scenario

• A 14 years old boy is sent by the teacher for checkup of vision as he has lost interest in studies and remains absent because of frequent headaches

What is his most probable problem?
How to approach this patient?
Examination

- Visual acuity right eye is 6/18
- Visual acuity left eye is 6/24
- Visual acuity improves with pinhole to 6/6 both eyes

What is his diagnosis?
How to proceed?
Emmetropia

Parallel rays of light brought to a focus on retina without accommodative effort.

Far point at infinity.
(Axial length matches dioptric power of the eye.)

Ammetropia is the opposite term.
Refractive Errors

- Myopia
- Hypermetropia
- Astigmatism
- Aphakia
- Anisometropia
Symptoms of Refractive Errors

- Visual Failure
  * Direct complaint
  * Complaint by parents
  * Routine checkup at school
  * Wrong or inadequate spectacle correction
  * Routine re-refraction
  * Complaint by a lens wearer
  * Other ophthalmic problem associated with DV (Amblyopia)
  * Macular diseases (difficulty in reading, recognition)
Symptoms of Refractive Errors

- Eyestrain symptoms
  * Intermittent blurring and diplopia
  * Weariness or drowsiness during work
  * Tired, hot and red eyes
  * Pain after continued work
  * Watery, suffused and bleary eyes
  * Chronic blephritis
  * Headaches, Digestive symptoms and nervousness
How do refractive errors present?

- Asthenopia, eyestrain & visual fatigue
- Blurring of vision
- Ocular discomfort with itching, burning of the eyes and at times increased sensitivity to light etc
- Headache, rarely could be attributed to refractive errors. Headache presenting after visual work especially in those above 40 years could be because of refractive errors, however a headache presenting early morning is extremely unlikely to be because of refractive errors
In preverbal children

• Can present in a variety of ways
• In preverbal children it can present as delayed milestones of visual development; inability to focus at visually stimulating objects, follow light or bright object
• Squint
• Lazy eye or eyes
In school going children

• Lack of interest in visual tasks, class work
• Generally apathic or withdrawn behaviour
• Difficulty in reading or seeing the black/white board from distance
• Squint
• Lazy eye
Signs

• Decreased visual acuity that improves with pinhole
• The eyeball may be obviously small (hyperopia) or large (myopia)
• The cornea may be conical in shape (irregular astigmatism (keratoconus))
• Pupils are normal
• Posterior segment may show abnormalities
Posterior segment signs

- In pathological myopia retinal degenerations (myopic crescent, lattice), breaks (holes and tears) etc
- In hyperopia pseudopapilloedema (blurring of optic disc margins with hyperopia of greater than 5 D)
- In high degrees of astigmatism the optic disc may appear oval
Refractive assessment

1. Check VA with and without spectacles.
2. Check with a pin hole.
3. Pupillary examination
4. Ophthalmoscopy.
5. Cover test with and without correction
6. Objective refraction/ autorefraction (cycloplegic in children)
7. Subjective refraction
Subjective verification

Duochrome test.

Muscle balance – Maddox rod for distance.

Near vision correction.

Maddox wing for near.
Myopia

• Myo– I close Pia– eyes (these people usually skew their eyes to see clearly)
• Parallel rays of light come to a focus in front of retina when the eye is at rest.
• Causes:
  * Usually axial
  * Curvature – usually of the cornea
    -- sometimes of the lens
  * Index – Rare, Increase in refractive index
    DM
    Nuclear cataract
Myopia..cont.

• Presentation :
  * May be congenital
  * May start in early childhood
  * Rarely may start in adult life.
  * Becomes stationary at 21 years—physiological
  * Rarely may progress after 21 years—Pathological
  * Rapid progression in pathological
Myopia..cont.

• Symptoms:
  * Eye strain— small degrees of myopia and astigmatism
  * Visual—D/V
  * Avoidance of outdoor activities by children
  * In the middle age— no glasses required for near (second vision of the old)
• **Signs:**
  * Atrophic retina
  * Tegroid fundus (loss of pigment from RPE)
  * Choroidal atrophy (white spots surrounded by black areas)
  * Cysts at the orra serrata
  * Weiss’s reflex streak
Myopia..cont.

Signs...cont:
* Dark circular area at the macula
* Vitreous– Liquefaction, floaters, PVD
* Myopic crescent
* Macular scaring
* Posterior staphyloma
* RD
Myopia. cont

• Types:
  Physiological
  Pathological
Myopia..cont

Complications:
• Scotoma—if macula is involved
• Slow blindness—in high myopia
• RD
Myopia..cont

Prognosis

- Good—Physiological
- Guarded--pathological
Hypermetropia

Parallel rays of light brought to a focus behind retina with relaxed accommodation.

Virtual far point

Corrected with plus lenses.

1858 – Donders suggested the term hypermetropia.

1859 – Helmholtz used the term hyperopia.
Hyperopia

Role of accommodation?
At birth practically all eyes are hypermetropic to the extent of 2.5 to 3.0 diopters.

Emmetropinisation ensues as the eye grows.

Emmetropia may not be reached and hypermetropia may persist.

May also occur pathologically due to orbital mass, intraocular tumour, retinal oedema and RD.
Types of hypermetropia

Total hypermetropia

Equals latent & manifest hypermetropia.

i. Latent hypermetropia

Overcomed physiologically by the tone of the ciliary muscle.
ii. Manifest hypermetropia:
   a. Facultative hypermetropia.
      Overcomed by an effort of accommodation
   b. Absolute hypermetropia
      Cannot be overcome by accommodation.

Hypermetropia that exceeds 5 dioptres may be associated with blurring of disc margins (Pseudopapilloedema).
Astigmatism

Variation of refraction in different meridia.

May be

1. Regular (axes perpendicular)
   a. With the rule (minus cylinder horizontal).
   b. Against the rule (minus cylinder vertical)
c. Oblique:
   I. Symmetrical
   II. Complementary
2. **Bioblique (axes not at right angle)**
3. **Irregular (no axes determinable)**

*May also be classified:*

a. **Simple** – One axis ametropic.

b. **Compound** – both axes ametropic but either myopic or hypermetropic.

c. **Mixed** – each axis of opposite power.
Symptoms

• Blurred and distorted images
• Head posture in oblique astigmatism
• Eyestrain symptoms
Aphakia

Absence of the lens in the pupillary area.
Aphakia

• Causes
  - Congenital
  - Traumatic
  - Surgical
Aphakia

• Signs
  Corneal scar (surgical and traumatic)
  Deep AC
  Iridotomy (surgical)
  Jet black pupil
  Iridodonesis
Aphakia

- Effects
  High hypermetropia
  Loss of accommodation
  Correction with glasses leads to spectacle magnification
Anisometropia

Difference of refraction between the two eyes.
Thank You