Paediatric Ophthalmology and Strabismus

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### **Case Scenario Links**

**Paediatric Ophthalmology and Strabismus** 

- Diplopia (Oph06)
- Infant with an altered light reflex (Oph12)
- Infant with strabismus (Oph09)
- Pupil abnormality (Oph08)
- Watery eye in an infant (Oph03)



# Paediatric Ophthalmology

- Key issues in Paediatric Ophthalmology
- Assessing vision in children
- Assessing strabismus
- Types of strabismus
- Management of strabismus



### The Paediatric Eye Examination

#### Different

- History not from the patient
- Conventional tests need to be modified
- Ophthalmic routine
- Variable cooperation
- Patience and talent
- PARENTS!



# Taking the history

#### Ask to state problem precipitating the visit and elaborate

- Visual problem- school, TV, computers
- Alignment- when, how long, which eye etc.
- Routine- Family hx, Sibs
- Amblyopia, Strabismus in the family

#### Development

- Ante, post natal History
- Milestones



# **Visual Milestones**

- Social Smile: 2 months
- Fixing & Following: 3 months
- Depth perception: 6 months





# **Normal Visual Development**

- At birth : VA = 3/60, no fixation, variable XT
- VA = 6/12 by 6-12 months
- Infants usually hyperopic (long sighted)
- Eyes should be straight by 2 months with good fixation
- Any strabismus at 3 months needs assessment!





### **Measuring Visual Acuity**

- Infant: fix and follow, preferential looking tests, asymmetrical objection to occlusion, fixation preference, optokinetic nystagmus
  - o 2 yrs: Kay's Pictures
    o 2 ½ yrs: Tumbling E's
    o 3 yrs: Sheridan-Gardner
    o 4-5 yrs: Snellen Acuity





# **Initial Observation**

- Examination begins on entering the room
- "The parent is always right"
- Observe while questioning the parent
  - o Head position
  - o Eye alignment
  - o Visual behavior
  - o Appearance



### Nasolacrimal Duct Obstruction

- Common, congenital, failure to canalize
- Recurrent tearing and infections
- 95 % resolve by 12/12. If not, unlikely to
- Surgery to probe duct and open









### **Abnormal Red Reflex**





## Leukocoria (White Pupil)

- Any opacity in the visual axis
- Corneal glaucoma, metabolic, trauma
- Aqueous and vitreous uveitis
- Lens cataract
- **Retinal** retinoblastoma, retinopathy of prematurity, retinal inflammatory disease







## Retinoblastoma

- Malignant eye tumour of childhood 1 in 20,000
- Mutation of *RB1*
- 2/3 unilateral, 1/3 bilateral;
- 2/3 sporadic, 1/3 heritable, 10 % inherited with FHx
- Rx gives high survival
- Risk of other malignancies with heritable forms









# **Congenital Cataract**

- 1 in 2000
- 65% sporadic

20% inherited

15% systemic or ocular problems

e.g.: Down syndrome, Peter anomaly etc.

• Detected by abnormal red reflex





# **Congenital Cataract**

- Surgery ideally performed by 4-6 weeks of age
- Vision traditionally corrected with contact lenses
- Intraocular lens (IOL) implants possible down to 6 months





### **Congenital Glaucoma**

- 1 in 10,000. Congenitally abnormal drainage angle
- +/- Systemic associations
- Photophobia, tearing, hazy corneas and buphthalmos (enlargement of the eye)
- The management is generally surgical



### **Retinopathy of Prematurity**

Early gestation

Low birth weight





### Ocular manifestations of systemic disease

### Neurofibromatosis

- Lisch Nodules
- Iris harmatomas





### Lisch Nodules

Increase with age





### Abusive head trauma

Multiple haemorrhages,

too numerous to count (TNTC), involving all layers of the retina,

often extending to the periphery...





# Abusive head trauma



Images property of Andrea Vincent

#### RH do not exist in isolation

#### In the context of

absence of external ocular injury, SDH /brain injury History inconsistent with degree of injury

Ophthalmologists do not exist in isolation

Part of multidisciplinary team





### Ocular manifestations of systemic disease

Lens subluxation

Connective tissue -Marfan Syndrome

Metabolic - Homocystinuria





### **Ocular Manifestations**







# **Ocular manifestations**

### **Osteogenesis imperfecta**



Deficiency of **Type-I collagen** 



# Strabismus/ Squint

- Approximately 5% of the population!
- Higher proportion in children with other problems
  - o Down Syndrome
  - o Cerebral Palsy
  - o Prematurity



### Strabismus = squint = misaligned eyes

Classification Phoria vs Tropia



#### Phoria

- Only present when eyes disassociated
- Usually controlled with two eyes open





### Classification

### Tropia Present under binocular viewing





### Strabismus classification

#### Horizontal

- Esotropia = ET = convergent squint
- **Exotropia** = XT = divergent squint

#### **Vertical**

- Hypertropia = Eye is deviated up
- Hypotropia = Eye is deviated down







# Amblyopia

- Poor development of the visual cortex due to a blurred visual input.
- Not an eye problem but a brain one
- The younger the child the greater the risk but also a greater the likelihood of successful Rx
- System fixed and no treatment possible by 7-8 years





# Causes of Amblyopia

#### • Refractive

 anisometropia > astigmatism > hyperopia > myopia

#### • Strabismus

- treating amblyopia prior to surgery improves stability of outcome
- Stimulus deprivation
  - e.g.: cataract, over-patching







### Amblyopia Treatment

Patching: Good eye is occluded (patched)

- part-time vs full-time occlusion
- o full time max 1 week per year of age
- recent studies suggest 2 hrs = 6 hrs per day
- o compliance is the key



**Penalization:** good eye is blurred with Atropine.

Beware of cycloplegic toxicity: facial flushing, rapid heart rate, confusion, irritability, seizures



### Examination

- Cycloplegic refraction is vital allow 40 mins for cycloplegia
- Strabismus is assessed with prism cover tests in 9 cardinal gaze positions depending on concerns
- Motility is assessed, versions and ductions
- The media and fundi are examined



# **Prescribing for Children**

- Hyperopia full correction only if esotropic
- Myopia full correction
- Anisometropia
  - $\circ$  keep difference between eyes constant. e.g.:net ret = +3.50, + 5.00
  - Rx : +2.50, +4.00
  - o can tolerate large anisometropic corrections



### Anisometropia

#### • 4 yr old with

Right eye: - 8.00 - 4.00 x 180 Left eye: + 3.00 - 3.50 x 180

- Couldn't tolerate a CL
- Wore glasses without a patch
- Final VA: 6/12 RE, 6/7.5 LE





### Assessing Strabismus-Corneal Reflex Test





# **Assessing Strabismus**

#### **Corneal Light Reflex Test**

Reflexes should be symmetrical and just nasal to visual axis

**Reflex displaced temporally =** Esotropia **Reflex displaced nasally =** Exotropia









### **Corneal Reflex Test**

### Hirschberg's Test





### **Assessing Strabismus**



### **Cover Test**

- cover straight eye
- · if other eye moves it was deviated
- if eye moves in = exotropia / divergence
- if eye moves out = esotropia / convergence



### Cover uncover-normal



Cover -look at other eye -does it move to take up fixation Uncover -look at eye under occluder

-does it move to take up fixation



### Cover–uncover test

Cover test - looks for manifest (apparent) deviations.

One eye is covered with an opaque occluder the other eye is observed. If the uncovered eye moves to take up fixation = manifest deviation

Uncover test - looks for latent (hidden) deviations.

One eye is covered same eye observed as the cover is removed for any corrective movement.



### Cover-Uncover L esotropia





### Alternate cover

Alternate cover test - tests the size of the deviation (squint)

Dissociates fusion of any sort





### Left Esotropia alternate cover





### Right exotropia alternate cover





# **Prism Cover Testing**

- To measure angle of deviation
- Cover test performed with prism over deviating eye
- Prism adjusted until any movement is negated
- Performed at near and distance and in different gaze positions
- Tables and experience used to calculate amount of surgery for deviation measured
- Prism orientation: ET = BO (base out), XT = BI (base in)







# Pseudoesotropia

- Broad epicanthic folds
- Medial sclera is buried with lateral gaze so the eyes look esotropic / convergent
- Corneal light reflex symmetrical
- Cover test no movement
- The only "Strabismus" a child will "grow out of"





# Infantile Esotropia

#### Onset from birth to 2 months of age

- Due to poor fusion
- Usually large angle, other motility issues:
  - IOOA, DVD, latent nystagmus

#### Management

treat amblyopia before surgery

- Surgery for fusion (stability) and 3D
- Ideal time to operate is 6 12 months
- Results poor if operate > 2 years
- 50 % require further surgery











# **Refractive Esotropia**

- Onset 18 months to 5 years
- Hyperopia and accommodative response stimulating convergence
- Give "full" hyperopic correction
- Many straighten with glasses alone,
- Some with residual ET also require muscle surgery







# Intermittent Exotropia

- Onset 2 5 years
- Usually worse at distance
- May close eye in bright light
- 60% progress to constant XT, 35% stable, 15% improve
- Surgery for depth perception or for cosmesis
- Control & proportion of time XT important



#### FIGURE 13-1

**A**, Patient with intermittent exotropia and straight eyes in the phoric phase. Patient has 35 seconds arc stereo acuity. **B**, Occluder of the left eye disrupting fusion. Under the occluder, the left eye is deviated temporally. **C**, Occluder removed and the left eye is deviated temporally showing the exotropia. Patient is in the tropic phase and suppresses left eye.







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A 10.

10.



### Sixth Nerve Palsy





# Superior Oblique Palsy

- Congenital, may break down later in life
- Acquired trauma/ lesion
- SO underaction, IO overaction, ipsilateral hypertropia worse on contralateral gaze and ipsilateral tilt
- Surgery often IO weakening or SO tuck









### **Basic principles of Strabismus Surgery**

- Muscles can be
  - o weakened (recession, myotomy, myectomy)
  - o strengthened (resection, tuck)
  - repositioned (transposition, Faden)
- Surgery on paralyzed muscles is poorly effective
- Amount of surgery depends on size of squint

















# **Resection / Strengthening**











Department of Ophthalmology

# The End

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