Heterotropia (strabismus):
diagnosis, classification, investigation

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    Prevention Blindness, Macular Degeneration, Legists, Limited Vision
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    Software, Spaceview, Thomas Pocklington Trust
- Lecture content always my own
- Author of Pickwell’s Binocular Vision Anomalies, editions 3-5
- i.O.O. Sales Ltd markets IFS orthoptic exercises, which
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  small royalty
- Community optometric practice in Brentwood, Essex

PLAN
INTRODUCTION
INVESTIGATION OF INCOMITANCY
INVESTIGATION OF HETEROTROPIA
CONCLUSIONS

Full handout of slides from www.bruce-evans.co.uk

FOR REGULAR TWEETS ON OPTOMETRIC RESEARCH:
@BruceJHEvans

OVERVIEW: CAVEAT
- >5% of patients seeing community
  optometrists have BV problems
- Always look for pathology:
  - Neuro-optometric checks
  - Pupils, discs, fields, strabismus, incomitancy,
  accommodation
  - Check these things regularly
- Don’t forget refraction
- Change management if not improving
  significantly
- Refer if still not improving
- Appropriate re-exam intervals (frequent)

Classification

comitant------------incomitant

Deviation
Heterophoria
compensated/ uncompensated
testing distance far/inter./near
direction of deviation exo/eso/hyper
sensory adaptation HARC/suppression
laterality unilateral/alternating
direction eso/inter./eso/hyper

Heterotropia
Heterophoria
Heterophoria

Strabismus

CAUSES OF INCOMITANCIES

**VASCULAR**
- Diabetes
- Hypertension
- Stroke
- Aneurysms
- Temporal arteritis

**NEUROLOGICAL**
- Tumours
- Multiple sclerosis
- Myasthenia gravis
- Migraine

**OTHER**
- Trauma
- Thyrotoxicosis
- Toxic
- Iatrogenic
- Idiopathic

*Underlined* = more likely in elderly

Motility test
- Use reliable pen torch
  - Check nose not occluding
- Really, three tests, so do three times:
  1) Observe corneal reflexes
  2) Cover test in peripheral gaze
  3) Ask about diplopia
- Beware of reports of diplopia
  - May break down (in view of target, distance, fus. res.)
  - May be variable
  - May be confused
- Know the muscle actions
  - Secondary actions of cyclovertical muscles: RADSIN (Recti Aduct; Superiors Intort)
**Max. vertical diplopia for RSO palsy**

- In any vertical deviation, look carefully for SO underaction
  - In SR palsies, look carefully at SO in contralateral eye
  - Reports of vertical diplopia may be unexpected
- Do tests of cyclo-torsion
  - But may not be measurable in congenital cases

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<thead>
<tr>
<th></th>
<th>Neurogenic</th>
<th>Mechanical</th>
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<tbody>
<tr>
<td>Underaction during motility</td>
<td>Gradually apparent</td>
<td>Abruptly apparent</td>
</tr>
<tr>
<td>Secondary sequelae</td>
<td>Apparent (unless new)</td>
<td>Absent</td>
</tr>
<tr>
<td>IOP in gaze positions</td>
<td>Similar</td>
<td>Increases in restriction</td>
</tr>
<tr>
<td>Saccadic velocities</td>
<td>Slow</td>
<td>Close to normal</td>
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**Incomitancies: conclusions**

- Some incomitancies are difficult to detect
- If symptoms are suspicious, do cover testing in peripheral gaze
- Testing for cyclo-deviations detects SO palsies
- Refer new or changing incomitancies
- In some long-standing cases, prescribing the prism required in the primary position may help

**PLAN**

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**INVESTIGATION OF INCOMITANCY**

**INVESTIGATION OF HETEROTROPIA**

**CONCLUSIONS**

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**DIPLOPIA**

- Suspect drug interaction if diplopia occurs shortly after starting new drug

**Drugs and diplopia**

- Suspect drug interaction if diplopia occurs shortly after starting new drug

**Cover test in strabismus**

- orthophoria
- vertical strabismus
- convergent strabismus
- divergent strabismus

**Dissociated heterophoria**

- fusional reserves
- motor fusion
- sensory fusion
- fusion lock
- NOT COMPENSATED
- STRABISMUS
FUSIONAL RESERVES
Can be measured with:
- loose prisms
- rotary prisms
- prism bar

Fusional reserves
- Measure the fusional reserve that opposes the phoria first
- Often the blur point cannot be measured
  Horwood & Toor (2014)

Stereotests
- Lang works well with infants: look at eye movements
- Frisby makes a good game with squeaky toy
- Recommended from age 2y is Randot
  - Random dot
  - Contoured
- Norms vary from test to test and even between editions of the same test
  van Doom, Evans, Edgar, Fortuin (2014)

STEREOTESTS
www.bernell.com

Strabismus: the bottom line for the busy optometrist

Strabismus: the bottom line for the busy optometrist
**FURTHER INVESTIGATION OF STRABISMUS**

**Binoscular sensory factors**
- tests of sensory adaptations (large OXO, Bagolini)
- ARC
- suppression
- assess depth ND bar
- shallow ND bar
- IN (1.0) OUT (ND)
- TREAT
- DON'T TREAT

**Monocular sensory factors**
- amblyopia
- < aged 6y
- over 7y
- TREAT
- DON'T TREAT

**Motor deviation**
- dissociation tests
- objective angle
- <10 pd 10-20 pd >20 pd
- TREAT
- DON'T TREAT

**SENSORY STATUS IN STRABISMUS:**

**Clinical overview**
- If a strabismic patient does not have diplopia they must have global suppression or anomalous retinal correspondence (ARC)
- global suppression and ARC develop usually before 6 years
- over 25%, global suppression very likely, also if exotropia
- correction of significant Rx can influence sensory status
- more naturalistic tests are preferable
  - Bagolini and modified OXO tests detect HARC in about 80-90% of cases of strabismus & can measure depth of adaptation
- Rare for cases of deep adaptations to require treatment
  - These cases are hazardous and only for the experienced

**MOTOR DEVIATION: HABITUAL AND TOTAL ANGLE**
- The **habitual angle** is the angle between the two visual axes which is usually present during natural viewing conditions
- Under dissociating conditions (e.g., repeated alternate covering or prolonged dissociation) the angle increases to the **total angle**

**MOTOR DEVIATION: OBJECTIVE AND SUBJECTIVE ANGLE**
- **objective angle** is the angle the optometrist measures, for example during cover-uncover test (habitual angle) or prism cover test (total angle)
- **subjective angle** is the angle the patient experiences
  - in HARC, this is zero
  - in NRC, this is the angle of the strabismus
- dissociation tests “can” measure the angle
  - BUT measurement may be confounded by suppression or HARC
  - some covering/uncovering may be necessary
  - BUT try to avoid building up the angle to the total angle
- different test methods give different results
- cover-uncover test may be the purest measurement
- results may vary at different times in a given patient

**MOTOR DEVIATION: INVESTIGATION OF DIPLOPIA**
- **Horror fusionis:**
  - Superimposition of monocular images does not occur
  - Typically with history of early onset disruption to binocularity
- Sensory fusion disruption syndrome
  - Superimposition occurs, but unstable
  - Typically with history of trauma
MICROTROPIA

- Definition:
  - “A small-angle strabismus” OR
  - A strabismus where the angle of strabismus equals
    the angle of eccentric fixation
    - No strabismus movement on cover testing
- Usually, microtropia is a “fully adapted
strabismus” and no treatment is required

CONCLUSIONS

- New or changing incomitant deviations should be referred
- Recent onset esotropia in a child is often caused by hyperopia and cured by correction of hyperopia
- New or changing strabismus that cannot be cured optometrically needs referral

PLAN

SYMPTOMS
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