Amblyopia – Management and Risk of Recurrence
Binocular Vision Anomalies – When is it Appropriate to Treat Them?

Faye Mather – Advanced Orthoptist

We are WHH & We are PROUD to make a difference
Amblyopia
Amblyopia

- Stimulus Deprivation
- Meridional
- Anisometropic
- Mixed
- Strabismic
Treatment Options

- Conventional occlusion and atropine occlusion – both effective treatments (PEDIG, 2003; PEDIG, 2008a)

- Both offered as a first-line treatment at WHH, when appropriate

- Conventional occlusion tends to be the most common treatment method
Commencing Treatment

- Patient has had a refraction, fundus and media assessment
- Full-time glasses wear
- A minimum of 1-line IOD
- End of refractive adaptation – some exceptions
Ceasing Treatment

- Equal VA
- No improvement in the amblyopic eye for 3 or more consecutive visits
- Reduction of the VA in the non-amblyopic eye
- Low density of suppression on the sbisa bar – risk of intractable diplopia
- Reports of diplopia in the presence of manifest strabismus
Recurrence of Amblyopia

- Recurrence rate 24-27% (PEDIG, 2004; Bhola et al., 2006; Walsh et al., 2009) – defined as a reduction in the VA of 2 or more lines

- Associated with better VA in the amblyopic when treatment stopped, level of improvement and previous recurrence

- Not associated with age, treatment duration, presence of strabismus or level of stereo
Stereopsis
## Stereopsis

- First demonstrated at 3-4 months old
- Level varies with different tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Child (Seconds of Arc)</th>
<th>Adult (Seconds of Arc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randot Circles</td>
<td>64.1</td>
<td>21.3</td>
</tr>
<tr>
<td>TNO</td>
<td>109.9</td>
<td>40.5</td>
</tr>
<tr>
<td>Frisby</td>
<td>250.7</td>
<td>142.8</td>
</tr>
</tbody>
</table>

(Simons, 1981)
## Stereopsis – Normative Values

<table>
<thead>
<tr>
<th>Age</th>
<th>Frisby</th>
<th>Randot Circles</th>
<th>TNO</th>
<th>Titmus Circles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 years</td>
<td>250”</td>
<td>70”</td>
<td>120”</td>
<td>200”</td>
</tr>
<tr>
<td>4 years</td>
<td>250”</td>
<td>70”</td>
<td>120”</td>
<td>140”</td>
</tr>
<tr>
<td>5 years</td>
<td>250”</td>
<td>70”</td>
<td>120”</td>
<td>100”</td>
</tr>
<tr>
<td>Adult</td>
<td>250”</td>
<td>20”</td>
<td>30”</td>
<td>40”</td>
</tr>
</tbody>
</table>

(Scott and Mash, 1974; Romano et al., 1975; Simons, 1981)
Reduced/Absent Stereopsis

- Reduced VA in one/both eyes
- Strabismus – including microtropia
- Anomaly of convergence/accommodation
- Lack of understanding – due to age/test used
- Non-organic cause
Reduced/Absent Stereopsis – Management

- Identification of underlying cause
- Glasses wear
- Amblyopia treatment i.e. conventional occlusion/atropine occlusion
- Exercises to treat anomalies of convergence/accommodation – exercises improve NPC/NPA and fusional reserves which may improve stereopsis
Convergence
Convergence

Normal NPC is \( \leq 10\) cm

Symptoms of Convergence Insufficiency

- Diplopia
- Headaches – frontal
- Eye strain
- Difficulty reading
- Blurred vision
Convergence Insufficiency - Management

- Exercises
  - Effective if conducted properly under supervision
  - The patient must have sufficient cooperation and motivation
  - The patient should be in good general health
  - Various exercises used – smooth pen convergence, dot card, prism bar, stereograms
Convergence Insufficiency - Management

- Prisms
  - Indicated for patients who are not responding to exercises or are unable to conduct exercises effectively – Fresnel prisms should be trialed before incorporation
  - Fresnel prisms may also be used in conjunction with exercises initially if NPC is particularly reduced – aim to wean off prisms
Convergence Insufficiency - Management

- **Surgery/Botulinum Toxin**
  - Not indicated for primary convergence insufficiency – no evidence that surgery improves the convergence mechanism
  - May be indicated for convergence weakness exophoria when the patient has not responded to exercises
  - A prism trial may be indicated first – those who do not respond may have defective motor fusion and may be poor candidates for surgery (Ansons and Davis, 2014)
Convergence – Key Points

- Only treat patients who are symptomatic.
- Refer to Orthoptist for differential diagnosis and management.
- Refrain from prescribing prisms prior to patients seeing the Orthoptist.
References

- Pediatric Eye Disease Investigator Group, 2008b. Patching vs atropine to treat amblyopia in children aged 7 to 12 years: a randomized trial. Archives of ophthalmology, 126(12), p.1634.
Diplopia – Red Flags
Differential diagnosis of recent and longstanding strabismus
Sonia MacDiarmid – Head Orthoptist
Aims

- Highlight ‘red flags’ for patients presenting with diplopia
- Clues from the patient to aid diagnosis
- Urgency of referral
Observations

- Abnormal head posture
- Orbits/Lids
- Limb weakness
- Gait
- Parkinsonian movements
- Tremor
- Navigational skills
- Dystonia
- Facial asymmetry
Taking a Good Case History

Listen to the patient’s description – let them talk

- Onset – gradual/sudden
- Direction of the diplopia
- Near/distance disparity
- When do they notice the diplopia – constant or intermittent? Does it vary? Uhthoff's phenomenon? Fatigue?
- Pain – location/nature of pain
- Headaches – waking up/bending down/coughing
- Monocular or binocular diplopia
- Associated signs/symptoms
Signs/Symptoms

- Numbness
- Pins
- Needles
- Neck stiffness
- Weakness
- Nausea
- Weight gain/loss
Social history

- Drinking/smoking/weight gain
- Medication/recreational drugs
- Family history
- Stress/mental wellbeing
Medical History

- Diabetes
- HTN
- Hyperlipidaemia
- Parkinson’s Disease
- MS
- Thyroid dysfunction
- Recent infection/illness
- Ocular trauma
- Other forms of trauma
- Previous ocular history...decompensating childhood squints/suppression mask diplopia
Look for **Incomitance** – children can have incomitant squints

**Esotropia larger for distance** - VIth, decompensating distance esophoria, myopia with esotropia, accommodative/convergence spasm

**Exotropia** – IIIrd, (pupil and non pupil sparing) Parkinson’s disease, INO (MS)

**Vertical squint** - IVth, skew (supine test) or mechanical, decompensating congenital IVth

**Mechanical and supranuclear** - small deviations compared with deficit

**Variability** – Myasthenia gravis
Assessing Eye Movements

Look for

- Description of the diplopia
- Greatest restrictions/limitations
- Ductions and versions
- Lid changes
- Globe retraction
- Variability
- Nystagmus
- Torsion
- Head tilt test
Binocular vision

• Convergence deficit – Parkinson’s
• Reduced/absent stereopsis – childhood microtropia decompensated
• Suppression – mask diplopia or nystagmus
• Extended vertical motor fusion
• Important – guide our treatment options
Differential diagnosis Acquired v Longstanding

Acquired
- History
- Awareness of abnormal head posture
- Incomitance

Longstanding/Congenital
- History
- Unaware of AHP
- Presence of amblyopia/microtropia
- Extended vertical fusion range
- Concomitance
Pupil involvement

• Horners – red flag

• IIIrd nerve
  – No pupil involvement – diabetic
  – Slow progressing pupil involvement
Lid assessment

- Blink rate – reduced in PSP and Parkinson’s
- Evidence of blephrospasm – Parkinson’s, benign, PSP
- Apraxia of lid opening - PSP
- VIIth nerve function
- Ptosis- Horner’s
Red Flags

- Pupil-involvement – Horner’s
- Incomplete III palsy – pupil may be affected later
- Pain (IIIrd)
- No recovery or improvement within 12-weeks – importance of serial Hess charts, measurements in 9 positions to monitor improvement or progression
- Multiple cranial nerve palsies
- Variability
- Papilloedema
- Neurological signs/symptoms...
Urgent radiological Investigation

- IIIrd N with pupil involvement and/or pain
- Consider for those under 60 years of age
- Patients without any appropriate history or trauma for diagnosis
- Multiple CNP
- Patients without known microvascular risk factors
- Recurrent CNP
- CNP that is not recovering after 12 weeks
Referral pathways to Ophthalmology

▪ Routine – Standard referral route to Ophthalmology primary care (current wait – 5 Weeks)
▪ Urgent referrals
▪ Warrington ED
▪ WEEP (Warrington emergency eye provision)
  – Min 6 sessions per week Mon-Friday
  – On call rota shared with STHK
  – GP urgent referrals via ICE system
  – Emergency eyes email
  – All referrals triaged
  – Aim to see urgent diplopic patients within 24 hours (orthoptist + Ophthalmologist)
Treatment options

- Fresnel prisms – acute phase (refrain from incorporation in the acute phase)
- Aim to incorporate once stable at least >12 weeks
- Torsion (IVth) – barrier to prism, occlusion
- Sector occlusion
- Acute VIth nerve – botox injection to MR urgently

- Botox (horizontal squints only)
- Strabismus surgery – Mr. Bregu
- Monitor for improvement/progression
- Advice – MECC, driving, eye health, support
Recap

- Overview of binocular vision
- Normative values
- Amblyopia treatment overview
- Ocular motility
- Red flags
- Referral process
Thank you

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