ESOTROPIA

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Classification of esotropia

- **Primary**
  - The deviation is the initial defect

- **Secondary**
  - The deviation is caused by another defect i.e. loss of vision

- **Consecutive**
  - The deviation has previously been in another direction
ESOTROPIA

PRIMAR Y

SECONDARY

CONSECUTIVE

CONSTANT

With an accommodative element (partially accommodative)

Without an accommodative element (non-accommodative)

INTERMITTENT

ACCOMMODATIVE

Fully accommodative esotropia

Convergence excess esotropia

RELATING TO TIME

Cyclic esotropia

RELATING TO FIXATION DISTANCE

Near esotropia

NON-SPECIFIC

Distance esotropia
Accommodative Esotropia

May result from:
- Uncorrected refractive error
- High AC/A ratio

Horwood and Riddel (2013, 2014) have shown that accommodative esotropia is sensitive to blur and excessive accommodation is exerted to see clearly.
Uncorrected Hypermetropia

- Low Degree ($\leq +3.00$DS)
  - To see clearly, child needs to exert increased amount of accommodation to overcome uncorrected hypermetropia
  - Causing increased amount of accommodative convergence
  - If sufficient negative fusional reserves BSV is maintained
Uncorrected Hypermetropia

- **Moderate Degree (+3.00 to +6.00DS)**
  - Accommodate to overcome hypermetropia
    - if sufficient negative fusional reserves to control the accommodative convergence BSV is maintained
    - If insufficient negative fusional reserves esotropia develops
      - Once hypermetropia corrected and deviation controlled cgl → **Fully Accommodative Esotropia**
  - Accept a single blurred image → BSV maintained
Uncorrected Hypermetropia

- **High Degree (≥ +6.00DS)**
  - Uncorrected hypermetropia exceeds that possible to control with the accommodative system
  - Child has no benefit for accommodating as cannot overcome total amount → persistent blurred image
  - Eyes remain straight or diverge
Fully Accommodative Esotropia

- Uncorrected hypermetropia (+2.00 to +7.00DS)
  - Esotropia develops when accommodation is exerted and excessive accommodative convergence to overcome uncorrected hypermetropia

- BSV is present with hypermetropia corrected
Orthoptic Investigation

Aims

• Confirm diagnosis
• Assess control once refractive error corrected
• Gain information from the investigation upon which management can be based
Case
Case History

- 6 year old boy referred by GP querying convergent strabismus
- Mother noticed RE turning in when eating and looking at books, also brings books very close when reading
- Mother notices the turn most of the time now
- BH FTND bw 7ibs
- GH fine
- FH nil
- PT nil
Fixating a light

Fixating a large accommodative target

Fixating a small detailed accommodative target

- **VA sgl**
  - R 0.200
  - L 0.275 crowded logMAR

- **CT sgl**
  - N light: initially straight → sl RET
  - N accom target: sl+ RET
  - D sl RET

- **OM full**
- **Conv** sgl convergence with ↓deviation to 6cm
Investigation

- **Bagolini Gls sglS**
  - N intermittent BSV response/ R suppression
  - D L suppression
- **20°prism** not over-come, R suppression response
- **Frisby** –ve
- **PCT sglS**
  - N 25°BO
  - D 18°BO
What would you do next?
Investigation visit 2

- **VA** cglc R 0.000 L 0.025 crowded logMAR
- **CT** cglc
  - N light: v sl E c good rec
  - N accom target: sl E c good rec
  - D v sl E c good rec
- **CT** sglc
  - n light: initially straight → sl RET
  - n accom target: sl+ RET
  - d sl RET
- **OM** full
- **Conv** cglc binocular convergence to 6cm, well maintained

Investigation visit 2

- **Bagolini GIs cgls**
  - N & D BSV response

- **PFR cgls**
  - N 30^A^BO→6^A^BI
  - D 15^A^BO→4^A^BI

- **CBA cgls**
  - N 6/12 (then becomes RET)
  - D 6/6

- **Frisby cgls 170 sec of arc**

- **PCT**

- **cgls**
  - N 15^A^BO
  - D 8^A^BO

- **sgls**
  - N 25^A^BO
  - D 18^A^BO
Common findings in investigation

Fully accommodative esotropia
Orthoptic Investigation

Case History

- Onset around 2-5 years
- Esotropia noticed when perform near tasks
- Child may rub/ close one eye
- Intermittent diplopia (rarely volunteer)
- May have family history of hypermetropia/ strabismus
Ophthalmic Investigation

- Fundus & media check
  - Normal

- Refraction under cycloplegia
  - Prescribe full hypermetropic correction
  - Hypermetropia (+2.00 to +7.00DS)
Orthoptic Investigation

Visual Acuity

• Good with glasses

• Amblyopia uncommon unless deviation becoming constant and glasses not worn
  • Generally mild or moderate

• If visual acuity reduced suspect associated microtropia
Orthoptic Investigation

Cover Test

- Perform c & sgl s, near & dist, accom & non-accom target
- Cgl s (n+d)
  - Esophoria or orthophoria
  - Exophoria ~ prescription may be too strong
  - Note rate of recovery
  - Microtropia
- Sgl s
  - Non-accom target – orthophoria/ esophoria/ esotropia
  - Accom target – esotropia
  - Distance – esotropia
  - Note spontaneous control
  - Ask if appreciates diplopia when manifest
Orthoptic Investigation

- OM
  - Full

- Convergence cglS
  - Binocular to 6cm
Assess Level of BSV

Sensory Fusion

- Bagolini gls, Worth Light’s
  - cglSs – BSV
  - sglSs – Suppression/ intermittent BSV/ diplopia
Assess Level of BSV

Motor Fusion

- PFR or Synoptophore
  - Assess cgl's (sgls if intermittent control)
  - Important to assess negative fusional reserves
Assess Level of BSV

- **Controlled Binocular Acuity (CBA)**
  - Indication of level of control of deviation
  - Assess near & distance fixation
  - Assess cgl & sgls
  - Record VA level becomes manifest or remains binocular

- **Bar Reading**
  - Assesses strength of control for near
    - using crossed physiological diplopia
  - Place bar on top of book held at 33cm & ask to read print without moving head
  - Record level achieved reading fluently across book

- **Stereoacuity**
  - Good cgl & sgls, often >120 sec of arc
Assess Level of BSV

$4^\Delta$ Prism Test
- Confirm bifoveal BSV

Visuscope/ Fixation Ophthalmoscope
- Central or eccentric fixation
Measurements

- **Measure size of deviation**
  - Near & distance, c & sgl's
  - Ensure use small accommodative fixation target

- **AC/A Ratio**
  - Normal (3-5:1)
FULLY ACCOMMODATIVE ESOTROPIA

Management
Management

Aims

- Depend upon degree of hypermetropia
- **Low Degree (≤ +3.00DS & ≤ ±1.00DC)**
  - Aim to achieve well controlled, symptom free BSV sgs
  - Gradually reduce prescription & possibly discard permanently
- **Higher Degree (> +3.00DS)**
  - Glasses required for visual purposes therefore unable to discard completely
  - Aim to teach control of deviation for social/specific occasions if patient keen to do this
Stages of Management

1. Correction of refractive error
2. Treatment of any amblyopia
3. Orthoptic exercises
4. Weaning out of hypermetropic prescription
Correction of Refractive Error

- Cycloplegic refraction
- Prescribe full hypermetropic prescription
- Full time wear of glasses
- Adaptation period
- Warn parents angle of deviation may appear to increase if child attempt to achieve clarity sgs
- Repeat refraction annually
Treatment of any Amblyopia

- Visual acuity (VA) at 1st visit may be reduced
- Review 16-18 weeks following full time wear of glasses & re-assess VA
- If amblyopia present (mild)
  - Part time (PT) total occlusion

Once maximum VA obtained, further treatment may not be needed
Orthoptic Exercises

1. Eliminate suppression & recognition of diplopia when the deviation is manifest
2. Fusion of diplopia & control of deviation sgl's
3. Improve CBA & negative relative convergence sgl's

- Who is suitable?
  - Sufficient age & intelligence to co-operate
  - Willingness to attend regularly
  - Hypermetropia ≤ +3.00DS
  - Angle of deviation <25^ΔBO sgl's
Elimination of Suppression

- Elimination of suppression is needed to appreciate pathological diplopia when manifest
  - Often light suppression

- Therapy
  - Coloured filters (R-G goggles/ Sbisa Bar)
  - Septum
  - Vertical prisms

*The harder it is to overcome suppression the less suitable the patient is!*
Fusion of Diplopia – and Control of Deviation sgl’s

- Spontaneous control of deviation sgl’s
- Find point of intersection & image fused ~ gradually withdraw target encouraging patient to maintain fusion
  - Image will be blurred

- Prisms
  - Reduce strength until control without

- Slow removal of glasses
  - Encourage to maintain a single (blurred) image
Improve CBA and Negative Relative Convergence

- **Improve CBA**
  - Repeat in clinic encouraging patient to read further down chart
  - Bar reading sgl$s$ to improve near CBA
  - Additional minus lenses may improve control
    - For near with bar reading
    - For distance fixation e.g. Watching TV

- **Improve negative relative convergence**
  - Exercise BI-range
  - Distance stereograms

- Extended periods of no glasses wear
Orthoptic Exercises

- **Homework Exercises**
  - Full explanation of aims & methods
  - Stress importance of close supervision throughout
  - Exercises should be performed regularly
  - Regular follow-up appointments are necessary
Weaning out of Hypermetropic Prescription

- Suitable for those with $\leq +3.00$DS
- Reduce prescription in 0.50 or 1.00DS steps
- Ensure
  - Maintain good binocular control at near & distance
  - VA is 0.20 logMAR (6/9 Snellen) or better
Orthoptic Exercises

Higher Degrees of Hypermetropia

● Aim
  ● Achieve control of deviation for special occasions only
  ● Glasses will be required for acuity

● ‘Misty & Clear’ sgl s
  ● Misty & straight: relaxes accommodation
  ● Clear & esotropic: exerts excessive accommodation
  ● May be given as a homework exercise
Alternative Management

● **Contact Lenses**
  - Calcutt (1986, 1989) found contact lenses may improve CBA & reduce angle of deviation
  - Rarely used in younger children
  - May consider in older children with a high standard of hygiene & motivation

● **Strabismus Surgery**
  - **NOT justified** unless decompensating cgls
Alternative Management

Refractive Surgery

• Aim
  - Correct hypermetropia
  - Ocular alignment and BSV

• Promising results in teenagers and adults

• Limited data on children
  - LASIK advocated in non-compliant children (Saeed and Abdrabo, 2011)
Long-term outcomes

- Mohan and Sharma (2014)
Management of case

Formulate a possible management plan for the 6 year old boy with:

Right Fully Accommodative Esotropia
Recap of case

- **Refraction**
  - R+3.00DS/+0.75CS x 90°
  - L+3.00DS/+0.50CS x 100°

- Given glasses to wear full time & review in 18/52
Orthoptic exercises

- Is he suitable?
- Types of exercises
  - Patient can control deviation sgl but image appear blurred
  - **Aim:**
    - Improve CBA for near
    - Negative relative convergence (BI range)
  - **Exercises**
    - Bar reading
    - Distance stereograms
Following orthoptic exercises

- **PFR cgl**:
  - N $30^{\Delta}BO \rightarrow 10^{\Delta}BI$
  - D $15^{\Delta}BO \rightarrow 6^{\Delta}BI$

- **CBA cgl**:
  - N 6/6
  - D 6/6

- **PCT**
  - cgl:
    - N $15^{\Delta}BO$
    - D $8^{\Delta}BO$
  - sgl:
    - N $25^{\Delta}BO$
    - D $18^{\Delta}BO$
Wean out of hypermetropic prescription

- Is she suitable?
- Reduce prescription by 1.00DS
  - **VA** cglS R 0.075  L 0.050 logMAR
  - **CT** cglS
    - N light sl E c good rec
    - N accom target initially straight → sl RET
    - D sl E c fair rec
  - **CBA** cglS
    - N 6/12 (then becomes RET)
    - D 6/9

- **What would you do?**
Wean out of hypermetropic prescription

- What would you do?
Management of case

- Leave with full prescription
- Teach ‘misty & clear’
- Monitor until 7 years old
Summary

- Management dependant upon refractive error
- Low Degrees – aim to remove glasses permanently
- High Degrees – aim to remove glasses for special occasions only
- Orthoptic exercises may be required to strengthen & improve BSV
- Prognosis is excellent