Strabismus: Simple to Systemic Diagnosis & Therapy

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Disclosure Slide

- Nothing to disclose

Goals

- Review commonly encountered forms of strabismus and treatment options
- Discuss strabismus and treatment in infants and children
- Present unusual forms of strabismus which may be secondary to systemic causes
- Discuss when referrals are needed and to whom
STRABISMUS

- Symptoms
- Testing
- Results
- Action
  - Behavioral Interventions
  - Surgery
  - Monitor?
- Unusual forms
- Success!

Symptoms

- None
- Someone notices eye turn
- Patient notices eye turn
- Patient complaints
  - Blur
  - Double vision
  - Words move
  - Headaches
  - Nausea/Vomiting
  - Acute v. chronic

Testing

- Visual Acuity
- Cover Test
  - Hirschberg
  - Bruckner
  - Krimsky
- Motilities
- Retinoscopy
- Health
- Stereopsis/Fusion
- Fixation
- Correspondence

Unusual forms

Success!
Visual Acuity

- Resistance to occlusion (1 eye)
- OMD
  - Central, Steady, Maintained
- Teller Acuity Cards
- Lea Gratings

Visual Acuity

- Central
  - Monocular light centered on pupil
- Steady
  - No Nystagmus
- Maintained
  - If tropic can they hold fixation with tropic eye for 5 seconds after removing cover from fixating eye
- A “U” preceeding means “un”
- For amblyopia common to see CSuM

Visual Acuity

- Teller Acuity Cards
  - Available from stereo optical
    - $2000-2200
    - $3650-4000
- Cardiff Cards
  - Cost $1800 (Good-Lite)
Visual Acuity
- Lea Paddles/Gratings
- Not grating acuity – but detection acuity
- Note: “response to grating of _CPM at distance of _”
- Typically calibrated for 57 cm
- Cost $250 (Good Lite)

Retinoscopy
- Distance/Near
- Dry/Cyclo
- “Just Look” – Dr. Steele
- Plus lenses
  - Observe fixation
  - Observe alignment

Infant Stereopsis
- Keystone Basic Binocular
- Stereo Smile (PASS)
Stereopsis

- Keystone Basic Binocular (KBB)
  - Available from Bernell
  - Approximately $135
Stereopsis

- Preschool Assessment Stereopsis with Smile
- Norms ages 6-17 months
- Disparity levels 480", 240", 120" and 60"
- Cost $178-389 (Good-Lite)

Fixation

- Visuoscropy
- MITI/Ii Haidinger's Brush
  - Cost $324.95/$734.95 from Bernell
Correspondence

- Synoptophore
- Worth 4 Dot
- Bagolini

Actions

- My MD example
  - Plusses and minuses of each
  - Goals
  - Success
- Behavioral Interventions
- Surgery
- Observe “Do Nothing”

Infant Alignment

<table>
<thead>
<tr>
<th>Niren (N=12386) 1985 Ages: Neonates</th>
<th>Sondhi (N=2907) 1988 Ages: Weeks to 36 mos</th>
</tr>
</thead>
<tbody>
<tr>
<td>46.6% Orthophoria</td>
<td>26.6%</td>
</tr>
<tr>
<td>30.7% Exotropia</td>
<td>51.5%</td>
</tr>
<tr>
<td>22.9% Intermittent Exotropia</td>
<td>15.6%</td>
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<tr>
<td>0.7% Esotropia</td>
<td>0.3%</td>
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<tr>
<td>1.4% Intermittent Esotropia</td>
<td>0.7%</td>
</tr>
<tr>
<td>1.3% Exotropia–Esotropia</td>
<td>2.6%</td>
</tr>
<tr>
<td>0.4% Unilateral Exotropia</td>
<td>2.6%</td>
</tr>
</tbody>
</table>
Infant Alignment

- Thorn et al 1994, IOVS (544-53)
  - Hirschberg
  - Fusion v. rivalry FPL
- Results
  - Why?
    - Large angle K?
    - Attention?
    - Poor convergence?

Pseudostrabismus

- Watch for development of strabismus!
  - 83 patients (age 21 mos)
    - 12% strabismus
      - 8/9 AET
      - 1/9 non-accommodative
    - 210 patients (age 13 mos)
      - 10% strabismus
      - 16/20 eso
      - 3/20 exo
      - 1 Duane
- Pritchard C. Am Orthopt J 2007, vol 57, 111-7
- Silbert A. JAAPDS 2012, vol 16, 118-9
Exotropia Characteristics
- Less common than esotropia
  - In Children: 1 for every 3-5 cases of esotropia
- Gender
  - Females > Males
- Onset
  - 35-70% within first 2 years of life
  - 85% Intermittent
  - 16-52% associated vertical

Exotropia Classifications
- Divergence Excess (5-17%)
  - Pseudo
  - True
- Basic (50%)
- Convergence Insufficiency (33%)
  - Older
  - Consecutive

Exotropia Characteristics
- The Clinical Course of X(T), Rutstein et al. OVS 2003, 644-49
  - 73 Patients, 4 years follow up, no surgery
    - Average age 20 yrs (1-63)
    - Average follow up 10 yrs (4-33)
    - 60 patients some treatment
      - 49% VT
      - 34% Prism
      - 27% over minus
      - 33% multiple
      - 18% none
  - “Intermittent exotropia improved for many patients quantitatively and qualitatively over time.”
Sensory Adaptations

- Suppression
- Panoromic viewing
- Close one eye in sunlight

Panoramic Viewing

- Binocularity
Infantile Exotropia

- Constant exotropia
  - Systemic/ocular disease?
  - Up to 70% neurological or ocular anomaly

Case

- 2 year old white male L eye turn out x 1 week
- VA
  - CSM OD
  - uCSuM OS
- CLXT 35, CLXT' 30
- PERRL (−) APD
Infantile Exotropia

- Additional Testing
  - “Prolong” occlusion
  - Look far
  - Dilation

Infantile Exotropia - Actions

- Behavioral Interventions
  - Home therapy
    - Encourage convergence
    - Alternate patching
  - Surgery?
  - Observe

Toddler Exotropia

- Optimum Spectacle Rx
  - Minimum plus
  - Sector occlusion
  - Alternate patching?
  - Monocular/binocular skills from onset
    - Monocular
      - Thumb rotations
      - Pegboard rotator
      - Michigan Tracking
      - Flashlight tag
Toddler Exotropia

- Encourage convergence
  - Ball in hole
  - String beads
  - Leggos
  - Pop bubbles
  - 3D movies/video games
- Red/Green Antisuppression ("TV Trainer" a/k/a Computer/I Pad Trainer)

Toddler Exotropia

- Red/Green Antisuppression
  - Red/Green toys
  - Simon
  - Lights
  - “Press Lights”
    - OVP 2013;1:62-7

Toddler Exotropia

- Finger Beam Lights
  - $7.99/dozen
  - Oriental Trading Co.
School Aged Exotropia

- Relieving prism
  - If stable binocularity
  - Vertical also
- Diplopia Awareness
  - Flax - unnatural
  - Cooper – early therapy
  - Birnbaum – end of therapy

School Aged Exotropia

- Optimum Spectacle Rx
  - Over minus at distance?
  - Plus at near?
- Cooper – minus lenses at distance especially for training, remove after
- Birnbaum – plus at near – many XTs over converge at near
  - High NRA, low PRA
  - No minus except constant XT
  - Wean
  - Detracts from automaticity

School Aged Exotropia

- Flax-Brock Model
  - Near to Far
  - Stereo to Flat Fusion
  - Larger to smaller
  - Detailed to less detail
  - Goal: Maintain alignment even in absence of targets that can be fused
- Office v. home therapy
Surgery

- 50 patients, age 28.6 (11-75)
  - 14.3 years at 1st surgery (2-65)
  - Time since surgery 14.3 years (10-29)
  - 60% multiple surgeries

Motor | Saniary
---|---
64% | 38%
18% | 34%
18% | 28%

Vision Therapy

- Studies
  - Good or better 378/615 = 61.41%
  - Some followed patients = 70% maintenance of gains
    - 4.5-65. years
Intermittent Exotropia


- “Success”
  - 28% Over minus lenses
  - 28% Prism
  - 37% Occlusion
  - 46% Strabismus Surgery
  - 59% Orthoptic Vision Therapy

Teenage Exotrope

- 15 year old F referred for strabismus treatment
  - OD turns out
  - Ret
    - OD +1.25 20/30
    - OS plano 20/20
  - Cover Test
    - Distance 6XP
    - Near 8 RX(T)
  - Stereopsis
    - 1/6 Randot shapes
Teenage Exotrope

- Dx: Pars Planitis OU, ?RD IT OS
- 5 years later
  - S/P steroid injections x 2 OD, x 1 OS
  - S/P Subtenon kenalog plaque placement OD
  - S/P Retinal tear repair OS
  - S/P glaucoma development
  - S/P Cataract with Phaco and PCIOL O YAG
  - S/P Aqueous shunt OD

Esotropia

- Infantile (Congenital)
- Accommodative
- Non-accommodative

Infantile Esotropia

- Onset
  - Birth to 6 months
- Traditional Characteristics
  - Large angle > 50Δ
  - IOOA up to 68%
  - DVD 51-90%
    - Onset after age 2
    - May occur years after surgery
  - Latent nystagmus
  - Amblyopia 50%
Congenital ET Observational Study

- Age 4 - <20 weeks, 20+ Δ'
- Heredity: 29%
- Frequency
  - 56% constant
  - 23% variable
  - 19% intermittent
  - <12 weeks 57% intermittent/variable
- Refractive error: 23% > +3.00
- Magnitude: 50% > 40 prism diopters

- Amblyopia 19%-43%
- IOOA 2% - 8%
- Latent Nystagmus 1% - 3%
- DVD 0 – 1%

- Resolution?
  - Deviation 1-8 prism diopters – 2%
  - Deviation – 0 in 25%
  - Includes 4/46 with glasses
  - Who?
    - Younger age
    - Variable or Intermittent
Infantile Esotropia - Treatment

- Refractive correction
  - Full Cyclo?
  - Over-correction?
  - Reassess 3-6 months
- Amblyopia Correction/Prevention
  - Patching
    - Direct:Indirect 2:1
    - Goal: improve fixation
    - Goal: prevent suppression
  - Binasals

Infantile Esotropia - Treatment

- Baby “Ergonomics”
  - Feeding
  - Sleeping
  - Crib placement
- Abduction work
- Gross Motor
  - Patty Cake
  - “So Big”
- Binocular Stimulation
  - Gingham Patterns OU

Infantile Esotropia - Treatment

- Botox
  - Neurotoxin
  - Duration
  - Bilateral Medial Recti
  - “Better for smaller angle”
  - Studies – McNeer 1994
    - < 12 months old, 45%, 41% success with 1 tx
    - > 12 months old, 35%, 63% success with 1 tx
Infantile Esotropia - Treatment

- Surgery
  - Magnitude
  - BMRRecess
  - Stability “good” 6 months

From Wright & Spiegel: Pediatric Ophthalmology & Strabismus

Infantile Esotropia - Treatment

- Surgical Success Rates in Infantile Esotropia by Scheiman et al JAOA 1989

- Categories
  - Subnormal Binocular Vision
    - Ortho, small angle strab < 8 prism
    - Motor fusion ranges
    - Any level of stereopsis and W4D/ Bagolini
  - Cosmetic Cure
    - 10 prism diopters or less
  - Unsuccessful

Infantile Esotropia - Treatment

- Surgical Success Rates in Infantile Esotropia by Scheiman et al JAOA 1989

- Results
  - Subnormal binocular vision 22% (4-66)
    - <12 months – 71%
    - 13-24 months – 43%
    - 25+ months – 12%
  - Cosmetic cure 64% (29-91)
From AAPOS

- At what age should surgery for infantile esotropia be done?
- Surgery is performed when any associated amblyopia has been treated and the amount of esotropia is stable. Surgery performed prior to 2 years of age has been found to give better visual prognosis.
- Will more than one surgery be required?
- The reoperation rate is variable. In the scientific literature it has been reported to be as low as 11% and as high as 69%.
- Will my baby have good depth perception when older?
- Most children with infantile esotropia demonstrate a deficit of depth perception when old enough to be tested reliably. If esotropia is corrected before 2 years of age, there is a better chance of developing the ability to use both eyes together, which is referred to as binocularity.

Accommodative esotropia

- Refractive
- Non-refractive
- Partially

Refractive Accommodative Esotropia

- Complete resolution with full Rx
- Magnitude
  - 70% 11-45Δ
- Refractive error 2-6D
- Motor
  - 35% IOOA
    - Not initially
  - ?? If associated with decompensation

webeye.uiowa.edu
Refractive Accommodative Esotropia

- Initial Age 4.81
- Anomolopia 33% (refractive or strabismic)
- Motor anomalies:
  - 2 DVD
  - 2 IOOA

Refractive Accommodative Esotropia

- 10 year
  - 79% ortho or <10Δ
  - 13% consecutive XT
  - 5% decompensation
  - 3% high AC/A
- Average time for consecutive: 5.5 years
- Risk factor: >+5.00

Non-refractive Accommodative Esotropia

- Convergence excess esotropia
- 5% of all cases
- Magnitude
  - Minimal at distance
  - 10Δ or greater at near
- Refractive error
  - Minimal hyperopia
Partially Accommodative Esotropia

- Incomplete resolution with full hyperopic correction
  - Residual component
  - Approximately 33% of all patients with ET
  - Constant
  - Primarily unilateral
  - Amblyopia common

Vision Therapy Success

- Accommodative esotropia: efficacy of therapy, Wick. JAOA 1987
- Full plus
- Prism for residual eso
- Therapy (home)
  - Amblyopia
  - Suppression
  - Reduced stereopsis
  - Reduced motor/sensory fusion

Vision Therapy Success

- Total success
  - No strabismus measured/noted
  - 100" stereopsis
  - Equal VA
  - No symptoms
  - No adaptations (EF)
- Partial success
  - Amblyopia 20/40
  - Central suppression
  - Absent stereopsis
  - No strabismus2

  92.6%

  7.4%
Esotropia – Preschool Treatment

- Glasses Rx?
  - Single Vision v. Bifocal
  - Maturity
  - How much plus?
- Patching/Occlusion
  - If fusion at one distance, consider occlusion at other
  - Eg. distance fusion, near not, occlude at near

Esotropia – Preschool Treatment

- Prism Correction
  - Concerns – Adaptation
  - Birnbaum “avoidsance response, an adaptive change to avoid bifoveal stimulation.”
  - Jampolsky – “disjunctive vergence” eye movement in response to BO prism
    - Prism Adaptation Test
    - BO prism to overcorrect ET
    - Wear glasses for 1 hour
    - Repeat UCT
    - BAD – ET

“Control and teaming of the two halves of the body is a prerequisite skill to the control and teaming on the two eyes together.”

- Donald J. Getz, OD
Gross Motor/Bilaterality

- Angels in the Snow
- Hop Scotch
  - L/R/Both
- Bowling
  - L hand/R hand/ Both hands
- Can incorporate metronome

Bosu Ball

Bosu Ball = Balance Board
• “Vision’s purpose is to guide actions, growth, understanding and quality of life. The sensory component of vision is to serve as a feedback mechanism to evaluate the adequacy of our actions.”
  - John Streff, OD, DOS, FCOD, FAAO

**Esotropia – Preschool Treatment**

- Visual Motor System Work
  - Egocentric
  - Centering system off
  - Fixation work
  - Kinesthetic
    - Pencil in paper towel holder, pen in cap
      - As small as possible
    - Ball in cup, Pennies in bank, Pop bubbles
    - Start close, different positions, extreme field
      - X-Y-Z axes
Esotropia – Preschool Treatment

- Improve Monocular Skills (Saccades/Pursuits)
  - Bead Stringing
  - Dot to dot
  - Color
  - Puzzles
  - Toy water gun with targets
  - “capture” raisins
  - Pound nails
  - Puzzles
  - Games
    - Operation (4+) by Hasbro
    - Hungry Hungry Hippos

Esotropia – Preschool Treatment

- Improve Monocular Skills (Saccades/Pursuits)
  - Wayne Saccadic Fixator
  - Pegboard Rotator
  - Michigan Tracking/Happy Face Tracking
  - Groffman Tracing

Esotropia – Preschool Treatment

- MFBF
  - Non-dominant eye sees central, dominant sees periphery
  - Bridge to binocular
  - “TV” Trainer one color
  - Sherman cards
    - Amblyopic eye
  - Tracing
Esotropia – Preschool Treatment

- Biocular
  - Red/Green toys
  - “TV” Trainer red/green
  - “Press Lights”
    - OVP 2013;1:62-7

Case

- 2 year old male
  - S/P astrocytoma resection
    - Complications after 1st surgery
      - hemorrhage, fungal infection, hydrocephalus
    - 2 Additional surgeries (15, 16 months after 1st)
  - OS turn in after treatment 50% of the time
  - OMD said patient needs surgery

Exam OMD #2

- CSM OD, OS
- Stereo: “grabbed at butterfly”
- EOMs: 100A OU
- Cyclo +2.00+0.5x180 OU
- CT: Distance 35 ET, Near 20 ET'
  - V Pattern: 35 ET downgaze, otho up
  - Bilateral CNIV Palsies (LHT right gaze, RHT left gaze?)
  - Chin down posture
- Observe (for now – surgery likely)
Follow up 3 months

- VA Allen: 20/50 OD, 20/60 OS
- Stereo: “Did not grab for fly”
- EOMs: IOOA OU
- DCT: 20 ET, NCT 16 ET’
  - V Pattern: 35 ET’ down, 14ET’ up
  - Bilateral CNIV Palsies (LHT right gaze, RHT left gaze?)
  - Chin down posture
- “Recommend surgery BMR Recession with downward transpositions and Bilateral inferior oblique myectomy”
  - 4 muscles!

Fourth Opinion – O.D.

- 3 months after MD visit
- VA 20/40 each eye
- Cover Test: Distance 16 AET, Near 14 AET’
  - Upgaze 14 AET’, Downgaze 20 AET’
- Stereopsis: No Lang, 1/3 animals

Fourth Opinion – O.D.

- Mom admits she does not want child to have surgery
- What happened?
  - Saw Dr. M
  - Glasses Rx +1.25 OU with prism
  - Doing exercises twice daily – following targets in periphery, placing holes in paper
22 Months Later
- VA 20/20 - each eye
- Stereo 3/3 animals, 3/9 circles
- Cover Test: Ortho distance, 8 AE(T)'

Esotropia Therapy
- Accommodative therapy
  - Loosen accommodative system
  - Increase flexibility
- Peripheral awareness
  - Look hard/look soft
  - Binasal occlusion
- Gross targets
- Vectograms with transparency

Esotropia Therapy
- Worth/British Model
- Monocular skills
  - Improvement in VA
  - Calisthenics
  - BI prisms
- MFBF
Esotropia Therapy

- Biocular/Simultaneous Perception
  - Equal stimulation to both eyes
  - Red green glasses
  - Vectograms
    - Right Clown/Left Spirangle
- 2 Tubes
- Synoptophore

Esotropia Therapy

- 2nd Degree Fusion
  - Synoptophore at objective angle (easier)
    - BO first
  - Centration point
    - Brock string

Early Onset Non-Accommodative Esotropia

- Onset 6 mos – 2 years
- Findings similar to infantile esotropia
- Magnitude: 30-70Δ
  - Similar distance and near
  - No significant hyperopic refractive error
- Better prognosis for binocular vision development than infantile
- Relationship with ocular disease
  - Retinoblastoma 11%
Acute Onset Non-Accommodative Esotropia

- Patient with previously normal binocular vision
- Deviation: moderate to large esotropia
- No signs of EOM paresis
- Diplopia
  - May cover one eye

Acute Onset Non-Accommodative Esotropia

  - 10 patients in 40 months
    - Average age 5 (3.5-24)
    - 1/10 cerebellar tumor
      - Rx?
    - 9/9 hyperopic
      - 5/9 Rx restored fusion
      - 6/9 surgery
  - Risk

Cyclic Esotropia

- Ages 2-6
- Cycles of esotropia alternating with orthophoria
  - 24-48 hours
- May have uncorrected hyperopia
- May have association with neurological problems
  - Seizures
  - Astrocytoma
- Can become constant over time
Case

- 6 year old male referred by PCP for “strabismus”
  - 5 months earlier mom noticed patient started closing OD and complaining of blurry vision
  - 5 months earlier OD turned in
  - Worse when tired

Case

- Medical history:
  - Posterior fossa ependymoma diagnosed at age 1
    - Surgical resection & radiation
  - Age 3 tumor recurrence
    - Repeat surgery & radiation
  - Age 5 tumor recurrence
    - Repeat surgery but no tumor (radiation necrosis)
  - Started on chemotherapy 5 months earlier
  - Meds: celecoxib (Celebrex), lansoprazole (Prevacid), Etoposide, Dexamethasone 0.5mg

Ependymoma

- Arise along ventricles
  - 60% infratentorial (posterior fossa)
  - Roof, floor or lateral 4th ventricle
### Initial Exam by Pediatric OMD

- VA 20/25 each eye
- Cover Test
  - 50 prism diopters distance and near
- Stereopsis: none
- EOMs: fast, upbeat vertical nystagmus
- Cycloplegic: +0.25 OU
- PERRL (‐) RAPD
- Optic nerves healthy
- Refer for VT

### Exam by OD

- Additional history
  - Eye turn most noticeable when on etoposide (day 7/21)
- DCT: RE(T) ortho to 40
- NCT: RE(T)' ortho to 50
  - No change +3.00
- Ret: +0.25
- MEM over +0.25 = +1.00 OU

### Treatment?

- None
- Surgery?
- Glasses – what?
- Vision Therapy?
- Combination?
- Other variable
Treatment

• +1.00 for near
• Patch OS 2 hours day
• Eye stretches – abduction work
• Work on localization when abduction
  • Finger touch
  • Pop bubbles
  • Lego®

Follow up – 2 months later

• DCT ortho to 25 RE(T)
• NCT ortho to 30 RE(T)
• Worth 4 Dot
  • OS suppression distance and near
• Additional treatment
  • Bi-nasals

Follow up 4 months later

• Cover test stable
• Fresnel prisms
  • 15 base out OD
  • Reduced ET to 8Δ distance and near
• Treatment
  • Continue
  • Mom offered to videotape eye turn
Comment

- Home therapy can be an option if no providers
- Diagnosis should not be a reason to avoid treatment

Acute Onset Non-Accommodative Esotropia

- Divergence Insufficiency
  - Eso distance > near
  - $10 + \Delta$ difference distance and near
  - Rx: Normal
  - Amblyopia uncommon
  - Suppression uncommon
  - AC uncommon
  - Diplopia at distance and worse towards the affected eye
  - THINK NEUROLOGICAL CAUSE!

Divergence Insufficiency v. Paralysis

<table>
<thead>
<tr>
<th>Insufficiency</th>
<th>Paralysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eso distance &gt; near</td>
<td>Eso distance &gt; near</td>
</tr>
<tr>
<td>Comitant</td>
<td>Comitant</td>
</tr>
<tr>
<td>Gradual onset of diplopia (mild)</td>
<td>Sudden onset of diplopia (marked)</td>
</tr>
<tr>
<td>Diplopia worse when tired</td>
<td>Small range of single</td>
</tr>
<tr>
<td>Large range of single</td>
<td>Neurological signs</td>
</tr>
<tr>
<td>Decreased negative fusional vergence</td>
<td>May have “A” pattern: more eso upgaze</td>
</tr>
</tbody>
</table>
Acute Onset Non-Accommodative Esotropia - Treatment

- Hyperopic Rx if no neurological signs
  - Follow up 2 months
- Consider MRI of brain
- Prism for fusion – if able
- Vision Therapy
  - Stereopsis
  - Anti-suppression
- Surgery
  - If stable for 6 months
  - Deviation > 15-20Δ

Case

- 16 year old F blurry vision OD and diplopia
- LEE 1 year ago
- VA 20/30 OD, 20/20 OS
- DCT 8CRET NCT 8-10CRET’t
- EOMs full
- No stereopsis
- Ret +0.50-1.75x180 20/25 OD +0.25 OS
- Refer for VT

Case – Exam 1 year ago

- Cover test: Ortho distance and near
- Stereopsis 100” sc
- Stereopsis 30” cc
Case

- Order MRI of brain
  - Ovoid Lesion within sella turcica
  - Measures 8x7.4x6.4mm
  - ? Rathke cleft

www.radiopedia.com

Case

  - When I saw him several days ago I thought eyes wiggled and told him to rest his eyes. It helped some”
  - Complains of double vision x few weeks, worse at distance. Notes OD turns in. Mild headache x 2 weeks alleviated with ibuprofen

Case

- Vision 20/20 each eye
  - PERRL (-) RAPD
  - Visual fields: Full to finger count
  - Motility: bilateral abduction deficit (-1/2)
  - Cover Test
Case

- Stereopsis: All shapes (250")
- Worth 4 Dot: Uncrossed diplopia D & N
- Single Vision
  - Near 18 BO
  - Distance 30 BO
- Refraction
  - -7.00 OU 20/20 OD/OS
- Dilation
  - Healthy optic nerves (+) SVP
- Plan: MRI brain

Case

- Abnormal enhancement of right CNVI suggesting inflammatory neuritis

Case

- Follow up 2 months later
  - VA 20/20 each eye
  - Cover Test
    - Distance RET 35
    - Near RET 30
  - Stereopsis: none
  - Unable to fuse prism
- Plan
  - Consult with MD
  - Neurology referral
  - Abduction work & patch when reading
Case

- Follow up 6 months later
  - Did not see neurology
  - Headaches no change
  - No double vision – closes 1 eye when reading
  - VA 20/20 each eye
  - Color 17/17 each eye
  - Cover Test/Maddox Rod

CN VI Palsy

Etiology of Cranial Nerve VI Palsy

- Adults
  - Undetermined 26-30%
  - Vascular 13-35%
  - Trauma 12-17%
  - MS 4-7%
  - Neoplasm 5-21%
  - Aneurysm 2-4%
  - R/O GCA

- Children
  - Neoplasm 19-39%
  - Trauma 10-34%
  - Congenital 5-12%
  - Inflammatory/Infectious 6-13%
  - Increased ICP 2-23%
  - Undetermined 5-15%
Vertical Strabismus

- Examination
  - Observe habitual head posture
  - Cover Test with head aligned

CN IV Testing

- Parks 3 Step
  - What eye hyper in primary gaze?
  - What eye hyper in right or left gaze?
  - What eye hyper with right or left head tilt?
  - Cover Test/Maddox Rod/Red Lens

CN IV Palsy

- Hyperdeviation greater on contralateral gaze and ipsilateral head tilt
- Patient will tilt head to contralateral side
- Excyclotorsion
- Complaint
  - Congenital
    - Photo review (FAT Scan)
    - Increased vertical fusion ranges (10-15 prism diopters)
Case

- 3.5 year old Black Male
- Droopy left eye with head tilt x 10 days
- Mom noted droopy right eye lid 3 months ago
  - Evaluation by pediatrician

Exam

- VA 20/30 each eye (Pics)
  - Cyclo Ret: +1.50-1.00x180 OU
- 10 prism diopter right hyper
  - Worse in left gaze
  - Worse with right head tilt
- 5 mm left ptosis
- Dilation unremarkable

Parks 3 Step

- RSR RIR LIO LSR
- RIR RSO LSO LIR
Differentials

- Congenital CN IV Palsy?
- Acquired CN IV Palsy?
  - If lesion at brainstem; can get SO palsy with contralateral Horner’s
  - Testing
    - MRI
    - No lesions found

Differentials

- Myasthenia Gravis
  - Variable ptosis
  - Strabismus
- Ice Pack Test
  - Improvement in Ptosis

Etiology of Cranial Nerve IV

- Adults
  - Congenital 38%
  - Trauma 29-35%
  - Idiopathic 8-32%
  - Vasculopathic 18-23%
  - Neoplasm 5%
  - Aneurysm 1%
- Children
  - Congenital 65-84%
  - Trauma 8-30%
  - Other 8%
Treatment of Vertical Deviations

- Prism
  - Base down on hyper eye
  - 10 or less
  - Split between eyes
- Surgery > 15Δ
- Vision Therapy

Conclusions

- “Functional Strabismus” as a diagnosis of exclusion
  - Not really....
- Be aware of treatment options to better inform patients
  - Chiropractor’s daughters
    - “Achieving Wellness Naturally”
- People, not eyeballs

Conclusion

- We are COVD
  - DEVELOPMENT
  - Early intervention = Better outcomes
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