Objectives

- Adults with Small Angle ET Case
- Therapy used for Improving Functional Vision
- Patient’s perspective of gaining 3D vision
John 28 yo – March 2013

CC: Wants to be a police officer, but failed visual requirement 3 years ago and really wants to re-apply.

Vision Standards

<table>
<thead>
<tr>
<th>Classification</th>
<th>Standard</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncorrected VA</td>
<td>20/40 OU</td>
<td>Less than +2.00D spherical equiv</td>
</tr>
<tr>
<td>BCVA</td>
<td>20/20 OU</td>
<td></td>
</tr>
<tr>
<td>Colour Vision</td>
<td>Normal Colour Vision on Ishihara/ D15</td>
<td></td>
</tr>
<tr>
<td>Stereoacuity</td>
<td>80&quot;</td>
<td></td>
</tr>
<tr>
<td>Distance Phoria</td>
<td>5 eso – 5 exo</td>
<td></td>
</tr>
<tr>
<td>Near Phoria</td>
<td>6 eso – 10 exo</td>
<td></td>
</tr>
</tbody>
</table>
How are standards chosen?

License Plate
- 20/40 unidentifiable > 3 car lengths

Facial Recognition
- 20/40 = questionable identification

Shoot-No-Shoot Decisions
- ↑Errors > 20/40
- 80% of shooting incidents w/n 20 ft
- Detection ↑with use of two vs one eye

Literature suggests 20/40 – 20/20 vision required
↓VA = less accurate and slower responses

John’s Ocular History

- Infantile Esotropia
Infantile vs Accommodative ET

**Presents < 1 year**
- Risks factors: Genetics, Prematurity, Peri-natal complications, developmental delay, CP
- Treatment: EOM Surgery, Botox, VT?

**Presents 2.5 yrs**
- Causation: High refractive error
  - High AC/A
- Treatment: Glasses
  - **No Tx increased risk of non-accommodative component**

VT for Infantile Esotropia?

← Centration Point
Prescribing Accommodative ET

- Rx *least* amount of plus to get them ortho
- Cyclo – wait full 40 minutes
- Cover Test with TF and Ranges

John’s Ocular History

- Infantile Esotropia
- **Bilateral Strab Surgery** (age 1)
- No hx of patching
- Glasses since age 4 yo
Long Term Outcome of Strab Sx

Any type of Strab
- 20-30% of those undergoing strab sx will require a 2\textsuperscript{nd} surgery and of these, another 20-30% may need a 3\textsuperscript{rd} surgery

Strab Sx for Older Pt
- N= 17, 8yo+
  - All had monocular response to Bagolini lenses,
  - Post-op 88% had central suppression with Bagolini lenses
  - All 17 had no sensory fusion, either preoperatively or postoperatively on W4D or synoptophore, and no stereopsis with the Titmus stereo test.

Strab Sx for Older Pt

- Kim S et al.
  - n = 43, 18yo +
  - Strab > 10 yrs without prior sx
  - Improvement seen in 80% exotropes, 30% esotropes
  - Improvement = ~450+/−815 seconds of arc (sec) in exotropes and 1000+/−1337 sec in esotropes

Core defect in consec XT

- Usually medial rectus underaction
- $R_x$: Have to make MR function normal [or near-normal] for satisfactory long term result

The Number of Placebo Controlled, Double Blind, Prospective, and Randomized Strabismus Surgery Outcome Clinical Trials: None!

Dominick M. Maino, OD, MEd, FAAO, FCVD-A

Keywords: double blind, clinical trials, placebo controlled, surgical, strabismus surgery outcomes.

Recently, a colleague of mine asked if I knew of any placebo controlled, double blind, prospective and randomized strabismus surgery outcome clinical trials (RCT). Are there one or more clinical trials that note the efficacy of strabismus surgery? This is an important question to ask for several reasons. One reason is that allopathic medicine continues to insist that optometry must have clinical trials completed before we can conduct optometric vision therapy for our patients with binocular vision anomalies and/or learning related vision problems. The second reason is that if our ophthalmology (OMD) colleagues require us to have such evidence based treatment, then it must follow that they have many such clinical trials to support the surgical intervention of a child with strabismus and that these clinical trials reflect the highest level of evidence based medicine. Finally, the most important reason is that if we refer a patient for surgical intervention, it would be most appropriate to have evidence based research supporting this surgical intervention.

Unfortunately when my colleague asked me about supporting clinical trials for the efficacy of strabismus surgery, I had to tell him that I did not know of any clinical trials offhand, but would see what I could find out. I then went to PubMed and conducted a literature search for placebo controlled, double blind, prospective and randomized strabismus surgery outcome clinical trials and found none! I did find articles about globe perforation during strabismus surgery, strabismus surgery for
So what is the best age?

- Patching until equal VA OU
- VT
  - Maturity
  - Cooperation
  - Parents’ Support

Prognosis Factors?

- Prognosis Factors
  - Correspondence
  - Direction
  - Frequency
  - Magnitude
Prognostic Factors

• Age?
  • Well-known case: Sue Barry, a neuroscientist who developed stereopsis through vision therapy in her 50s
  • She describes from a patient’s perspective what it feels like when she gained 3D vision.

TEDxPioneerValley - Sue Barry - Fixing My Gaze
https://www.youtube.com/watch?v=XXCtphdXhq8

Back to John’s Visual Findings

Uncorrected
  • VA 20/20 D&N
Refraction
  • OD +2.00ds
  • OS +2.00ds
Cover Test
  • D: 2-4 pd CRET
  • N: 6 pd CRET

Stereoacuity
  • Near: None
  • Distance= 200”
Police Stereo Requirements

RCMP - 100"
British Columbia - no std
Alberta - 80"
Calgary - 80"
Saskatchewan - normal BV
Manitoba - 70"
Ontario - 80"
Quebec - 100"
Montreal - no std
PEI - 70"
New Brunswick - 70"
Nova Scotia - normal BV
Newfoundland - 70"

Stereo and Job Performance

- “Little evidence that stereoacuity measurements with standard office tests of stereopsis give a true and complete indication of depth perception ability for a given task.”
- “…because stereoacuity tests, in their quest to only measure stereoacuity, attempt to eliminate other depth cues such as monocular cues that are present in real-life situations.”

http://www.science.uwaterloo.ca/~a2hill/AdamHill-PoliceStandards.pdf

Long, J, Siu C. 2005
http://www.scientificamerican.com/article/seeing-is-believing-aug-08/
Depth Perception ≠ Stereopsis

- Monocular Cues
  - Colour, texture, size, overlap etc

- Binocular Cues
  - Retinal Disparity and Convergence

John’s Visual Findings Continued

Fusional Ranges
- BI Distance: OD supp
- BO Distance: OD supp
- BI near: OD supp
- BO near: x/18/10

Acc’d Facility
- BAF w/ supp: 8cpm
- MAR OD 11 cpm, OS 16cpm

Amps
- OD 7.75D OS 8.75D
  Min amps for age 8D
Stereoacuity Goals?

Normal subjects can detect up to 2-10 sec of arc.

Microstrabs

- Motor fusion amplitudes can be normalized
- NRC with peripheral binocular stimuli and ARC with central fusion stimuli.
- Can get local stereoacuity (Wirt Circles) ~80"
- Will not get global (RDS) stereoacuity

http://www.iovs.org/content/44/10/4293.long
Vision Therapy
Perceptual Learning

- **Perceptual learning** is the process of learning improved skills of perception
- Dennis Levi from Berkley
  - 2011 Charles F Prentice Medal ; Am Academy of Opt
  - Stereoblind or stereoanomalous recovered stereopsis
  - Positive subjective improvement in activities of daily living and sports


Dpmt of Ophthalmology, Dr. R.F. Hess


<table>
<thead>
<tr>
<th></th>
<th>April 2013</th>
<th>June 2013</th>
<th>August 2013</th>
<th>November 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodative Training</td>
<td>MAR +/- 1.00 D</td>
<td>MAR +/- 2.00 D</td>
<td>BAR +/- 1.50</td>
<td>BAR +/- 2.00</td>
</tr>
<tr>
<td>Anti-suppression</td>
<td>Suppression at 3 ft</td>
<td>Suppression at 5-6 ft</td>
<td>No Suppression</td>
<td>No Suppression</td>
</tr>
<tr>
<td>Brock String</td>
<td>Having troubles keeping X on bead</td>
<td>Can hold X for ~5-9 see before losing a string; brings X back with occlusion</td>
<td>Can bring X back without occlusion</td>
<td>Working on jump ductions</td>
</tr>
<tr>
<td>BI Fusional Range</td>
<td>OD sup.</td>
<td>x/5/4</td>
<td>x/10/7</td>
<td>x/21/18</td>
</tr>
<tr>
<td>Vectograms (BI)</td>
<td>Rope - P R&amp;L Flickers</td>
<td>Clown - P R&amp;L Flickers</td>
<td>Spirangle – M Less Flickering</td>
<td>Mother Goose – M or P</td>
</tr>
<tr>
<td></td>
<td>Cannot appreciate float or SILO</td>
<td>Cannot appreciate float or SILO</td>
<td>Less Flickering</td>
<td>Now trying with +/- 1.00D</td>
</tr>
<tr>
<td>Stereoacuity</td>
<td>None</td>
<td>200”</td>
<td>140”</td>
<td>80”</td>
</tr>
</tbody>
</table>


John’s Progress

- Near Stereoacuity
  - March – None
  - June – 200”
  - August – 140”
  - Nov – 80”

- Maintenance therapy
  - Brock String
  - Vectogram
  - +/-1.50 Word Rock with RG bar readers
What is it like to gain 3D vision

- Immersed in a volume of space
- Even photographs (2D) have more depth
- Heighted awareness of other senses
What makes a good candidate?

- Drive
- Hard Working
- Self Awareness
- Right Training

Conclusion

- Small-Angle Esotropes can develop stereopsis through vision therapy
- Age is not a limiting factor
- Although patients with reduced stereopsis can appreciate depth perception, it is not to the same extent.
- Gaining stereo vision improves quality of life
Locating a Developmental Optometrist

www.covd.org  -> Locate a Doctor

Feel free to contact me at dr.luk@browzeyeware.com
www.visiontherapycalgary.com