Objectives
- Review diagnosis of common nearpoint vergence disorders
- Explain how to use added plus lenses and prisms to manage some of these conditions
- Review research on efficacy of treatment
- Explain how to prescribe VT for these disorders

Overview of Nearpoint Vergence Disorders
- Prevalence
  - ~14% of children (Scheiman et al., 1996)
  - ~10% of university students (Porcar & Martinez-Palomera, 1997)
  - Convergence excess more common than convergence insufficiency

General symptoms common to vergence disorders
(Barnhardt et al., OVS 2012)
- Loss of place when reading/having to re-read
- Loss of concentration/sleepiness when reading
- Blurred or double vision
- Eyestrain and/or headache with visual tasks
- Words appearing to move on page
- These symptoms had prevalence of 20-50% in CI

Main Types of Nearpoint Vergence Disorders
- Convergence excess (CE)
- Examination findings through refractive correction:
  - Nearpoint esophoria
  - High AC/A ratio
  - Reduced divergence range at near
  - Difficulty w/ -2.00 D. lenses on binocular lens flippers
  - PRA lower than -1.50
Convergence excess
- Differential diagnosis:
  - Ocular inflammation
  - Sympathetic paralysis
  - Syphilis
  - Drug-induced accommodative/convergence spasm

Convergence insufficiency (CI)
- Examination findings through refractive correction:
  - Receded NPC – often more receded w/ red lens vs accommodative target (Pang et al., 2010)
  - Exophoria at near at least 4Δ greater than at far
  - Reduced fusional convergence range/ failure to meet Sheard’s criterion
  - Difficulty w/ +2.00 D. lenses on binocular lens flippers
  - NRA lower than +1.50

Convergence insufficiency
- Differential diagnosis:
  - Ischemic infarction
  - Viral infection
  - Parkinson’s disease
  - Parinaud syndrome
  - Multiple sclerosis
  - Myasthenia gravis
  - Prior strabismus surgery

Fusional vergence dysfunction
- Examination findings through refractive correction:
  - Normal near phoria
  - Receded NPC
  - Reduced convergence & divergence ranges
  - Difficulty w/ both +2.00 and -2.00 lenses on binocular lens flippers
  - PRA lower than -1.50 and NRA lower than +1.50

Fusional vergence dysfunction
- Differential diagnosis:
  - Systemic disease or medications causing weakness

Management of Nearpoint Vergence Disorders

Management of Nearpoint Vergence Disorders – Convergence Excess
Lenses for CE

- Give appropriate distance Rx with added plus for near (single vision or multifocal)
  - Add for long-term use or possibly discontinue after VT
  - Attempt to eliminate near esophoria with added plus
    - Near phoria + gradient AC/A gives a starting point
  - Try to balance the NRA and PRA
    - \( \text{(NRA + PRA)} + 2 \)

Vision therapy for CE - Efficacy

- Gallaway & Scheiman (JAOA 1997)
  - 83 CE patients ages 7-32 years (mean 11.8 years)
  - 84% reported total relief of symptoms
  - Significant improvements in divergence ranges following VT
- Daum (AJPO 1982 and 1986)
  - Divergence can be significantly improved with VT
  - VT is intended to improve divergence amplitudes and reduce symptoms, not eliminate esophoria.

Vision therapy for CE

- Expected treatment time: 12-15 weekly office visits
- Prescribe 15-20 minutes/day home VT
- Work on 3-4 techniques during office visits
- Prescribe 2-3 of these techniques daily at home
- More VT needed if there are concurrent oculomotor or accommodative problems

Management of Nearpoint Vergence Disorders – Convergence Insufficiency

Lenses for CI

- Give appropriate distance Rx
- Added plus lenses usually not accepted well for near, if true CI

Base-in Prism for CI

- Consider for children only if VT is not a good option
- Prism may be useful in presbyopic patients with CI (Teitelbaum et al., OVS 2009)
  - Sheard's formula:
    \( \text{BI } \Delta = \frac{\text{(exophoria}}{2} - \text{BO range to blur}}{3} \)
  - Consider prescribing the horizontal associated phoria value for near (fixation disparity neutralization)
Vision therapy for CI - Efficacy
- CITT (Arch Ophthalmol 2008)
  - 221 children ages 9-17
  - Treated with 12 weeks of office-based VT
  - 73% showed decreased symptoms and improved convergence skills
- CITT 12-month follow-up (OVS 2009)
  - 84% of office-based VT group remained asymptomatic

Improved academic behaviors (OVS 2012)
- Correlate with successful VT for CI
- VT is intended to improve amplitude and speed of convergence long-term, and to reduce symptoms.

Vision therapy for CI
- Treatment of choice
- Expected treatment time: 12-15 weekly office visits
  - More VT needed if there are concurrent oculomotor or accommodative problems
  - Prescribe 15-20 minutes/day home VT

Management of Vergence Disorders – Fusional Vergence Dysfunction

Lenses for vergence dysfunction
- Prescribe the appropriate distance lens prescription
- Added plus lenses may not be accepted for near work
- Prism is not indicated due to normal phorias

VT for vergence dysfunction
- Treatment of choice
- VT is intended to improve amplitude and speed of both convergence and divergence, reduce symptoms and improve visual efficiency long-term.
- Expected treatment time: 12-15 weekly office visits plus 15-20 minutes/day home VT for isolated fusional vergence dysfunction
Typical VT sequence for vergence disorders

- Monocular accommodation (& oculomotor) skills
- Gross vergence/physiological diplopia
- Fusional vergence
  - Smooth
  - Jump
- Binocular accommodation
- Integration/loading of procedures
- Maintenance

Accommodative VT

Gross vergence/physiological diplopia VT

- Brock string activity progression
  - Single bead push-up (or push-away)
  - Multiple bead jumps
  - "Bug on string" – voluntary vergence

Fusional vergence VT

- Accommodation ideally remains on the target plane while patient convergences or divergences
- Improve smooth ranges before emphasizing jumps
Fusional vergence VT

- Practice combining techniques to make them more automatic
  - Vergence
  - Accommodation
  - Pursuits
  - Saccades
  - Gross motor

Integration VT

- Control lenses for exam: none
- CT: ortho at far, 12° exophoria at near
- Gradient AC/A: 3/1
- NPC: 3/9 cm, repeated 9/15 cm
- Stereo: 20'', (+) forms
- Prism bar vergences: BI 14/20/8, BO x/14/0 at near
- Minus lens amplitudes: 10.75 OD, 11.50 OS
- NRA: +2.75, PRA: -1.50
- Acc. facility: 15 cpm OD, 12 OS, 5.5 OU
- MEM: A/R cylinder unaided, +0.75 sph. OU aided
- Developmental Eye Movement test: high vertical & horizontal times, ratio, and errors

Patient FM: 10 y.o. female

- Referred for VT with diagnosis of CI
- Poor performance in reading with A’s in math
- Notes headaches, tearing, diplopia and thus is avoiding near work
- Recent Rx: +0.75 -0.75 x 090 OU (20/20 far, near)
- Ocular health: normal

- Diagnosis:
  Saccadic dysfunction
  Convergence insufficiency

- Treatment:
  Continue current Rx for school/close work
  Begin VT

Saccadic VT:
- Hart chart saccades (all variations)
- Sanet Vision Integrator saccades
- Ann Arbor letter tracking

Vergence VT (BO, BI, smooth & jump):
- Pencil push-up, Brock string, Barrel card
- Vectograms, Computer vergences, Eccentric circles, Lifesaver card, Aperture rule

Integration VT:
- Binocular lens flippers, BIM/BOP
- Lifesaver card with pursuit movements

Maintenance: Letter tracking, Lifesaver card
Patient FM: Results

- Patient attended 12 office VT visits over 4 months
- Excellent compliance with home VT
- Improved comfort: no symptoms with close work
- Improved grades in reading
- CT: ortho at far, 2^e esophoria at near
- NPC: to nose, repeatedly
- Stereo: ±20°, (+) forms
- Prism bar vergences: BI x/14/6, BO x/35/20 at near
- DEM: slightly slow, but normal ratio and errors

Thank you!

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