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James Kundart, OD, MEd, FAAO FCOVD-A (kundart@pacificu.edu)

The author has no financial interest in any of the products herein.

Prisms and Palsies: Lessons from the 3D Vision Clinic
James Kundart OD MEd FAAO FCOVD-A
Associate Professor
Pacific University College of Optometry

Learning Objectives
○ To reveal when CI is really a subtle CN III palsy, best treated with BI prism
○ To discuss when DI is really due to CN VI
○ To show when vertigo and CN IV go together
○ To define associated phorometry and binocular subtraction

When Needed, Why Not Prescribe Press-on Prism?
○ Fresnel prism is great for large (>10^) angles and acute-onset diplopia
○ However, we all know they degrade acuity, often 4 lines or more
Diplopia, on the other hand, is very forgiving of blur, up to 20/400

5 Clinical Pearls for Prism Prescribing
1. Prescribe prism from the red lens test
2. Only prescribe prism for symptomatic patients
3. Prism adaptation frequently occurs in asymptomatic patients, and rarely otherwise

6 Conditions for Which Prism is Appropriate
1. Convergence Insufficiency
2. Divergence Insufficiency
3. Basic Esophoria
4. Basic Exophoria
5. Vertical Heterophoria
6. Binocular blur (subtraction)

7 How NOT to Prescribe Prism

8 Prescribing Prism with Red Lens: Associated Phorometry, Step 1
   1. The first step is red lens testing to attempt to measure the diplopia, if any
   2. If you want to prescribe from your measurements, use filters, such as:
      1. Red lens only
      2. Red-green anaglyphs
      3. Red-blue anaglyphs
      4. Polaroids

9 Associated Phorometry Targets (at far and near)

10 Associated Phorometry, Step 2
   1. The second step is find the midpoint of the horizontal or vertical breaks, sometimes both
This works even if the patient is not diplopic on step one
When you get to the midpoint, you might see performance change
We check for changes in stereopsis, such as this Lea stereo-target at far

11 **Associated Phorometry, Step 3**
- Third, perform forced-choice prism testing
  - I do horizontal, then vertical, then horizontal again at each working distance
  - Note that unlike vergence ranges, this defaults to 1° steps
- Use threshold Snellen letters instead of a light as a target

12 **What if Patients Suppress?**
- If the patient has diplopia, keep looking until you find out why!
- Turn down the room lights
- Use red/green instead of just red
- Alternately occlude
- Flicker your penlight

13 **For Those Who Use Risley Prism**
- There is no easy way to use forced choice to subjectively refine prism in a manual phoropter –why?
- Risley prisms don’t have discrete stops
- Without a digital phoropter, the best I’ve been able to do is use a prism bar

14 **Fine-Tuning With a Prism Bar**
- Even with a digital phoropter, I like to use prism bars to check my Rx
- I keep the Snellen letter target, and let the patient do the driving this time
- Orient the bases of the prism bars first

15 **Associated Phorometry**
Case Examples
1. Vertical Deviations
2. Exo- Deviations
3. Eso- Deviations
4. Combination cases

16 1. Vertical Deviations
- Trochlear nerve palsies are the most common congenital palsy, but also easily acquired in even mild head trauma
- I have found that this is most common reason that depth perception is lost
- These patients often present with the chief complaint of motion sickness

17 Motion Sickness?
Think Vertical!

18 Fourth Nerve (Trochlear) Palsy
- The trochlear nerve controls the SO muscle which is the primary intorter of the eye
- Because of the long, tortuous route of the fourth nerve over the sella turcica, it is highly susceptible to trauma
- It is also the most common congenital eye muscle nerve palsy (75% of the cases)
- All vertical deviations are due to superior oblique palsy until proven otherwise!

19 Trochlear Nucleus (#2 in photo)
1. Oculomotor (III) nucleus
2. Trochlear (IV) nucleus
3. Pons
4. Fourth ventricle
5. Abducens (VI) nucleus
6. Vestibular nucleus
7. Medial longitudinal fasciculus

20 The FAT Scan:
“Family Album Tomography”

21 **FAT Scan:**
“Family Album Tomography”

22 **Causes of Trochlear (CN IV) Paresis**

- Most undetermined ones are presumed congenital.
  Source: L. Rutstein & Daum, figure 10-21

23 **DDx: Trochlear Palsy (left) vs. Skew Deviation (right)**

24 **Vertical Deviation Case #1**

- 36 YOF, computer engineer
- Can’t read on MAX train, but would prefer to take it to work rather than drive downtown
- Low myopia
- 1Δ right vertical deviation (up)
- Confirm with head turn and head tilt tests

25 **Head Turn and Head Tilt Tests for Trochlear Nerve Palsy OS**

26 **Vertical Deviation Case #2**

- 55 YOF, motion sickness when whale watching, no depth perception when parallel parking
- Duration: lifelong
- Habitual head tilt to left shoulder
- Rx: Low farsightedness, moderate bifocal power, and very small vertical deviation (0.50Δ BD OD)

27 **Vertical Deviation Case #3**

- 36 YO, Flute Player
- Sees double when reading x 15 years
- “Worst it has ever been”
(+)+Hx Carpal Tunnel Syndrome
4D myopia, moderate astigmatism
Dx: 5Δ vertical deviation, prism split between eyes, up to 6-7Δ one year later

28 Vertical Deviation Case #4
This patient sees double, right image large, fuzzy, up and to the left
Getting worse, wears glasses maladjusted
Can cross eyes to bring them together horizontally, not vertically
(+)+ Hx of Scoliosis and plantar fasciitis, (+) FHx stroke (mother)
Rx: Horizontal and vertical prism (5Δ BI and 3Δ BU OD) at near, with more (5Δ) vertical at far

29 2. Symptomatic Exo- Deviations
“The use of acrylic refractive prism shared evenly on each eye would be optimal method to minimize the reduction of stereoacuity during the prismatic therapy for intermittent exotropia.”

30 The Third Nerve Nucleus

31 Causes of Nuclear CN III Palsy

32 Causes of Nuclear CN III Palsy
Rutstein & Daum, figure 10-14

33 DDx of Nuclear CN III Palsies

34 The Third Nerve Fascicle
35 □ Etiology of Fasicular CN III Palsy

36 □ Syndromes of the Oculomotor Nerve Fascicle
- Weber Syndrome is ipsilateral third nerve palsy plus contralateral facial hemiparesis, including lower face and tongue
- Claude Syndrome is third nerve palsy, contralateral cerebellar ataxia due to involvement of the superior cerebellar peduncle, plus contralateral tremor due to involvement of the red nucleus
- Four videos of Claude Syndrome follow

37 □ Claude Syndrome in 54 YOM

38 □ Claude Syndrome

39 □ Exo- Deviation Case #1
- 46 YOM, physical therapist
- Wants to be police reservist, needs better stereo-
- Dx: Partial oculomotor nerve palsy in right eye
- Modestly improved (~100") stereopsis with small vertical and horizontal prisms (1Δ BD OS and 2Δ BI)

40 □ Exo- Deviation Case #2
- 83 YO, closing left eye to drive, read x 2 years
- Had cataract surgery in 2003 with implanted lenses to allow the right eye to see close without glasses
- Dx: Presumed mild oculomotor palsy in right eye, caused by anesthetic injection
- Rx: Mild horizontal and vertical prism (4Δ BI and 1Δ BU OD)

41 □ 3. Symptomatic Eso- Deviations
- When symptomatic, crossed eyes at far and near is easy to treat with prism because patients can wear prism at all distances
The most common result of CN VI palsy is divergence insufficiency (DI)

42 Traumatic Abducens (CN VI) Paresis

43 The Sixth Nerve and Beyond

44 Causes of Sixth Nerve Paresis

45 Why You Must Dilate Patients with DI

46 CN VI Paresis and Methadone

47 Eso- Deviation Case #1

48 Eso- Deviation Case #2
Eso- Deviation Case #3

56 YOF, reading books is nearly impossible
Works on a computer all day (12+ hours)
Lazy right eye since childhood, acuities 20/25 in right eye
Only needs glasses for reading, but has small vertical deviation along with crossed eyes (3Δ Hyper OS, 2Δ BO)
Baha Implant in left ear (shown here), preceded the nerve palsy

Eso- Deviation Case #4

54 YOF, sees 20/60 in right eye with strong farsighted prescription (+7D SE) and 20/40 in the left with moderate Rx (+4.50 SE)
Blur when driving, turns head to read in bed with no-line bifocals
Contact lenses relieve it
Rx weak vertical and strong base out prism (2Δ BD OD, 10Δ BO) gives patient proper depth perception out the window

Take-Home Pearls

THANK YOU!
Contact information:

James Kundart OD
Director, 3D Performance Service, Pacific Eye Clinic, Beaverton
Associate Professor
Pacific University
College of Optometry
kundart@pacificu.edu