OVERVIEW OF TODAY’S LECTURE:
- Diagnosis of Normal AC/A Conditions
  - Fusional Vergence Dysfunction
    - General Information
    - Symptoms & Signs
    - Differential Diagnosis
- Basic Esophoria
  - General Information
  - Symptoms & Signs
  - Differential Diagnosis
- Basic Exophoria
  - General Information
  - Symptoms & Signs
  - Differential Diagnosis

FUSIONAL VERGENCE DYSFUNCTION
- Background Information:
  - Distance and near phoria are within expected values, normal AC/A, PFV & NFV are restricted.
  - Not part of Duane’s original classification system.
  - Prevalence is not clearly established:
    - Scheiman: 0.6% of n = 1650 children (6-18yrs)
    - Porcar: 1.5% of n = 65 college students

- Etiology:
  - Uncertain

- Symptoms: Table 11.5 S & W
  - Eyestrain
  - Headaches
  - Blurred vision
  - Excessive tearing
  - Inability to attend & concentrate
  - Problems with reading comprehension

- Reasons a patient may be asymptomatic:
  - Suppression
    - FVD patients tend to have central suppression
  - Avoidance of near work
  - High pain threshold
  - Occlusion of one eye
**Signs:**
- Normal AC/A ratio
- Normal phoria at distance & near
- Reduced PFV & NFV at distance and/or near
- Reduced vergence facility (trouble with BI & BO)
- Low NRA & PRA
- Fails BAF; trouble with (+) and (-)
- Passes MAF
- Normal AA
- Intermittent central suppression

**Vergence Ranges vs. Facility:**
- Some patients with FVD demonstrate adequate smooth PFV & NFV ranges.
- Vergence facility then becomes key to diagnosis.
  - The patient will have trouble with BO & BI

**Differential Diagnosis:**
- Functional Disorders to Rule-out:
  - Accommodative Infacity
  - Latent Hyperopia
  - Vertical or cyclodeviation
  - Fixation disparity
  - Aniseikonia
- Serious Underlying Conditions to Rule-out: (rare)
  - Systemic disease
  - Medication

**Case Example #1**
**Brief Case History:**
- 16 yo; 11th grader
- CC: eyestrain and blurry vision after 20 minutes of reading.
- Problems present for several years.
- Prior eye docs haven’t been able to help.
- Last year was given reading glasses which did NOT help; stopped using them after 4 weeks.
- Good general health.
- No medications or allergies.

**Exam Findings:**
- PD 62/59
- Prior Rx +0.50DS OU
- DVA (sc) 20/20 OD, OS
- NVA (sc) 20/20 OD, OS
- DCT (sc) orthophoria
- NCT (sc) 2 XP
- AA: 11D OD, OS
- NPC: 5cm (ac. target); 5cm (penlight)
- Subjective: +0.25 -0.25 x 180 20/20 OU
- Cycloplegic: +0.75 -0.25 x 180 20/20 OU
- Dist DPh Hz: Ortho Vt: 0
- BI (Dist) x/4/2
- BO (Dist) 6/10/6
- Near DPh Hz: 3 XP Vt: 0
- -1.00 Gradient 1 EP
- BI (near) 4/8/6
- BO (near) 6/10/2
- Verg Facil: 3 cpm (trouble with BI & BO)
- NRA/PRA +1.50/-1.25
- BAF: 2 cpm
- MAF: 11 cpm OD, OS
- MEM: +0.25 OU

- Is AC/A Low, Normal, or High?

- DDx:

- What is the final diagnosis?

**BASIC ESOPHORIA**

- **Background Information:**
  - Tonic vergence is high and AC/A is normal.
  - Equal amount of EP at distance and near (within 4-5pd) with reduced NFV.
  - Prevalence:
    - Scheiman: 0.7% of n = 1650 children (6-18yrs)
    - Porcar: 1.5% of n = 65 college students

- **Etiology:**
  - Presumed to be due to tonic vergence errors.
  - There also seems to be a genetic predisposition.

- **Symptoms:**
  - Symptoms may be at distance and/or near.
  - Long standing
  - Near Symptoms:
    - Eyestrain, headaches, blurred vision, diplopia, sleepiness, difficulty concentrating, loss of comprehension over time.
Distance Symptoms:
- Blurred vision, diplopia when driving, watching TV or movies, or looking at the board in class.

Reasons a patient may be asymptomatic:
- Suppression
- Avoidance of near work
- High pain threshold
- Occlusion of one eye

Signs:
- Esophoria equal at distance and near (w/in 4-5pd)
- Normal calculated AC/A
- Hyperopia often present
- Direct tests of NFV at distance & near:
  - Low NFV ranges (smooth or step)
  - Reduced vergence facility (trouble with BI)
- Indirect tests of NFV at near:
  - Low PRA
  - Low BAF, trouble with (-)
  - High MEM (high lag)

Refractive Error:
- BEP is often associated with hyperopia.
  - This is desirable because the correction of the hyperopia will decrease the magnitude of EP at distance and near.

Differential Diagnosis:
- Functional Disorders to Rule-out:
  - Divergence insufficiency
  - Convergence excess
- Serious Underlying Disease to Rule-out:
  - CN VI palsy
  - Divergence paralysis
- Refer to DI for info on CN VI palsies and divergence paralysis.
- History is key!
  - Timeline of onset (long-standing vs acute)
  - Medical illnesses
  - Medications used
  - Neurologic symptoms/signs
Case Example #2

Brief Case History:
- 14 yo, 9th grader
- CC: intermittent double vision in school.
- Worse when she looks at the teacher or chalkboard.
- Has complained on & off of these symptoms for several years, but has not received any treatment.
- When patient was 2 or 3 she was noted to have an intermittent crossing of her eyes and was told she would “outgrow it.”
- Normal general health.
- No medications or allergies.

Exam Findings:
- PD 58/55
- DVA (sc) 20/20 OD, OS
- NVA (sc) 20/20 OD, OS
- DCT (sc) 16 EP
- NCT (sc) 14 EP
- AA 12D OD, OS
- NPC 5cm (ac. target)
- Subjective +1.00 DS 20/20 OU
- Cycloplegic +1.50 DS 20/20 OU
- Dist DPh 18 EP
- BI (Dist) diplopia, needs 8 pd BO to fuse
- BO (Dist) 8/26/18
- Near DPh 16 EP
- -1.00 Gradient 22 EP
- BI (near) x/2/-4
- BO (near) x/28/20
- Verg Facil 0 cpm (diplopia with BI)
- NRA/PRA +2.50/-0.25
- BAF Diplopia with -2.00
- MAF 10 cpm OD, OS
- MEM +1.50 OU

Case Example #2
- Is AC/A Low, Normal, or High?

- DDx:

- What is the final diagnosis?
BASIC EXOPHORIA

- **Background Information:**
  - Tonic vergence is low and the AC/A is normal.
  - Equal amount of XP at distance and near (within 4-5pd) with reduced PFV.
  - Prevalence:
    - Scheiman: 0.3% of n = 1650 children (6-18yrs)
    - Porcar: 3.1% of n = 65 college students
    - Daum: n = 177 pts with exodeviations
      - 62.1% CI; 27.6% BXP; 10.3% DE

- **Etiology:**
  - Related to low tonic vergence.

- **Symptoms:**
  - Symptoms may be at distance and/or near
  - Long standing
  - Near Symptoms:
    - Eyestrain, headaches, blurred vision, diplopia, sleepiness, difficulty concentrating, loss of comprehension over time.
  - Distance Symptoms:
    - Blurred vision, diplopia when driving, watching TV or movies, or looking at the board in class.

- **Reasons a patient may be asymptomatic:**
  - Suppression
  - Avoidance of near work
  - High pain threshold
  - Occlusion of one eye

- **Signs:**
  - Receded NPC
  - Equal XP at distance & near (within 4-5pd)
  - Normal AC/A
  - Direct Measures of PFV:
    - Low PFV ranges (smooth or step)
    - Low vergence facility (trouble with BO)
  - Indirect Measures of PFV
    - Low NRA
    - Low BAF, trouble with (+)
    - Low MEM (low lag or lead)

- **Differential Diagnosis:**
  - Functional Disorders to Rule-out:
    - Convergence insufficiency
    - Divergence excess
  - Serious Underlying Diseases to Rule-out:
Convergence paralysis due to:
- Ischemic infarct, demyelination, viral infection, Parkinson’s disease, Parinaud’s syndrome
- Medial rectus weakness due to:
  - Multiple Sclerosis (MS), Myasthenia Gravis (MG), previous strabismus surgery

History is key!
- Timeline of onset (long-standing vs acute)
- Medical illnesses
- Medications used
- Neurologic symptoms/signs

Case Example #3
Brief History:
- 9 yo, 4th grader
- CC: problems with reading
- Has struggled with reading since started school and the patient complains that it “hurts his eyes.”
- Patient’s teacher suggested a CEE even though the patient passed his school screening.
- Normal general health.
- No medications or allergies.

Exam Findings:
- PD 59/56
- DVA (sc) 20/20 OD, OS
- NVA (sc) 20/20 OD, OS
- DCT (sc) 12 XP
- NCT (sc) 14 XP
- AA 12D OD, OS
- NPC 14 cm
- Subjective plano DS 20/20 OU
- Dist DPh 12 XP
- BI (Dist) x/16/10
- BO (Dist) x/18/10
- Near DPh 14 XP
- -1.00 Gradient 9 XP
- BI (near) x/24/20
- BO (near) x/16/8
- Verg Facil 2 cpm (difficulty with BO)
- NRA/PRA +1.00/-2.75
- BAF 2 cpm, trouble with +2.00
- MAF 10 cpm OD, OS
- MEM -0.25 OU

Is AC/A Low, Normal, or High?
□ DDx:

□ What is the final diagnosis?

REFRACTIVE ERROR CLASSIFICATIONS REVIEW:
- CHA (compound hyperopic astigmatism) +3.00 -1.00 X 180
- SHA (simple hyperopic astigmatism) +1.50 -1.50 X 180
- SH (simple hyperopia) +2.00DS
- CMA (compound myopic astigmatism) -2.00 -1.50 x 090
- SMA (simple myopic astigmatism) Plano -2.00 x 170
- SM (simple myopia) -3.00DS
- MA (mixed astigmatism) +2.00 -3.00 x 045

Case Example #4: Now you are the doctors...
11 year old CM
CC: eyestrain, headaches, blur at distance and near without Rx;
Symptoms were slightly less with prior glasses that broke 3 months prior.

Case History

Exam Findings:

Assessment & Plan: