OVERVIEW OF TODAY'S LECTURE:
- Diagnosis of High AC/A Conditions
  - Convergence Excess
    - General Information
    - Symptoms & Signs
    - Differential Diagnosis
  - Divergence Excess
    - General Information
    - Symptoms & Signs
    - Differential Diagnosis

CONVERGENCE EXCESS
- Background Information:
  - Esophoria at near, orthophoria or low to moderate esophoria at distance, reduced NFV, high AC/A.
  - Some studies suggest that CE is more prevalent than CI.
  - Prevalence:
    - Hokoda: 5.9% in population of symptomatic patients
    - Scheiman: 8.2% of n=1650 children (6-18yrs)
    - Porcar: 1.5% of n=65 college students

- Etiology:
  - CE is due to the high AC/A ratio.

- Symptoms: Table 10.3 S & W
  - Eyestrain associated with reading
  - Headaches associated with reading
  - Inability to attend & concentrate when reading
  - Sleepiness when reading
  - Problems with reading comprehension
  - Occasional diplopia
  - Blurred vision

- Reasons a patient may be asymptomatic:
  - Supression
  - Avoidance of near work
  - High pain threshold
  - Occlusion of one eye
Convergence Excess con’t

● Signs:
  ○ EP greater at near than distance
  ○ Frequency of Esodeviation worse @ N than D
  ○ High AC/A ratio (calculated) ≥ 7:1
  ○ Moderate degree of hyperopia
  ○ Comitant deviation
  ○ Direct Measures of NFV
    ● Reduced smooth or jump NFV
    ● Reduced vergence facility
  ○ Indirect Measures of NFV
    ● Low PRA
    ● Difficulty with (-) lenses on BAF
    ● High MEM finding

● Refractive Error:
  ○ CE may be associated with hyperopia
  ○ Due to the high AC/A, hyperopia would be desirable
  ○ Correction of the hyperopia would reduce the EP

● Differential Diagnosis:
  ○ Functional Disorders to Rule-out:
    ● Basic EP
    ● Divergence Insufficiency
    ● Accommodative disorders
  ○ Serious Underlying Disease to Rule-out:
    ● Spasm of accommodation/convergence due to:
      ○ Local inflammation (scleritis, iritis, uveitis)
      ○ Sympathetic paralysis, syphilis
      ○ Drugs (eserine, pilocarpine, excessive vitamin B1, sulfonamides)
  ○ History is key!
    ● Timeline of onset (long-standing vs acute)
    ● Medical illnesses
    ● Medications used
    ● Neurologic symptoms/signs

Case Example #1
Brief History
● 10 yo, 5th grader
● CC: eye strain and blurry vision after 15-20 minutes of reading.
● Problems began this school year when the teachers started giving more homework.
● Never had CEE.
● Good general health.
● No medications or allergies.
Case Example #1
Exam Findings

- PD 60/57
- DVA (sc) 20/20 OD, OS
- NVA (sc) 20/20 OD, OS
- DCT (sc) orthophoria
- NCT (sc) 10 EP
- AA 15D OD, OS
- NPC 5cm (ac. target); 5cm (penlight)
- Subjective OD: plano 20/20
  OS: plano 20/20
- Dist DPh Ortho
- BI (Dist) x/7/4
- BO (Dist) 12/24/15
- Near DPh 10 EP
- -1.00 Gradient 18 EP
- BI (near) x/4/-4
- BO (near) 14/30/18
- Verg Facil 0 cpm (diplopia with BI)
- NRA/PRA +2.50/-0.25 (diplopia on PRA)
- BAF 0 cpm, diplopia with (-)
- MAF 12 cpm OD, OS
- MEM +1.50 OU

• What is the calculated AC/A?

• DDx

• What are the diagnoses?

DIVERGENCE EXCESS

- Background Information:
  ○ Greater amount of exophoria at distance than at near. (Average values of 29pd @ D & 13pd @ N)
  ○ Tendency for the patient to be intermittent strabismic at distance.
  ○ Prevalence:
    ● Bair: 7.5% of 1000 XTs were DE
    ● Pickwell: 7% of 250 strabs were DE
    ● Wick: 24% of IXTs were DE
Divergence Excess con’t

● Etiology:
  ○ Innervational theories
  ○ Low tonic vergence

● Symptoms: Table 10.8 S & W
  ○ Generally, subjective symptoms are rare
    ● Due to suppression &/or ARC
  ○ Occasionally diplopia
  ○ Concern about cosmesis
  ○ Closes one eye &/or squints in bright light

● Signs:
  ○ XP greater at distance than at near
  ○ Frequency of exo deviation worse at distance than at near
  ○ High AC/A ratio (calculated ≥ 7/1)
  ○ Essentially normal PFV at distance and near
    ● Not always true
  ○ No significant RE
    ● Although, Wick found higher prevalence of myopia and anisometropia in DE pts when compared to normals.
  ○ Deviation is comitant

● Proportion of Time the Deviation Occurs:
  ○ Often IXT at distance
  ○ XT Triggers Include:
    ●
    ●
    ●
    ●

● AC/A Ratio:
  ○ Generally high calculated AC/A
    ● Based on the fact that distance exo is greater than near
      • i.e. if DCT = 29pd XP & NCT = 9pd XP, AC/A = 14/1
  ○ Studies have shown that the stimulus AC/A is actually in the normal to high range (3/1 – 9/1)
    ● Cooper et al found high stimulus AC/A (10.4/1); and normal response AC/A (4.2/1)
  ○ The difference in stimulus and response AC/A is likely related to fusional convergence “aftereffects” and proximal convergence.
Divergence Excess con’t

- **Simulated DE:**
  - The near exo approaches the magnitude of distance exo after 30-45 min of occlusion.
  - Occurs due to loss of convergence “aftereffect”
  - True vs. Simulated DE priority for surgical management
  - Important to compare calculated & gradient AC/A
    - If both are high → then follow high AC/A management plan
    - If calculated is high, but gradient is normal → then follow normal AC/A management plan

- **CA/C**
  - When the DE patient converges to fuse at distance, there will often be excess accommodation due to convergence accommodation.
  - If the DE patient cannot inhibit this accommodation, small amounts of added minus may help to maintain single clear BV.

- **Differential Diagnosis:**
  - Functional Disorders to Rule-out:
    - CI
    - Basic XP
    - Simulated DE

**Case Example #2:**

Brief History
- 10 yo, 5th grader
- CC: left eye is drifting outward
- First noticed at age 2-3 yrs, but getting worse
  - Used to only drift when tired
  - Now drifting a large % of the day
  - No diplopia
- Good general health
- No medications

Exam Findings
- PD 58/54
- DVA (sc) 20/20 OD and 20/20 OS
- NVA (sc) 20/20 OD and 20/20 OS
- EOM Full and smooth OU
- NPC 7 cm (accom) / 7cm (penlight)
- AA 13 D OD/OS
- DCT (sc) 20pd ILXT (tropes 25% of time)
- NCT (sc) 5pd XP
- Dry Subj OD +0.25DS 20/20
  OS +0.25DS 20/20
Case Example #2 con’t:

- DDPh (cc) Hz: Suppression
- DBO: Suppression
- DBI: Suppression
- NDPh (cc) Hz: 6 pd BI
- -1.00 Grad 2 pd BI
- NBO: x/15/10
- NBI: 10/16/12
- NRA/PRA(cc): +1.75 / -1.50
- Stereo: 30” local
- Binoc AF: 3 cpm
- Monoc AF: 4 cpm
- MEM: +0.25D OU

- AC/A
  - Gradient = 4/1
  - Calculated = 12/1

- Diagnosis
  -
  -
  -

  - What could we do to test for true vs. simulated DE?

Case Example #3:

Brief History

- 6.11 yo, CF in 1st grade
- CC: Eyes get tired and watery after reading for 15 minutes
- Sxs present for about 1 year (since started school)
- Normal general health
- No medications

Exam Findings

- PD: 58/54
- DVA (sc): 20/20 OD and 20/20 OS
- NVA (sc): 20/20 OD and 20/20 OS
- EOM: Full and smooth OU
- NPC: 4 cm (accom)
- AA: 15 D OD/OS
- Dry Subj: OD Plano -0.25 x 004 20/20
  OS Plano -0.25 x 175 20/20
- DCT (sc): orthophoria
- NCT (sc): 8pd EP
- NBO (PB): x/25/18
- NBI (PB): x/10/2
- Stereo: 20” local; 250” global
Case Example #3 con’t:
- Binoc AF 3 cpm; (-) more difficult
- Monoc AF 8 cpm OD, OS
- Pupils PERRL, (-) APD
- OH Normal OU

- Is AC/A low, normal, or high?

- Differential Diagnosis?

- Diagnosis?

Now you are the Doc:
- A 12 year old boy, in the seventh grade, presented with complaints of eyestrain, tearing, and the words moving around on the page when reading longer than 20 minutes.
- These problems began a month after the school year began.
- He also reported that after doing in-class reading assignments when he looks up to take notes off the chalkboard the writing on the board is a bit blurry for a couple of minutes.
- These problems get worse later in the day.
- This is the patient’s first eye exam.
- He is not taking any medications.
- He has no known drug allergies.
- He is in good health.

DATA:
1. What is the calculated AC/A? Is this a low, normal or high AC/A?

2. Make a list of the most likely differentials for this patient.

3. What is/are the diagnoses for this patient? Include the refractive error assessment.