6.11.2. Vertical Deviations (II)

Superior Oblique Muscle Palsy

- most common paralysis of a single cyclovertical muscle is fourth nerve palsy
- etiology
  - congenital
    - etiology
      - absent ipsilateral trochlear nerve + varying degrees of SO muscle hypoplasia — most patients
      - congenitally lax, attenuated, or absent superior oblique tendon
      - unusual course of the muscle
      - malpositioned orbital pulleys
      - craniofacial abnormalities
    - differentiating features
      - examine childhood photographs
        - compensatory head tilt
        - facial asymmetry
      - large vertical fusional amplitudes
  - acquired
    - closed head trauma — most common
    - direct trauma to tendon or trochlear area
    - diabetes mellitus
    - vascular problems of the central nervous system
    - brain tumor
      - recently diagnosed palsy that cannot be attributed to known trauma suggests the possibility of a serious intracranial lesion and need for neurologic investigation
    - isolated nontraumatic fourth nerve palsy
      - usually ischemic or idiopathic
      - lack of signs of recovery by 3 months after onset should prompt neuroimaging
- references
- clinical features
  - can fixate with normal or affected eye
  - examination
    - hyperdeviation
      - unilateral palsy
      - typically incomitant
        - especially in the acute stages
        - "spread of comitance"
          - contracture of the ipsilateral superior rectus or contralateral inferior rectus muscle
          - minimal difference in magnitude of hypertropia when patient looks from one side to other
    - versions
      - underaction of superior oblique muscle — action of superior oblique muscle can appear normal
      - overaction of inferior oblique muscle
    - torsion
      - if depression cannot be evaluated because of eye's inability to adduct — eg, 3rd nerve palsy
      - ask patient to look downward and inward from primary position — superior oblique muscle palsy leads to extorsion
        - observe surface or fundus landmarks
        - subjective incyclodiplopia
      - double Maddox rod test
        - to measure torsional imbalance
        - intorsion of the higher eye—instead of the expected extorsion—signifies skew deviation — especially when there are associated neurologic findings
    - 3-step test
      - for diagnosis of unilateral superior oblique muscle palsy
      - can be confounded by
        - DVD
        - entities involving restriction
        - skew deviation — vertical tropia typically decreases significantly in supine position — typically does not change in superior oblique palsy
      -
        Figure 11-3 (Courtesy of American Academy of Ophthalmology)
    - document serial changes in the deviation
      - Hess screen
      - Lancaster red-green test
      - plotting the field of single binocular vision
  - differentiate bilateral from unilateral superior oblique muscle palsy
    - unilateral
      - little if any V pattern
      - <10° extorsion in downgaze
      - subjective incyclodiplopia is uncommon — unless palsy is severe
      - 3-step test yields positive results for the involved side only
      - abnormal head positions are common — head tilt toward the opposite shoulder
      - oblique muscle dysfunction is confined to the involved eye
      - SO overaction --> A-pattern
      - IO overaction --> V-pattern
      - usually show a V pattern — a chin-down head posture
      - >10° extorsion in downgaze — >20° of extorsion is highly suggestive of bilateral involvement
      - subjective incyclodiplopia is common
      - Bielschowsky head-tilt test yields positive results on tilt to each side — right head tilt reveals a right hypertropia and left head tilt a left hypertropia
      - bilateral oblique muscle dysfunction
    - bilateral
      - markedly asymmetric bilateral palsies that initially appear to be unilateral — even the mildest degree of oblique muscle dysfunction on the presumedly uninvolved side
      - more common in patients with closed head trauma
      - masked bilateral palsies
        - bilateral objective fundus extorsion
        - esotropia in downgaze — V-pattern ET
        - must be distinguished from situations in which the initial palsy is overcorrected, leading to a postoperative oblique muscle abnormality in the fellow eye
- management
  - unilateral superior oblique muscle palsy
    - prisms — small, symptomatic deviations that lack a prominent torsional component
      - especially those that have become comitant
      - compensate for hyperdeviation in primary position
    - indications for surgery
      - significant vertical deviation
      - diplopia
      - asthenopia
    - deviation is incomitant
      - hyperdeviation is worse in contralateral upgaze — weaken the antagonist inferior oblique muscle
      - hyperdeviation is worse in contralateral downgaze — strengthen the weak superior oblique muscle
    - lax superior oblique muscle
      - strengthen the weak superior oblique muscle — tendon tucking
      - can be confirmed at surgery — globe is pushed (translated) posteriorly into the orbit while it is simultaneously extorted
    - cyclodiplopia or significant extorsion — superior oblique tendon strengthening procedure
      - tendon tucking
      - Harada-Ito procedure
    - one of these options alone may be effective
    - deviation ≥15Δ in primary position — amount of deviation in primary position corrected by inferior oblique weakening is proportional to degree of preoperative overaction of muscle — not performed in skew deviation because inferior oblique muscle weakening would aggravate the intorsion of the higher eye
    - hyperdeviation is incomitant and >15Δ in primary position — usually is also large in ipsilateral (secondary) gaze field
      - recession of ipsilateral superior rectus muscle or contralateral (yoke) inferior rectus muscle should be added to oblique muscle surgery — (choice depends on whether hyperdeviation is worse in downgaze or upgaze, as well as tightness of these muscles on forced-duction testing
    - hyperdeviation has become comitant — vertical rectus muscle surgery is generally preferred
      - <15Δ–20Δ — recession of 1 vertical rectus muscle
      - >15Δ–20Δ — recession of both vertical rectus muscles
    - hyperdeviation >20Δ in primary position — 3-muscle surgery
      - recession of overacting antagonist inferior oblique muscle
      - recession of either ipsilateral superior rectus or contralateral inferior rectus muscle or both — based on forced-duction test results
      - ipsilateral superior oblique tendon tucking may have to be included if the tendon is lax
    - Hering's law may cause the superior oblique muscle to overact in the normal eye — avoid superior oblique tenotomy on normal eye
      - converts a unilateral superior oblique palsy to a bilateral one
        - disabling torsional diplopia
    - avoid overcorrection of a long-standing unilateral superior oblique muscle palsy in adult patients — overcorrection can worsen with time and can cause disabling diplopia
  - bilateral superior oblique muscle palsy
    - surgery on both eyes is required and any asymmetry of the paralysis must be taken into account
    - palsies are symmetric & both inferior oblique muscles are significantly overacting
      - weakening of both inferior oblique muscles
      - if superior oblique muscles are lax or weak and cyclodiplopia or sizable extorsion is present — these muscles should be strengthened
        - tendon tucking
        - Harada-Ito procedure
    - paralysis is asymmetric
      - a hyperdeviation is usually present in primary position and hyperdeviations on right and left gaze differ
      - techniques
        - symmetric oblique muscle surgery + unilateral vertical rectus recession
        - asymmetric oblique muscle surgery
    - any of these approaches should collapse a large V pattern — additional surgery may be necessary

Inferior Oblique Muscle Palsy

- etiology
  - congenital
  - posttraumatic
  - rare — localized orbital lesion
- clinical features
  - greatest in adduction — hypotropia
    - similar to Brown syndrome
    - deficient elevation in adducted position
      -
        Figure 11-4 (Courtesy of American Academy of Ophthalmology)
  - head tilt toward paralyzed side (elevated eye) — intorsion
    - positive head tilt test
- differential diagnosis
  - skew deviation
    - especially those with a history of head trauma or with additional neurologic findings
    - hypotropic eye is extorted
    - higher (hypertropic) eye is intorted
  - differentiates from SO palsy
    - subjective excyclodiplopia — a inferior oblique muscle palsy, the hypotropic eye is intorted
  - asymmetric or unilateral primary superior oblique muscle overaction with secondary underaction of the inferior oblique
    - results of the 3-step test are not clear
  - Brown syndrome
    - positive forced-duction
    - no strabismus or V-pattern
    - no or minimal superior oblique overaction
    - no torsion
    - negative head tilt test
- management
  - indications for treatment
    - abnormal head position
    - vertical deviation in primary position
    - diplopia
  - weakening ipsilateral superior oblique muscle — will aggravate the existing extorsion of the hypotropic eye if an undetected skew deviation is the true underlying abnormality
  - weakening contralateral superior rectus muscle

Other Incomitant Vertical Tropias

- Duane retraction syndrome
- partial third nerve palsy
- upshoots and downshoots seen in
  - innervational problems
  - mechanical disorders
    - Brown syndrome
    - thyroid eye disease
    - orbital tumors
    - glaucoma drainage devices
    - scleral buckles
    - orbital implants