5.8.2. Diplopia (II): Supranuclear causes

Introduction

- definition: any afferent input to the ocular motor nerves
- supranuclear pathway for eye movement
  - corticobulbar pathway
    - drives volitional eye movement
      - "look to the right"
  - vestibular pathway
    - analyzes the relative position of the eyes/head and the direction of the intended visual target
    - allows accurate calculation of saccadic velocity and direction
    - horizontal movement: particular population of neurons in the PPRF
- most supranuclear disorders affect both eyes equally
  - do not cause diplopia!
    - except
      - See Table 8-1
      - Alternating Skew Deviation
      - Convergence insufficiency or spasm
      - Divergence insufficiency
      - Ocular tilt reaction
      - Skew deviation
      - Thalamic esodeviation

Thalamic Esodeviation

- acquired esodeviation
- lesions near the junction of the diencephalon and midbrain
  - thalamic hemorrhage
- insidious or acute
- consider the possibility of a CNS lesion in children being evaluated for strabismus surgery

Skew Deviation

pathogenesis

- asymmetric disruption of supranuclear input from otolithic organs
  - peripheral lesions
    - utricle and saccule
      - sense linear motion and static head tilt
      - transmit information to
        - vertically acting ocular motoneurons
        - interstitial nucleus of Cajal (INC)
          - midbrain
  - central lesions
    - more common
    - anywhere within the posterior fossa
      - brainstem
      - cerebellum

clinical presentation

- acquired
- vertical misalignment
  - comitant or incomitant
- ± torsional abnormalities
- often produces diplopia
- difficult to distinguish from a fourth nerve palsy
  - Parks-Bielschowsky 3-step test

alternating skew deviation on lateral gaze

- hypertropia of the abducting eye
  - right hypertropia on right gaze
    - switches when gaze is directed to the opposite side
- lesions of
  - cerebellum
  - cervicomedullary junction
  - dorsal midbrain
- differential diagnosis
  - bilateral fourth nerve palsies
    - hypertropia of the adducting eye
      - right hypertropia larger on left gaze
    - excyclotropia
  - opposite to alternating skew deviation

ocular tilt reaction

- lesions of
  - medulla, pons, or midbrain
    - alters the sense of true vertical
- bilateral
- clinical presentation
  - head tilt
  - skew deviation
    - head tilt is associated with contralateral hypertropia
  - cyclotorsional abnormalities
    - rotation of the upper poles of both eyes toward the lower ear

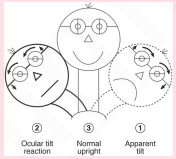

Figure 7-2 (© 2020 American Academy of Ophthalmology)

- differential diagnosis
  - fourth nerve palsy
    - head tilt to opposite side (opposite to hypertropic eye)
      - similar to ocular tilt reaction
    - higher eye is extorted
      - opposite to ocular tilt reaction
    - hypertropia of adductiing eye (gaze to opposite side)
      - opposite to ocular tilt reaction
  - normal response of head tilting
    - rotation of the upper poles of both eyes toward the higher ear
      - counter rolling
    - opposite to ocular tilt reaction
    - similar to fourth nerve palsy

periodic alternating skew

- alternating hypertropia
- 30–60 second periodicity
- rare
- midbrain lesion

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