Brain stem

Lec 11
Functions of brain stem:

- Motor & sensory function for face & head
- Control of Respiration
- Control of CVS
- Reflexes (R); vomiting R, swallowing R, coughing R, sneezing R, and Hiccupping R.
- Control of equilibrium
- Control of eye movements (Up-gaze and horizontal conjugate gaze)
- Maintain consciousness.
- Cranial nerves (3rd – 12th)
Brainstem and Cranial Nerves

Nolte 3-15; Wilson-Pauwels VII-13
The vestibular apparatus of the inner ear responds to changes in the body’s position in space. The cristae are sensory receptors for rotational acceleration. The maculae are sensory receptors for linear acceleration and head position.
The posterior canal of the vestibular apparatus senses the tilt of the head toward the right or left shoulder. The superior canal senses rotation of the head from front to back, such as that which occurs when nodding "yes." The horizontal canal senses rotation of the head as it turns left or right, such as that which occurs when shaking the head "no."
Movement of the endolymph pushes on the gelatinous cupula and activates the receptor cells.
The otoliths are crystals that move in response to gravitational forces.
Summary

• Vestibular signals are generated in the utricle, saccule and semicircular canals

• Hair cells embedded in gelatinous membranes (the otolithic membrane or cupula) convert mechanical forces to electrical signals

• The otolithic organs (utricle and saccule) convey information about linear acceleration

• The semicircular canals convey information about rotational acceleration

• Vestibular signals are brought into the CNS in CN VIII and terminate in the cerebellum and the four vestibular nuclei

• The vestibular nuclei are connected to 2 descending tracts, the cerebellum, the reticular formation, the thalamus, and the ocular motor nuclei

• Information from the vestibular nuclei is used to maintain gaze, balance and posture and is used in cortex to track one's position in space
Figure IV-5-10. Voluntary Horizontal Conjugate Gaze
Figure 5–19. Disorders of gaze associated with hemispheric and brainstem lesions. **A**: Destructive lesion in the frontal lobe of the right cerebral hemisphere. **B**: Seizure arising from the frontal lobe of the right cerebral hemisphere. **C**: Destructive lesion in the right pons. Arrows indicate the direction of gaze preference (away from the hemiparetic side in A and toward the convulsing or hemiparetic side in B and C).
Fig. 8.11 Ocular responses to caloric stimulation of the semicircular canals. Caloric testing involves the patient laying supine with the head tilted backwards at an angle of 30° so that the horizontal canal is vertically orientated. Water is flushed into the ear, and this sets up convection currents in the semicircular canal endolymph that cause movements of the eyes. (A) Normal patient (conscious). (B) Unconscious patient (brainstem intact). (C) Unconscious patient with a bilateral medial longitudinal fasciculus lesion.