Diencephalon: Thalamus and Associated Structures

Chapter 6

Diencephalon

• thalamus
• hypothalamus
• subthalamus (considered with the basal ganglia)
• epithalamus (not correlated with specific deficits in man)

http://upload.wikimedia.org/wikipedia/commons/5/52/Diencephalon.gif
Brain Development

Embryonic Development

Figure 19.1  Embryonic development of the human brain. (a) The neural tube becomes subdivided into (b) the primary brain vesicles, which subsequently form (c) the secondary brain vesicles, which differentiate into (d) the adult brain structures. (e) The adult structures derived from the neural canal.


http://www.gen.umn.edu/courses/1135/lab/brainlab/braindevelopment.html

http://faculty.washington.edu/chudler/develop.gif
Diencephalon

Thalamus and Hypothalamus


http://www.dwm.ks.edu.tw/bio/activelearner/40/ch40c2.html
**Thalamus**

- **Sensory function:**
  1. Visual input from the optic tract relays in the lateral geniculate nucleus (LGN): lesions result in hemianopia.
  2. Auditory input from the lateral lemniscus relays in the medial geniculate nucleus. Unilateral lesions have little effect on hearing, because auditory information from each ear ascends bilaterally.
  3. Somatosensory input from both the posterior column/medial lemniscus system for position and vibration and the spinothalamic system for pain and temperature relay in the thalamus (ventral posterior lateral nucleus [VPL] and ventral posterior medial nucleus [VPM]). Lesions affecting this part of the thalamus can therefore cause loss of all sensation on one side of the body. Paradoxically, some patients experience abnormally painful sensations (thalamic pain®) on the anesthetic side.

http://medinfo.ufl.edu/year2/neuro/review/images/thalamus.jpg

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**Visual Field**

Visual input from the optic tract relays in the lateral geniculate nucleus (LGN): lesions result in hemianopia.

http://medinfo.ufl.edu/year2/neuro/review/images/visfield.jpg
Thalamus

- **Motor function**
- Thalamic strokes are not known for their motor manifestations, but interruption of the cerebellar input to
  
  4. ventral anterior nucleus (VA) and ventrolateral (VL) may result in ataxia, and interruption of basal ganglia input (to these same thalamic nuclei, VA and VL) may result in akinesia.

http://medinfo.ufl.edu/year2/neuroreview/images/thalamus.jpg

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Thalamus

- **Cognitive function:**
  
  5. Arousal: bilateral lesions affecting the intralaminar thalamic nuclei, which can be considered extensions of the brainstem reticular formation, can cause unresponsiveness, but the eyes remain open. This has been called coma vigil or akinetic mutism.

  6. Memory: Lesions affecting medial thalamic structures (the confluence of mammillothalamic and amygdalofugal tracts, dorsomedial and possibly anterior nuclei) can cause profound amnesia.

  7. Other cognitive functions: aphasia, neglect and visuospatial dysfunction have been described with thalamic lesions, and presumably relate to interruption of reciprocal thalamic connections with the cerebral cortex.

http://medinfo.ufl.edu/year2/neuroreview/images/thalamus.jpg
Hypothalamus

- exerts control over the pituitary gland and thus over endocrine function in general
- has extensive connections with brainstem autonomic nuclei
- Lesions of the hypothalamus affect appetite, emotional behavior, temperature control, and numerous other autonomic and endocrine-influenced behaviors.

http://www.colorado.edu/intphys/Class/IPHY3730/image/figure3d.jpg