Thalamus and the Internal Capsule

MHD - Neuroanatomy Course

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Outcomes you need to be able to demonstrate

- List the major subdivisions of the diencephalon and the thalamus
- Identify the internal medullary lamina and intralaminar nuclei
- Define the three functional groups of the thalamus
- Summarize the function of the reticular nucleus of the thalamus
- List what “afferents” supply individual thalamic nuclei and where those thalamic nuclei project
"Basic" pathway of sensory information to the thalamus

1. Information gets collected
2. Transmitted
3. Looked at & analyzed
4. Interpreted

General Anatomical Overview

- Divisions of the Diencephalon
  - Epithalamus (pineal gland, habenula, stria medullaris)
  - Dorsal thalamus
  - Subthalamus (subthalamic nucleus, zona incerta)
  - Hypothalamus

Dorsal thalamus

- Internal medullary lamina
  - Anterior division nuclei
  - Medial division nuclei
  - Lateral division nuclei
- Intralaminar nuclei
- Thalamic reticular nuclei
- Midline nuclei
Common functional principles

• Thalamic nuclei “decide” what information passes
• Classification of nuclei – location and input/outputs
• Consist of projection (majority) and inhibitory neurons
• Inputs into the thalamus
  – Specific – e.g., posterior column/medial lemniscus pathway
    • Use glutamate as their neurotransmitter
  – Regulatory – Majority (Cortex, thalamic reticular nucleus, reticular formation, aminergic projections)

Functional thalamic groups

• Three groupings
  – Specific or relay nuclei
    • Well defined inputs and projections
    • Anterior, ventral anterior, ventral lateral, ventral posterior, lateral dorsal, medial and lateral geniculate
  – Association nuclei
    • Reciprocally connected to association cortex
    • Lateral posterior, pulvinar, medial dorsal nuclei
  – Non-specific nuclei
    • Not the same point-to-point connections like relay nuclei
    • Intralaminar and thalamic reticular nuclei
Specific or relay nucleus (specificity)

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Internal capsule

Thalamic peduncles (anterior, posterior, superior, inferior)

“The” thalamic nuclei to remember
Blood supply

Vascular (stroke) anatomic lesions and syndromes

Thalamic region  Primary functions
Anterior  Language (dominant) and hearing
Lateral  Motor and sensory
Medial  Vision, arousal, memory
Posterior  Higher visual