TEMPORAL LOBE ANATOMY

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Embryology of the temporal lobe.

The appearance of the early features of the temporal lobe starts at the age of 11 weeks.

It measures 10 cm in adults.
Surface anatomy of the temporal lobe.
Supramarginal gyrus

Visual association cortex

Broca's area

Wernicke's area

Angular gyrus
• The posterior boundary of the temporal lobe is not a true boundary
The Anterior occipital sulcus.


• 50 hemispheres.
• 25 males and 25 females
• 10% of brains
Parenchymal anatomy of the temporal lobe.
The temporal lobe.

- Divided into two major units
  - Lateral
    - Superior, middle, inferior gyri
  - Mesiobasal.
    - Occipito-temporal gyrus (fusiform gyrus)
    - Parahippocampal gyrus.
    - Hippocamus and amygdala
Superior temporal gyrus.
Superior temporal gyrus
Middle temporal gyrus
Inferior temporal gyrus
Frontal opercula

Insula

Heschel gyrus

Superior temporal gyrus
Inferior aspect.
Mesial aspect.
The Amygdala (Almond)

- Group of nuclei taking the shape of an almond.

- Situated between the anterior end of the temporal horn and the ventral surface of the lentiform nucleus.
Amygdala
Hippocampus proper
Caudate nucleus—tail (CT)
Amygdala connections

- Afferent from
  - Olfactory cortex
  - Information from the external environment concerning the frontal, parietal and temporal lobes.

- Viscero-sensory afferents from
  - Tractus solitarius
  - Dorsal motor nucleus of the vagus nerve.
Amygdala connections.

- **Efferents to**
  - Amygdalofugal pathway to the thalamus and hypothalamus.
  - Stria terminalis
Functions

- Ingestion
- Aggression
- Reproduction
- Memory
- Learning
Clinical deficit

- Unilateral damage

- Bilateral damage
  - Psychic blindness, visual Agnosia.
  - Oral tendencies.
  - Hypermetamorphosis.
  - Emotional changes.
  - Hypersexualility
  - Dietary habits.
Hippocampus.

• Hippocampus, (Gr a horse+ lat; field or race-track).

• Hippocampus (Greek, Hippos+campos= Horse +a mythical sea monster) some may translate it as a caterpillar.

• Early descriptions.
  – Arantius 1587, sea horse, silk worm.
  – Duvernoy 1729, hippocampus and sea horse.
  – Winslow 1752, Ram horn.
Hippocampal connections.

- Afferent connections.
  - Entorhinal area, (neo-cortex).
  - Amygdala
  - Septal area.
  - Contralateral hippocampus.
  - Reticular formation of the brain stem.
• Efferent:
  - Fornix, (one million fibres).
Hippocampal formation.

- Hippocampus
- Dentate gyrus
- Parahippocampal gyrus, (subiculum).
Dentate gyrus.

• Continued growth of the cortical tissue of the hippocampus may be responsible for the development of the dentate gyrus.
Alveus

- Alveus (L), canal or trough

- Covers the intra-ventricular surface of the hippocampus, just underneath a layer of ependyma

- Continue medially as the fimbria, which continue as the fornix
Alveus

• It contains both the afferent and efferent projections from and to the septal nuclei.
Entorrhinal area.

The anterior area of the parahippocampal gyrus medial to the rhinal sulcus.
Optic radiation.
Cingulum

Superior longitudinal (arcuate) fasciculus

Insula
The temporal stem.
The temporal stem, Albal stalk.

- Thin band of white matter that forms a bridge between the medullary core of the temporal lobe and the inferior frontal lobe.

- Boundaries.
  - Anterior, the Amygdala.
  - Posterior, the lateral geniculate body.
The uncinate fasiculus. UF.

• Can be divided into the temporal, insular and frontal segments.

• Temporal segment.
  – Originates from the cortical nuclei of the amygdala, area 28,34 and 36. and the anterior three temporal convulsions, area 20 and 38, in front of the temporal horn.
• Area 20, inferior temporal area.
• Area 28, Entorhinal area.
• Area 34, dorsal entorhinal area.
• Area 36, Ectorhinal area. Lateral to the rhinal sulcus
• Area 38, temporo-polar area.
• All the fibers come together as a solid tract in the anterior temporal stem in the white matter of the middle temporal gyrus anterior of the temporal horn.
• The UF passes upward over the lateral nucleus of the amygdala toward the limen insula.

• The insular segment of the UF, in the limen insula, is situated below the putamen and the claustrum.
• The insular segment of the UF measures 2-5 mm in height and 2-7mm in width.

• The inner fibers of the UF pass thru the external capsule and the outer fibers pass thru the extreme capsule, therefore a part of the clasutrum is imbbeded in the UF.
• In the region of the external and extreme capsules the insular fibers of the UF is inferior to the fibers of the inferior occipito-frontal fasciculus.
• They do merge in this region as well.
• The frontal segment of the UF has a fanlike shape in the fronto-orbital white matter and is oriented in the horizontal plane.

• The frontal fibers are lateral to the lateral edge of the inferior occipito-frontal fasciculus.
- The inferior occipito-frontal fasciculus merges with the UF in the inferior frontal lobe.

- The UF connects the cortical nuclei of the amygdala and the uncus with the subcallosal region.

- The tips of the three temporal gyri are connected via the UF with the gyrus rectus and the medial and lateral orbital gyri as well as the orbital segment of the inferior frontal gyrus.
• The UF is a monosynaptic cortico-cortical route of interaction between the temporal and frontal lobes.

• Clinically the UF disruption may be responsible for the post-traumatic retrograde amnesia.
The inferior occipito-frontal fasciculus. IOFF.

- Prominent component of the temporal stem.
- Rarely mentioned and often confused with the UF.
- It connects the occipital lobe,
Fascicular sign - part of CAA
Amygdala
Hippocampus proper
Caudate nucleus—tail (CT)
Subtemporal transparahippocampal amygdalohippocampectomy for surgical treatment of mesial temporal lobe epilepsy

Technical note
Fig. 2. Schematic drawing showing temporomesial region distances measured on axial sections through 10 adult human cadaver hemispheres. $S-V$ = rhinal sulcus to tip of temporal horn; $P-V$ = temporal pole to tip of temporal horn; $P-M$ = temporal pole to midlevel of brainstem; $V-M$ = tip of temporal horn to midlevel of brainstem. *Shaded area* represents extent of temporomesial en bloc resection.