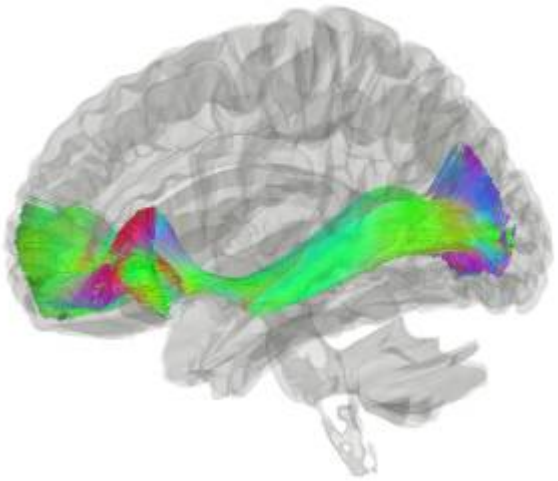
Inferior fronto-occipital fasciculus



Inferior Fronto-Occipital Fasciculus (IFOF)

Definition

The **Inferior Fronto-Occipital Fasciculus (IFOF)** is a major long-range associative white matter tract that connects the **frontal lobe** to the **occipital**, **temporal**, and **parietal lobes**. It is involved in higher-order cognitive functions, **semantic processing**, **visual integration**, and **language**.

Anatomical Course

- **Origin**: Deep white matter of the **frontal lobe**, primarily in the **middle frontal gyrus** and **inferior frontal gyrus**.
- **Trajectory**:
  - Courses **deep to the insula**, traversing the **extreme and external capsules**.
  - Runs **lateral to the basal ganglia**.
  - Continues through the **temporal stem** and beneath the **Sylvian fissure**.
- **Termination**: **Occipital lobe**, posterior **temporal cortex**, and **inferior parietal lobule**.

Relationships

- **Medial to**: Uncinate fasciculus (UF)
- **Lateral to**: Anterior commissure, putamen
- **Crosses**: External capsule, claustrum, extreme capsule

- Runs parallel and lateral to the **optic radiations**

Function

- **Semantic processing and comprehension**
- **Visual-spatial attention and perception**
- **Lexical access and language comprehension**
- Integration of **frontal executive functions** with **visual and auditory inputs**

Evidence from Studies

- **fMRI–DTI correlation**: Functional connectivity with semantic networks (frontal-temporal)
- **Direct electrical stimulation** (DES) during awake surgery: Disruption causes **semantic paraphasias**, **naming difficulty**, or **semantic perseveration**
- **Lesional studies**: Impairment of reading and non-verbal visual tasks in right IFOF injury

Surgical Implications

- Critical in **dominant hemisphere** surgery for **gliomas** and **temporal lobe resections**
- Must be preserved in **awake craniotomies** with mapping for semantic function
- Dissection plane: Identified and preserved during subcortical mapping (DES)
- Often approached via **subpial resection**, especially in the **temporal stem** or **inferior frontal gyrus**

Related Tracts

- Uncinate Fasciculus (UF)
- Arcuate Fasciculus
- Inferior Longitudinal Fasciculus (ILF)

References

- Duffau H. `Stimulation mapping of white matter tracts to study brain functional connectivity`. Nat Rev Neurol. 2015.
- Catani M, Thiebaut de Schotten M. `Atlas of Human Brain Connections`. Oxford University Press, 2012.
- Sarubbo S et al. `Anatomical architecture of the IFOF: a study with diffusion tractography and fiber microdissection`. Brain Struct Funct. 2013.

The occipitofrontal fasciculus passes backward from the frontal lobe, along the lateral border of the

caudate nucleus, and on the medial aspect of the corona radiata; its fibers radiate in a fan-like manner and pass into the occipital and temporal lobes lateral to the posterior and inferior cornua.

Some sources distinguish between a “Inferior fronto-occipital fasciculus” and “superior occipitofrontal fasciculus,” however the latter is no longer believed to exist (in the human brain).

In the Transylvian approach to the mesiotemporal structures in the left dominant hemisphere, an incision within the posterior 8 mm from the limen insulae is less likely to damage the IFOF than more posterior incisions along the inferior limiting sulcus. In the temporal transopercular approach to left temporo-insular gliomas, the IFOF constitutes the deep functional limit of the resection within the temporal stem [1)].

1)
Martino J, Vergani F, Robles SG, Duffau H. New insights into the anatomic dissection of the temporal stem with special emphasis on the inferior fronto-occipital fasciculus: implications in surgical approach to left mesiotemporal and temporoinsular structures. Neurosurgery. 2010 Mar;66(3 Suppl Operative):4-12. doi: 10.1227/01.NEU.0000348564.28415.FA. PubMed PMID: 20173571.