Insular Glioma Classification

- Safety and Efficacy in the Transcortical and Transsylvian Approach in Insular High-Grade Gliomas: A Comparative Series of 58 Patients
- Feasibility, Safety, and Impact of Awake Resection for Recurrent Insular Diffuse Gliomas in Adults
- Predicting Extent of Resection and Neurological Outcome for Insular Gliomas: An Analysis of Two Available Classifications
- Anatomical and subcortical invasiveness in diffuse low-grade astrocytomas differ between IDH status and provide prognostic information
- The Transtemporal Isthmus Approach for Insular Glioma Surgery
- Surgical treatment for insular gliomas. A systematic review and meta-analysis on behalf of the EANS neuro-oncology section
- Survival outcome and predictors of WHO grade 2 and 3 insular gliomas: A classification based on the tumor spread
- The transfrontal isthmus approach for insular glioma surgery

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Insular gliomas can be classified based on anatomical location, topographic extension, or involvement of subcortical white matter tracts. The following are the most referenced classification systems:

Insular Glioma Classifications

Insular gliomas are surgically complex due to their location near eloquent brain regions and deep vascular structures. Multiple classification systems help guide surgical planning and risk assessment.

This page includes the **Berger–Sanai**, **Yaşargil**, **Mandonnet–Duffau**, and **Kawaguchi** classification systems.

▶ Berger–Sanai Classification (Most Used)

see Berger–Sanai Classification

Divides the insula into four quadrants using:

- **Horizontal axis** → Sylvian fissure
- **Vertical axis** → Foramen of Monro

- **Zone I**: Anterior–superior
- **Zone II**: Posterior–superior
- **Zone III**: Posterior–inferior
- **Zone IV**: Anterior–inferior

✔ Simple and reproducible ✔ Used in preoperative MRI ✔ Zone II = ↑ risk (lenticulostriate arteries)

▶ Yaşargil Classification

Yasargil Classification of Insular Glioma

Anatomical classification based on **topographic extension**.

- **Type 3A**: Confined to insular cortex
- **Type 3B**: Involving perisylvian opercula
- **Type 5A**: Extends to paralimbic areas
- **Type 5B**: Includes hippocampus, frontal and temporopolar regions

Used to understand **structural spread** beyond the insula.

▶ Mandonnet–Duffau Classification

Functional classification based on **white matter tract infiltration**.

Focuses on:

- **Uncinate fasciculus (UF)**
- **Inferior fronto-occipital fasciculus (IFOF)**
- **Corticospinal tract (CST)**
- **Arcuate fasciculus**

Primarily used in **awake craniotomy** and **tractography-based resection**.

▶ Kawaguchi Grading System

Grading system based on **surgical complexity** and **depth of tumor invasion**:

- **Grade I**: Confined to insula
- **Grade II**: Extends to opercula
- **Grade III**: Involves putamen/internal capsule
- **Grade IV**: Opercula + deep structures

✔ Helps estimate risk of morbidity ✔ Useful for predicting resectability

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Classification Summary Table

Classification	Basis	Primary Use
Berger–Sanai	Quadrant anatomy	Vascular risk, surgical corridor
Yaşargil	Topographic extension	Spread to limbic/paralimbic structures
Mandonnet–Duffau	White matter tract infiltration	Functional preservation, awake surgery
Kawaguchi	Depth and complexity	Surgical risk and difficulty grading

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References

- Berger MS, Sanai N. *Neurosurgery* (2010)
- Yaşargil MG. *Microneurosurgery Vol IVB* (1996)
- Mandonnet E, Duffau H. *Neurochirurgie* (2008)
- Kawaguchi T et al. *Neurosurgery* (2011)

Dominant insular tumor

Nondominant insular tumor

Despite the described Berger Sanai Classification of insular gliomas, other based on anatomical localization (Yasargil) or on extension within white matter tracts (Mandonnet and Duffau) are in use

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The study findings of Wang et al., suggest that the putamen classification is an independent predictor of survival outcome in patients with insular low-grade gliomas. This newly proposed classification allows preoperative survival prediction for patients with insular gliomas [1].

Insuloopercular glioma

see also insuloopercular glioma.

1)
Wang Y, Wang Y, Fan X, Li S, Liu X, Wang J, Jiang T. Putamen involvement and survival outcomes in patients with insular low-grade gliomas. J Neurosurg. 2016 Aug 26:1-7. [Epub ahead of print] PubMed PMID: 27564467.