Supplementary Table S1 Search strategy

Concept	MeSH + synonyms
Insular glioma	Insular cortex, Insula, Island cortex, Island of Reil, Lobe of Reil, Insula of the brain, Insular lobe, Central operculum, Brain, Cerebral cortex, Limbic system, Operculum, Astrocytoma, Ependymoma, Glioma, Glioblastoma, Glioblastoma multiforme, Medulloblastoma, Oligodendroglioma, Brain cancer, Brain tumor, Glial cell tumor, Glial neoplasm, Glioma of the central nervous system, Neuroepithelial tumor, Brain tumors, Central nervous system neoplasms, Neurooncology, Oncology
Surgical approaches	Transcortical, Transopercular, Transsylvian sulcus, Lateral sulcus, Sylvian fissure, Fissure of Sylvius, Lateral Sylvian sulcus, Lateral Sylvian fissure, Brain, Cerebral cortex
Outcomes	Gross total resection, subtotal resection, partial resection, near total resection, extent of resection, postoperative, complications, deficits, mortality

Supplementary Table S2 National Heart, Lung, and Blood Institute quality assessment

Study	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Rating
Duffau et al, 2000[33]	Y	Y	Y	Y	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	Fair
Lang et al, 2001[26]	Y	Y	N	Y	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	Fair
Simon et al, 2009[23]	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	NA	NA	NA	NA	Fair
Duffau, 2009[34]	Y	Y	Y	Y	Y	Y	Y	N	Y	–	–	–	–	–	Good
Sanai et al, 2010[17]	Y	Y	Y	Y	CD	Y	Y	Y	Y	NA	Y	NR	NA	N	Fair
Eseonu et al, 2015[35]	Y	Y	Y	Y	N	Y	Y	Y	Y	NA	Y	NA	NR	Y	Fair
Hervey-Jumper et al, 2016[36]	Y	Y	Y	Y	Y	Y	Y	N	Y	NA	Y	NA	NA	NA	Fair
Przybylowski et al, 2019[7]	Y	Y	Y	Y	Y	CD	Y	NA	Y	NA	Y	N	CD	Y	Good
Mandonnet, 2019[37]	Y	Y	Y	Y	Y	Y	N	N	Y	–	–	–	–	–	Fair
Hameed et al, 2019[19]	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	NA	N	NA	Good
Li et al, 2020[9]	Y	Y	Y	Y	N	Y	Y	NA	Y	NA	N	NA	NA	NA	Fair
Singh et al, 2020[38]	Y	Y	Y	Y	Y	CD	Y	N	Y	NA	Y	NA	NA	NA	Fair
Panigrahi et al, 2021[39]	Y	Y	Y	N	N	CD	Y	CD	Y	Y	Y	N	Y	Y	Fair
Rossi et al, 2021[20]	Y	Y	Y	Y	N	Y	Y	N	Y	NA	Y	N	CD	NA	Good
Pallud et al, 2021[40]	Y	Y	Y	CD	N	Y	Y	N	Y	Y	Y	N	Y	Y	Good
Pitskhelauri et al, 2021[14]	Y	Y	Y	Y	Y	Y	Y	Y	Y	–	–	–	–	–	Good

Abbreviation: NA, not applicable.
Risk of bias assessed using the U.S. National Institutes of Health (NIH) National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.
Question 1: Was the research question or objective in this paper clearly stated?
Question 2: Was the study population clearly specified and defined?
Question 3: Was the participation rate of eligible persons at least 50%?
Question 4: Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?
Question 5. Was a sample size justification, power description, or variance and effect estimates provided?
Question 6: For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?
Question 7: Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?
Question 8: For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?
Question 9: Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
Question 10: Was the exposure(s) assessed more than once over time?
Question 11: Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?
Question 12: Were the outcome assessors blinded to the exposure status of participants?
Question 13: Was loss to follow-up after baseline 20% or less?

Question 14: Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?

Risk of bias for case series assessed using NHLBI

1. Was the study question or objective clearly stated?
2. Was the study population clearly and fully described, including a case definition?
3. Were the cases consecutive?
4. Were the subjects comparable?
5. Was the intervention clearly described?
6. Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?
7. Was the length of follow-up adequate?
8. Were the statistical methods well-described?
9. Were the results well-described?

Supplementary Table S3 Preoperative deficit details of included studies

Study	Preoperative neurological deficits							
	Motor deficits	Sensory deficits	Speech deficits	Seizure	Raised ICP	Headache	Dizziness	Other
Duffau et al, 2000[33]	02	02	02	12	NR	NR	NR	NR
Lang et al, 2001[26]	07	NR	04	14	NR	NR	NR	NR
Simon et al, 2009[23]	NR	NR	NR	83	NR	NR	NR	NR
Duffau, 2009[34]	1	NR	5	50	1	NR	NR	NR
Hervey-Jumper et al, 2016[36]	03	NR	1	88	NR	9	NR	NR
Przybylowski et al, 2019[7]	NR	NR	NR	61	NR	NR	NR	NR
Li et al, 2020[9]	27	–	8	144	–	74	52	NR
Panigrahi et al, 2021[39]	7	1	7	33	11	NR	NR	NR
Rossi et al, 2021[20]	11	3	16	70 (73.7%)	NR	NR	NR	NR
Singh et al, 2020[38]	NR	9	NR	14	NR	17	NR	NR
Sanai et al, 2010[17]	NR	13	5	75	NR	7	NR	NR
Pallud et al, 2021[40]	NR	29	NR	111	NR	20	NR	NR
Mandonnet, 2019[37]	NR	NR	NR	11	NR	1	NR	NR
Pitskhelauri et al, 2021[14]	NR	NR	NR	58	1	NR	NR	NR
Eseonu et al, 2017[35]	17	5	12	26	NR	14	NR	NR
Hameed et al, 2019[19]	NR	NR	NR	104	NR	NR	NR	NR

Abbreviation: NR, not reported.

Supplementary Table S4 Pre- and postoperative Karnofsky Performance Scale scores

Study	Preoperative KPS scores	Postoperative KPS scores	
Duffau et al, 2000[33]	NR	NR	
Lang et al, 2001[26]	NR	NR	
Simon et al, 2009[23]	Mean KPS: 85 ± 14 82% (80–100) 13% (60–70)	Mean KPS score at 3-month follow-up: 79 ± 8 68% (80–100) 25% (60–70) 10 cases had KPS scores <60	
Duffau, 2009[34]	KPS scores value 70: 1 80: 5 90: 22 100: 23	KPS scores value 70: 2 8: 2 90: 24 100: 23	
Hervey-Jumper et al, 2016[36]	NR	NR	
Przybylowski et al, 2019[7]	NR	NR	
Li et al, 2020[9]	NR	NR	
Panigrahi et al, 2021[39]	KPS scores >70 Transopercular: 28 (87%) Transsylvian: 36 (92.1%)	NR	
Rossi et al, 2021[20]	NR	NR	
Singh et al, 2020[38]	KPS score >80: 12 KPS score <80: 15	Median KPS score: 65 (range 0–100)	
Sanai et al, 2010[17]	KPS at diagnosis Median: 84 (range 18–75)	NR	
Pallud et al, 2021[40]	Whole series ($n = 149$) Mean: 90.6 ± 9.9 ≥70: 145, <70: 4 Awake resection ($n = 61$) Mean: 93.9 ± 9.4 ≥70: 60, <70: 1 Asleep resection ($n = 50$) Mean: 87.0 ± 9.3 ≥70: 48, <70: 2 Biopsy subgroup ($n = 38$) Mean: 90.0 ± 10.1 ≥70: 37, <70: 1	Early postoperative KPS score Awake resection ($n = 61$) Mean: 80.2 ± 10.9 ≥70: 57, <70: 4 Asleep resection ($n = 50$) Mean 76.1 ± 13.9 ≥70: 33, <70: 5 Biopsy subgroup ($n = 38$) Mean 84.8 ± 12.9 ≥70: 27, <70: 2	3-month postoperative KPS score Awake resection ($n = 61$) Mean 92.7 ± 10.7 ≥70: 55, <70: 6 Asleep resection ($n = 50$) Mean 82.4 ± 12.5 ≥70: 41, <70: 5 Biopsy subgroup ($n = 38$) Mean 80.0 ± 21.4 ≥70: 30, <70: 5
Mandonnet, 2019[37]	NR	NR	
Pitskhelauri et al, 2021[14]	Median 88 (range 60–100)	Median 82.8 (range 40–100)	
Eseonu et al, 2017[35]	Median 80 (range 50–100)	Median 80 (range 50–100)	
Hameed et al, 2019[19]	KPS score ≥90 in 90.80% of patients	NR	

Abbreviations: KPS, Karnofsky Performance Scale; NR, not reported.

