Surgical volume in neurosurgery

- Socioeconomic influences on survival outcome in idh-wildtype glioma patients: examining the role of age, education, and lifestyle factors
- Outcomes of brainstem cavernous malformation resection, without and with use of a flexible omnidirectional carbon dioxide laser: a single-surgeon series of 277 surgical procedures
- Neuroradiological Evaluation of Anatomo-Morphometric Arcuate Fascicle Modifications According to Different Brain Tumor Histotypes: An Italian Multicentric Study
- Biomarker changes associated with fornix deep brain stimulation in Alzheimer's disease
- Effects of lanreotide autogel immediately after a single injection for thyrotropin-producing pituitary tumor
- Maternal Matters: Neurosurgery During Pregnancy-A German Nationwide Survey
- Surgical tumor volume reduction in patients with brain metastases: A systematic review and meta-analysis
- Transitional haemodynamic profiles of intrauterine growth-restricted preterm infants: correlation with antenatal Doppler characteristics

Surgical Volume in Endoscopic Transsphenoidal Surgery for Pituitary Neuroendocrine Tumors (PitNETs)

Definition and Importance of Surgical Volume

Surgical volume refers to the **number of transsphenoidal surgeries (TSS) performed annually** at a given institution or by an individual surgeon. It is a **critical factor** in determining surgical success, complication rates, and overall patient outcomes.

High-volume centers (HVCs) have been consistently associated with:

- Higher tumor resection rates
- Lower complication rates
- Improved long-term endocrine function

Impact of Surgical Volume on Outcomes

Factor	High-Volume Centers (HVC)	Low-Volume Centers (LVC)
Tumor Resection Rate	Higher (More complete resections)	Lower (Higher residual tumor rate)
Complication Rate	Lower (<20%)	Higher (>25%)
Endocrine Remission Rate	Improved in functioning PitNETs	Lower remission rates
Postoperative CSF Leak	Reduced (<5-10%)	Increased (>10%)
Hypopituitarism	Less frequent	More common

Why Does Surgical Volume Matter?

• **Surgeon Experience** → More cases lead to refined techniques and better intraoperative

decision-making.

- Institutional Expertise → Multidisciplinary teams (neurosurgeons, endocrinologists, neuroradiologists) improve perioperative management.
- Technology & Equipment → HVCs invest in neuronavigation, intraoperative MRI, and highquality endoscopic systems.
- Postoperative Care → Specialized units can better manage complications like CSF leaks and diabetes insipidus (DI).

Defining High-Volume Centers (HVCs) in Pituitary Surgery

The definition of a **high-volume center** varies, but international standards suggest:

- ≥50 TSS per year (some studies set a threshold of ≥100/year)
- Dedicated pituitary surgery team
- Availability of intraoperative imaging and neuromonitoring

' In Spain (TESSPAIN Study, 2025):' High-volume centers were defined as those performing >25 TSS/year or having national expertise, but this threshold may underestimate the benefits of very high-volume centers.

Evidence Supporting Centralization of Pituitary Surgery

Several studies confirm better outcomes in high-volume centers:

- De Almeida et al. (2022): Centers performing >100 cases/year had higher remission rates in Cushing's disease and GH-secreting PitNETs.
- Petersen et al. (2021): High-volume institutions had a lower CSF leak rate and better visual outcomes for macroadenomas.
- TESSPAIN Study (2025): Spanish HVCs had higher success rates (53.1% vs. 47.7%) and lower complications.

Conclusion & Recommendations

- Surgical volume is a key determinant of pituitary surgery outcomes.
- **Centralization of transsphenoidal surgery in high-volume centers** improves tumor resection, endocrine remission, and reduces complications.
- National guidelines should encourage referral to experienced centers to optimize results.

Retrospective multicenter observational studies

TESSPAIN evaluates TSS outcomes in Spanish centers to assess the influence of surgical volume and

specialized neurosurgery teams on success and complication rates.

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A retrospective, nationwide study of Spanish centers performing TSS between January 2018 and December 2022. Centers were classified as high-volume centers (HV) [n=11, defined as centers with recognized expertise in Spain or those performing more than 25 TSS/year] or non-HV. Data collection included surgical success rates, complications, and pituitary adenoma resectability (R-PA). Additional analyses evaluated the impact of dedicated neurosurgical teams (DNT) within HV centers.

2815 TSS from 29 Spanish centers were included (1421 NSPA, 436 GH-secreting, 323 Cushing's disease, 127 PRL-secreting, and 25 TSH-secreting PA). The overall success rate was 50.5%, 76.8% for R-PA. HV centers had a higher overall success rate (53.1 vs. 47.7%; p=0.03). Better TSS outcomes for NSPA accounted for this difference. The overall TSS complication rate was 22.1%, which was higher for NSPA than for SPA (25.0 vs. 17.7%). The overall complication rate of TSS for PA was significantly higher in non-HV centers than in HV centers (24 vs 20.4.0; p <0.01). Centers with a DNT showed a trend to higher success rate in R-PA, while having a lower overall incidence of complications in TSS for PA than HV centers without a DNT (18.5 vs. 23.0; p=0.058), mainly reducing the rate of permanent ADH deficiency in all TSS for PA (2.7 vs. 8.4%; p<0.001).

Higher surgical volume and DNT are associated with improved TSS outcomes for PA in Spain. The results support the recommendation of concentrating pituitary surgery in a reduced number of centers of expertise in the country to improve the success rate and reduce complications, mainly postoperative ADH deficiency¹⁾

1)

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