

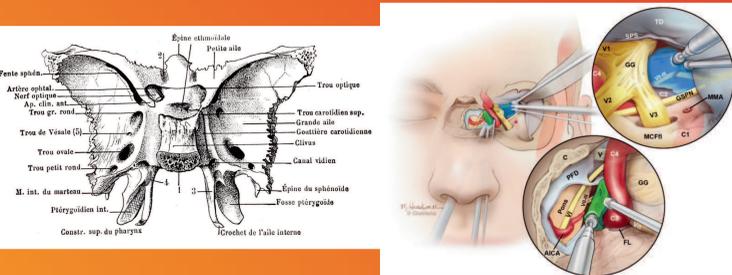
Incidence of Cerebrospinal Fluid Leak Following Endoscopic Surgical Management of Petrous Apex Lesions: A Systematic Review and Meta-Analysis

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Endoscopic petrous apex surgery has a low CSF leak and acceptable risk, but cranial nerve deficits and recurrence still require meticulous closure and ongoing follow-up

Introduction

- Endoscopic approaches have expanded access to the petrous apex with lower morbidity than open skull base surgery
- Postoperative CSF leak remains a common, high-impact complication
- Published leak rates vary widely due to small, single-center series and heterogeneous reporting
- Goal: systematic review + meta-analysis to benchmark CSF leak incidence and related outcomes after endoscopic petrous apex surgery



Methods

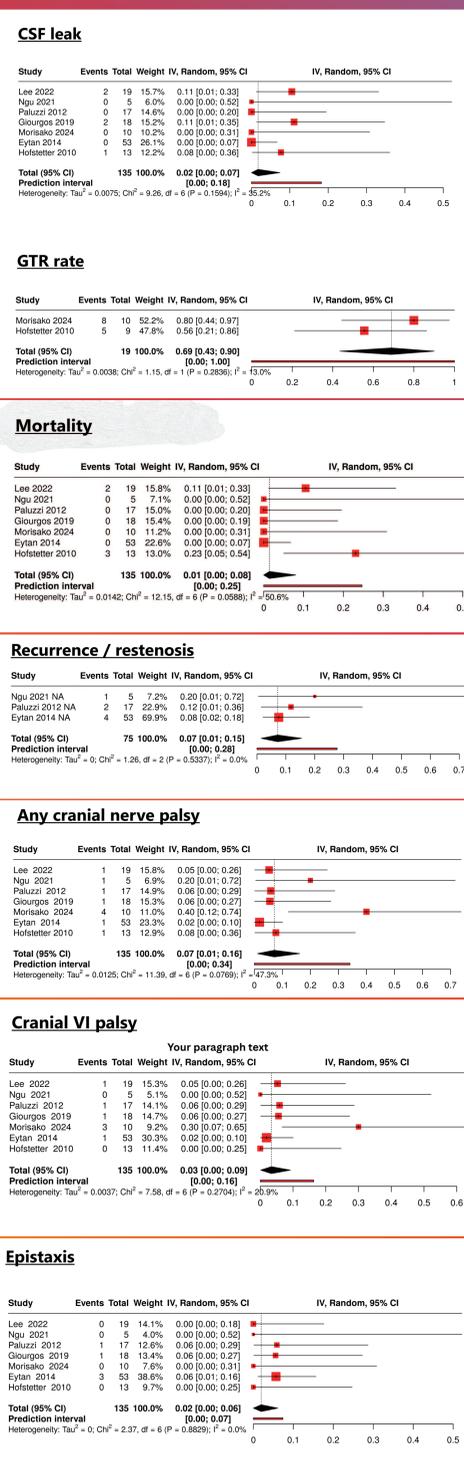
- PRISMA-guided systematic review with prospectively defined eligibility criteria
- Databases: PubMed + Embase (inception → July 2025) (around 398 article)
- Inclusion: ≥5 patients, Endoscopic surgical management of petrous apex lesions, Extractable data for ≥1 clinical outcome
- Exclusion: case reports, technical notes without outcomes, reviews, duplicate dataset
- Outcomes: Primary: postoperative CSF leak
- Secondary: EOR (GTR), recurrence/restenosis, mortality, CN palsy (incl. CN VI), epistaxis, other complications
- Statistics: Random-effects (DerSimonian-Laird) pooled proportions (logit transform; continuity correction for zero events)
- Wilson score CIs for study-level proportions
- Heterogeneity: Cochran's Q and I²
- Narrative synthesis when numeric pooling not feasible

Results

- 7 Include studies and 135 patients
- CSF leak: 4.0% (95% CI 1.0–10.0), I² = 35.2%
- Gross total resection (GTR): reported with extractable numerators in 2 studies (n=19) → 68.0% (95% CI 44.0–88.0)
- Recurrence/restenosis: 3 studies (n=75) → 10.0% (95% CI 4.0–18.0)
- Mortality: 7 studies (n=135) → 4.0% (95% CI 0–11.0)
- Complications:
 - Any new CN palsy: 10.0% (95% CI 4.0–18.0)
 - CN VI palsy: 6.0% (95% CI 2.0–12.0)
 - Epistaxis: ~5.0% (95% CI ~2.0–9.0)*
 - Rare single events: ICA injury, otitis media, postoperative sinusitis

Discussion

- Endoscopic petrous apex surgery shows low CSF leak risk (~4%) across 7 series with modest heterogeneity
- GTR ~68% (2 studies) suggests complete resection is achievable in selected lesions but data remain limited
- Recurrence/restenosis ~10% (3 studies) highlights the need for durable drainage/resection and long-term imaging follow-up
- Cranial nerve deficits are the main morbidity – any new CN palsy ~10%, isolated CN VI ~6%
- Mortality ~4% and epistaxis ~5% indicate overall acceptable risk for this complex skull base region
- Implication: supports endoscopic approaches in expert centers, with emphasis on meticulous reconstruction and CN-sparing technique
- Next step: standardized, multicenter reporting (uniform definitions for CSF leak, GTR, recurrence, and complications)



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