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Olfactory Function Outcomes Following the Endoscopic Endonasal Transsphenoidal Approach for Pituitary and Skull Base Surgery: A Systematic Review and Meta-Analysis

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Introduction

The endoscopic endonasal transsphenoidal approach (EETA) is widely used for pituitary and skull base lesions [1]. However, endonasal approaches require traversing the nasal cavity, raising concerns about postoperative olfactory dysfunction. The impact of EETA on olfactory function and risk factors for loss of olfaction remain poorly characterized[2–7].

This review evaluates the pattern of olfactory decline after EETA and explores the intraoperative variables thought to influence olfactory dysfunction.

Methods and Materials

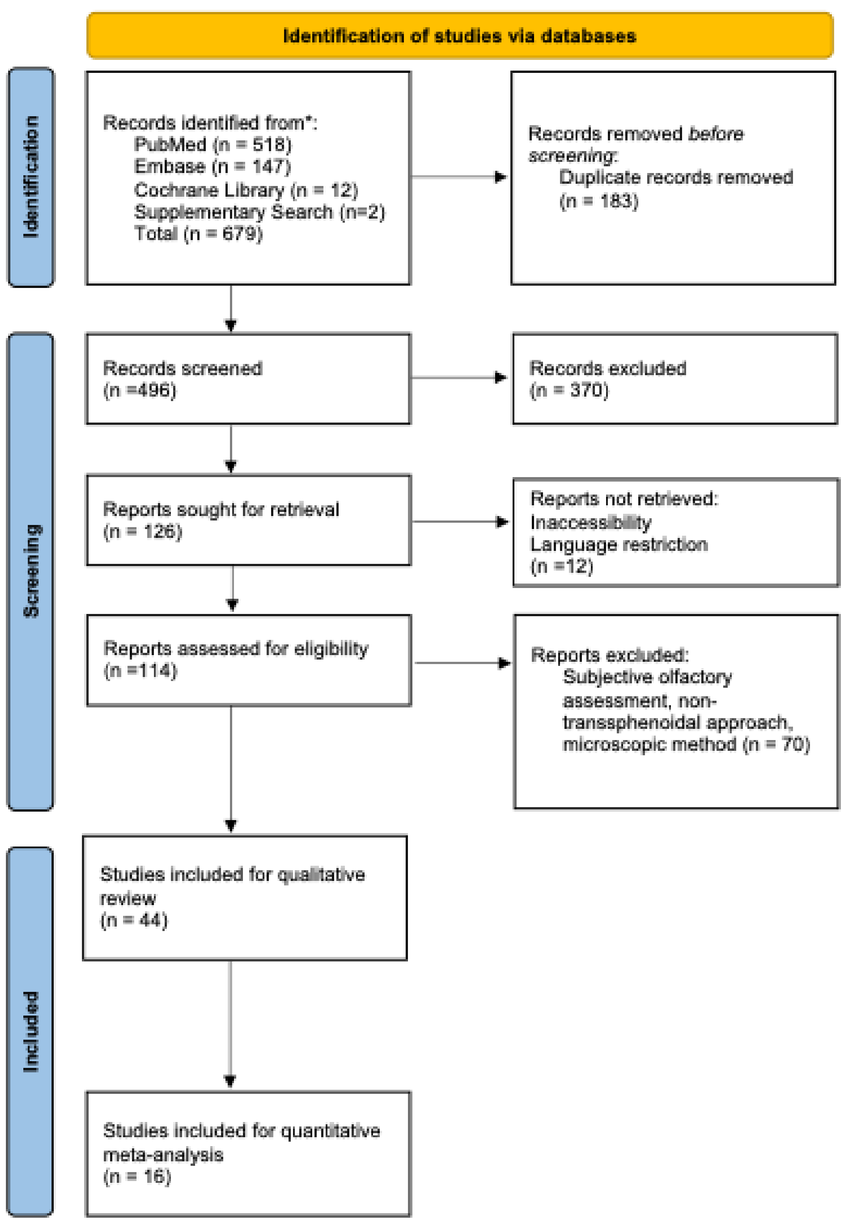
PubMed, Embase, and Cochrane databases were searched through November 2025.

Inclusion Criteria:
- Peer reviewed primary data cohort studies, case series, and randomized controlled trials published in English
- Patients undergoing EETA for skull base or pituitary lesions
- Assessing pre and postoperative olfaction using a verified odor based olfactory assessment

Exclusion criteria:
- Studies reporting subjective patient reported olfactory function assessments only
- Surgical approaches directly transgressing the olfactory fila
- Pathologies involving the olfactory apparatus
- Non-endoscopic endonasal or transcranial approaches

Meta analysis:
Studies that provided mean and standard deviations on a cohort level for pre and postoperative olfactory scores were considered for analysis. A random-effects meta-analysis of mean differences (MD) between pre- and postoperative olfactory function scores was performed using the most common olfactory assessment, the University of Pennsylvania Smell Identification Test (UPSIT). Cohorts were dichotomized based on follow up times of three months or earlier and six months or later. I^2 statistic and τ^2 estimates were used to assess heterogeneity.

Figure 1. Prisma Flow Chart



Results

Qualitative Review:
- 44 studies including a total of 2794 patients were identified for inclusion
- The most common lesions included pituitary adenomas, rathke cleft cysts, craniopharyngiomas, and meningiomas
- Overall, qualitative evaluation of the included studies demonstrated a trend of transient decline in the early postoperative period followed by recovery toward baseline olfactory function at later follow-ups
  - Of studies measuring olfaction at one month follow up, eight of nine reported significant decline
  - Of studies measuring olfaction at three months follow up, zero of 21 reported significant decline
  - Of studies measuring olfaction at six months follow up, six of 23 reported significant decline
- 53% of studies following olfaction longitudinally reported transient declines in olfaction with a median recovery time of 13 weeks (range 4-26.1 weeks)
- Studies comparing superior/middle turbinate resection vs preservation and cold knife vs electrocautery found no significant differences in postoperative olfactory outcomes between groups
- Qualitative analysis of studies investigating the use of conventional nasoseptal flaps (NSFs) demonstrated that their use may be associated with prolonged time to recovery of olfaction compared to controls

Meta-Analysis:
- Eight studies making 11 cohorts using UPSIT were included in the analysis
- For UPSIT cohorts measured three months or earlier postoperatively, there was a significant decline in olfaction (MD= -0.78, $p<0.0001$)
- For UPSIT cohorts measured at six months or later postoperatively, there was no significant decline from baseline (MD= -1.24, $p=0.3$)

Figure 2a. UPSIT Scores at Three Months or Earlier Follow Up

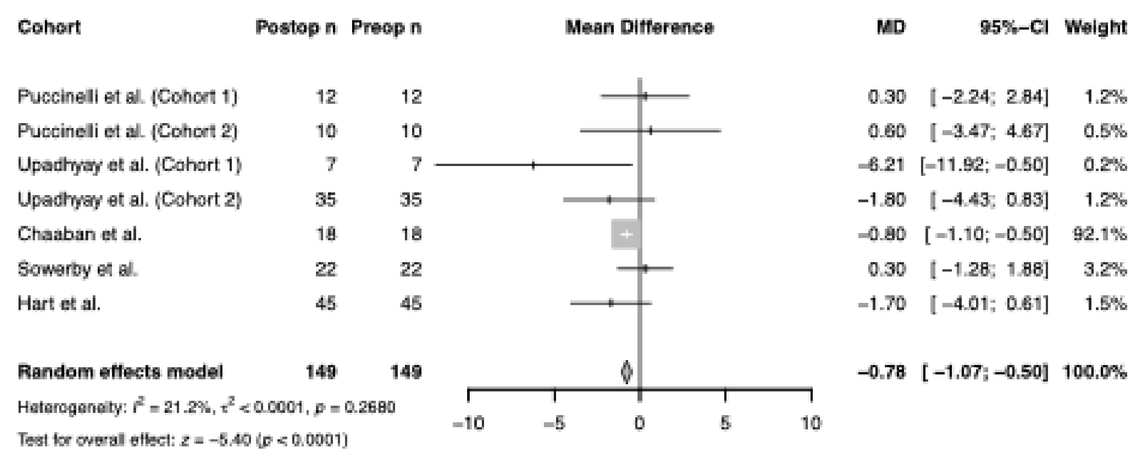
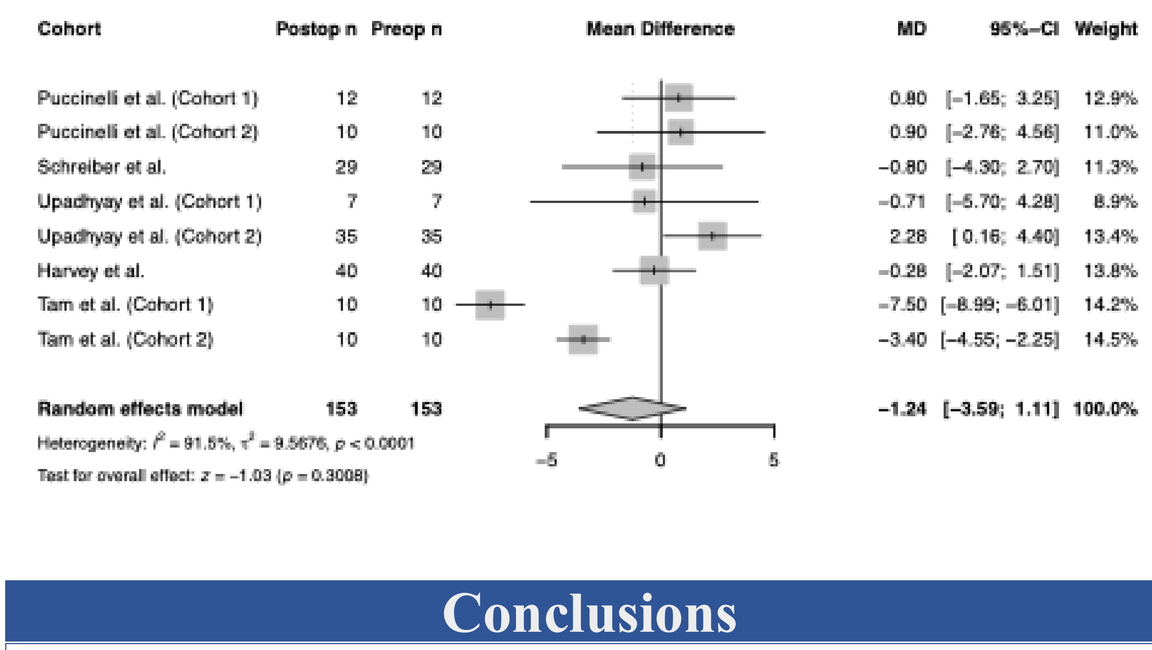


Figure 2b. UPSIT Scores at Six Months or Later Follow Up



Conclusions

The use of EETA for pituitary and skull-based lesions could be associated with transient olfactory decline. While superior or middle turbinate resection and use of electrocautery versus cold knife appear to not influence olfaction, the use of conventional NSF may increase the time to recovery of olfactory function.

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References

1. Schwartz TH, Fraser JF, Brown S, Tabaee A, Kacker A, Anand VK. Endoscopic cranial base surgery: classification of operative approaches. Neurosurgery. 2008 May;62(5):991–1002; discussion 1002-1005.
2. Figueredo LF, Martínez AL, Suarez-Meade P, Marenco-Hillembrand L, Salazar AF, Pabon D, et al. Current Role of Endoscopic Endonasal Approach for Craniopharyngiomas: A 10-Year Systematic Review and Meta-Analysis Comparison with the Open Transcranial Approach. Brain Sci. 2023 May 23;13(6):842.
3. Lee JY, Park JS, Jeun SS, Kim SW, Jang D, Kim DH, et al. Sinonasal Complications of Combined Transseptal-Transnasal and Bilateral Transnasal Approaches for Endoscopic Endonasal Transsphenoidal Pituitary Surgery. World Neurosurg. 2024 Dec;192:e410–5.
4. Aziz Baban MI, Hadi SJ, Mahmoud AA, Shareef DJ. Preservation versus resection of middle turbinate in endoscopic transnasal transsphenoidal pituitary surgery. Am J Otolaryngol. 2023;44(3):103826.
5. Rotenberg BW, Saunders S, Duggal N. Olfactory outcomes after endoscopic transsphenoidal pituitary surgery. Laryngoscope. 2011 Aug;121(8):1611–3.
6. Puccinelli CL, Yin LX, O'Brien EK, Van Gompel JJ, Choby GW, Van Abel KM, et al. Long-term olfaction outcomes in transnasal endoscopic skull-base surgery: a prospective cohort study comparing electrocautery and cold knife upper septal limb incision techniques. Int Forum Allergy Rhinol. 2019 May;9(5):493–500.
7. Koo BM, Jeong JI. Long-term Recovery Patterns of Olfactory Function after Trans-sphenoidal Approach with Nasoseptal Flap Elevation. Int Arch Otorhinolaryngol. 2023 Oct;27(4):e699–705.