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INPLASY

Risk factors for postoperative epistaxis after endoscopic endonasal transsphenoidal surgery for skull base tumors: a systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 June 2025 and was last updated on 28 June 2025.

INTRODUCTION

Review question / Objective P (Patient/Population): Patients undergoing transsphenoidal surgery for skull base tumors; I (Intervention/Exposure): Postoperative nasal hemorrhage (epistaxis) group; C (Comparison): Non-hemorrhage control group (patients without postoperative epistaxis); O (Outcome): Risk factors/causes of postoperative nasal bleeding (surgical technique, vascular injury, coagulation status, tumor characteristics).

Condition being studied The endoscopic endonasal transsphenoidal approach has become the primary surgical option for skull base tumors due to its minimally invasive nature, rapid postoperative recovery, and low complication rates. However, postoperative epistaxis represents a particularly severe complication following this approach, significantly increasing readmission rates and imposing substantial burdens on both healthcare systems and patients' financial resources. Currently, the precise etiological mechanisms underlying postoperative nasal hemorrhage in patients undergoing endoscopic endonasal skull base surgery remain incompletely understood.

METHODS

Search strategy ("skull base neoplasms" OR "skull base tumors" OR "pituitary adenoma" OR "pituitary tumor" OR "craniopharyngioma" OR "chordoma" OR "meningioma" OR "schwannoma" OR "neurilemmoma" OR "Rathke cyst" OR "Rathke's cyst" OR "olfactory neuroblastoma" OR "esthesioneuroblastoma" OR "clival tumor" OR "clivus tumor" OR "clival chordoma" OR "cavernous sinus tumor" OR "sellar tumor" OR "suprasellar tumor" OR "parasellar tumor" OR "chondrosarcoma" OR "epidermoid cyst" OR "dermoid cyst" OR "metastatic skull base" OR "skull base metastasis") AND ("epistaxis" OR "nasal hemorrhage" OR "nasal bleeding" OR "nosebleed" OR "postoperative bleeding" OR "haemorrhage").

Participant or population Patients with skull base tumors undergoing endoscopic endonasal transsphenoidal surgery.

Intervention Exposure group: Postoperative nasal hemorrhage (epistaxis).

Comparator Non-hemorrhage control group (patients without postoperative epistaxis).

Study designs to be included Case-Control Study and Cohort Study.

Eligibility criteria
(1) publications in a peer – reviewed journal in English
(2)Clearly document risk factors associated with postoperative epistaxis
(3)Patients diagnosed with skull base tumors
(4)Studies report or provide data convertible to odds ratios (ORs) with 95% confidence intervals (CIs) and standard errors (SEs).

Information sources
We will systematically search peer-reviewed articles across four major biomedical databases: PubMed, MEDLINE, Cochrane Library, and Embase. The search will encompass:
All primary studies published in peer-reviewed journals
Relevant articles identified through reference lists of included publications (i.e., backward citation tracking)
For studies with incomplete or missing data, we will make direct contact with corresponding authors to request additional information. This will include but not be limited to:
Unpublished outcome measures
Raw data necessary for effect size calculation
Clarification of methodological detailsPubmed; MEDLINE; Cochrane Library and Embase.

Main outcome(s)
(1)Incidence of postoperative nasal hemorrhage/ epistaxis
(2)Pooled odds ratios (ORs)/risk ratios (RRs) of identified risk factors such as Surgical factors (e.g., intraoperative vascular injury, operative duration) and patient baseline characteristics (e.g., coagulation dysfunction, tumor type).

Quality assessment / Risk of bias analysis We will evaluate the methodological quality of included prevalence studies using the Joanna Briggs Institute (JBI) appraisal tool for prevalence research. This validated instrument will examine nine critical methodological components related to study design quality and potential biases, including sampling methodology and analytical approaches, with detailed evaluation criteria to be provided in Supplementary Table 1. We will only include articles that clearly document their methodology and results, scoring each quality item as "yes," "no," "unclear," or "not applicable."

For non-randomized comparative studies, we will employ the Newcastle-Ottawa Assessment Instrument (NOAI) to assess three key domains: (1) cohort selection methodology, (2) between-group comparability, and (3) outcome measurement validity through eight specific criteria. This assessment will consider essential methodological elements including population representativeness, participation rates, exposure measurement, control of confounding variables, and statistical methods. We will classify studies scoring more than six points on the nine-point scale as demonstrating high methodological quality.

Two independent reviewers will conduct all quality assessments. When discrepancies occur, a third senior researcher will arbitrate to reach consensus through discussion.

We will grade the evidence strength for identified risk factors using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) to categorize findings as high, moderate, low, or very low confidence. The evaluation will systematically assess four critical domains: risk of bias, inconsistency, indirectness, and imprecision. While we will not evaluate publication bias for observational studies, we will downgrade evidence ratings by one to three levels when methodological concerns are identified. Two reviewers will independently perform the grading, followed by consensus discussions to finalize confidence ratings.

Strategy of data synthesis (1)Two independent reviewers will extract data using a standardized form. Discrepancies will be resolved by consensus. Extracted data include:
Study characteristics: author, year, country, design
Patient demographics: age, sex, comorbidities
Surgical factors: approach (endoscopic/ microscopic), operative time, vascular injury
Outcomes: incidence of epistaxis, severity grading (e.g., Bleeding Severity Scale), adjusted/ unadjusted effect sizes (OR/RR with 95% CIs).
Missing data will be requested from original authors; if unavailable, we will perform sensitivity analyses excluding such studies."
(2)Dichotomous outcomes will be expressed as pooled odds ratios (ORs) or risk ratios (RRs) with 95% confidence intervals (CIs), using the Mantel-

Haenszel method for fixed-effects models or DerSimonian-Laird for random-effects models (if I^2>50%).
(3)Continuous outcomes (e.g., blood loss volume) will be analyzed using weighted mean differences (WMDs) or standardized mean differences (SMDs) with 95% CIs.

Subgroup analysis Subgroup analyses will be conducted when the following conditions are met:
Surgical factors: endoscopic vs. microscopic approach, operative time.
Tumor types: pituitary adenomas vs. meningiomas vs. chordomas
Study quality: high-quality (Newcastle-Ottawa score ≥7) vs. low-quality studies".

Sensitivity analysis We will exclude studies with:
High risk of bias (Newcastle-Ottawa Scale [NOS] ≤4 for observational studies)
Unadjusted confounding variables (e.g., age, tumor size, surgical approach).

Language restriction Only English-language publications will be included.

Country(ies) involved China.

Other relevant information None

Keywords Transsphenoidal surgery, Postoperative epistaxis, Skull base tumor, Risk factors.

Dissemination plans None.

Contributions of each author
Author 1 - Jiajun Chen - Author 1: Performed literature screening and manuscript drafting.
Email: 1030112394@qq.com
Author 2 - Yingyue Zhang - Author 2: Conducted literature screening and data extraction.
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Author 3 - Xuehua Che - Author 3: Designed the study protocol and served as arbitrator to resolve discrepancies between Author 1 and Author 2 during the review process.
Author 4 - Weiqiang Yang - Author 4 search strategy formulation.
Author 5 - Ying Huang - Author 5 oversee the entire research process, including protocol development, methodology refinement, and quality control.