Endoscopic versus microscopic trans-sphenoidal pituitary surgery: a systematic review and meta-analysis

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CRD summary
The authors suggested that endoscopic and microscopic transsphenoidal pituitary surgery had similar rates of complete tumour excision and remission. Endoscopic surgery had fewer complications related to surgical technique and a shorter hospital stay. Due to limitations in the review (such as poor study quality and poor reporting in the review) these conclusions require cautious interpretation.

Authors' objectives
To compare the efficacy and safety of a pure endoscopic approach versus a microscopic approach in pituitary surgery.

Searching
MEDLINE (from 1952), EMBASE (from 1974) and The Cochrane Library were searched to February 2010. Search terms were reported. The reference lists of relevant studies were checked for further studies. The search was not limited by language.

Study selection
Eligible pituitary tumour surgery studies compared a pure endoscopic transsphenoidal approach (fully endoscopic with endoscopic resection) with a microscopic transsphenoidal approach (sublabial, trans-septal). Studies were required to include at least 20 adult participants who had undergone surgery in the same centre. Outcomes of interest in the review were: remission of hypersecretion for functioning adenomas; gross complete tumour removal rate; rate of improvement in patients with preoperative visual field deficit; complications attributable to the surgical approach, such as intra and post-operative cerebrospinal fluid (CSF) leak, diabetes and other complications (such as loss of visual acuity, septal perforation or death); and characteristics of the operation (such as length of hospital stay, blood loss, operative time). Outcomes were defined in more detail in the review.

Participants had functioning or non-functioning pituitary microadenomas or macroadenomas, in some cases with cavernous invasion. Surgical procedures compared in the studies included a pure endoscopic or endoscopic-assisted approach versus an endonasal transsphenoidal microscopic approach or a sublabial trans-septal transsphenoidal microscopic approach, where reported. The definition of remission varied across studies. Duration of follow-up ranged from 6.8 to 42 months in the endoscopic group and from 4.9 to 61 months in the microscopic group, where reported.

It was unclear how many reviewers were involved in the initial stages of study selection. Final study selection was assessed independently by two reviewers, with disagreements resolved by discussion.

Assessment of study quality
Criteria for evaluating randomised controlled trials (RCTs) were: reporting of randomisation and allocation methods; group size greater than 10 participants; blinding of outcome assessment; use of intention-to-treat analysis; and completeness of outcome data. RCTs were graded from A (all criteria met) to C (no criteria met). Evaluation of retrospective comparative case series was based on the Newcastle-Ottawa Scale; studies were graded as I (score at least 6) or II (score 5 or below).

The authors did not state how many reviewers performed the assessment.

Data extraction
Odds ratios (ORs) or risk ratios (RRs) with 95% confidence intervals (CIs) were extracted or calculated for dichotomous outcomes and weighted mean differences (WMDs) for continuous outcomes. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Studies were combined to calculate pooled odds ratios, risk ratios, weighted mean differences and 95% confidence intervals. Heterogeneity was assessed using $X^2$. A fixed-effect model was used unless there was significant heterogeneity, in which case a random-effects model was used. Subgroup analyses were conducted according to functioning adenoma type (acromegaly, prolactinoma or Cushing disease). Sensitivity analyses were conducted by study design, excluding retrospective studies and excluding grade II retrospective studies. Subgroup analysis examining extension of pituitary adenomas was not possible due to lack of data.

**Results of the review**

Eleven studies were included in the review (812 participants, range 20 to 176); one RCT (20 participants), one quasi-RCT (44 participants) and nine retrospective observational studies (748 participants). Both RCTs were poor quality (rated C); seven of the observational studies were rated as grade I and two as grade II.

There was no significant difference between a pure endoscopic approach and a microscopic approach in rates of initial remission (three studies), gross complete tumour removal (seven studies) or CSF leak (nine studies). The rate of diabetes in the acute postoperative period was significantly higher in the microscopic group (RR 1.14, 95% CI 1.04 to 1.24; eight studies) and the rate of permanent diabetes was significantly lower in the endoscopic group (RR 0.30, 95% CI 0.10 to 0.86). The overall occurrence of other complications was significantly lower in the microscopic group (RR 0.18, 95% CI 0.09 to 0.35; 10 studies).

Length of hospital stay was significantly shorter in the endoscopic group (WMD -1.53 days, 95% CI -2.3 to -0.77; two studies). The authors stated that there was no significant difference between the groups in operative time or blood loss.

Subgroup and sensitivity analyses did not affect the main review findings. It did not appear that any significant heterogeneity was detected except for the analysis of diabetes in the acute postoperative period ($p=0.03$).

**Authors’ conclusions**

Evidence suggested that endoscopic and microscopic transsphenoidal pituitary surgery had similar rates of complete tumour excision and remission. Endoscopic surgery had fewer complications related to surgical technique and a shorter hospital stay.

**CRD commentary**

The objectives and inclusion criteria of the review were clear in most respects, but the inclusion of studies of endoscopy-assisted rather than “pure” endoscopy surgery did not appear consistent with the inclusion criteria. Relevant sources were searched for studies without restriction by language, which minimised the potential for language bias. No specific effort was made to retrieve unpublished studies, which may have increased the potential for publication bias. It was unclear how many reviewers were involved in the initial stages of study selection or how many reviewers performed quality assessment and data extraction: failure to have more than one reviewer independently undertake these processes may have increased the potential for reviewer bias and error. The specific quality characteristics of each study were not reported. Most of the included studies were retrospective case series, which were subject to bias. These factors made it difficult to assess the reliability of the review findings.

The statistical methods used to pool the studies and to assess and explore differences between them appeared appropriate in most respects. The results of heterogeneity tests were not reported for all analyses; where significant heterogeneity was detected it was not explored and a random-effects model was not used. It was not always clear whether findings on complications applied to all complications or just surgery-related ones. Text that reported the findings for hospital stay and blood loss was inconsistent with the numerical results presented, and neither units of analysis nor direction of effect were reported for these outcomes. Study quality appeared very poor; as the authors noted, studies were small, short-term and poorly reported. There was very high potential for selection bias.

Due to limitations in the review (such as poor study quality and poor reporting in the review) the authors’ conclusions require cautious interpretation.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that studies with long term follow up were needed to compare an endoscopic versus a...
microscopic approach in pituitary surgery.

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