Effects and side-effects of surgery for snoring and obstructive sleep apnea: a systematic review

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CRD summary
The review found no evidence of any effect from laser-assisted uvulopalatoplasty or radiofrequency ablation on daytime sleepiness, apnoea, quality of life or snoring; uvula removal carried a high risk of persistent side effects. The authors' conclusions may require some caution, as there were very few controlled studies (which were possibly underpowered) and findings for snoring were inconsistent.

Authors' objectives
To determine the benefits and side effects of surgery for snoring and obstructive sleep apnoea in adults.

Searching
PubMed and Cochrane Central Register of Controlled Trials (CENTRAL) were searched in September 2007 for studies in English. Search terms were reported. Reference lists of articles retrieved were checked.

Study selection
Randomised controlled trials (RCTs) that compared the effectiveness of surgery versus sham surgery or conservative treatment for snoring or obstructive sleep apnoea in adults were eligible for inclusion. Primary review outcomes were daytime sleepiness (measured with the Epworth Sleepiness Scale, Multiple Sleep Latency test or Maintenance of Wakefulness test) and quality of life. Secondary outcomes were the apnoea-hypopnoea index and severity of snoring. RCTs and observational studies that reported postoperative complications and side effects (other than postoperative pain) were eligible for inclusion.

Types of surgery in the included studies were laser-assisted uvulo-palatoplasty (LAUP), temperature-controlled radiofrequency tissue ablation (TCRAFTA), uvulopalatoplasty (UPP) and uvulopalatopharyngoplasty (UPPP). Controls (where relevant) received sham surgery or no treatment. A variety of questionnaires were used to measure effectiveness outcomes. Snoring characteristics were measured with a 1-10 visual analogue scale (VAS), where reported. Duration of follow-up was rarely reported in the review, but three months and seven months were reported.

Two reviewers independently selected the studies.

Assessment of study quality
RCTs were scored for quality using a modified version of the Jadad scale to assess adequacy of reported randomisation, allocation concealment, blinding and withdrawals. Study quality was designated high (4 to 5 points out of 5), medium (3 points) or low (zero to 2 points).

Observational studies were defined as high quality (criteria included prospective design, detailed reporting of methods, loss to follow-up of under 30%); or medium quality (criteria included prospective design or consecutive enrolment, detailed reporting of adverse effects, loss to follow-up <30%). Only high- or medium-quality studies were included for most outcomes; all studies that reported life-threatening side effects and deaths were included.

Two reviewers independently conducted the assessment.

Data extraction
For effectiveness outcomes, mean differences and 95% confidence intervals (CIs) were calculated from differences in change in the two groups. For adverse effects, the proportion of participants who experienced an event in each study was calculated.

Two reviewers independently extracted data. Primary study authors were contacted for more information if required.

Methods of synthesis
Data were combined to calculate weighted mean differences (WMDs) between the groups, with 95% CIs. For adverse effects, ranges and mean rates (weighted by sample size) were calculated. Overall evidence was graded as strong (consistent evidence from ≥two high-quality studies), moderate (≥one high-quality and two medium-quality studies) or limited (≥two medium quality studies). Estimates of statistical heterogeneity (measured by $\chi^2$ and $I^2$ statistics) were presented in forest plots.

**Results of the review**

Forty-nine studies were included in the review: four high-quality RCTs (n=160, range 26 to 60) that reported effectiveness; and 45 observational studies (five high quality, 33 medium quality, seven low quality, n=over 6,189, range 12 to 3,130) that reported adverse effects. Withdrawal rates ranged from nil to 42% where reported.

There was no statistically significant difference between intervention and control groups for any measure of daytime sleepiness (four RCTs pooled), quality of life (two RCTs) and apnoea-hypopnoea (three RCTs). One RCT (n=46) reported that LAUP significantly improved snoring intensity (VAS WMD -4.0, 95% CI -5.5 to-2.5) and frequency (WMD -3.6, 95% CI -1.3 to 15.9) compared to no treatment. A second RCT found no significant difference between LAUP and sham treatment for snoring measures. One RCT (n=26) reported that TCRAFTA significantly improved snoring (VAS WMD 2.5, 95% CI 0.4 to 4.6) compared to sham surgery.

Six studies (one high, two medium and four low quality, n=15,398) reported a total of 30 deaths after UPPP or LAUP, in most cases associated with respiratory compromise, bleeding, intubation problems, infection or cardiac arrest. One of these, a high-quality observational study (n=3,130) reported perioperative/postoperative death in 0.2% (95% CI 0.1 to 0.4) and other serious complications in 1.5% (95% CI 1.1 to 1.9) of patients after UPPP. There was moderate or strong evidence that both UPP (weighted mean 27%, range 19 to 29; six studies) and UPPP (weighted mean 31%, range 13 to 36; four studies) were associated with swallowing problems.

No significant statistical heterogeneity was evident. Other data on adverse effects were reported in the review.

**Authors’ conclusions**

There was no evidence of any effect from LAUP or TCRAFTA on daytime sleepiness, apnoea, quality of life or snoring; uvula removal carried a high risk of persistent side effects.

**CRD commentary**

The objectives and inclusion criteria of the review were clear. Relevant sources were searched for studies, but the restriction by language meant that there was a possible risk of language bias. It was unclear whether the review was limited by publication status and it did not appear that the risk of publication bias was assessed. Steps were taken to minimise risks of reviewer bias and error by having more than one reviewer independently select studies, assess validity and extract data. There were some discrepancies in reporting of study characteristics and insufficient detail about duration of follow-up for adverse event outcomes. Appropriate statistical techniques were used to combine studies and assess for statistical heterogeneity. With regard to the Epworth sleepiness scale, the authors’ conclusions did not acknowledge the consistent non-significant trend for superior outcomes in the surgical groups, which suggested that the studies might have been underpowered. The authors neither acknowledged that there was some inconsistent evidence of benefit for snoring outcomes nor attempted to explain the inconsistency.

The authors’ conclusions may require some caution in view of the small sample sizes of the controlled studies and unexplained inconsistency in some of the findings.

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

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

**Research:** The authors stated that studies of surgical modalities other than UPP and UPPP should be conducted (such as tonsillectomy). They suggested that controls could be randomised to delayed surgery rather than placebo and recommended blinding of outcomes assessment (at least).

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