A cost-effective and rational surgical approach to patients with snoring, upper airway resistance syndrome, or obstructive sleep apnea syndrome

Utley D S, Shin E J, Clerk A A, Terris D J

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Laser-assisted uvulopalatoplasty (LAUP) surgical approach to patients with snoring, upper airway resistance syndrome (UARS), or obstructive sleep apnea syndrome (OSAS).

Type of intervention
Secondary prevention; Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with sleep disordered breathing.

Setting
Institution. The study was carried out at the Stanford University Medical Centre Division of Otolaryngology - Head and Neck Surgery, California, USA.

Dates to which data relate
Effectiveness and resource data were collected between November 1, 1993 and December 31, 1995. No prices were stated.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken alongside the same patient sample as that used in the study.

Study sample
229 patients were evaluated for treatment for snoring. 95 of these patients were determined to be candidates for surgical treatment. The remaining 134 patients either chose non-surgical interventions or refused conventional treatment. 56 patients (50 men, 6 women) with a mean age of 45.3 (+/- 11.3) years underwent 134 LAUP procedures (mean/patient, 2.4 (+/- 1), range: 1 - 5). No power calculations were used to determine sample size. This group had a mean Epworth Sleepiness Scale (ESS) score of 8.5 (+/- 5.6), a mean respiratory disturbance index (RDI) of 12.1 (+/- 14.5) (mean apnea index [AI] = 5.5 (+/- 10.9), mean hypopnea index of 6.8 (+/- 8.6)) and a mean lowest oxygen saturation (LSAT) of 87.9 (+/- 5.7%), and all patients snored. 32 patients (30 men, 2 women) with a mean age of 46.1 (+/- 11) years...
mass index of 31.1 (+/- 4.8), underwent multilevel pharyngeal surgery and all patients snored.

**Study design**
A retrospective review was undertaken on patients for evaluation of sleep-disordered breathing (SDB). The preoperative evaluation included a thorough history, complete head and neck examination, flexible fiberoptic nasopharyngoscopy with a modified Muller manoeuvre, the Epworth Sleepiness Scale (ESS) questionnaire and polysomnography. The examiner was blinded to the polysomnography data at the time of both preoperative and postoperative modified Muller manoeuvre. The LAUP procedures were performed with a Luxar LX-20 CO2 laser (Bothel, WA) at a setting of 20W, continuous mode. No follow-up period was mentioned.

**Analysis of effectiveness**
The analysis of the study was based on intention to treat. The primary health outcomes were ESS and RDI. 21 of 95 patients for surgical treatment (22.1%) underwent a trial of continuous positive airway pressure (CPAP) prior to surgery. In the ESS questionnaire the patient rates each situation from 0 to 3, with 3 being the highest likelihood, giving a total range of scores from 0 to 24. A score of less than 7 was considered within normal limits, and a score greater than 9 is suggestive of SDB.

**Effectiveness results**
56 patients underwent 134 LAUP procedures in a 26-month period. Within this group all patients snored. 11 of these were diagnosed with UARS (minimal esophageal pressure < -20mm Hg, RDI < 10 and ESS >= 7). The degree of palatal collapse on the modified Muller manoeuvre was 2.2 (+/- 1.3). Of the 47 patients for whom preoperative and postoperative ESS data were available, the mean score fell from 8.9 (+/- 6) to 6.6 (+/- 4.50, (P=0.041). Preoperative and postoperative modified Muller manoeuvre data were available for 18 patients, with palatal collapse decreasing from 2.5 (+/- 1.3) to 0.9 (+/- 1.3), (P<0.001). 32 patients underwent multilevel pharyngeal surgery consisting of UPPP, genioglossus advancement (GA), hyoid myotomy (HM) and all patients snored. In 29 of those for whom preoperative and postoperative ESS scores were available, the mean score fell from 12.1 (+/- 4.9) to 4.5 (+/- 4.1), (P<0.001). The improvement in RDI (P=0.011) and AI (P=0.006) were statistically significant.

Preoperative and postoperative modified Muller manoeuvre data were available for 21 patients with mean palatal collapse decreasing from 3.3 (+/- 1) to 0.8 (+/- 0.9), (P<0.001). The mean lateral pharyngeal wall collapse decreased from 2.5 (+/- 1.1) to 1.5 (+/- 1.1), (P<0.05), and the mean base of tongue collapse decreased from 1.9 (+/- 1.4) to 0.7 (+/- 1.2), (P<0.05). 6 patients underwent septoplasty and bilateral inferior turbinate resection (5 men, 1 woman; mean age 48.8 (+/- 11.1) years; mean BMI 29.8 (+/- 6.2)). ESS scores for 4 patients worsened or remained unchanged, but the overall mean score decreased from 7.8 (+/- 5.2) to 6.8 (+/- 5.4), (P=0.56). Data were assessed using the paired Student's t-test for means.

**Clinical conclusions**
The analysis confirmed that LAUP is an effective tool for the treatment of primary snoring.

**Measure of benefits used in the economic analysis**
The measures of benefits used in the economic analysis were the improvement in the RDI, AI, and hypopnea index together with a decline in the degree of palatal collapse and BMI.

**Direct costs**
The estimates for direct costs included anaesthesia fees, surgeon fees, and operating room and hospital charges. Quantities and costs were not analysed separately nor were they discounted.

**Statistical analysis of costs**
No statistical analysis was carried out on costs.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analysis was not carried out.

**Estimated benefits used in the economic analysis**
In the LAUP group, postoperative AI < 10 or a postoperative RDI < 20 resulted in a success rate of 41.7%. Snoring was completely cured in 23 patients (41.8%), 50% to 99% improved in 28 patients (50.9%), and less than 50% improved in 4 (7.3%). Overall, 72.7% of patients had greater than 70% improvement in their snoring. Of the 56 patients who underwent LAUP, 81.8% reported improvement in EDS symptoms as evidenced by improved ESS scores from 13.5 (+/- 4.4) to 8 (+/- 2.5), (P=0.002). Of the patients who underwent multilevel pharyngeal surgery, the RDI decreased in 92.9% (13 of 14), and 57.1% (8 of 14) were considered a success by having a reduction in RDI > 50% and a postoperative RDI < 20. Application of the response criteria yielded a success rate of 85.7% (12 of 14 patients). The improvement in RDI (P=0.011) and AI (P=0.006) were statistically significant. All patients in the UPPP/GA/HM group reported an improvement in the volume and frequency of snoring: snoring was completely cured in 12 patients (50%), 50% to 99% improved in 10 (41.7%), and 25% or less improved in 2 (8.3%). 19 of 24 patients (79.2%) had >70% improvement in snoring.

**Cost results**
The estimated charge for complete treatment of snoring with LAUP was $2,500. A UPPP with a single-night, inpatient hospitalisation would incur a charge of approximately $10,600. The charge for UPPP/GA/HM for one night on the ward was estimated to be $28,000. The approximately charge for outpatient septoplasty and bilateral turbinate trim was $9,600.

**Synthesis of costs and benefits**
Costs and benefits were not combined.

**Authors' conclusions**
The authors concluded that LAUP is an effective surgical procedure for primary snoring and UARS, with success rates for snoring that are comparable to UPPP for one-fourth the cost. The authors recommend a stratified surgical approach to patients with sleep-disordered breathing. Progressively worse airway obstruction marked by multilevel pharyngeal collapse and more severe sleep-disordered breathing should be treated with incrementally more aggressive surgery addressing multiple areas of the upper airway.

**CRD COMMENTARY - Selection of comparators**
The reason for choice of comparator was clear. You, as a user of this database, should consider whether the health technologies examined are applicable to your own setting.

**Validity of estimate of measure of benefit**
The measures of benefit were validated by the use of various indices: the RDI, AI, hypopnea index, BMI and the degree of palatal collapse. Although there is bias built into any retrospective study, this was moderated by the use of the modified Muller manoeuvre evaluation.
Validity of estimate of costs
The cost methodology could have been better specified. There was no mention of prices used.

Other issues
Due to the small sample size, caution should be exercised when applying these results to other settings.

Source of funding
None stated.

Bibliographic details

PubMedID
9185727

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Airway Obstruction /economics /surgery; Cost of Illness; Cost-Benefit Analysis; Female; Humans; Laser Therapy; Male; Middle Aged; Palate /surgery; Polysomnography; Retrospective Studies; Sleep Apnea Syndromes /economics /surgery; Snoring /economics /surgery; Turbinates /surgery; Uvula

AccessionNumber
21997000860

Date bibliographic record published
28/02/1999

Date abstract record published
28/02/1999