Surgical procedures and non-surgical devices for the management of non-apnoeic snoring: a systematic review of clinical effects and associated treatment costs

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CRD summary
There was only scarce, poor quality research available on the effects of surgical procedures and non-surgical devices for the management of non-apnoeic snoring, and any conclusions were considered tentative. The results of this review should be considered as reliable, while bearing in mind the potential limitations of excluding unpublished and non-English literature.

Authors' objectives
To review the evidence on the clinical effects and associated treatment costs of surgical procedures and non-surgical devices for the management of non-apnoeic snoring.

Searching
The following databases were searched between 1980 and 2007: MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of Controlled Trials (CENTRAL) and NHS EED. Search terms were reported. No study filters or language restrictions were used in the searches, but only full text-English language papers were considered for inclusion.

Study selection
Studies were eligible for inclusion where they reported on randomised controlled trials (RCTs), controlled trials (CCTs), and pre-post studies, provided they reported an objectively measured outcome.

The interventions of interest were specified as non-surgical devices (continuous positive airway pressure - CPAP; mandibular advancement splints; tongue retaining devices) or surgical procedures (surgery for coincident nasal obstruction; uvulopalatopharyngoplasty, with or without tonsillectomy; laser-assisted uvulopalatoplasty; uvulopalatal elevation palatoplasty, uvulectomy alone; radio frequency ablation of soft palate or tongue base; palatal stiffening techniques; tongue base suspension procedures).

Comparators could be another of the interventions, placebo, lifestyle modification techniques, or no intervention. Studies assessing adenoidectomy or tonsillectomy, either alone or in combination with each other, were not included.

Adults with non-apnoeic snoring (defined as an apnoea/hypopnoea index score of less than or equal to 5) who were eligible for any of the interventions, providing the diagnosis of obstructive sleep apnoea syndrome had been excluded by sleep study, were eligible for inclusion in the review. Snorers with specific related co-morbidities were also not included.

Studies were required to report one or more of the objective (snoring recording/acoustic analysis, polysomnography (PSG) or oximetry, cephalometric radiographs or MRI scans) or subjective (patient and partner questionnaires relating to symptoms, quality of life or quality of sleep, patient symptom scores) outcome measures of snoring, or on complications.

The majority of the included studies assessed surgical procedures (89%). These were broadly grouped as: uvulopalatopharyngoplasty versus laser-assisted uvulopalatoplasty; uvulopalatopharyngoplasty alone; laser-assisted uvulopalatoplasty alone; radio frequency ablation of the soft palate or tongue base; and palatal stiffening techniques.

The included studies differed considerably in study design, sample size and duration of follow-up. Studies were predominantly surgical case series that reported pre-post data. Overall 85% of studies only included patients with a diagnosis of non-apnoeic snoring. There was a trend for objective outcome measures to be reported for the shorter follow-up periods and subjective measures to be assessed at longer follow-up times.

Mean patient age in the included studies ranged from 40 to 50 years, although this ranged from 19 to 83 years across the papers. All studies included a higher percentage of males, ranging from 56 to 100%. Almost all recruited patients with a body mass index classified as 'overweight'. Studies usually took place in the otolaryngology department (or
equivalent). Countries of origin included North America, Scandinavia, UK and Europe, with smaller numbers in Thailand, Turkey, Israel, Hong Kong and Australia. The reported outcome measures could be broadly categorised as polysomnography parameter results, subjectively assessed snoring, daytime sleepiness, and objectively assessed snoring measures.

Studies were selected by two independent reviewers; disagreements were resolved by discussion and a third reviewer where necessary.

**Assessment of study quality**

Study quality was assessed separately for RCTs/CCTs and pre-post studies according to criteria based on CRD guidance. Internal validity was assessed according to the following criteria: selection of study groups; handling of potential confounders; blinding of assessors and data analysts; validity and reliability of outcome measures; rate of attrition; and appropriateness of data analyses. External validity was assessed according to the applicability of the findings to a patient group in practice. Further details were given in the report.

Validity assessment was carried out by one reviewer and independently checked for agreement by a second reviewer.

**Data extraction**

Data were extracted by one reviewer and checked by a second independent reviewer.

**Methods of synthesis**

Results were grouped by intervention/comparator, and then further subdivided according to intervention type and study design. Narrative synthesis and tabulation were used, due to heterogeneity in the outcome measures and variation between studies assessing the same type of intervention.

**Results of the review**

A total of 27 studies (n=1,191 participants, range 9 to 231) were included in this review: three RCTs, two CCTs, and 22 pre-post studies. Study quality was judged to be low overall. Duration of follow-up ranged from 10 days to five years.

**Non-surgical interventions:**

Both uvulopalatopharyngoplasty and laser-assisted uvulopalatoplasty reduced the number of snores per hour and produced a modest reduction in snoring loudness. One RCT and one CCT compared uvulopalatopharyngoplasty and laser-assisted uvulopalatoplasty, seven pre-post studies reported on uvulopalatopharyngoplasty alone and three pre-post on laser-assisted uvulopalatoplasty alone. Uvulopalatopharyngoplasty was effective in reducing a number of objectively reported snoring indices, but results from objective measures were equivocal. Some limited evidence from subjective measures indicated that snoring was improved after laser-assisted uvulopalatoplasty.

Radio frequency ablation of soft palate or tongue base (one RCT, one CCT, five pre-post studies) was associated with a reduction in partner-assessed snoring intensity, although there was mixed evidence for any objective reduction in snoring sound levels.

Pillar implants (one RCT, four pre-post studies) were moderately effective at reducing partner-rated snoring intensity, but had no effect on objective snoring indices.

**Surgical interventions:**

Use of continuous positive airway pressure (CPAP; one pre-post study) reduced the number of snores per hour. No objective measures were recorded.

Mandibular advancement splints (two pre-post studies) improved objective snoring outcomes including maximal snoring sound volume, mean snoring sound volume and percentage of time spent snoring. No subjective measures were recorded.
Authors' conclusions
There was only scarce, poor quality research available on the effects of surgical procedures and non-surgical devices for the management of non-apnoeic snoring, and any conclusions were considered tentative. It was not possible to definitively compare the relative effectiveness of different treatment options.

CRD commentary
This broad review addressed a clear question with detailed inclusion criteria. The searches appeared appropriate, but the exclusion of non-English and unpublished research introduced the risk language and publication biases. The review processes were clearly reported and likely to have substantially reduced any risk of error or bias being introduced by the reviewers. The quality assessment was carried out comprehensively and incorporated into the narrative synthesis.

The results of this review should be considered as reliable, while bearing in mind the potential limitations of excluding unpublished and non-English literature.

Implications of the review for practice and research
Practice: The authors stated that, in the absence of evidence showing any one treatment option was superior, patient choice is paramount.

Research: The authors stated that methods of measuring outcomes and of reporting in studies require standardisation. Controlled trial data is rare and such studies are required, particularly using continuous positive airway pressure (CPAP) and mandibular advancement splint devices. Longer-term evidence is needed to demonstrate the impact of radio frequency ablation of the soft palate and Pillar implants after one year post treatment.

Funding
HTA Programme (on behalf of the Therapeutic Procedures Panel), project number 07/17/01.

Bibliographic details

PubMedID
19091167

DOI
10.3310/hta13030

Original Paper URL
http://www.hta.ac.uk/execsumm/summ1303.htm

Other URL
Link to record in HTA database:http://www.crd.york.ac.uk/crdweb/ShowRecord.asp?AccessionNumber=32009100025& amp;UserID=0

Indexing Status
Subject indexing assigned by NLM

MeSH
Airway Obstruction /physiopathology /surgery /therapy; Cost-Benefit Analysis; Equipment and Supplies /economics; Health Care Costs; Humans; Laser Therapy /economics; Pharynx /physiopathology /surgery; Snoring /etiology /surgery /therapy; Technology Assessment, Biomedical; Treatment Outcome; Uvula /physiopathology /surgery; Velopharyngeal Sphincter /physiopathology /surgery
AccessionNumber
12009104607

Date bibliographic record published
09/09/2009

Date abstract record published
26/05/2010

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.