Radiofrequency ablation for the treatment of obstructive sleep apnea: a meta-analysis
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CRD summary
This review concluded that radio frequency ablation was effective in reducing Epworth Sleepiness Score and Respiratory Disturbance Index in patients with obstructive sleep apnoea. All the included studies appeared to be "before-and-after" studies without control groups. The design of included studies, as well as significant weaknesses in the review process and analysis, mean that these conclusions cannot be considered robust.

Authors' objectives
To assess the effectiveness of radio frequency ablation for the treatment of obstructive sleep apnoea.

Searching
MEDLINE and the Cochrane Library were searched from inception with no language restrictions. Search terms were reported. Bibliographies of included studies were screened for additional articles.

Study selection
Studies of radio frequency ablation of the palate, tongue base, or both, in patients with obstructive sleep apnoea were eligible for inclusion. In eligible studies, radio frequency ablation had to be conducted as a stand-alone procedure and could not include other procedures as part of surgery. The diagnosis of obstructive sleep apnoea was on the basis of symptoms and a pre-operative polysomnogram showing a respiratory disturbance index of 5 or more. Studies had to report at least one of the following clinical outcomes: preoperative and postoperative Respiratory Disturbance Index; Epworth Sleepiness Scale scores; or lowest oxygen saturations.

Study participants were all adults (over 18 years), with most studies excluding participants older than 65 years. No study excluded patients on the basis of gender, but gender distributions were not reported. Mean body mass index ranged from 25.7 to 30.6. The method of radio frequency ablation delivery was similar across studies: local anaesthetic, electrode placed in the submucosal tissue of the tongue base or soft palate, followed by delivery of a variable amount of energy (mean energy ranged from 1008 to 14,288 Joules); all but one study performed ablation using a transoral approach.

The authors did not state how many reviewers performed the study selection.

Assessment of study quality
The authors did not state that they assessed study validity.

Data extraction
Data were extracted on the mean and standard deviation pre- and post-treatment values of Epworth Sleepiness Scale, Respiratory Disturbance Index and oxygen saturation. Effect sizes were presented as odds ratios (ORs) with 95% confidence intervals (CIs), although it was unclear how these were derived, given that all reported outcomes were continuous rather than dichotomous measures, and no comparator groups were reported. Data on reported complications of radio frequency ablation were also extracted.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Data were analysed separately for short-term (less than 12 months) and long-term (over 24 months) studies. Pooled odds ratios, with 95% confidence intervals, were presented, but the method used to calculate these was not clear.

Between study heterogeneity was assessed using the Q statistic.
Results of the review
Sixteen studies were included in the review (n=346 patients, range 9 to 56). Three studies were randomised and 13 were non-randomised; no further details of study design were reported. The mean follow-up ranged from six weeks to 28 months.

Short-term follow-up (less than 12 months): There was an overall reduction in Epworth Sleepiness Scale of 31% (OR 0.69, 95% CI 0.63 to 0.75; 14 studies) associated with radio frequency ablation, with no evidence of statistical heterogeneity. Similarly, there was an overall reduction in Respiratory Disturbance Index of 31% (OR 0.69, 95% CI 0.61 to 0.77; 12 studies), with no evidence of statistical heterogeneity. Nine studies, reporting the lowest oxygen saturation, showed no improvement after radio frequency ablation.

Long-term follow-up (over 24 months): Two studies reported data for two year follow-up. The Epworth Sleepiness Scale showed a 32% overall reduction (OR 0.68, 95% CI 0.43 to 0.73). The Respiratory Disturbance Index showed a 45% overall reduction (OR 0.55, 95% CI 0.45 to 0.72).

Complications of radio frequency ablation: Thirteen studies reported complications rates. Two tongue abcesses progressed to airway obstruction requiring tracheotomy. All soft palate ulcers and fistula healed without incident. Tongue base radio frequency ablation may carry a higher risk of serious complications.

Authors' conclusions
Radio frequency ablation seemed to be a clinically effective tool that reduced Epworth Sleepiness Scale and Respiratory Disturbance Index levels in patients with obstructive sleep apnoea syndrome.

CRD commentary
The study reported a clear objective and inclusion criteria were clearly defined for participants, intervention and outcome measures. However, no study design or comparator was defined and the design of included studies was unclear; the majority of included studies appeared to be observational "before-and-after" studies. The review methodology was poorly reported; it was not clear whether any measures were taken to minimise error and/or bias and no assessment of the methodological quality of included studies was reported.

Included studies had small sample sizes and mainly short-term follow-up. Perhaps most significantly, all reported outcome measures were for continuous scales and extracted data were reported as the mean and standard deviation before and after treatment; there were no data for any comparator treatment or control group(s). The appropriate effect size measure appeared to be change in outcome measure with treatment. An overall effect size could be generated using weighted mean differences or similar. It was not clear how the authors derived odds ratios; a measure usually applied to dichotomous outcomes compared between treatment groups, The method used to generate pooled odds ratios was also unreported.

Although most of the included studies appeared to show reductions in Epworth Sleepiness Scale and Respiratory Disturbance Index following radio frequency ablation treatment, the absence of control groups and significant weaknesses in the review process and analysis mean that the authors' conclusions cannot be considered robust.

Implications of the review for practice and research
Practice: The authors stated that radio frequency ablation should be considered a valid treatment option for patients who refuse, or are unable to tolerate, continuous positive airway pressure.

Research: The authors suggested future research on the long-term effectiveness of radio frequency ablation.

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