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CO_2 Laser palatoplasty: early results

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Abstract

It is now widely accepted that snoring causes significant social dysfunction. In the absence of obstructive sleep apnoea syndrome, palatal surgery offers a very good chance of eliminating or reducing snoring. The traditional operation of uvulopalatopharyngoplasty remains the 'gold standard', but may be complicated by velopharyngeal incompetence, severe post-operative pain and even nasopharyngeal stenosis. A newer technique to reduce snoring caused by palatal flutter by using a neodymnium: yttrium aluminium garnet laser to stiffen the soft palate has been introduced recently by another unit. We show that this procedure can be carried out using a CO_2 laser, and present the initial results of the first 29 patients operated on at The Royal National Throat, Nose and Ear Hospital.

Key words: Snoring; Laser surgery, carbon dioxide

Introduction

It is now accepted that loud regular snoring, in the absence of obstructive sleep apnoea syndrome, may cause sufficient social dysfunction and sleep pattern alteration to warrant surgical intervention. Ellis *et al.* introduced a new surgical technique to treat snoring in 1993 using a neodymium: yttrium aluminium garnet (Nd:YAG) laser, and reviewed their early results. Snoring was reduced or eliminated in 14 of 16 patients, which compared favourably with the 11 of 15 patients treated with uvulopalatopharyngoplasty (UPPP) in that study who had a significant reduction in snoring. In addition, there was an improvement in the post-operative complication of nasal regurgitation from six of 15 in the UPPP group to none of 16 in the laser group (Ellis *et al.*, 1993). These results encouraged us to carry out an uncontrolled prospective pilot study using the same technique, modified slightly by using a CO_2 laser, in the absence of a Nd:YAG laser.

Materials and methods

Patients referred to the outpatients department with a history of disruptive snoring were assessed with a full history, including drug, alcohol and tobacco useage, a general examination, including height, weight and collar size, and a detailed examination of the nose and throat. Those with symptomatic nasal obstruction were excluded from the initial study and offered medical or surgical treatment where appropriate. Blood examination was carried out to ensure that the patients were euthyroid and not anaemic. Conservative treatment measures for snoring were discussed. These included appropriate weight loss, and a reduction in alcohol intake. An individual was selected for palatal surgery only if his or her snoring had failed to improve with conservative methods. In addition, each patient underwent hospital-based overnight polysomnography, including measurements of transcutaneous oxygen saturation, pulse, chest and abdominal movements, and expired carbon dioxide concentration to exclude from the study those patients with obstructive sleep apnoea syndrome. Those patients thus shown to have 'simple' snoring then had pre-operative sleep nasendoscopy assessment, and were excluded if their snoring was not due to palatal flutter, for example if it appeared to be due to negative pressure-induced tongue base collapse, or collapse of other soft tissues in the oro- or hypopharynx. The patients were then offered the choice of undergoing laser surgery to the palate. Full informed consent was obtained, and those patients who did not wish to undergo the new procedure were offered conventional UPPP.

The operations were carried out under routine inhalational general anaesthetic, delivered via an oro-tracheal tube. The patients were positioned in a standard tonsillectomy position, and a Boyle- Davies gag was used. All exposed facial skin was covered with wet swabs. The post nasal space was lightly packed with wet swabs, and the posterior pharyngeal wall and visible anaesthetic tube were similarly protected. Standard CO_2 laser precautions were taken by all theatre staff.

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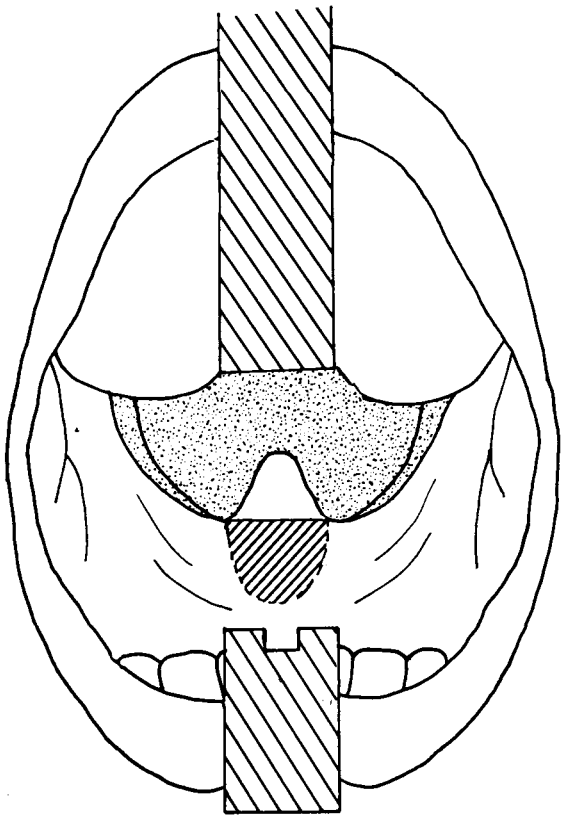

FIG. 1

Intraoral view from tonsillectomy position prior to positioning of wet swabs. Shading shows area where mucosa is stripped and level of uvulectomy.

Using the CO_2 laser in continuous superpulsed mode at a power of 10W, a U-shaped cut was made. The ends of the arms were positioned at the reflection of the lateral borders of the uvula on to the free border of the soft palate, and the apex of the U at the junction of the hard and soft palates. (See Figure 1.) An inferiorly based flap of mucosa and submucosa was then raised superficial to the intrapalatal muscle aponeurosis, and removed from the palate by excising the uvula flush with the free edge of the soft palate. Post-operative pain relief was given by the combined use of diclofenac sodium suppositories and soluble paracetamol. Patients were encouraged to eat and drink freely, and were all discharged on the second post-operative morning. They were advised to refrain from work for at least one week. They were seen at two weeks post-operatively, and at three months to ensure full healing had occurred.

Post-operative information was acquired using a short postal questionnaire which asked patients and their bed partners to say whether they felt the symptoms they had experienced pre-operatively were improved, unchanged or had become worse since the operation.

Results

Thirty-one patients had this operation between 1.2.93 and 18.7.94. Full post-operative information was available on 29 (94 per cent). The average length of follow-up was nine months. Twenty-three (79 per cent) reported a subjective improvement in snoring, and 16 of 19 patients (84 per cent) who had complained of a nocturnal sensation of airway obstruction pre-operatively, felt that the symptom had improved. Ten of 16 patients (63 per cent) reported that subjectively they were less likely to fall asleep during the day, and 13 of 22 patients (59 per cent) felt that their daytime tiredness was better. In addition, seven of 19 patients (37 per cent) reported that their memory or concentration had improved (Table I).

TABLE I
POST-OPERATIVE ASSESSMENT OF SYMPTOMS (%)

	Better	No change	Worse
Snoring	79	21	0
Sensation of obstruction	84	11	5
Falling asleep during day	63	37	0
Tired during day	59	41	0
Concentration and memory	37	63	0

Complications were reported by 22 patients (76 per cent). Nineteen (66 per cent) complained of a dry throat, and in six (21 per cent) this persisted for the length of their follow-up period (mean of 11 months). Five (17.2 per cent) complained of a temporary change in voice and three (14 per cent) said they had some initial nasal regurgitation of fluids which was no longer present at the time of the questionnaire. These latter three patients all reported that they had received sufficient benefit from the surgery to have made it worthwhile. Only five patients, after a mean follow up of 13 months, did not feel the procedure was worthwhile. Of these, three reported no change in snoring, one said that his snoring improved initially but had since got worse, and one patient felt that the operation was not worthwhile, despite improvements in snoring, nocturnal obstruction and daytime somnolence, and no recorded complication other than a temporary dry throat (Table II).

A subset of 10 patients were followed up for more than one year (mean 14 months). This group included the patient who reported that although his snoring improved initially, it had got worse again. Overall, five patients reported that their snoring had not improved from the pre-operative state (50 per cent). Of the 19 patients followed-up for less than one year, only one felt that his snoring had not improved (five per cent).

Discussion

TABLE II
COMPLICATIONS (%)

	At any time	Persistent	Mean length of follow-up
Dry throat	66	21	11 months
Change in voice	77	0	N/A
Nasal regurgitation	10	0	N/A
Clinical infection	3	0	N/A

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Although the role of surgery in treating patients with snoring uncomplicated by sleep apnoea syndrome is now widely accepted, the common complications of post-operative pain and velopharyngeal incompetence seen with UPPP are sufficiently severe to encourage the development of alternative operative techniques (Kamami, 1990; Lindholm and Lowry, 1990; Carenfelt, 1991; Crestinu, 1991; O'Leary and Millman, 1991; Wennmo *et al.*, 1992). Ellis *et al.*, 1993 showed that if snoring was due to palatal flutter, then it could be eliminated by making the soft palate stiffer; there was no requirement to make the palate shorter. This approach has a great advantage over traditional UPPP operations in that is should eliminate permanent post-operative velopharyngeal incompetence and nasopharyngeal stenosis. The paper also reported a reduction in the length of stay in hospital and in the overall time for full recovery. The described technique used the Nd:YAG laser, but we have slightly modified this in the use of the CO_2 laser. This type of laser is probably move available to British Otolaryngologists, but has a potential disadvantage in this procedure, in that it does not penetrate tissues as deeply as the Nd:YAG. This may result in less fibrosis of the intra-palatine muscles, and thus less stiffening. Ellis' results and our own suggest that the two types of laser have a broadly similar clinical effect on the soft palate, supporting our view that the procedure may be undertaken without having to acquire expensive new equipment.

It is important that this form of surgery is restricted to patients whose snoring is due to palatal flutter, and we routinely used sleep nasendoscopy to help us to reach that decision (Croft and Pringle, 1991; Pringle and Croft, 1993). Other authors have shown that it is also important to correct restricted nasal airflow, if this is possible, prior to undertaking palatal surgery, as the decreased respiratory effort after such a correction, may eliminate palatal flutter (Ellis *et al.*, 1992; Woodhead and Allen, 1994).

The 79 per cent improvement in snoring seen in this study compares favourably with other reports of this procedure (Ellis, 1994) and with reports of UPPP (Croft and Golding-Wood, 1990; Sharp *et al.*, 1990). Although we were not expecting any cases of velopharyngeal incompetence because the length of the soft palate is not reduced noticeably at the time of surgery, three patients complained of this complication. In all cases it was a temporary condition, and all expressed satisfaction with the overall results of the procedure, but it serves as a reminder that palatal surgery must only be undertaken with full knowledge of the risks involved. The only complication that persisted in some patients for the duration of the follow-up period was the sensation of a dry throat. Nineteen of the 29 patients (66 per cent) complained of this problem at some point during the post-operative period, but by the time of the analysis it persisted in only six patients (21 per cent). The average length of follow-up for these six patients was 10 months, compared to four months for the group who had recovered. This is the only long term complication that we found.

The fact that patients followed-up for longer than one year had less good results than the group followed-up for a shorter period has been noted previously (Ellis, 1994). However, there seems no theoretical reason why the procedure could not be repeated, although there is no published data to support this at the moment.

This pilot study supports our view that laser palatoplasty is a useful alternative to UPPP in the treatment of snoring. We feel that it has the additional advantage of being repeatable in those patients who do not gain immediate benefit, provided that the snoring is due to palatal flutter. An alternative would be to carry out UPPP in this group, if that were preferred by the patient or surgeon. These initial results are encouraging enough to support a full randomized comparison of this technique versus UPPP. Longer term follow up of these patients remains important.

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