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# Long-term results of laser-assisted uvulopalatoplasty for snoring

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**Abstract**

We present the ongoing results of the series of 53 consecutive patients who underwent laser-assisted uvulopalatoplasty (LAUP) for snoring at the Kent and Canterbury Hospital. Twenty-nine patients (55 per cent) were completely satisfied with their surgery 18 to 24 months following LAUP when previously questioned via telephone questionnaire.

We have followed up the 29 patients with a previously successful result at between 70 and 79 months following surgery. They underwent an average of 1.6 procedures. Twelve patients (22 per cent) continue to be completely satisfied at this late stage, and a further 12 (22 per cent) have some ongoing improvement in their snoring. Only three patients have indicated that a previously successful result has failed since the previous survey.

The failure rate of LAUP in the treatment of snoring is seen predominantly in the first two years following surgery, but some long-term subjective recurrence of snoring does occur.

**Key words: Snoring; Palate, Soft; Laser Surgery; Treatment Outcome**

## Method

Our methods of patient selection and assessment have been previously described by Wareing and Mitchell.[1,2]

The 53 consecutive patients all underwent a full otolaryngological history and examination, sleep nasendoscopy and a limited sleep study (comprising overnight oximetry, pulse recording and observation) and were recruited as palatal snorers via the following inclusion criteria:

(1) historical evidence of snoring on structured history taking;
(2) palatal snoring on sleep nasendoscopy.

Exclusion criteria were:

(1) multi-segmental snoring on sleep nasendoscopy;
(2) obstructive sleep apnoea on the sleep study;
(3) more than 50 per cent oropharyngeal collapse on Müller manoeuvre;
(4) demonstrable ENT anatomical abnormalities predisposing to upper airway obstruction, such as septal deviation, chronic rhinosinusitis, macroglossia or tonsillar hypertrophy.

Surgery was performed under local anaesthetic as an out-patient, using a $CO_2$ laser in a continuous mode at a 20 Watts setting. One centimetre full thickness vertical trenches were cut in the soft palate either side of the uvula and the uvula reshaped to leave a U-shaped remnant as described by Kamami,[3] but using custom-designed laser handpieces (Sharplan Laser Corp.).

Further surgery was carried out if snoring continued on re-assessment four weeks after the initial treatment via further 0.5 centimetre trenches, until either the snoring was controlled, the patient was unwilling to undergo further surgery, or there was a risk of velopharyngeal incompetence.

Follow-up was carried out by telephone interview by one investigator (H.S.) on 27 of the 29 patients with a successful result 18 to 24 months following surgery as previously described.[2] One patient with a successful result in the previous survey has died of unrelated causes in the intervening time, and one patient was untraceable.

The patient and their spouse/sleeping partner were asked to respond 'Yes', 'No' or 'Maybe' to the following questions:

(1) Is your sleeping partner happy with the results of the operation?
(2) Do you think the operation was worthwhile?
(3) Would you go through it all again?

As in previous surveys on this patient series,[1,2] a completely successful result from surgery was taken as a sleeping partner responding 'yes' to the question 'Is your sleeping partner happy with the results of the operation?' An improvement in snoring without

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TABLE I
RESULTS AT 18 TO 24 MONTHS

| | Yes | Maybe | No |
|---|---|---|---|
| Is your partner happy with the result of the operation? | 29 (55% of total) | 2 (4% of total) | 6 |
| Do you think the operation was worthwhile? | 27 | 2 | 8 |
| Would you go through it all again? | 26 | 2 | 9 |

complete resolution was taken as 'maybe' response to the same question. In addition, the patients were asked to score their snoring out of 10 (with a reference to their pre-operative level being 10/10) and to report any ongoing side-effects of the surgery.

## Results

Twenty-seven of the 29 patients with a successful result between 18 and 24 months (Table I) were contacted by telephone between 70 and 79 months from their last LAUP procedure (average 75 months) and asked the same specific questions as previously described (Table II).[1,2] None refused to participate in the study.

Twenty-six subjects were male and one was female, and the average age was 51 years (range 28 to 76 years).

Subjects underwent an average of 1.6 procedures (range one to four). The average snoring score was four (range 0–10).

Ten of the 27 patients (37 per cent) described minor post-operative sequelae persistent at this stage. Four described mild nasal regurgitation on occasions, five experienced non-specific pharyngeal symptoms ranging from dryness to a feeling of 'something at the back of the throat', and one had noticed that the pitch of his voice had changed.

## Discussion

Snoring affects a significant proportion of the general population. Young *et al.*[4] discovered via a questionnaire of 3 513 people that between the ages of 30 and 60 years, 22 per cent of women and 44 per cent of men snored. Lugaresi *et al.*[5] suggested that the figure is higher, with 60 per cent of men and 40 per cent of women between the ages of 40 and 65 snoring every night.

Uvulopalatopharyngoplasty (UPPP) has long been recognized as a surgical option in the treatment of snoring, with short-term improvements in snoring described in 76–95 per cent of treated patients[6] but this has been shown to decrease with time – in one study the success rate dropped from 87 per cent initially to 46 per cent at 13 months.[7] Significant morbidity is also known to be associated with this procedure,[8] and it is in the light of this that laser-assisted uvulopalatoplasty (LAUP) has been popularized. This procedure has been shown to have limited long-term morbidity and low complication rates of around three per cent,[9] but the operative technique and type of laser used does vary between series. The depth of penetration, amount of collateral thermal damage and thus degree of fibrosis is altered according to these differences.[10]

The majority of LAUP series have reported encouraging short-term results, but few measure outcome beyond two years post-operatively. Kamami[3] described a technique to create paramedian transpalatal incisions and partial uvulectomy under local anaesthesia via a $CO_2$ laser over several stages until snoring ceased, and it is his operative technique we used in our patient cohort. His initial results demonstrated a 97 per cent success rate in 31 patients over an undisclosed time period, and he subsequently produced figures of 70 per cent abolition and 25 per cent improvement in snoring over a similarly unknown length of follow-up.[11] He does admit that after a period of time 'snoring had re-appeared in a few cases, but much less disturbing than before.' Krespi *et al.*[12] claimed 84 per cent short-term success using a similar technique, as did Walker *et al.*[13] with 60 per cent patient satisfaction at 18 months. Kotecha *et al.*[14] performed an essentially similar operation under general anaesthesia with 78 per cent success after nine months. Ellis *et al.*[15] excised a vertical mucosal strip down to the muscular aponeurosis using a Nd:YAG laser. His success rate declined to 66 per cent with more than one year follow-up.[16]

Remacle *et al.*[17] vaporized a rectangle of mucosa from the 'palatal dimple' to the base of the uvula, trimmed the palatal arches and shortened the uvula in an effort to combine the efficacy of all these techniques. They reported a 73.5 per cent success rate at six months. Coleman[18] also used a Kamami-type technique, but is alone in claiming a 90 per cent success rate at 'more than five years' in 20 patients, although the means by which he measured his success is not mentioned.

TABLE II
RESULTS AT 70 TO 79 MONTHS

| | Yes | Maybe | No |
|---|---|---|---|
| Is your partner happy with the result of the operation? | 12 (23% of total) | 12 (23% of total) | 3 |
| Do you think the operation was worthwhile? | 22 | 2 | 4 |
| Would you go through it all again? | 18 | 0 | 9 |

Several authors have addressed the issue of subjective versus objective assessment of the results of LAUP. Self-reporting is widely held to be unreliable, with large variation between subject and spouse interpretations.[19] Even the subjective assessment of trained sleep technicians compared to objective snoring assessment is not comparable.[20] Pre- and post-operative polysomnography has been taken as the 'gold standard', but this is often not practical in the constraints of the National Health Service, and a single night measurement in an unfamiliar environment may not be representative.

Such objective results have been shown to be potentially misleading. In a series of 69 patients undergoing UPPP for snoring and sleep apnoea, Miljeteig *et al.*[21] noted a 78 per cent subjective improvement in snoring despite no objective improvement in snoring index (average number of snores per hour) or mean and maximum snoring intensity 13 to 15 months post-operatively. Walker *et al.*[6] proposed that the low frequency velum-like respiratory noise is the component of the snoring noise most irritating to the human ear. They demonstrated that the maximal and average noise loudness were statistically significantly lower following LAUP but that the velum-like respiratory noise loudness (VRL) decreased the most, with the fundamental frequency of the snoring concurrently rising after each LAUP stage. In addition, they demonstrated a significant correlation between subjective improvement in snoring and the VRL difference pre- and post-operatively.

In our study, many more partners answer 'maybe' to question 1 (23 per cent) at 75 months than at 18 to 24 months (five per cent), and 81 per cent of the patients themselves thought the operation was worthwhile. This implies that there is ongoing subjective improvement in snoring without complete resolution, and this may be due to a decrease in the VRL and consequent alteration in the fundamental frequency of the snoring.

Banerjee and Dempster[22] evaluated success following LAUP via the Glasgow Benefit Inventory (GBI), which is a valid patient-oriented evaluation of health status and benefit that was developed for ENT procedures.[23,24] They reported a 53 per cent benefit at two years, which is very much in line with the previous results in our series. They also suggested that there was a decrease in the amount of benefit in the first year, but that after this the number of patients with a satisfactory result and the degree of benefit remained stable.

Richardson and Prichard[24] utilized the GBI to show that LAUP and UPPP had similar scores at 15 months post-operatively and demonstrated the close correlation between the GBI and subjective measures of success. Banerjee and Dempster[22] have cited the previous results from this series[2] as evidence of the close agreement of the GBI with our subjective measures of outcome.

We accept the limitations of a study on what is now a small series of patients via telephone interview, and the loss of two patients to follow up. We feel that the partners' opinion is the best subjective measure of success, but the lack of face-to-face reporting may promote lower, although possibly more realistic, success rates. We have also assumed that no patient with a previously poor result subsequently stopped snoring. Our results demonstrate an ongoing small decrease in the quantitative and qualitative subjective success rate of LAUP for palatal snorers despite careful patient selection. The reasons for this are probably multifactorial: weight fluctuation is a likely factor, and a body mass index less than 28 has been shown to be a positive factor.[25] This may be allied to the development of multisegmental snoring, although it has been shown that at least pre-operatively the majority of patients snore at a single site in the upper aerodigestive tract.[26,27] The induced rigidity of the soft palate may reduce with time, and this has been shown to be the case 12 to 18 months following UPPP.[28]

Following our experience, and particularly given the consequential and well-documented early post-operative pain, we would recommend realistic informed consent before the recommendation of LAUP for the long-term cure of palatal snoring. Optimization of body mass index and other lifestyle factors is preferable before embarking on surgical management.

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