

Role of KTP-532 laser in management of oral submucous fibrosis

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Abstract

Introduction: Oral submucous fibrosis is a chronic disease characterised by progressive inability to open the mouth. Various treatment modalities are available for its management, but these have largely been ineffective.

Materials and methods: Nine cases of oral submucous fibrosis underwent a release procedure using a KTP-532 laser, from March 2005 to January 2006, within the ENT – head and neck surgery department of a tertiary centre.

Results: Pre- and post-operative mouth-opening was compared using the Wilcoxon signed rank test, and a significant difference observed ($Z = -2.690, p = 0.007$). Follow up over an average period of 12 months showed encouraging results.

Conclusion: This preliminary study indicated that adequate release of oral submucous fibrosis can be achieved by using a KTP-532 laser release procedure, with minimal morbidity and satisfactory results. These promising results should encourage more widespread use of this technique in the management of this condition.

Key words: Oral Cavity; Fibrosis; Laser Surgery

Introduction

Oral submucous fibrosis is an insidious oral disease characterised by progressive inability to open the mouth, due to loss of elasticity and development of vertical fibrous bands in the buccal and submucosal tissues. The disease was first described by Schwartz, and can occur in any decade but most commonly between the ages of 20 and 40 years.^{1,2} The major cause of submucous fibrosis is the habit of betel quid chewing, which is common in central, southern and south-east Asia.

Treatment of oral submucous fibrosis over the past decades has been varied and largely ineffective. Medical modalities of treatment include intralesional injections of steroids, γ interferon, hyaluronidase, placental extracts, triamcinolone and chymotrypsin to reduce the collagen content.^{3–5} Systemic medications have also been advocated, such as α lipoic acid, multivitamins, and iron and folic acid supplementation.⁵ Various surgical approaches for the treatment of oral submucous fibrosis have been disappointing. Several approaches have been tried, with varying results, including: simple division of the fibrotic bands; use of local flaps from the oral cavity; coronoidectomy with temporal muscle myotomy and radial forearm flap reconstruction; and the use of pedicled buccal fat pad.^{3,4,6,7}

Here, we report our experience with nine patients suffering oral submucous fibrosis who underwent KTP-532 laser assisted release of fibrous bands. This article will also discuss the surgical technique used.

Materials and methods

Nine patients with oral submucous fibrosis underwent a fibrotic band release procedure using KTP-532 laser, within the ENT – head and neck surgery department of a tertiary centre. The diagnosis was made on the grounds of clinical history and characteristic findings.

Post-operatively, all patients were instructed to perform mouth-stretching exercises using a dental screw (made of acrylic resin; Figure 1) for three to six months. Systemic supplementation with oral α lipoic acid was also given, using a once-daily dose for three to six months. The patients were followed up for a period of 12 months.

Patient evaluation was based on (1) pre-operative mouth-opening, measured in terms of inter-incisal distance (in mm), and (2) post-operative mouth opening, measured in the same way, at six months.

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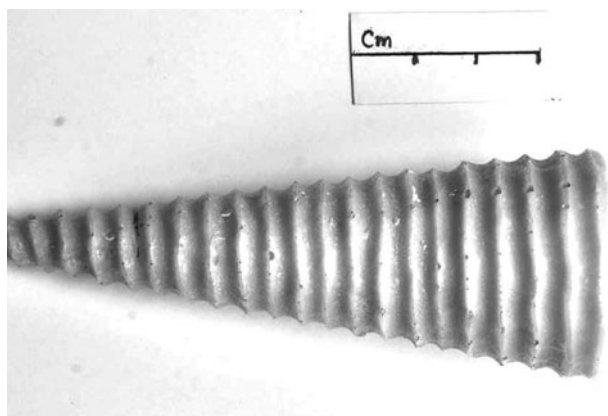


FIG. 1

Dental screw used for mouth-stretching exercises.

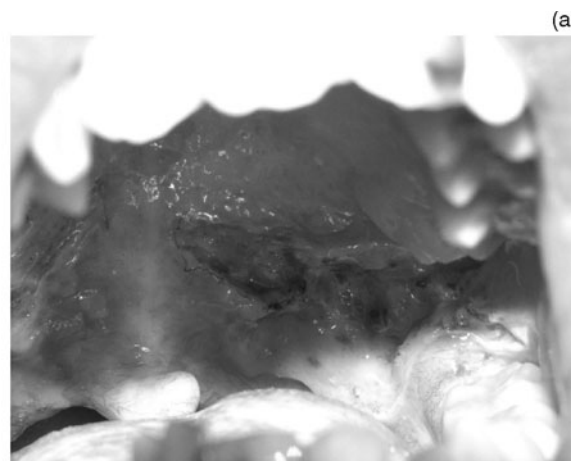
Surgical technique

The operation was performed under general anaesthesia with nasotracheal intubation. The patient was placed in the supine position. The eyes of the patient were covered with aluminium foil. Adequate surgical exposure was obtained using a Boyles Davis mouth gag with tongue blade. Using a KTP-532 laser (0.6 mm fibre; Laserscope, San Jose, USA) set at 8 W in continuous mode, multiple parallel incisions were made perpendicular to the fibrous bands over the anterior faucial pillar, soft palate and retromolar trigone (Figure 2). Extension of the cuts to the buccal mucosa was made depending on the extent of involvement. The complete release of fibrous tissue was verified by palpation of soft (i.e. pliable) tissue at the bottom of the defect. Intra-operatively, 2 per cent lignocaine was instilled over the mucosa, to aid in post-operative analgesia. The following day, patients were commenced on mouth-stretching exercises using a dental screw, to be undertaken four to five times per day (Figure 1). Patients were instructed to turn the screw by two threads per day until the maximum turns were reached. This exercise was carried out for six months.

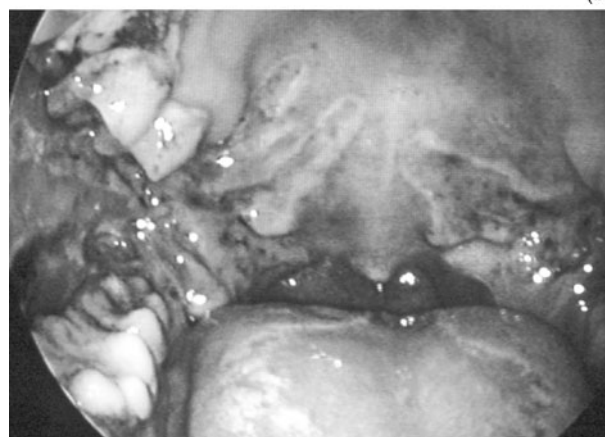
Results and analysis

All our patients were male and their average age was 35.8 years. All patients gave a history of betel quid chewing for a period ranging from seven to 15 years. Restricted mouth-opening and difficulty in tongue protrusion were the most common symptoms. Trismus and the characteristic pale palatal and buccal mucosa and erosions were the most common findings.

The average surgical time for the procedure was 20–30 minutes. There was minimal intra-operative blood loss. An intra-operative interincisal distance of three to four finger breadths was achieved in all patients. The main complaint expressed by the patients during the immediate post-operative period was pain, which was controlled with adequate analgesia. The patients were discharged two to three days after the operation. All patients complied with the mouth-stretching exercises, using the dental



(a)



(b)

FIG. 2

Intra-operative views, showing multiple incisions over the anterior faucial pillars and retromolar trigone extending to the buccal mucosa, made using a KTP-532 laser.

screw, for a period of three to six months. Our procedure increased the interincisal distance from an average of 15.50 mm (range 8 to 22 mm) to 39 mm (range 34 to 45 mm) six months post-operatively, with a mean net gain of 23.7 mm (range 20 to 33 mm) (Table I). Pre- and post-operative mouth opening was compared using the Wilcoxon signed rank test, and a statistically significant difference was found ($Z = -2.690, p = 0.007$). This finding supports the role of KTP-532 laser in the management of oral submucous fibrosis. At 12 months' follow up, examination failed to reveal any recurrences and the patients were symptom-free. At the time of writing, patients were being followed up for recurrence of symptoms and for any signs of malignant change.

Discussion

Oral submucous fibrosis is a multifactorial disease. There appears to be a genetic predisposition which renders the oral submucosal tissue susceptible to chronic inflammatory changes. Habitual chewing of betel quid has been found to be the major cause of oral submucous fibrosis. The quid is defined as 'a substance, or mixture of substances, placed in the

TABLE I
CASE REPORTS – PRE- AND POST-OPERATIVE ASSESSMENT

Case no	Age (yr)	Sex	Chewing habits & duration	Symptoms & duration	Signs	Laser input (j)	Mouth-opening (mm)		
							Pre-op	Post op*	Net gain
1	38	M	BQ, 10 yr	RMO, 6 mth RTP, 3 mth	Bilat SMFB	3072	22	45	23
2	31	M	TOB + GUT, 10 yr	RMO, 3 yr RTP, 3 yr BOC, 3 mth	Bilat SMFB	900	22	42	20
3	32	M	BQ, 10 yr	RMO, 3 mth RTP, 2 mth	Bilat SMFB ER	1100	14	34	20
4	32	M	BQ, 10 yr	RMO, 2 mth BOC, 1 mth	Bilat SMFB ER	1200	08	41	33
5	46	M	BQ, 15 yr	RMO, 4 mth RTP, 2 mth	Bilat SMBF	2727	09	36	27
6	41	M	BQ, 7 yr	RMO, 2 mth	Bilat SMBF	3522	18	41	23
7	32	M	BQ, 10 yr	RMO, 4 mth RTP, 2 mth	Bilat SMBF ER	1957	15	36	21
8	42	M	BQ, 15 yr	RMO, 9 mth RTP, 5 mth	Bilat SMBF ER	3218	11	38	27
9	29	M	BQ, 12 yr	RMO, 5 mth	Bilat SMBF	1114	18	38	20

*Six months. No = number; yr = years; mth = months; pre-op = pre-operative; post-op = post-operative; M = male; BQ = betel quid; TOB = tobacco; GUT = gutka; RMO = restricted mouth-opening; RTP = restricted tongue protrusion; BOC = burning sensation of oral cavity; Bilat SMFB = bilateral submucosal fibrotic bands; ER = erosion

mouth or chewed and remaining in contact with mucosa, usually containing one or both of the basic ingredients, i.e. tobacco and/or areca nut (supari), in raw or any manufactured or processed form.⁸ A clear, dose-dependent relationship has been observed between both the frequency and the duration of chewing areca nut and the development of oral submucous fibrosis.⁹ Arecoline, an alkaloid component of areca nut, can stimulate fibroblast proliferation and collagen synthesis *in vitro*.^{10,11} Recent work by Sumeth Perera *et al.* has shown that areca nut extracts can also induce atrophy and fibrosis of connective tissue and muscle atrophy in an animal model.¹² All our patients had a history of betel quid chewing.

Early lesions of oral submucous fibrosis can present as blanching of the mucosa, imparting a mottled, marble-like appearance. Progressive lesions show palpable, vertical, fibrotic bands in the buccal mucosa and in a circular fashion around the mouth and lips.⁸ The histological changes in established cases include atrophy of the epithelium together with a keratinising metaplasia and accumulation of hyalinised collagen beneath the basement membrane, with a progressive loss of vascularity. At any stage in the disease, the overlying epithelium may become the site of nonspecific ulceration, dysplastic change or malignant transformation.¹¹

A common prodromal symptom is oral dysaesthesia aggravated by spicy foods. In later stages, fibrosis leads to gradual limitation of mouth-opening and tongue protrusion, thus causing difficulty in eating, swallowing and articulation. Oral submucous fibrosis does not regress either spontaneously or with cessation of betel quid chewing. For this reason, release of fibrotic bands by surgical means is necessary, with the primary aim of enabling mouth-opening sufficient for oral hygiene and feeding. Such surgical treatment also facilitates inspection and management of subsequent cancer.

Medical management with local injections of corticosteroids and hyaluronidase, along with systemic ingestion of multivitamins, iron and folic acid, apparently has been known to decrease the burning sensation. The mechanism of action is probably prevention or suppression of the local inflammatory response, without any distinct histological change in the connective tissue that causes most of the condition's morbidity.^{5,13,14} Local physiotherapy, in the form of hot rinses or selective deep heating therapies (such as short wave diathermy), does not produce any beneficial effects.^{5,14} Use of intralesional γ interferon, an antifibrotic cytokine, has been shown to reduce the burning sensation and to improve mouth-opening.⁵

Surgery is indicated in moderately advanced to advanced cases of oral submucous fibrosis, as defined by maximum mouth-opening of 25 mm.⁴ However, most surgical procedures have been disappointing because of the high incidence of recurrence. Simple division of fibrotic bands with secondary healing has resulted in more fibrosis and disability.⁴ The use of local oral flaps has several limitations. Tongue flaps have the limitation of bulkiness and also require secondary surgical division and revision. Their use in cases of bilateral involvement requires bilateral tongue flaps, which will cause secondary dysphagia, disarticulation and an increased risk of aspiration.⁴ According to Wei *et al.*, adequate release of submucous fibrosis induced trismus can be achieved by the complete release of fibrotic bands and coronoidectomy with temporal muscle myotomy and a small radial forearm flap reconstruction.^{3,4} It was found that free tissue transplantation introduced healthy, well vascularised tissue of optimal size and thickness into the defect without creating more scarring; this procedure also allowed the surgeon to perform a complete release of the fibrotic bands, the raw areas being covered by the

flap. However, some of these cases may require secondary debulking. A new technique of covering the buccal defects with pedicled buccal fat pad has been devised, with satisfactory results.⁶ The advantage of using this technique is that the fat pad is in close proximity to the buccal defect and may be approached through the same incision; the physiological functions of the cheek are also improved.¹⁵ Use of flaps have the following disadvantages: time consuming, scarring at the graft host site, increased hospital stay, possibility of graft failure (in free flaps) and the possible necessity of secondary procedures like debulking.

- **The treatment of oral submucous fibrosis over the past decades has been varied and largely ineffective**
- **This condition does not regress either spontaneously or with cessation of betel quid chewing. Release of fibrotic bands by surgical means is necessary**
- **This preliminary study of treatment with KTP-532 laser showed encouraging results in the management of this very difficult, chronic condition widely prevalent in tropical countries**
- **The procedure was less time-consuming and more economical due to a shortened hospital stay, which resulted in better patient satisfaction and compliance**

Our choice of using KTP-532 laser was based on the fact that the use of laser to release fibrotic bands leads to healing with minimal scarring, thereby decreasing the probability of procedure-induced trismus, usually seen following simple release procedures. Laser is also associated with early wound healing. The other advantages of using laser include spontaneous occlusion of small, transected vessels, providing good haemostasis. The laser also assists the surgeon in making precise incisions with minimal collateral damage.

In our patients, the use of post-operative mouth-stretching exercises using a dental screw helped to maintain good mouth-opening.

Conclusion

This preliminary study of treatment of oral submucous fibrosis with KTP-532 laser found that the procedure was less time-consuming and more economical than flaps due to a shortened hospital stay, which resulted in better patient satisfaction and compliance. These promising results should

encourage more widespread use of this technique. A large scale study with long term follow up is required to corroborate these findings.

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Dr D R Nayak takes responsibility for the integrity of the content of the paper.

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