

Case Series

Role of carbon dioxide laser in the treatment of oral leukoplakia

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ABSTRACT

The aim of the present study is to evaluate the treatment results of carbon dioxide (CO₂) laser vaporisation in the well-defined cohort patients with oral leukoplakia. The group consisted of 20 patients. Before treatment, a clinical photograph and an incisional biopsy were performed in all the cases. Also, post treatment results were documented with clinical photographs. The mean follow-up period was 12 months. 18 out of 20 patients treated for cure (90%) achieved local control after one treatment. The remaining 2 patients required (10%) 2nd and 3rd vaporisations. The rate of malignant transformation after CO₂ laser treatment is found to be 2.27% which is comparable to the other studies. CO₂ laser vaporisation in the treatment of oral leukoplakia lesions is an excellent procedure in not only preventing the local recurrence and the malignant transformation but also in preventing the post-operative dysfunction. It is a time saving procedure with a negligible intra operative bleeding. The wound healing procedure after CO₂ laser is extremely good causing the least post procedure morbidity.

Keywords: Oral leukoplakia, CO₂ laser vaporisation, Malignant transformation

INTRODUCTION

Oral leukoplakia is the most common potentially malignant disorder of the oral cavity. The worldwide prevalence is approximately 2%.¹ The World Health Organization (WHO) definition of leukoplakia is a lesion that has a white patch or plaque appearance on the oral mucosa that cannot be removed by scraping and cannot be classified clinically or microscopically as another disease entity. The following are the etiological factors proposed: tobacco, alcohol, viral infections, candidiasis and chronic irritation associated with dentures.¹ The risk of potential malignant transformation of these lesions range from 0.7% to 6%.^{12,14} The leukoplakic lesions have the following histologic features which can range from hyperkeratosis without and with dysplasia to proliferative verrucous leukoplakia and carcinoma in situ.^{8,10}

The aim of this study was to assess the usefulness of carbon dioxide (CO₂) laser in management of oral

leukoplakia, while reviewing the evidence of laser surgery reported previously.

CASE SERIES

20 patients with 44 oral leukoplakia lesions presented to surgery out-patient department (OPD) was assessed by oral examination and by taking incisional biopsy either few days prior to or immediately before laser treatment (Table 1). They were treated by CO₂ laser vaporisation in the Department of General Surgery, Dr. D. Y. Patil Medical College and Hospital, Pune.

Treatment was undertaken after taking an informed written consent and after getting the institutional ethical committee clearance. This group was followed up for a period of 6-12 months (mean 9 months).

Any etiological factors such as smoking, alcohol or dental trauma were identified and eliminated if possible.

Buccal mucosa was the most frequent affected site in our study with a total of thirty lesions in the palate and five lesions in the retromolar trigone, four in the floor of mouth, three in the tongue and two in gingiva. Size of the lesions ranged from 0.6×0.6 cm to 7×7 cm. Treatment was instituted following pre-operative evaluation and a thorough ear, nose and throat (ENT) and head and neck examination. Tissue for histopathological examination was taken either few days prior to laser treatment or immediately prior to the laser treatment of lesions. Histopathological examination varied from hyperkeratosis to carcinoma in situ. These lesions were grouped into hyperkeratosis without dysplasia, hyperkeratosis with mild, moderate and severe dysplasia (Table 2).

Table 1: Assessment of patients.

Number		Patient age	Sex	
Patients	Lesions		Male	Female
20	44	20-65 (mean-42 years)	12	8

Table 2: Histological findings.

Examination	Findings (in number)
Hyperkeratosis without dysplasia	22
Hyperkeratosis with	
Mild dysplasia	14
Moderate dysplasia	5
Severe dysplasia	3
Total	44

All the transoral CO₂ laser excisions were performed under local anesthesia using 1% xylocaine with 1:100,000 adrenaline. About 2-5 cubic centimetre (cc) of the local anaesthesia was injected beneath the lesion after sensitivity testing.

The patients' eyes were covered with protective eye pads. For histologic classification, one or more incisional biopsies were taken under local anaesthesia. CO₂ laser was used in vaporisation of leukoplakia lesions. The treatment was carried out by moving a slightly focused CO₂ laser spot of about 1 mm over the lesion until it was completely vaporised and the submucosa was reached. A margin of about 4 mm around each lesion was taken.

The CO₂ laser was set on continuous mode at 4 to 6 Watts (W). The continuous mode allowed to control the excision dynamically allowing for an efficient and precise excision and defocusing of the beam was achieved by elevating the focus of the hand pieces a few millimetres above the tissue surface. Destruction of the abnormal soft tissue is accomplished by vaporization of the intracellular fluid with concomitant rupture of the cell membrane. The excised or vaporized area was left open and allowed to heal by secondary intention.



Figure 1: (a) Pre-procedure, and (b) post-procedure findings of CO₂ laser vaporisation.

All treatments were carried out on an outpatient basis. Minimal pain was experienced by the patient after surgery. They generally responded well to oral analgesics (acetaminophen diclofenac combinations). Oral cephalosporin was prescribed for 5 days to minimize cellulitis and discomfort. Oral care was instituted with betadine mouth wash to maintain hygiene. After treatment, the patients were seen for follow up after 1 week, 3 months, 6 months, 9 months and 12 months.



Figure 2: (a) Pre-procedure, and (b) post-procedure findings of CO₂ laser vaporisation.

Statistical analysis

The Statistical analysis was performed with Microsoft Word. Data analysis were performed with descriptive statistics like mean and percentage.

20 patients with 44 lesions were treated. All of these patients were treated for cure. A recurrence rate of 9.1% was observed in this group. 4 of the original 44 lesions recurred after the first laser treatment. 2 of these lesions showed resolution with the subsequent one more repeat laser vaporisation, 1 after subsequent 2 laser vaporisations, the remaining 1 lesion on histology showed hyperkeratosis with severe dysplasia. This patient was followed up regularly and he received subsequent laser vaporisations. Repeated biopsy after 6 months showed moderately differentiated squamous cell carcinoma. Hence this patient was excluded from our study and the rate of malignant

transformation in the patients in our study was found to be 2.27% (1/44 lesions).

40/44 lesions showed 100% cure with just one treatment of laser vaporization. 2/44 lesions required the second setting and 1/44 required 3 settings of laser vaporization. There were no complications observed in the patients who were enrolled in the study and the wound healing happened in 3 to 6 weeks.

DISCUSSION

Oral leukoplakia is quite often difficult to manage because of the high recurrence rate upto 30-35% and the extent of the lesion.¹ The common treatment modalities are scalpel excision, electrocautery and cryotherapy. CO₂ laser which is microscopically controlled, allows the treating surgeon to remove these lesions completely with greater accuracy and to achieve better hemostasis.^{3,6,7} The complication rate is very negligible which are minimal scarring and contracture.^{11,13} The CO₂ laser, as shown with our results has a clear cut advantage in the treatment of oral leukoplakia.^{6,7,9}

The advantages of CO₂ laser can be summarized as follows: precision of tissue removal especially when the added benefits of magnification and precise beam control provided by the operating microscope and microscope manipulator are considered; minimal (only 15 to 18 cells/layer) damage to the neighbouring tissues is incurred because of energy absorption by the tissue to which the beam is directed and rapid fall off in the power density of the laser beam energy beyond this area; immediate haemostatic effect by sealing small blood vessels allowing better visibility of essential bloodless operative field; more normal tissue healing by minimizing factors (i.e., reduced number of myofibroblasts in the wound and less collagen matrix laid down) that cause tissue scarring and wound contracture and concomitant interference with the function of intra oral structures; reduction of post-operative pain and tissue edema by creating a biological dressing over the open wound with the denatured fibrin debris; and effective removal and destruction of all the abnormal mucosa minimizing the local recurrence of the disease.^{2,11,13,14}

CONCLUSION

CO₂ laser is the best means of treatment for oral leukoplakia after elimination of all the risk factors (tobacco chewing, smoking and alcohol). This modality has dramatically changed the management of this potentially premalignant lesion. This has become the treatment modality of choice in several tertiary care centres because of the excellent wound healing with minimal complications and reduced recurrence rate. Outpatient based management for almost all the patients of oral leukoplakia is another added advantage.

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