

# Carbon Dioxide Laser Surgery in Management of Oral Leukoplakia

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## ABSTRACT

**Introduction:** Oral Leukoplakia is an important premalignant lesion of the oral mucosa. Oral Leukoplakia has a potential for mucosal growth and malignant transformation. Various treatment procedures for oral leukoplakia have been reported. However, after some treatments, oral leukoplakia show recurrence and/or malignant transformation, even following complete resection. CO<sub>2</sub> Laser surgery for oral leukoplakia has been reported to have many advantages, and it is widely used in the treatment of oral leukoplakia. The aim of present study was to evaluate the overall effectiveness of Carbon dioxide laser as a surgical treatment of oral leukoplakia, recurrence rate and malignant transformation rate of oral leukoplakia after Carbon dioxide laser treatment.

**Material and methods:** In the present study, 32 patients with 44 oral leukoplakia lesions were treated with CO<sub>2</sub> laser vaporisation.

**Results:** Forty of the original 44 lesions treated for cure (90.9%) achieved local control after one treatment with a total control rate of 97.7% after a 2nd/3rd vaporization, if required. There was 9.10% recurrence rate and 2.27% malignant transformation rate after CO<sub>2</sub> laser surgery. This was similar to the previous Studies.

**Conclusion:** CO<sub>2</sub> laser surgery for oral leukoplakia lesions is a time saving procedure with negligible intra-operative bleeding. The wound healing process after laser surgery was satisfactory and no significant complications were observed. CO<sub>2</sub> laser surgery of oral leukoplakia lesions is an excellent procedure preventing not only recurrence and malignant transformation, but also postoperative dysfunction.

**Keywords:** CO<sub>2</sub> Laser Surgery, Oral Leukoplakia

## INTRODUCTION

Oral Leukoplakia is the most common premalignant lesion of the oral mucosa. WHO defined it as a lesion which 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.<sup>1</sup> Although numerous etiologic factors have been implicated, such as tobacco, alcohol, viral infections, candidiasis and chronic irritation associated with dentures and cheek biting the cause remains unclear in some cases.<sup>1,4,6</sup> These lesions are reported to have a potential for malignant transformation to carcinomas of 0.7% to 6%.<sup>4,7</sup> The histologic picture of Leukoplakia varies from hyperkeratosis without and with dysplasia to proliferative verrucous leukoplakia and carcinoma in situ.<sup>1,4</sup>

Carbon dioxide (CO<sub>2</sub>) laser surgery, however, has become the treatment of choice in many medical institutes, offering rapid and precise tissue dissection, reduced bleeding and post operative pain, low morbidity, minimal scarring and wound contracture and more importantly excellent patient acceptance.<sup>4,7,12</sup> The aim of this study was to assess the usefulness of CO<sub>2</sub> Laser in management of oral Leukoplakia, while reviewing the evidence of Laser surgery reported previously.

## MATERIAL AND METHODS

32 patients with 44 oral leukoplakia lesions presenting to ENT OPD, assessed on oral examination and after taking incisional biopsy either few days prior to or immediately before laser treatment (Table 1), were treated by CO<sub>2</sub> laser vaporisation in Deptt of ENT and Head & Neck Surgery, SMGS Hospital, GMC Jammu. 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, palate and Retromolar trigone five lesions, floor of mouth four, tongue three and gingiva two lesions. Size of the lesions ranged from 0.6 x 0.6cm to 7 x 7cm. Treatment was instituted following pre operative evaluation and a thorough 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).

All the transoral CO<sub>2</sub> laser excisions were performed under local anesthesia using 1% xylocaine with 1:100,000 adrenaline. About 2-5cc of the local anaesthetic 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 anaesthetic. The ACUPULSE CO<sub>2</sub> laser was used in vaporisation of leukoplakia lesions. The treatment was carried out by moving a slightly defocused CO<sub>2</sub> laser spot of about 1mm over the lesion until it was completely vaporised and the submucosa was reached. A margin of about 4mm around each lesion was taken. The Carbon dioxide laser was set on continuous mode at 4 to 6 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 millimeters above the tissue surface. Destruction of the abnormal soft tissue is accomplished by vaporization of the intracellular fluid with

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concomitant rupture of the cell membrane.<sup>4</sup> The excised or vaporized area was left open and allowed to heal by secondary intention.

All treatments were carried out on an outpatient basis. Minimal pain was experienced by the patient after surgery. This generally responded well to oral analgesics (Acetaminophen diclofenac combinations). Oral cephalosporin was prescribed for 5 days to minimize cellulitis and thus 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.

## STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used for data analysis.

## RESULTS

Thirty two patients, with a total of 44 lesions, were treated. All of these patients were treated for cure. A recurrence rate of 9.10% was observed in our patient population. Four of the original 44 lesions recurred after the first laser treatment. Two of these lesions have remained clear after one repeat laser vaporization and one more lesion remained clear after two repeat laser vaporizations. The remaining one lesion was in a patient initially diagnosed as leukoplakia left side buccal mucosa and on histopathologic examination lesion was hyperkeratosis with severe dysplasia. Laser vaporization was done in this patient and initially lesion showed improvement with good healing, however after 6 months the lesion recurred and repeat laser vaporization failed to yield results. Repeat biopsy was taken and lesion came out to be moderately differentiated squamous cell carcinoma. This patient was excluded from the study and managed as a case of squamous cell carcinoma. Thus a malignant transformation rate of 2.27% (1/44) was observed in our study.

Forty of the original 44 lesions treated for cure (90.9%) achieved local control after one treatment with a total control rate of 97.7% after a 2nd/3rd vaporization, if required.

No major and significant minor complication were observed as a result of the laser therapy. Wound healing took place by epithelialization from the border of the wound. Complete re epithelialization took place within 3 to 6 weeks. Minimal scarring and complete contraction of the regenerated mucosa occurred.

The operative time of carbon dioxide laser treatment of oral leukoplakia lesions was in the range of 2 to 8 minutes, with an average of 3.5 minutes, and the average amount of intra operative bleeding was negligible.

## DISCUSSION

Oral leukoplakia is a potentially premalignant lesion which needs expert management. The usual modalities of treatment for oral leukoplakia have been close observation, scalpel excision, electrocautery or cryotherapy.<sup>1,4,7,9</sup> The carbon dioxide laser has certain advantages over the scalpel and cryoprobe in the management of oral leukoplakia, especially where large areas of epithelium are involved. Laser can control bleeding<sup>4,7,11,15</sup> both during and after the operation and the surgeon has excellent visibility during the operation.<sup>7</sup> Although our patient population is small, 97.7% control obtained show that CO<sub>2</sub> laser removal

Patient Base	
Number of Patients	32
Number of Lesions	44
Patient Age	18-64 (Mean 42 yrs)
Sex	
Male	23
Female	9

Table-1: Patient Base

Histologic Findings	
Hyperkeratosis without dysplasia	22
Hyperkeratosis with:	
Mild dysplasia	14
Moderate dysplasia	5
Severe dysplasia	3
Total	44

Table-2: Histologic Findings



Figure-1: Leukoplakia on the dorsum of tongue and right side buccal mucosa of a 50 year old male patient



Figure-2: Follow up of the same patient 1 year after CO<sub>2</sub> laser vaporization of the oral leukoplakia lesions.

of leukoplakia is a more effective technique when compared to the approximate 65% rate of control reported with other techniques.<sup>4,14,16</sup> Laser is a precise technique which produces immediate tissue destruction with minimal damage to adjacent structures.<sup>1,8</sup> Little collagen is deposited during healing and there is minimal interference with normal oral function.<sup>1</sup> Studies have

shown that histologically, there are few myofibroblasts present, which appears to be responsible for less scar contraction.<sup>4,11</sup> Accordingly, laser vaporization can be repeatedly performed under local anesthesia on an outpatient basis, even if a new lesion occurs adjacent to the primary lesion.<sup>3,7,13</sup> In addition, recurrence rate is low<sup>11</sup>, reduced postoperative pain, swelling, edema or infection.<sup>3,7,9,11,15</sup> Laser surgery is able to remove lesions accurately<sup>2,5,7,16</sup> and produce a sterile surgical field based on instant vaporization of tissue and adjacent vascular and lymphatic sealing.<sup>11</sup> Furthermore, it helps in preventing the seeding of the dysplastic cells in adjacent soft tissue areas.<sup>4,11</sup>

Laser surgery has some disadvantages. The most important disadvantage of laser surgery in oral leukoplakia management is that the lesion is not available for histology and this investigation is only done on small incisional biopsies.<sup>7,8</sup> A second disadvantage is that epithelial regeneration is delayed and wounds take longer to re-epithelialize than following excision surgery with sutures.<sup>7,11,17</sup> Another disadvantage is safety precautions, that is, the mandatory use of eye glasses is needed to protect both the patient and the operator.

## CONCLUSIONS

Laser vaporization of oral leukoplakia lesion has dramatically changed the management of this potentially premalignant condition. Reduced recurrence rate with CO<sub>2</sub> laser treatment as compared to scalpel excision and cryosurgery together with many other advantages of laser vaporization such as excellent wound healing, minimal scar tissue, and precise removal of lesion with minimal damage to surrounding tissues has led to CO<sub>2</sub> laser vaporization of oral leukoplakia becoming the treatment modality of choice in majority of tertiary care institutes. Almost all of the oral leukoplakia lesions can be managed on an outpatient basis.

Changes in oral habits could be of great importance to the outcome of laser surgery of dysplastic oral leukoplakia. After elimination of potential causal factors including smoking, chewing tobacco and alcohol, CO<sub>2</sub> laser is the best means currently available for the management of oral leukoplakia lesions.

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