

Diode laser: In treatment of recurrent verrucous leukoplakia

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Abstract

Laser first came into light in 1960 and had been used extensively in various fields of medicine. Laser has been experimented in the various dental field, and its utility is being recognized and established well in the dentistry. Lasers are widely used for a number of procedures such as cavity preparation, scaling, and root planning, surgical procedures like excision of soft tissue growths, etc., Improved healing, hemostasis, and sutureless excisions are some of the many advantages of laser over conventional treatment modalities. It is because of these advantages that laser is becoming more and more popular as a treatment option in various aspects of dentistry. We hereby present a case report, where we have used diode laser for surgical management of a proliferative verrucous leukoplakia (PVL), because of its many advantages over conventional methods. It presents very specific characteristics, mainly a more aggressive biological behavior than other forms of leukoplakia expressed by: A tendency toward multifocality (field cancerization); a high prospect of recurrence; and a high rate of malignant transformation, which can range between 40% and 100% in a follow-up period of 4.4–11.6 years. In this case, we evaluated the advantages of diode laser for the treatment of verrucous leukoplakia, where the results that we obtained were excellent. The patient had come for evaluation till the time of complete healing.

Keywords: Diode laser, verrucous leukoplakia, proliferative verrucous leukoplakia

Introduction

Oral cancer accounts for about 3–4% of all cancers. Of all oral cancers, 96% are carcinomas and 4% are sarcomas. The most common type of oral cancer is squamous cell carcinoma (SCC), constituting about 90% of oral malignancies, with a ~50% survival rate over 5 years despite various treatments in the past three decades.^[1] Tobacco and alcohol use, as well as diet, have been implicated in the large increase in oral cancer mortality. One of the new approaches for control of this cancer is early detection and control of potentially malignant oral lesions (PMOLs) and conditions of the oral cavity. A PMOL has been defined as a lesion or condition, in which risk of malignancy, being present at the time of

initial diagnosis or at a future date.^[2,3] Leukoplakia is the most common potentially malignant lesion of the oral mucosa and among all proliferative verrucous leukoplakia (PVL), distinct clinical form of oral leukoplakia (OL), is a rare potentially malignant oral mucosal disorder with a high rate of progression to oral SCC (OSCC) and verrucous carcinoma (VC).^[4] The condition develops initially as focal clinical hyperkeratosis that progressively becomes a wide multifocal disease with gross exophytic features. Multiple oral sites such as buccal mucosa, gingiva, alveolar ridges, and tongue are affected with high recurrent characteristic.^[5,6]

There are many treatment modalities that can be used for these PMOL such as the conventional nonsurgical treatment by medications or complete removal of lesion by scalpel excision, electrical surgery, and the recently recognized laser surgery. Diode lasers are very commonly used in a variety of surgical procedures and have many advantages such as reduced scar formation, less pain and bleeding, and reduced chances of infection.^[4] Lasers have been used in medicine and dentistry since the early 1960s (Husein 2006). Laser (light amplification by stimulated emission of radiation), is a device that generates a high-intensity parallel beam of monochromatic electromagnetic radiation. There are different types of lasers that are currently being

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used in dentistry depending on their wavelength range and their absorption. Carbon dioxide (CO₂), erbium-doped yttrium-aluminum-garnet (YAG) lasers are absorbed by water because of which there is minimal penetration responsible for fast heating, with effective removal of soft and hard tissue. CO₂ lasers are mainly used as laser scalpels for the excision of tumors from soft tissues.^[5] Laser wavelengths such as neodymium: YAG, CO₂, and diodes have also been used successfully for various procedures.^[6]

Case Report

A 32-year-old female patient reported to the Department of Oral Medicine and Radiology with a complaint of a growth present on the right side of cheek since last 3 months. The patient gave a history of similar kind of growth on the right cheek 7–8 years (2007) back for which she had undergone partial surgical removal 6 years (2009) back by local dentist and report had been given with leukoplakia. After surgery, she had noticed a gradual increase in the size of the growth for which she had undergone second surgery 4 years (2011) back. During second surgery complete removal was done. In report atypical changes of cells were present in the sample was mentioned. After 1 year of complete removal of growth, it again reappeared. Then third surgery was performed, complete removal done and diagnosis was given in favor of inclusion cyst (sebaceous cyst). After third surgery, no recurrence was seen for next 2 years. Six to 7 months back she had noticed a white patch initially on the same region which had gradually been increasing and had become a growth since last 2 months. On the region of growth, she often felt mild and intermittent pain and used to chew during eating.

The patient reported no history of past medical details. On personal history, she reported of chewing paan masala and betel nut since last 8–9 years. She used to take 3–4 packets/day. On clinical examination mouth opening was found to be slightly reduced. Mouth opening was 37 mm blanching was present on both right and left buccal mucosa extending from retromolar region till the 16.46 region on the right side and 27, 36 regions on the left side giving marble like appearance. Diffuse brown pigmentation was present on buccal mucosa. A thick nonscrapable white lesion was present on right buccal mucosa near the commissure of lip measuring approximately 1 cm × 2 cm in diameter. On the right side, an exophytic soft tissue growth was present irt 47.48 measuring approximately 0.3 cm × 1 cm in diameter extending from distal aspect of 47 till the distal surface of 48 anteroposteriorly and supoinferiorly from the occlusal level of 48 till the mucogingival junction. Superficial mucosa of growth was hyperkeratinized and multiple projections elevated from the base. On palpation base of growth was firm with multiple superficial projections [Figure 1]. Reduced cheek flexibility was present on both

sides with vertical, horizontal bands in retromolar region. After clinical examination, diagnosis was made in for growth as verrucous leukoplakia irt 48 with leukoplakia on right buccal mucosa and oral submucous fibrosis Grade 1. On management, we had planned for surgical removal of growth by diode laser. Before surgical procedure hemogram assessment was performed along with viral profile. Diode laser of 980 nm wavelength was used for the surgical excision. The laser was used in continuous mode at 2 watts. The growth was surgically completely excised using laser [Figure 2].

A slight char tissue in the base of the wound was seen, this char acts a bioprotective plug that has prevented bleeding and also helps to prevent infection in such wounds. The absence of bleeding was the most evident feature of this wound. The borders were rolled out, and these borders flattened out later. The excised tissue was sent for histopathological examination. The biopsy confirmed the case to be that of verrucous leukoplakia. The patient was recalled for follow-up after 7 days [Figure 3]. On the 7th day follow-up, granulation tissue was seen which was sign of secondary healing. The patient came after 11 and 13 days for follow-up. Gradual decrease in site of surgery and complete healing as seen [Figures 4 and 5]. After 1 month, complete resolution of the lesion was seen without recurrence and restricted mouth opening. Histopathologically, multiple soft specimens were sent to Oral Pathology Department measuring 11 mm × 2 mm, 8 mm × 4 mm, irregular in shape, slightly blackish in margin and firm. Under the microscope, the section showed high cellular stroma. On higher magnification, fragmented epithelium was seen. Epithelium showed cleft formation with parakeratin plugging. The connective tissue stroma is condensed with dense inflammatory cells mainly lymphocytes and endothelial lined blood vessels suggestive of verrucous leukoplakia (Batsakis *et al.* Grade 2) [Figure 6].

Discussion

It has been suggested that widespread multiple OLs may have a higher potential for developing carcinoma regardless of the grade of epithelial dysplasia. Reports indicate that 15.8–48.0% of OSCC patients were associated with OL when diagnosed. Collective estimate of annual rate of OL malignant transformation is 1.36% (95% confidence interval, 0.69–2.03%) in various populations and geographical areas.^[1] The World Health Organization group has defined leukoplakia as “a white patch or plaque that cannot be characterized, clinically, or pathologically, as any other disease.”^[2] Scarcely a few decades ago, a rare form of OL known as PVL was described, first by Hansen *et al.* in 1985.^[7] It presents very specific characteristics, mainly a more aggressive biological behavior than other forms of



Figure 1: Preoperative and clinical examination of lesion



Figure 2: During operative, after removal of lesion with laser



Figure 3: Postoperative view after 7 days (day 1)



Figure 4: Postoperative view after 11 days (day 2)



Figure 5: Postoperative view after 13 days (day 3)

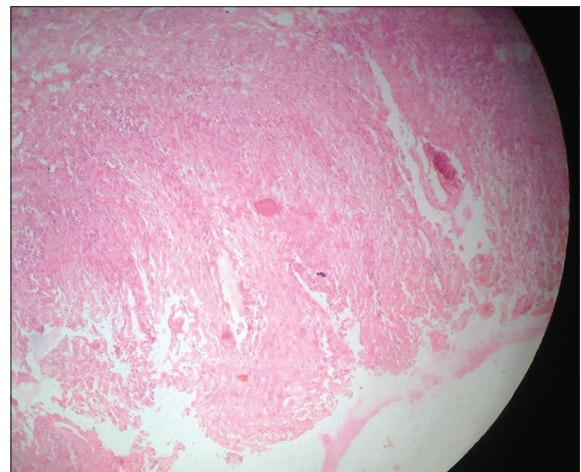


Figure 6: Histopathological picture, on higher magnification, fragmented epithelium was seen. Epithelium showed cleft formation with parakeratin plugging

leukoplakia expressed by: A tendency toward multifocality (field cancerization); a high prospect of recurrence; and a high rate of malignant transformation, which can range between 40% and 100% in a follow-up period of 4.4–11.6 years.^[5] PVL behaves in a more aggressive and relentless manner than the more innocuous white oral lesions that it can resemble clinically. PVL is seen more frequently in females and most often diagnosed after the sixth decade of life.^[4] Tobacco use does not seem to have a significant influence on the disease given that PVL occurs both in smokers and nonsmokers.^[5] Initially, it appears as a white plaque of hyperkeratosis that eventually becomes a multifocal disease with confluent, exophytic and proliferative features. As this is a persistent and progressive lesion, it requires a very close follow-up along with early and aggressive treatment to increase the chances of a favorable outcome. The etiology of PVL is still not known. The proliferative effect of PVL was explained on basis of the high rate of field cancerization existing in PVL patients (Bagan *et al.* 2004) 89% positivity for human papillomavirus (HPV) DNA using polymerase chain reaction was found by Palefsky. Although several authors have suggested that HPV might have a role in the pathogenesis of PVL, Bagan *et al.* in 2007 suggested that there is no association of PVL with HPV.^[5] For the first time it has been shown that frequent alteration of cell cycle regulatory genes, p16INK4a and p14AR is common in oral verrucous leukoplakia.^[7] Association with HPV strain 16 and 18 has also been reported. This was reported by Palefsky 1995, Gopalakrishnan 1997, Eversole 2000. Candida was found in 68% of the patients. This was reported by Silverman *et al.* Recently, Bagan *et al.* reported Epstein–Barr virus associated with PVL. Gender and age-related effects on immune competence have also been reported.^[8]

PVL exhibits progressive histopathological features that may be observed in a single biopsy, multiple biopsies taken from a single patient at the same time or serial biopsies. Surgical excision is the treatment of choice for oral epithelial dysplasia and can be accomplished with a scalpel or a laser.

In most cases where conventional surgery is done, complications such as intra-operative bleeding, difficulties in wound healing and maintenance of sterility during surgery are very frequently seen. With the recent advancements and developments in the field of lasers diode lasers has become the choice of treatment for excision of such benign tissue growths. Diode lasers have been used in a variety of soft tissue surgical procedures mainly because of its ability to decontaminate and bactericidal property which is responsible for lesser pain and lesser inflammatory signs, for example, swelling and postoperative analgesia.^[9] Other advantages include reduced scar formation and minor bleeding which provides a bloodless field thus allowing the surgeon to get a better view of surgical field. As a result of

enhanced healing and hemostasis, intraoral laser wounds can often be left without sutures, healing by secondary intention (granulation tissue) which is the most effective healing method when the wound involves multiple layers of mucosa.^[9-11]

Laser ablation reportedly has been successful in a very small group of patients followed for 6–178 months.^[12]

From the histological perspective, it is thus suggested that a stage of PVL must be considered in a lesion with features of lichenoid inflammation with basilar hyperplasia.^[8]

Hansen *et al.* reported that PVL on histopathologic continuum goes through four stages:^[8]

1. Hyperkeratosis
2. Verrucous hyperplasia
3. VC
4. Papillary SCC.

Hansen *et al.* proposed a microscopic grading of PVL on a scale from 0 to 10 denoting a continuum of severity that included histologically normal oral mucosa, clinically homogenous leukoplakia, verrucous hyperplasia, VC, papillary SCC, less differentiated SCC, and intermediates.^[7]

Batsakis *et al.* reduced the number of histologic stages to four with intermediates:^[7,12]

- Grade 0: Clinical flat leukoplakia without dysplasia
- Grade 2: Verrucous hyperplasia
- Grade 4: VC
- Grade 6: Conventional SCC with intermediate.

Proposal of major and minor diagnostic criteria for PVL recommended by Cerero-Lapiedra *et al.* (2010).^[8]

Major criteria:

- a. A leukoplakia lesion with more than two different oral sites, which is most frequently found in the gingiva, alveolar processes and palate
- b. The existence of a verrucous area
- c. That the lesions have spread or engrossed during development of the disease
- d. That there has been a recurrence in a previously treated area
- e. Histopathologically, there can be from simple epithelial hyperkeratosis to verrucous hyperplasia, VC or OSCC, whether *in situ* or infiltrating.

Minor criteria:

- a. An OL lesion that occupies at least 3 cm when adding all the affected areas
- b. That the patient be female
- c. That the patient (male/female) be a nonsmoker
- d. A disease evolution higher than 5 years.

To make the diagnosis of PVL, it was suggested that one of the two following combinations of the criteria mentioned before were met.

1. Three major criteria (being E among them) or
2. Two major criteria (being E among them) + two minor criteria.

Nevertheless, at present, there is no criterion that will allow for the early diagnosis of the disease.

In the present case, we evaluated the advantages of diode laser for the treatment of verrucous leukoplakia, where the results that we obtained were excellent. The patient had come for evaluation till the time of complete healing.

Conclusion

Diode laser is often used as a successful treatment modality for obtaining biopsy specimens. The application of lasers as a substitute of soft tissue surgeries is also gaining more and more recognition. Laser treatments have been shown to be superior over conventional mechanical approaches because of its ability to easily ablate, decontaminate, and better hemostasis, as well as less surgical and postoperative pain in soft tissue management.

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Conflicts of interest

There are no conflicts of interest.

References

1. Liu W, Wang YF, Zhou HW, Shi P, Zhou ZT, Tang GY. Malignant transformation of oral leukoplakia: A retrospective cohort study of 218 Chinese patients. *BMC Cancer* 2010;10:685.
2. Goyal D, Goyal P, Singh HP, Verma C. An update on precancerous lesions of oral cavity. *Int J Med Dent Sci* 2013;2:70-5.
3. Bokor-Bratić M, Vučković N, Mirković S. Correlation between clinical and histopathologic diagnoses of potentially malignant oral lesions. *Arch Oncol* 2004;12:145-7.
4. Carnelio S, Rodrigues GS, Shenoy R, Fernandes D. A brief review of common oral premalignant lesions with emphasis on their management and cancer prevention. *Indian J Surg* 2011;73:256-61.
5. Shaurya M, Ravindra S, Murthy S. Proliferative verrucous leukoplakia of the gingiva: A rare palatal presentation. *J Adv Oral Res* 2012;3:43-8.
6. Ghazali N, Bakri MM, Zain RB. Aggressive, multifocal oral verrucous leukoplakia: Proliferative verrucous leukoplakia or not? *J Oral Pathol Med* 2003;32:383-92.
7. Hansen LS, Olson JA, Silverman S Jr. Proliferative Verrucous Leukoplakia. A long term study of thirty patients. *Oral Surg Oral Med Oral Pathol* 1985;60:285-98.
8. Aesha S, Tanveer S, C Sreeja, Kumar SM. Proliferative Verrucous Leukoplakia: A Recalcitrant. *J Adv Med Dent Scie Res* 2014;2:75-9.
9. Agarwal N, Panat SR, Gupta P, Aggarwal A, Upadhyay N. Proliferative Verrucous Leukoplakia: A Case report. *J Dent Sci Oral Rehabilitation* 2013;4:41-3.
10. Tatu R, Shah K, Palan S, Brahmakshatriy H, Patel R. Laser excision of labial leukoplakia with diode laser: A case report. *JRRMS* 2013;3:64-6.
11. Ishii J, Fujita K, Komori T. Laser surgery as a treatment for oral leukoplakia. *Oral Oncol* 2003;39:759-69.
12. Issrani R, Prabhu N, Keluskar V. Oral proliferative verrucous leukoplakia: A case report with an update. *Contemp Clin Dent* 2013;4:258-62.