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Management of gingival leukoplakia using 980nm diode laser– A case report

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Abstract
Gingival leukoplakia is one such oral potentially malignant disorder that requires prompt diagnosis and treatment as it is notorious for having a high recurrence rate and increased chances of malignant transformation. Therefore, though many medical therapies are present and tried, surgical excision remains the gold standard treatment protocol. The use of a 980nm diode laser for surgical excision has recently been tried with promising results, including a slightly lower recurrence rate when compared with conventional scalpel excision.

Keywords: Oral leukoplakia, gingival leukoplakia, diode laser

Introduction

Oral leukoplakia (OL) is a frequently encountered oral potentially malignant disorder (OPMD) which should be diagnosed and treated as early as possible to reduce the chances of malignant transformation. The World Health Organization (WHO) Collaborating Centre in 2020 described it as "a predominantly white plaque of questionable risk having excluded (other) known diseases or disorders that carry no increased risk for cancer [1]." The prevalence of OL was reported to be 1.39% with the pooling estimated global prevalence as 3.41% [2]. It is more prevalent in males than in females. The most common sites affected are the tongue (36–50%), buccal mucosa (18–26%), floor of mouth (8–22%), gingiva (6–22%), and hard palatal mucosa (7%) [3].

The etiology of OL remains an enigma, though several risk factors like smoking, tobacco chewing, alcohol consumption, presence of viruses (e.g., HIV, Human Papilloma Virus), family history of cancer, etc. have been identified. The absence of any risk factors indicates a genetic predisposition and an increased risk of malignant transformation. The rate of malignant transformation potential ranges from 0.13% to 34% [4]. Once it transforms into oral squamous cell carcinoma, the 5-year survival rate drops to 50-66% [5].

The management of OL includes surgical treatment and several medical therapies like vitamin A, retinoid, beta carotene or carotenoids, herbal extracts, bleomycin, and Bowman-Birk inhibitor. The surgical treatments include conventional scalpel excision, electrosurgery, cryosurgery, laser surgery, or vaporization [6]. Various types of lasers have been used for laser surgery or ablation including CO_2, Nd:YAG, Er:YAG, KTP, and diode laser. Though CO_2 lasers have been extensively used for excision or ablation of OL, the use of diode laser have also been reported recently. This case report describes the management of a case of gingival leukoplakia in a 41-year-old female patient using 980nm diode laser.

Case Report

A 41-year-old female patient reported to the Department of Periodontics with chief complaints of noticing white spots on the gum of lower right posterior teeth for the past year. Though the lesion was asymptomatic, it kept spreading during the past year. The patient had no history of indulging in deleterious oral habits during her lifetime. There is also no history of taking any medications for any systemic disease.

On intra-oral examination, a non-scrapable, non-tender, white patch was noted on the buccal gingiva extending from tooth no. 44 (distal) to 47 (mesial) measuring approximately 25mm X 5mm in its greatest dimensions. The surface appeared rough resembling cracked mud without any signs of inflammation or ulceration (Figure 1). The cervical lymph nodes were non-palpable. Intra-oral radiographs of the region appeared normal. All the haematological parameters were within normal limits. Based on the clinical and radiographic findings, a provisional diagnosis of gingival leukoplakia was made and an incisional biopsy was performed under local anaesthesia.

Fig 1: Intra-oral view of the gingival leukoplakia.

Sections stained with haematoxylin and eosin (Figure 2) showed hyper-keratinized stratified squamous epithelium supported by mature fibro-collagenous connective tissue stroma. The basal layer of epithelium showed spindling of nuclei focally. Mild chronic inflammatory cell infiltration

was noted within the connective tissue. The overall histopathological features were suggestive of hyperkeratosis with mild dysplasia.

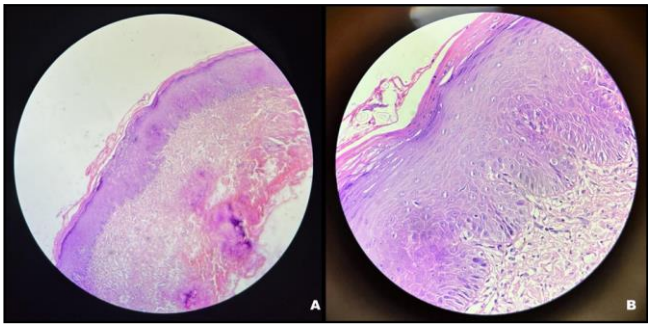

Fig 2: Haematoxylin and eosin-stained sections depicting hyperkeratosis with mild dysplasia (A – 10X magnification; B – 45X magnification).

Based on the histopathological report, excision of the lesion using 980nm diode laser was planned. After taking a written informed consent, the area was anaesthetized using 2% lignocaine hydrochloride with 1:80,000 adrenaline (Xicaine, ICPA). Thereafter, the lesion was excised using 980nm diode laser (DPI Diode Laser, India) at 2-watt power in continuous-wave mode with a fiber optic tip of 300µm in contact with the tissue (Figure 3). The tip was used in swiping or brushing motion with constant movement across the lesion to prevent unwanted charring. At least 3mm of normal tissue all around the lesion was excised as a safety margin to reduce the chances of recurrence. A high-volume suction was used to evacuate the laser plume. Irrigation with copious amounts of normal saline was performed intermittently to prevent excessive thermal damage to adjacent tissue. All safety precautions for laser surgery, including wearing protective eyewear, were followed. Antibiotics (Amoxicillin 500mg + Clavulanic Acid 125mg, TDPC and Metronidazole 400mg, TDPC) and analgesics (Ketorolac tromethamine 10mg) were prescribed for the next 5 days. The patient was also advised to apply a local anaesthetic ointment (20% Benzocaine) in the region before taking meals. Follow-up after 14 days revealed uneventful healing of the region. Though follow-up till 2 years (Figure 4) after surgery showed no signs of recurrence, she was advised to undergo regular monitoring 3 months apart for early detection of recurrences.

Fig 3: Surgical excision of the lesion with 980nm diode laser.

Fig 4: 2 years post-operative view.

Discussion

Management of gingival leukoplakia should be done as early as possible since it has been reported that 4–20% of gingival leukoplakias tend to undergo malignant transformation [3, 7]. Despite the absence of associated risk factors, the incidence of malignant transformation of the lesion does not reduce, indicating that a possible genetic predisposition is present. Moreover, gingival leukoplakia has been reported to have a high recurrence rate of 42–54.5% [8]. This high recurrence rate may be attributed to the fact that gingival tissues are too thin to resect with a safety margin of 3mm and also, sometimes, it is practically impossible to remove all the dysplastic cells especially those involving the interdental gingiva and the sulcular epithelium [9]. Thus, though the literature describes several non-surgical medical therapies for the management of gingival leukoplakia, surgical excision remains the gold standard. This has been concluded by a systematic review by Lodi *et al*., where it was found that the medicinal treatments did not reduce the risk of development of oral cancer more than placebo [6]. Therefore, surgical excision of the lesion was justified.

There is a lot of debate present regarding the technique that should be used for surgical excision. The conventional technique using scalpel excision is usually associated with increased bleeding, and post-operative pain, and also causes tissue scarring and contraction, which can sometimes mask early signs of recurrence. The tissue scarring was also reported for surgical excision using electrosurgery and cryotherapy. Thus, surgical excision by laser seems advantageous as it provides a bloodless surgical field, reduced scar formation, less procedural and post-operative pain, bactericidal effect, less oedema, minimal damage to adjacent tissues, and improved wound healing. Moreover, a study by M. de Pauli Paglioni, *et al*. showed a slightly lower recurrence rate (16.5%) for lesions treated with laser as compared to those excised using scalpel (10-34%) or cryotherapy (12-25%). The rate of malignant transformation was found to be 5.2% for laser excision and 5.4% for conventional scalpel excision, which is almost similar [10]. Also, conventional scalpel excision of OL affecting the gingiva may result in unwanted mucogingival defects as the mean marginal thickness for gingival tissue is usually only 1.25mm. Thus, laser excision or ablation of OL, especially those affecting the gingiva, can sometimes be a better option than traditional scalpel excision.

Amongst all the types of lasers available, CO_2 laser, Nd:YAG laser, Er:YAG laser, and diode laser have been documented to be used for excision or ablation of OL with CO_2 laser being most commonly used. Diode lasers are available in various wavelengths ranging from 805nm to 1064nm. They have a remarkable affinity for water-based tissue, thereby, providing precision during excision of superficial lesions with minimal damage to deeper tissue. They can be used in continuous-wave or gated-pulse mode, either in contact or out of contact with the tissue. The advantages of diode laser over CO_2 laser include its compact size, portable nature, cost-effectiveness, and can also be used in contact mode [11]. Moreover, diode laser being a soft tissue laser, can never cause damage to the underlying bone in contrast to CO_2 laser (both soft and hard tissue laser). A study by Natekar *et al*. found lesser post-operative pain in patients treated with diode laser than those treated with CO_2 laser [12]. Amongst the different wavelengths of diode laser, the 980nm diode laser demonstrates significantly higher absorption in water, allowing it to cut more optically than thermally, with an optical penetration of less than 300µm [13]. Hence, it produces a more precise incision margin as compared to other wavelengths. Thus, the use of 980nm diode laser seems to be justified.

The excision was performed by keeping a safety margin of at least 3mm all around the lesion to minimise the chances of recurrences. This is in accordance with a study by Kuribayashi *et al*., where it was stated that to reduce the recurrence rate to 10% or less, an optimal safety resection margin of at least 3mm width needs to be excised. A recurrence rate of nearly 100% was observed for all the lesions that were resected with a safety margin of <2mm.[9] However, though a safety margin of 3mm was excised all around the lesion, it is not possible to excise a 3mm depth of gingival tissue due to the thinness of the gingiva. Thus, routine follow-up every 3 months apart was advised to the patient for early detection of recurrences.

Another reason for advising regular check-ups is due to the high recurrence rate noted in gingival leukoplakia and their tendency to undergo malignant transformation as explained by the 'field cancerization' concept [14]. This is because the adjacent clinically normal epithelial tissues contain abundant active cells in the basal cell layer that have an inherent tendency to undergo dysplastic changes and might proliferate to give rise to oral squamous cell carcinoma. This remains true even after successful removal of the lesion using a laser.

Conclusion

OL affecting the gingiva, though not being a commonly affected site, seems to have a very high recurrence rate and a high tendency to undergo malignant transformation. Therefore, early diagnosis and prompt intervention by surgical excision should be the treatment of choice. The use of diode lasers for surgical excision can be a good treatment modality as it offers several advantages over conventional scalpel excision. Nevertheless, even after surgical removal, continuous monitoring is advised for early detection of recurrences.

Declaration of patient consent

All authors certify that appropriate consent of the patient has been obtained including the consent to use her images and other relevant clinical information for publication purposes. The patient understands that the name and identity will not be published, though anonymity cannot be guaranteed.

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Nil.

Conflict of Interest

There are no conflicts of interest.

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