

DIODE LASER THERAPY OF HOMOGENOUS LEUKOPLAKIA – A CLINICAL STUDY

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Abstract

Background : To assess the efficacy of diode laser excision in the treatment of oral leukoplakia, to evaluate intra-operative and post-operative pain on the 7th, 14th and 21st day, to assess bleeding intra operatively and post-operatively and to evaluate wound healing after laser excision.

Materials & Method: The present study comprised of 5 subjects of either gender in the age group between 18-60 years clinically diagnosed with oral leukoplakia who received diode laser ablation of the leukoplakia lesion. The intra operative bleeding at the site of the lesion was assessed employing gauze visual analogue scale while pain estimation was done using Visual Analogue Scale (VAS). The patients were then recalled on the following 7th, 14th and 21st post-operative days to evaluate pain and status of wound healing.

Results: In this study it was found that the intra operative and post operative pain in the diode laser therapy was minimal and wound healing was also good.

Conclusion: Diode lasers can be successfully employed in the surgical management of oral leukoplakia. Diode laser is an enticing advance in the field of oral medicine for the management of potentially malignant disorders like oral leukoplakia owing to patient comfort and its inherent benefits. Their rapid progress compels more exploration into this therapy to revolutionize treatment of soft tissue pathologies.

Keywords: Leukoplakia, Diode laser, Potentially malignant disorder, Surgical excision.

Introduction

Oral cavity is lined by keratinized or non keratinized stratified squamous epithelium.¹ Leukoplakia is the most frequently encountered premalignant lesion of the oral mucosa.^{2,3,4,5,6} The mucosa appears white due to increase in the thickness of the epithelium i.e. hyperkeratosis and acanthosis, increase in the amount of edema fluid in the epithelium, reduced vascularity of the underlying lamina propria, surface ulcerations covered by pseudomembrane and ruptured bullae.^{1,2,4}

“WHO” defines it as “A Lesion which has a white patch or plaque on the oral mucosa that cannot be removed by scraping and cannot be classified clinically or microscopically as another disease entity”.⁷ The term leukoplakia should be used to identify “a predominantly white plaque of questionable risk having excluded other known diseases that carry no increased risk for cancer” - WHO (2005).^{8,9} Among the various causative factors for leukoplakia, tobacco is regarded as the primary cause for its occurrence.^{2,3,4,5,8} Homogeneous and Non-Homogeneous leukoplakia are the two main clinical types of leukoplakia.^{2,3,4,5,8} Homogenous lesions appear uniformly white, flat and thin while non homogenous lesions may appear speckled (with mixed red and white components), nodular, exophytic and corrugated.^{2,3,4,5,8} The malignant transformation of oral leukoplakia, ranges from 0.17% to 17.5%.^{2,3,6}

The risk factors include tobacco chewing and smoking (cigar/pipe/cigarette/beedi), alcohol, chronic trauma, candidiasis, galvanism, syphilis, vitamin deficiencies, infections and hormonal influences.^{1,2,3,4,6} A multitude of surgical and non-surgical therapeutic modalities have been adopted for oral leukoplakia ranging from non

invasive methods such as use of carotenoids, Vitamin A, C and K, feretinide, bleomycin, photodynamic therapy to use of invasive treatments like conventional surgery, electrocautery, cryosurgery and lasers.^{2,6,8}

Laser excision is one of the latest therapeutic modality for oral leukoplakia.^{6,7,8} Various soft tissue lasers, hard tissue lasers and semiconductor diode lasers can be utilized to treat oral leukoplakia. Diode lasers are semiconductor lasers that are regarded as soft tissue lasers.⁸ Diode lasers have an active solid medium manufactured from semiconductor crystals employing a mixture of aluminium, gallium and arsenide.⁸ The existing wavelengths include 810 nm, 940 nm and 980nm.⁸ The most significant interaction that occurs when lasers are focussed at oral soft tissue is absorption which raises the temperature of the affected tissues to between 50 and 100 degrees.¹⁰ At this temperature, denaturation of proteins occur thereby causing destruction of diseased epithelium.¹⁰

In striking contrast to conventional scalpel surgery, effortlessness of soft tissue ablation, hemostasis, less bacteremia, decreased edema, minimal scar as a result of little wound contraction, decreased intraoperative and postoperative pain and enhanced patient comfort due to elimination of topical anaesthesia and sutures, are some of the various advantages offered by diode laser excision.^{8,10,11} Apart from these benefits, soft tissue diode lasers have an excellent incision performance with a cutting depth of 2-6 mm.¹¹

Considering the aforementioned benefits and utility of diode lasers in the treatment of oral leukoplakia, this study was undertaken to evaluate the effectiveness of diode lasers in the treatment of oral leukoplakia

Materials & Method

Following routine haematological investigations, 5 patients clinically diagnosed with homogenous leukoplakia were included in the study were subjected to diode laser therapy. For excision of the lesion, each patient was comfortably seated on the dental chair with proper good illuminated light and draped. Patients were given protective eye wear to prevent any untoward exposure of the eye to the laser beam. After administering local anaesthesia (Lidocaine HCL 25% with 1:80,000 Epinephrine, Hounsco.ltd Korea) over the affected area to ensure maximum comfort for the patients with minimum pain and minimal bleeding. The lesion was excised carefully in each patient using diode laser - Clean Cut (Class IV Laser Germany) wavelength of 630-990 nm with output power 7 watt with continuous wave and in contact mode with the tip of the bare fiber (200 micron). (Figure 1)



Figure 1: Equipment Used for Diode Laser Excision

Mucopain ointment was applied as a topical emollient after laser ablation of the lesion.

After excision was done in patients, bleeding and pain was assessed intra operatively during the diode biopsy procedures and the data was recorded for all 5 subjects in their respective proforma. The bleeding at the site of the lesion was assessed employing gauze visual analogue scale. Pain estimation was done using Visual Analogue Scale (VAS) rating scale in which 0 signified no pain and 10 depicted worst possible pain.² According to the criteria given by Sarkar S et al, minimal bleeding was scored as (1), and profuse bleeding was scored as (2) depending on the number of gauze pieces employed to obtain a clear surgical site. After excision, the tissue was sent for histopathological examination.⁸

The patients were then recalled on the following 7th, 14th and 21st post-operative days and were again assessed for post operative pain on each of these days using Visual Analogue Scale (VAS) pain rating scale. The wound healing was assessed visually and graded as partial or complete healing. (Figure 2)

These findings were entered in the case sheet Performa for each case. All the details were tabulated and subjected to statistical analysis. The histopathological reports of the excised lesions were suggestive of leukoplakia with no dysplastic changes.



Figure 2: Pre and Post-Operative Images of Homogenous Leukoplakia Following Laser Ablation

Statistical Analysis

Statistical analysis was done using Statistical Package of Social Science (SPSS Version 20; Chicago Inc., USA) the tabulated data was statistically analyzed using Chi-Square test and Friedman's test.

Results and Discussion

The mean VAS value of intra operative pain was 2.26 with a standard deviation of 1.42. This observation is in agreement with the study conducted by Sarkar S et al in 2015 who also observed minimal intra operative pain in patients who underwent diode laser ablation of oral leukoplakia.⁸

All five study subjects exhibited mild intra-operative bleeding. This finding is in accordance with the study conducted by Shalawe W S et al in 2012 and Sarkar S et al in 2015 who observed minimal intra operative bleeding in patients during diode laser ablation of oral leukoplakia.^{8,12}

The mean VAS value of post operative pain on the seventh day following laser ablation of oral leukoplakia was 1.04 with a standard deviation of 0.87. This is in accordance with the study conducted by Sarkar S et al in 2015 who found a minimal to no pain on the 7th post operative day in patients who underwent diode laser ablation of oral leukoplakia.⁸ Another study conducted by Sai Praveen K N et al in 2015 stated that mild pain was noted on the 7th post operative day in a majority of patients who underwent diode laser ablation of oral leukoplakia.¹⁰

The mean VAS value of post operative pain on the fourteenth day following laser ablation of oral leukoplakia was 0.64 with a standard deviation of 0.83. This finding is in accordance with the study conducted by Sarkar S et al in 2015 who found that a majority of patients who underwent diode laser ablation of oral leukoplakia were pain free on the 14th post operative day.⁸ Another similar study conducted by Kharadi U A R et al in 2015 found near complete resolution of pain on the 14th post operative day in almost all patients who underwent diode laser therapy of oral leukoplakia.¹³

The mean VAS value of post operative pain on the twenty first day following laser therapy of oral leukoplakia was 0.00. This observation is in accordance with the study conducted by Syed T F et al in 2009 who stated that laser excision of oral leukoplakia showed no

pain in patients on the 21st post operative day.¹⁴ Another such study conducted by Sai Praveen K N et al in 2015 found that most of the patients with oral leukoplakia who underwent diode laser therapy exhibited no pain on the 21st post operative day.¹⁰ (Graph 1)

The reduction in VAS values of pain over 21 days following laser excision of oral leukoplakia was statistically significant with a p-value of 0.05.

Three of the five subjects enrolled in this study exhibited complete wound healing on the seventh post operative day. This observation is in accordance with the study conducted by Sarkar S et al in 2015 who reported near complete wound healing on the 7th post operative day in patients who underwent diode laser ablation of oral leukoplakia.⁸ Another such study reported by Ramwala V in 2016 stated a good wound healing on the 7th post operative day in patients with diode laser ablation of oral leukoplakia.¹⁵

All five subjects exhibited complete wound healing by the fourteenth post operative day. This observation is in accordance with the study conducted by Sarkar S et al in 2015 who observed complete wound healing on the 14th post operative day in all patients who underwent diode laser ablation of their leukoplakic patch.⁸ (Graph 2) The comparative evaluation of wound healing on the seventh, fourteenth and twenty first day following laser excision of oral leukoplakia was statistically significant with a p-value of 0.05.⁸

Conclusion

Diode lasers have shown to exhibit numerous advantages over scalpel for many procedures. Few of these benefits include hemostasis, enhanced wound healing, minimal intra operative and post operative pain as well as decreased scarring. Oral leukoplakia is a fairly common precancerous lesion. As a majority of patients are asymptomatic, the chief objective of treatment must be directed towards prevention of such malignant transformation. Hence, lesions which do not subside with conventional therapy must be surgically excised. Diode laser therapy is a novel treatment modality for oral leukoplakia, which has shown fruitful results in earlier literature. Hence, this study was done to evaluate the effectiveness of diode laser in oral leukoplakia.

References

1. More B C, Thakkar K, Patel H. Oral Leukoplakia – A hospital based study. *J Int. Oral Health*, 2011, 3 (1), 23-30
2. Greenberg MS, Glick M, Ship JA. *Burket's Oral Medicine*, Eleventh edition. Hamilton: BC Decker Inc. 2008
3. Neville, Damm, Allen, Bouquot. *Oral and Maxillofacial Pathology*. 2nd edition. New Delhi: Elsevier, 2002
4. Shafer, Hine and Levy. *A textbook of oral pathology*. Fourth edition, Pennsylvania, Elsevier, 2003

5. Philip L Mc Carthy, Gerald Shklar. *Diseases of the oral mucosa. Diagnosis, management and therapy*. USA, McGraw Hill, 1964
6. Tatu R, Shah K, Palan S, Brahmakshatriy H, Patel R. Laser excision of labial leukoplakia with diode laser: A case report. *IJRRMS*, 2013, 3(4), 64-66
7. Kapoor D, Kapoor V, Garg S, Gill S. Diode Laser As a treatment option for leukoplakia Tongue: A case report. *IJDS*, 2014, 6(4), 62-63
8. Sarkar S, Kailasam S, Iyer V H. Effectiveness of Diode Laser and Er,Cr:YSGG Laser in the Treatment of oral leukoplakia –A Comparative Study, *Dentistry* 2015, 5(1), 1-6.
9. Nomenclature and classification of potentially malignant disorders of the oral mucosa, S Warnakulasuriya, Newell W Johnson, I van der Waal; *J Oral Pathol Med* 2007, 36 (10): 575-80
10. Praveen Kotu N S, Veeraraghavan G, Reddy R S, Kotha P, Koneru J and Yelisetty K. Management of Oral Leukoplakia Using Diode Laser: A Pilot Study. *BJMMR* 2015, 10 (7):1-6
11. Ize-Iyamu I N, Saheeb B D, Edetanlen B E. Comparing the 810NM Diode Laser with conventional surgery in orthodontic soft tissue procedures. *Ghana Medical Journal*, 2013, 47(3): 107-11
12. Shalawe WS, Ibrahim ZA, Sulaiman A D. Clinical comparison between diode laser and scalpel incision in oral soft tissue biopsy. *Al – Rafidain Dent J* 2012, 12(2), 337-343
13. Kharadi Usama A R, Onkar S, Birangane R, Chaudhari S, Kulkarni A, Chaudhari R. Treatment of Oral Leukoplakia with Diode Laser: a Pilot Study on Indian Subjects. *APJCP* 2015, 16(18), 8383-6
14. Syed T F, Thukral N. CO₂ Laser Surgery for the Excision of Leukoplakia: A Comparison with the Traditional Technique. *The Journal of Oral Laser Applications* 2009; 9(4); 213-218
15. Ramwala V. Use of Diode Laser in the management of Oral Leukoplakia - A study of 10 cases. *IOSR- Journal of Dental and Medical Sciences*, 2016, 15(7), 81-85

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