International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 483-486 www.ijdmsrjournal.com ISSN: 2582-6018

Lasers: Reframing the Endodontic Practice – A Case Report

Aarushi Chopra

Date of Submission: 15-10-2023 Date of Acceptance: 25-10-2023

ABSTRACT-
Laser technology applied to endodontics, more so than ever was investigated in past two decades especially since the development of fiberoptic delivery systems, and lately has undergone an important evolution thereby becoming an aide to the Endodontist. One such elaboration of its potency has been explained in brief in this case report where the patient was diagnosed with pulpal necrosis with symptomatic apical periodontitis (also evident by large periapical lesion on the radiograph) and non-surgical root canal treatment was performed using DIODE LASER irradiation as a method of disinfection. These lasers have the capacity to induce biomodulation of deeper dentin layers and photothermal effect on bacterial cells in the root canal. In this case, diode laser disinfection has resulted in drastic reduction in the periapical lesion over a period of one year.
Keywords: Necrotic pulp, large periapical lesion, root resorption, LASER disinfection

I. INTRODUCTION –

The complexity of root canal anatomy limits the ability of chemical irrigants to three dimensionally clean and disinfect the entire length of canal. During chemo-mechanical preparation, various intracanal irrigants like sodium hypochlorite (NaOCl), Ethylene-diaminetetra-acetic acid (EDTA) and MTAD (mixture of doxycycline, citric acid and a detergent (Tween 80) have been used for disinfection; however, they do not achieve a complete disinfection of root canal space and the inner layers of dentin[1].

The ramifications and variations from normal in apical one third of the root canal often eludes the debridement with chemo mechanical variations which crusades the need for utilization of newer techniques. Over the last ten years, diode lasers have acquiredextensiveembracing in the genre of laser-assisted endodontics, and various studies have performed deep disinfection of the root canal through diode laser irradiation[2].Lasers have the capability to condense the energy of the light and produce powerful effect, targeting tissues at energy level lower than the natural light[3]. It is this bactericidal action of lasers due to its thermal properties which makes them an asset in biomechanical preparation of the tooth.

II. CASE REPORT :

A 50 year old Male patient reported to the Department of Conservative Dentistry & Endodontics with a chief complain of continuous pain in upper front teeth region since six months. On investigation, patient gave history of trauma in the same region 20-25 years ago. Clinical examination revealed that left maxillary central incisor (#21)was tender on percussion and non vital. Radiographic Examinationrevealed large periapical radiolucency in relation to 21 with blunt root apex suggestive of root resorption (Fig. 1). It was diagnosed as Pulpal Necrosis with Symptomatic Apical Periodontitis with respect to 21.

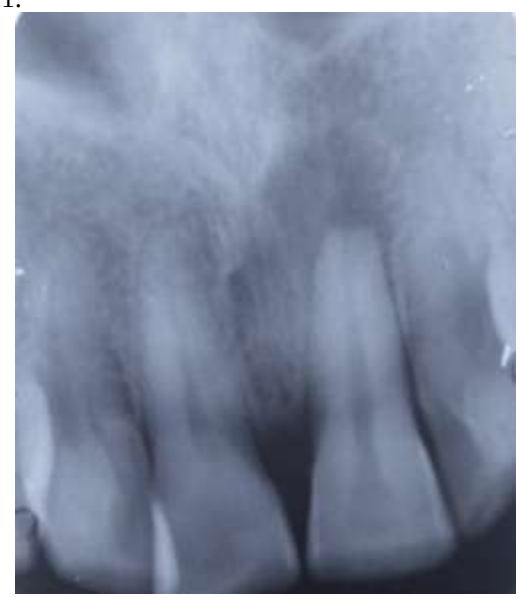

Fig. 1 - PRE – OP RADIOGRAPH

ENDODONTIC TREATMENT PLAN –

Non Surgical Root canal therapy was decided as the treatment of choice for tooth 21.Tooth was anesthetised with 2 % lidocaine with 1:200,000 epinephrine under rubber dam isolation. Access opening was initiated with Endoaccess bur (Dentsply Maillefer) and working length was determinedusing 10K file (Dentsply Maillefer, Switzerland)(Fig. 2). Apical trephination was done using a 15k file which led to pus discharge from

International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 483-486 www.ijdmsrjournal.com ISSN: 2582-6018

the canal.Shaping & cleaning wasperformedupto F2 (Dentsply ProTaper Gold Rotary System)in the same visit with copious irrigation with saline and 0.2% Chlorhexidine. Sodium Hypochlorite was not used at this appointmentdue to continuous pus drainage from root canal.

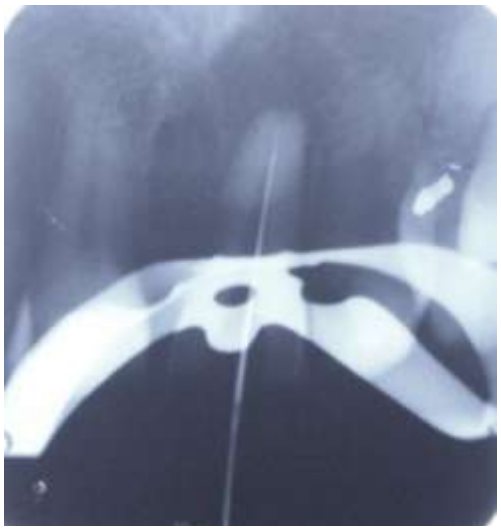

Fig 2 - WORKING LENGTH DETERMINATION

Following irrigation, Metapex dressing was placed in the canal for 21 days (Fig. 3).

Fig. 3 - METAPEX DRESSING PLACED

The patient was recalled and metapex dressing was removed. But, due to the long standing necrotic pulp and large size of periapical lesion, it was decided to use Laser Disinfection technique for thorough disinfection of the root canal. The tooth was flushed with 5.25% Sodium Hypochlorite (NaOCl) and irradiated with the diode LASER (BIOLASE EpicX) at an output power of 2.0 W and a wavelength of 940 nm in continuous mode (Fig. 4). An optical fiber 200 μm in diameter was inserted into the root canal 1 mm short of the working length. The irradiation was done for 5 secondsand repeated four times. A 10 secondresting interval was given after each cycle. Post disinfection with laser, isolation was maintained. On the same appointment, master cone selection with F2 was determined keeping gutta percha 2 mm short of root apex due to root resorption (Fig. 5).Obturation was donevia lateral compaction obturation technique using AH Plus sealer and post endodontic restoration was done using Composite Resin (Fig. 6).

Patient was recalled for follow up after 1 year and showed healing of periapical lesion and rounding of root apex suggesting the arrest of root resorption (Fig. 7).

Fig. 4 - BIOLASE EpicX DIODE LASER

International Journal Dental and Medical Sciences Research
Volume 5, Issue 5, Sep-Oct 2023 pp 483-486 www.ijdmsrjournal.com ISSN: 2582-6018

Fig 5 - MASTER CONE SELECTION

Fig. 6 - OBTURATION

Fig. 7 - ONE YEAR FOLLOW UP

III. DISCUSSION -

Disinfection is one of the maingoals in successful root canal treatment[4]. The victory of a root canal treatment, the aim of which is to heal apical lesions, lies on an effective bacterial reduction[5]. Conventional methods often do not showcase desired results and necessitate the use of variable means in achieving optimal treatment goals. Many laser wavelengths (from 532 nm to 10,600 nm) clinically or experimentally used in dentistry have bactericidal potentialowingto their thermal effect which can bring about structural reorganization in bacterial cells[6].The near-infrared lasers (from 810 nm to 1340 nm) have negligible affinity for water and the hydroxyapatite of hard dental tissues and therefore penetrate to a large extent through dentinal tubules and are absorbed by the bacterial pigments. This permits for a bactericidal effect in deeper dentin layers[7].Near-infrared lasers(including diode lasers) can cause morphological alterations of the dentinal wall leading to partial removal of the smear layer.

Diode lasers emit their energy in a continuous-wave (CW) modeA mechanical interruption of the energy emission called as "gated" or "chopped" is possible authorizing for enhanced control of thermal emission and vandalism in dentin[6].It has also been found that with progressive decrease in diameter of the deep dentinal tubules, the penetration of irrigants is restricted.The fine diameters of optic fibers (200-320 μm) warrant efficacious delivery of laser light to the root canal to aide with depletion of bacterial contamination. The antibacterial effect disceredoutstretches over 1000um deep into the dentin, surpassing the effective range of chemical disinfectants, such as NaOCl (Sodium Hypochlorite) which go upto a depth of only 300 um and exhibiting modestpotency against E. fecalis even in the deeper layers of dentin[7]. An additional merit attained with the use of Lasers disinfection is

a shorter treatment span in contrast to conventional root canal treatment to arrest resorption which may last upto months in order to achieve desired therapy goals.

However, a temperature rise to a critical level could have deleterious effects on the tissues surrounding the tooth. The temperature rises by approximately 10 °C and a treatment duration of 60 seconds can cause irreversible injury to periodontal tissues[8].Gutknecht et al demonstrated that diode laser irradiation for 5 seconds, with 10 seconds of resting time, should be considered to avoid a temperature rise to an undesired level[5].

Yet these shortcomings can be conquered with sustainable use of lasers accompanied with proper resting intervals in between exposure cycles, to optimize their efficacy.

Therefore, laser irradiation with its inherent properties of light scattering, local intensity enhancement and attenuation allows light penetration deeper in the dentinal tubules contributing to a superior antimicrobial efficacy.

IV. CONCLUSION –

The 980 nm diode laser can abolish bacteria that has relocated into dentin, thus being competent to elevate the success rate in endodontic therapy[9]. They are able to simplify endodontics and decrease the unwanted thermal effects on the dentinal walls, using lower levels of energies in the presence of chemical irrigants[6]. Despite inadvertent disadvantages that they may confer their usage is a regular practice in endodontics for indicated cases such as the case presented above where appreciable amount of healing occurred. Their significant ability to show antibacterial effect in deeper layers of dentin makes them popular for the modern day dental treatment.Finally, the use of laser is recommended not as an alternative to Sodium Hypochlorite or other irrigants but as an adjunct to the traditional methods of disinfection and debridement protocols performed in day to day endodontics.

REFERENCES :

[1]. Buck RA, Eleazer PD, Staat RH, Scheetz JP. Effectiveness of three endodontic irrigants at various tubular depths in human dentin. J Endod. 2001;27:206–8.

[2]. Genc Sen O, Kaya M. Effect of Root Canal Disinfection with a Diode Laser on Postoperative Pain After Endodontic Retreatment. PhotobiomodulPhotomed Laser Surg. 2019 Feb;37(2):85-90.

[3]. Jafarzadeh H, Mohammadi Z, Shalavi S, Sahebalam R, Kinoshita J. Laser-based Disinfection of the Root Canal System: An Update. J Contemp Dent Pract 2017; 18 (1):74-77.

[4]. Dai S, Xiao G, Dong N, Liu F, He S, Guo Q. Bactericidal effect of a diode laser on Enterococcus faecalis in human primary teeth-an in vitro study. BMC Oral Health. 2018 Aug 31;18(1):154.

[5]. Gutknecht N, van Gogswaardt D, Conrads G, Apel C, Schubert C, Lampert F. Diode laser radiation and its bactericidal effect in root canal wall dentin. J Clin Laser Med Surg. 2000 Apr;18(2):57-60.

[6]. OliviG.Laser Use in Endodontics: Evolution from Direct Laser Irradiation to Laser-Activated Irrigation.Material Science 2013.

[7]. Schoop U, Kluger W, Moritz A, Nedjelik N, Georgopoulos A, Sperr W. Bactericidal effect of different laser systems in the deep layers of dentin. Lasers Surg Med 2004;35(2):111-116.

[8]. Kwon SJ, Park YJ, Jun SH, et al. Thermal irritation of teeth during dental treatment procedures. Restor Dent Endod. 2013;38(3):105-112.

[9]. Kaiwar A, Usha HL, Meena N, Ashwini P, Murthy CS. The efficiency of root canal disinfection using a diode laser: in vitro study. Indian J Dent Res. 2013 Jan-Feb;24(1):14-8.