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# CASE REPORT

# Management of Internal Resorption by Laser Disinfection and Thermoplasticised Obturation

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***ABSTRACT:***

Endodontic therapy for teeth diagnosed with irreversible pulpitis has been in use for many years,and continues to be the standard of care in the dental practice. In simple cases, where mechanical instrumentation and chemical irrigation can achieve sufficient cleaning and disinfection, endodontic treatment is reported to be as high as 96% successful. However, in cases where root canal systems are more complex, proper cleaning of the organic debris, removal of smear layer and disinfection, has proven to be a challenge. Long-standing chronic periapical lesions and complex root canal anatomy, examples of which include the presence of isthmus, apical deltas and lateral canals, the predictability of successful endodontic therapy is significantly reduced. Lasers of different wavelengths have been shown to be useful in improving disinfection and smear layer removal in more complicated endodontic cases. In this article, we describe a case of laser-assisted endodontic therapy of a lower premolar exhibiting radiographic evidence of internal resorption and clinical symptoms of irreversible pulpitis. The case was recommended for extraction following endodontic consultation, as there was suspected buccal root perforation.Mechanical instrumentation was performed using Protaper Next Rotary system followed by the diode 940nm laser for deeper disinfection of the dentinal tubules. Thermoplasticized obturation technique was utilized. The protocol was successful and one-year radiographic follow-up is presented as evidence.

**Key Words:** Internal resorption, laser disinfection, thermoplasticised obturation.

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## INTRODUCTION

It is well known that long-term success and predictability of root canal therapy is dependent on the presence, or absence, of infection and our ability to disinfect and seal all the main and accessory canals three-dimensionally. Prognosis for endodontic therapy in teeth with apical periodontitis is 10-15% lower than for teeth without periapical lesion.[1,2] Once the tooth becomes infected, it becomes very difficult to completely eliminate the bacteria from the three-dimensional network of complicated root canal systems.[3] Several pigmented endodontic pathogens, such as *P. gingivalis, P. endodontalis, P. intermedia* and *P. nigrescens,* have been found to persist after proper instrumentation of the canals, and are responsible for failure of endodontic therapy.[4] Smear layer produced during mechanical instrumentation, with either rotary or hand files, reduces permeability of intra-canal irrigants, like NaOCl (sodium hypochlorite) and CHX(chlorhexidine) by 25-49%.[5] Hence, anti-bacterial rinsing solutions can only reach the bacteria to a depth of 100 mm into the dentinal tubules.[6] However, microorganisms such as *E. faecalis* have been found as deep as 800-1100 mm.[7,8]

In the recent years, different laser wavelengths have been shown to be advantageous for deeper penetration of dentinal tubules, compared with chemical irrigants[9,10] and therefore, for better bactericidal effect.[11,12]

The clinical case presented here describes a successful endodontic treatment of an upper lateral incisor, which exhibited radiographic signs of internal resorption. The observation by an endodontist suggested a hopeless prognosis for the tooth and, hence recommended extraction. We utilized a diode 940nm wavelength laser known for its ability to penetrate deep into the tubules and disinfect the canals.

**CASE REPORT**

A 24-year-old male presented to the department of Conservative dentistry & Endodontics with pain in the upper left back tooth region since one month. On clinical examination, the tooth was found to be sound. A closer radiographic examination revealed an area of internal resorption. Recommended treatment was extraction of the tooth and implant placement.

Upon the patient's return to the department for possible extraction, the use of lasers in endodontics to help with extremely compromised cases[13,14] was explained, and the patient consented to try laser-assisted endodontic treatment. Local anaesthesia was administered followed by rubber dam isolation.The tooth was accessed and brisk bleeding confirmed the activity of the resorptive lesion.Triple Antibiotic Paste was placed as intracanal medicament in order to dissolve necrotic soft tissue and to control the bleeding followed by sealing of the access cavity with GIC. Patient was recalled after 2 weeks.

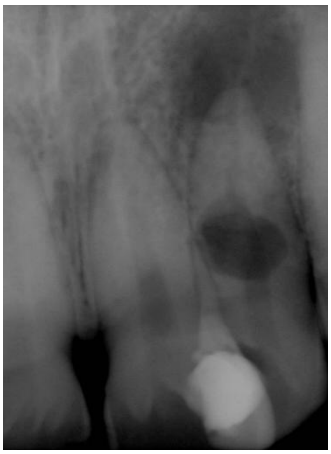
In the second appointment, working length was estimated. Mechanical instrumentation of the canal was completed using Protaper Next Rotary System. Before final obturation, dual wavelength laser cleaning and disinfection protocol was performed.

**Endodontic debridement, decontamination and disinfection laser protocol:**

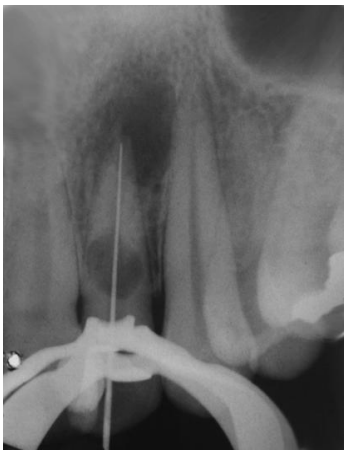
Laser diode of 940 nm , continuous wave mode, EZ200 end-firing tip 200mm diameter was utilized with Power 1.0W. Tip was inserted 1mm short of the apex and moved at the speed of 2mm/s while being fired on the way out of the canal. Six cycles of 7.5s each for a total 30s of irradiation with total energy of 30J was delivered.

Following the laser protocol, sectional obturation was performed in the apical portion till the resorptive defect. The remainder of canal was obturated with an E & Q Gun using thermoplastic gutta percha using Roekoseal as root canal sealer. The tooth was permanently restored with resin restoration immediately following obturation. The patient was instructed to inform the office should any pain or discomfort persist past first two to three days following the endodontic therapy. He returned in three months for a routine follow-up and reported only minor discomfort for the first two to three days, which quickly subsided, with the tooth feeling "normal" ever since. Post-operative radiographs were taken at 12 and 18 months after the completion of the laser-assisted endodontic treatment. The tooth remains asymptomatic and functional.

**Pre Operative Photograph Of 22**

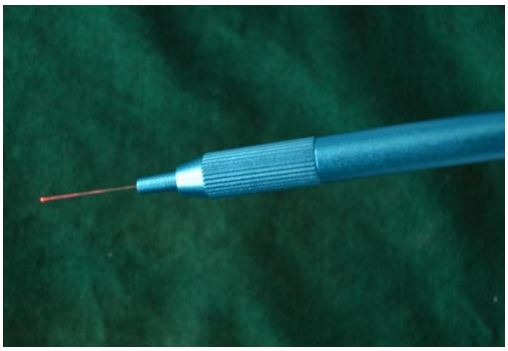


**Pre Operative Radiograph of 22**



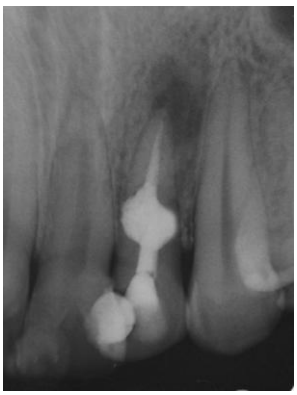
**Working Length Determination**

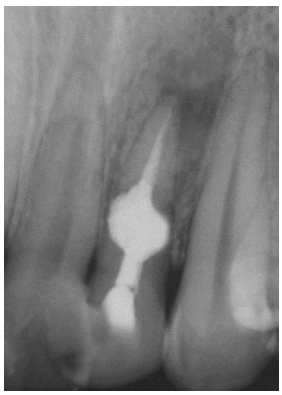
**Master cone selection**

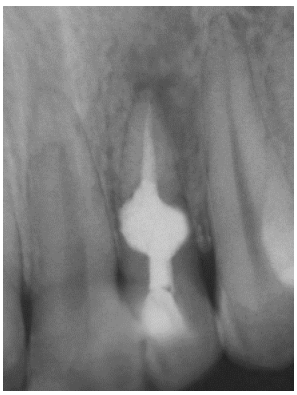



**Diode Laser Unit**

**Canal Disinfection Using Diode Laser**







**Sectional obturation** **Obturation Completed using thermoplasticised Gutta Percha** **12 Months follow up** **18 Months follow up**

## DISCUSSION

It has been shown that bacterial contamination of the root canal system, presence of necrotic tissue and bacterial colonies deep inside the dentinal tubules (as far as 1.1mm)[15] are the main contributing factors to the long-term failure of endodontic therapy. Performing a root canal treatment prior to onset of deep bacterial colonization is a valuable service we can provide to our patients, to ensure long-term success. Unfortunately, early intervention is not always possible. As well, the difficult three-dimensional anatomy of the canal systems, such as internal resorption network, also makes it difficult to achieve complete debridement and disinfection of the entire surface area of the root canal walls and into the depth of the tubules. Laser systems, the 940nm diode, add an advantage to the traditional mechanical debridement and chemical disinfection.Diode lasers have deeper penetration in dentin [16,17] their high absorption in melanin and haemoglobin allows for selective killing of pigmented and pigment producing bacteria, which make up the majority of endodontic infections.[4]A recent study has shown that dual wavelength protocol (2780nm with 940nm) is safe and does not result in adverse temperature changes on the external root canal surface in vitro.[18] Temperature rise was recorded to be $5^{o}$C to $7^{o}$C depending on the thickness of the dentinal wall. Continuous movement of the laser tip inside the canal and distilled water irrigation, between laser exposures,

ensures control of temperature rise. The cooling effects of blood circulation should make this protocol even safer in vivo. Lastly, the sealer chosen to complete the endodontic obturation is also of great importance to the long-term success of complicated cases involving possible perforations and/or open apices. Extrusion of Roekoseal sealer past the apex has shown to be well tolerated by periapical tissues and does not interfere with normal bone healing. Owing to its excellent flowability, no shrinkage and wetting characteristics it is ideal for the filling of the complex internal resorption network of canals, especially since complete dryness inside the tooth cannot be accomplished with the use of paper points, and possibly even diode laser irradiation.

## CONCLUSION

The one-year success of this clinical case may be an indication that laser systems, such as the 940nm diode lasers can be beneficial additional tools in the treatment of extremely complicated endodontic cases, otherwise doomed for extraction. An inability of conventional hand or rotary files to completely remove organic material from such a complex resorption system was another reason for recommended extraction for this tooth. The lasers' ability to remove debris and smear layer with acoustic shockwaves and the great bactericidal effect[19,20] due to deep penetration and pigment affinity, helped us treat this case in a conservative, non-surgical manner.

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