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Laser-Enhanced Intentional Reimplantation: A Successful Case Report of Young Permanent Tooth Salvage

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Abstract

Intentional replantation (IR) is a promising treatment for teeth with persistent periapical pathology when conventional endodontic therapy did not yield result. This report presents a case of a 14-year-old female with a chronic periapical abscess in the permanent left mandibular first molar. Conventional root canal treatment failed due to a persistent periapical infection. The tooth was atraumatically extracted, treated endodontically extra orally with root end filling, and reinserted into the socket and I- PRF was placed. Adjunctive Photo-biomodulation was performed for enhanced healing. Follow-up at three months showed complete periapical healing with no pain or mobility. The placement of PRF and Photo-biomodulation enhanced healing with bone regeneration. With proper technique, IR is a viable alternative to tooth extraction and implants, offering long-term retention and favourable outcomes in endodontic failure cases.

Key words: PBM, Intentional reimplantation, Periapical Abscess

Introduction

The concept of an Intentional replantation (IR) has been known for over a thousand years, it is defined by Grossman (1966) as an atraumatic extraction of a tooth and reinsertion into its socket immediately after root canal treatment and apical repair is done extra-orally[1-3]. IR is a potential therapeutic option for teeth with a periapical disease that would otherwise be considered unrestorable. Periapical pathology, namely persistent periapical abscess, is a typical complication of untreated dental diseases and is also a chronic radiographically visible periapical disease that does not disappear after sufficient endodontic treatment. A persistent inflammatory or infectious process in the periapical tissues frequently characterizes this condition. Endodontic treatment is frequently the first line of defense; however, if traditional root canal therapy (RCT) or surgical intervention is not possible, IR may be considered. There are various reasons for

purposeful replanting. This is the last therapeutic option for canal obstruction caused by a cemented post, complex perforation, or separated instrument. The age and the absence of infection may be the predictors of treatment outcome in IR[4]. Adjunctive Photo-Biomodulation(PBM) will increase success outcomes by disinfecting stimulating healing and promoting regeneration. IR is recommended when surgical access to the apices is not possible, especially if the tooth is symptomatic[5]. Surgical complications are more likely when a major anatomical structure, such as the mental nerve, is nearby or when extensive bone removal is required, potentially causing injury to surrounding structures.

This report describes a successful intentional reimplantation of a mandibular molar with a persistent periapical abscess.

Case Report

General Data

A 13-year-old Female visited the Department of Pedodontics and Preventive Dentistry of AMEs Dental College with the Chief Complaint of Pain and swelling in the left back tooth region for 15 days. History of Present Illness revealed the patient had intermittent, throbbing pain that initiated spontaneously and was relieved by medication, though she was unaware of the specific medication taken.

Clinical Examination

Clinical Examination revealed GV Black's Class I caries involving the pulp in tooth #36, Miller's Grade I mobility, and the tooth was tender on percussion.

Upon Radiographic observation, it showed radiolucency involving enamel, dentin, and pulp in tooth #36. And Widening of periodontal space and discontinuity of lamina dura at the apical third of the mesial root, apex of the distal root, and furcation area. Periapical radiolucency (10mm x 6mm) near the mesial root, with haziness involving the furcation and apical region of the distal root, was noted.

Diagnosis

Thus, the final Diagnosis was made as Chronic periapical abscess with interradicular involvement to tooth #36.

Initial Line of treatment

Treatment was initiated with conventional Root canal therapy (RCT) and Abscess drainage was performed through intracanal access. Sinus curettage was completed on the second visit. During biomechanical preparation (BMP), an accidental file separation occurred in the apical third of the mesiobuccal root, and an attempt to retrieve and did not succeed. Then proceeded with the placement of Metapex as an intracanal medicament for 21 days. Despite the medicament, the periapical radiolucency persisted, and mild swelling remained. Due to the presence of the separated instrument and persistent pathology, IR was planned and consent was obtained for the same from the patient.

Procedure of IR

The tooth was a traumatically extracted using forceps with a minimal rocking motion and gentle luxation, without the use of surgical elevators(Figure 1A)[6]. A thorough root inspection was performed to check for fractures, additional canals, portals of exit, and other anatomical variations. The extracted tooth was preserved in normal saline to prevent desiccation. Residual Metapex was removed from the canal, and BMP was completed using a rotary system. Root-end resection of approximately 2mm was performed, and a Class I cavity was prepared at the apex using a high-speed round bur. Root-end filling was done using mineral trioxide aggregate (MTA) to ensure biocompatibility and sealing ability. Intentional over-obturation with gutta-percha was performed, and the excess material was trimmed(Figure 1B,C). Socket curettage was carefully executed to remove granulation tissue without damaging the socket walls. Socket debridement was done with the help of Laser phototherapy (660nm,0.2J/cm^2, 60 sec) to enhance Antimicrobial activity, healing, and bone regeneration with the photosensitizer methylene blue(Figure 3A)[7]. The tooth was repositioned in its original socket, and digital pressure was applied to ensure proper seating. Injectable platelet-rich fibrin (I-PRF) was placed in the sulcular space to promote healing by drawing the 2ml of 20cc venous blood from the patient just

before the centrifugation(Figure 2). The tooth was de-occluded to prevent occlusal forces and was stabilized using a zinc oxide eugenol periodontal pack. The tooth was stabilized by the periodontal pack itself hence no additional splinting was needed. The reimplantation was completed in 16 mins. Postoperative laser PBM therapy (810nm, 100mW power, 70J/cm² energy) was applied in the sub-mandibular region to accelerate healing(Figure 3B).

Postoperative management.

Patient instructed to avoid mastication on the operated tooth for 3 months and oral antibiotics(Amoxicillin 0.5g,TID) and analgesics(Aceclofenac 100mg, paracetomol 325mg, TID) were given for 5 days.

Follow-up and Outcome:

At the 7-day follow-up, periapical radiolucency showed early signs of resolution. After 30 days, clinical examination confirmed no tenderness or mobility. At the 3-month follow-up, postoperative intraoral periapical radiographs (IOPA) demonstrated a Reduction of periodontal space widening and continuity of lamina dura in the furcation and apical third of mesial and distal roots. At 1 year follow up normal trabecular pattern and radiodensity, suggest complete healing(Figure 4). Clinically, the patient reported no pain or discomfort, and the tooth remained stable.

Discussion: Intentional replantation is a viable alternative when conventional endodontic retreatment or apical surgery is not feasible. The technique has been refined over time, with adjunctive therapies like laser PBM and platelet-rich fibrin (PRF).

One of the key factors in ensuring a successful outcome is the preservation of the periodontal ligament (PDL). Studies have shown that maintaining PDL integrity enhances reattachment and prevents root resorption. In this case, the atraumatic extraction technique without using elevators contributed significantly to the survival of PDL cells. The immediate placement of the tooth in Normal Saline(NS) further supported the vitality of these cells, reducing the likelihood of ankylosis or inflammatory resorption. Research indicates that keeping extra time under 15 minutes is critical to PDL survival. In this case, meticulous planning ensured procedure was completed efficiently, minimizing extraoral dry time.

Root-end preparation plays a significant role hence 3mm deep Class I cavity with no bevel was prepared at the apex, which eliminated lateral canals and apical ramifications, enhancing the sealing efficacy of MTA. The choice of MTA as the root-end filling material was based on its biocompatibility, antibacterial properties and superior marginal adaptation [(8)].

Laser PBM was employed to accelerate wound healing and stimulate osteoblastic activity. Research suggests that PBM enhances collagen synthesis, fibroblast proliferation, and angiogenesis, thereby improving the healing potential of replanted teeth[(9)].

Additionally, PRF was used to enhance tissue regeneration. PRF releases growth factors that stimulate mesenchymal stem cell migration and proliferation, promoting bone healing. Its use in IR aligns with contemporary regenerative approaches in endodontics[(10)].

To ensure success after tooth reimplantation, stabilization is crucial. In this case, a eugenol periodontal pack was used. This technique provided support, allowed functional movement, and offered anti-inflammatory benefits, promoting soft tissue healing and reducing discomfort.

Extraoral dry time should be minimized to preserve the viability of the periodontal ligament (PDL). J. Andreasen reported 90% success rates when avulsed teeth were replanted within 30 minutes[(11)]. Grossman 1966 should be a matter of minutes PDL can be kept alive for 15 to 20 minutes[(12)]. Kratchman suggested that maximum extraoral time of 10 to 15 minutes. [(13)]

IR has shown promising long-term results. Cho et al. (2016)[14] reported high retention rates exceeding 10 years, while Chiu et al. (2023)[15] observed intact PDL space without resorption after 20 years. These findings support IR as a predictable treatment alternative when properly executed.

This case underscores the importance of precise technique, modern materials, and adjunctive regenerative therapies in ensuring the success of IR. With careful patient selection and adherence to best practices, IR can be a reliable option for managing complex endodontic failures while preserving natural dentition.

Conclusion:

Intentional reimplantation is a reliable treatment modality for teeth with persistent periapical pathology when conventional endodontic therapy is ineffective. The combination of adjunctive techniques such as PRF and laser PBM contributed to the successful outcome in this case. At the 3-month follow-up, radiographic and clinical findings confirmed complete periapical healing, demonstrating the efficacy of intentional reimplantation as a conservative alternative to extraction and dental implants.

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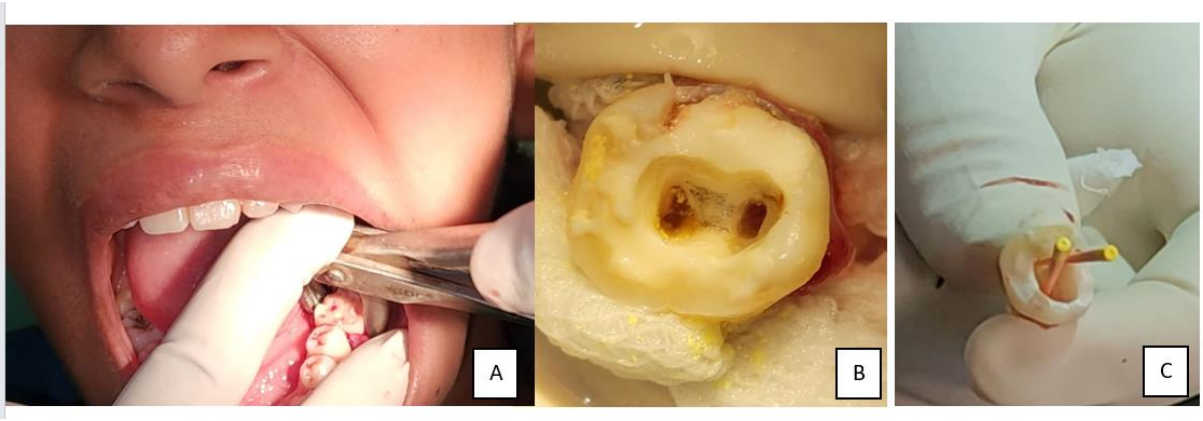

Figure 1, A- Atraumatic extraction only using forceps, B- Extraoral Access cavity, C- Extraoral obturation, B&C:- Tooth was held in saline soaked gauze.

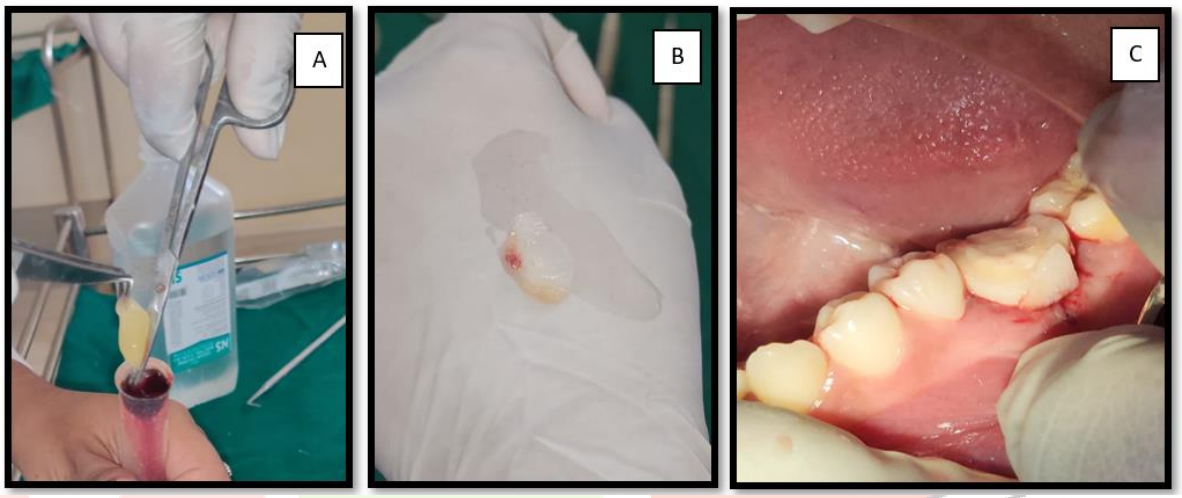

Figure 2- A: Centrifuged blood, B: I-PRF Obtained, C: I-PRF placed inside the socket

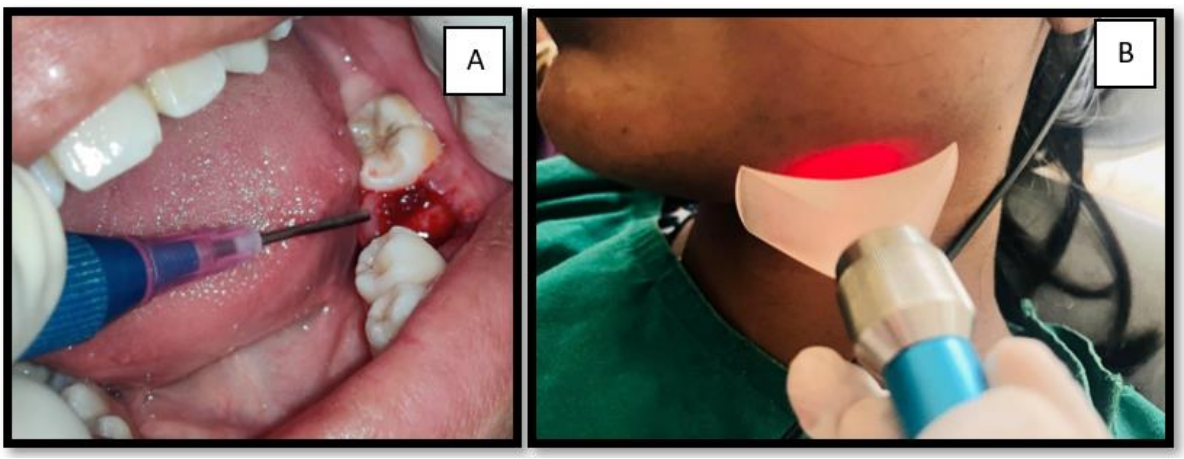

Figure 3- A: Laser Photodynamic therapy to the socket, B: Laser PBM in the submandibular region

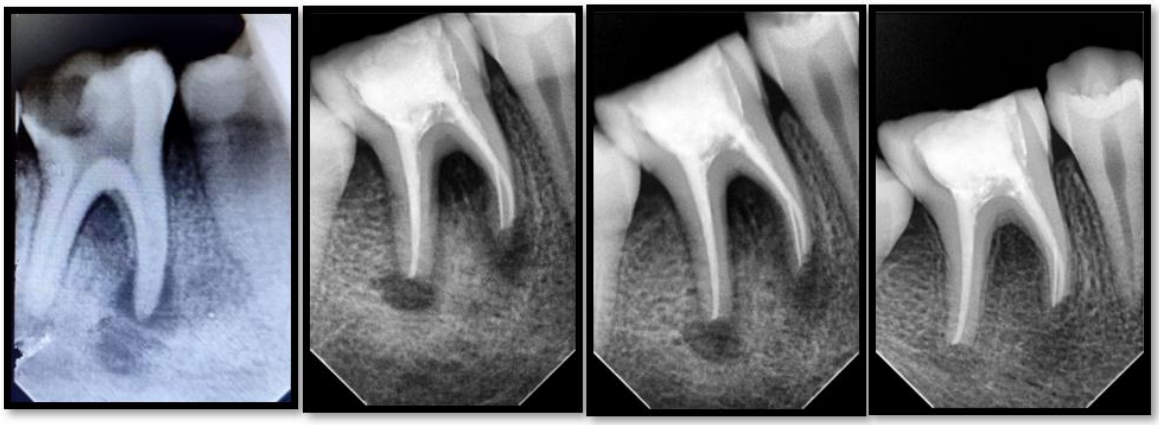

Figure 4