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Immediate Implant Placement In A Pathologically Infected Socket Using Platelet-Rich Fibrin In A Controlled Diabetic Patient: A Case Report

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Abstract
Immediate implant placement has become an increasingly accepted approach for replacing missing teeth while reducing treatment time and preserving alveolar bone architecture. However, implant placement in pathologically infected sites remains controversial, particularly in patients with systemic conditions such as diabetes mellitus, which may impair wound healing and bone regeneration. Platelet-rich fibrin (PRF), an autologous platelet concentrate rich in growth factors, has shown to enhance angiogenesis, bone regeneration, and soft-tissue healing.

This case report describes the successful rehabilitation of a 42-year-old male patient with controlled type II diabetes mellitus who presented with a grossly decayed mandibular right first molar (46) associated with chronic periapical infection and adjacent periapical pathology involving tooth 47. Following atraumatic extraction of tooth 46 and 47 followed by thorough debridement of the infected sockets, immediate implant placement was performed in the sites corresponding to teeth 46 and 47. Platelet-rich fibrin membranes was used as a biological adjunct to promote healing and enhance bone regeneration.

Clinical and radiographic evaluation during a 12-month follow-up period proved successful osseointegration, absence of infection, and restoration of functional occlusion. The case highlights the potential benefits of PRF in improving healing and implant success in medically compromised patients and supports the feasibility of immediate implant placement in carefully managed infected sites when proper surgical protocols are followed [1–5].

Keywords: *Dental implant; Immediate implant placement; Platelet-rich fibrin; Infected extraction socket; Diabetes mellitus; Oral rehabilitation*

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I. Introduction

Dental implants are widely recognized as a predictable and reliable treatment modality for replacing missing teeth and restoring oral function and aesthetics. Traditionally, implant placement followed a delayed protocol, where implants were placed several months after tooth extraction to allow complete healing of the extraction socket. However, advancements in implant surface technology and surgical protocols have enabled the development of immediate implant placement, which reduces treatment time, preserves alveolar bone architecture, and minimizes surgical interventions [6–9].

Immediate implant placement has gained considerable popularity due to its ability to preserve alveolar ridge dimensions and soft-tissue contours, thereby improving both functional and aesthetic outcomes. Nevertheless, the placement of implants in infected extraction sockets has long been considered a relative contraindication because of concerns regarding bacterial contamination, impaired osseointegration, and potential implant failure. Recent studies and systematic reviews, however, suggest that successful implant outcomes can be achieved in infected sites when meticulous debridement, adequate irrigation, and appropriate antimicrobial protocols are implemented [6,17,27]. These findings indicate that infection alone should not necessarily preclude immediate implant placement when proper surgical principles are followed.

Systemic conditions such as diabetes mellitus may further complicate implant therapy due to delayed wound healing, impaired immune response, and altered bone metabolism. Hyperglycaemia can negatively influence osteoblastic activity and collagen synthesis, thereby potentially affecting implant osseointegration. Despite these concerns, several clinical studies have demonstrated that patients with well-controlled diabetes can achieve implant survival rates comparable to those of healthy individuals, provided that glycaemic control is maintained and appropriate surgical protocols are followed [13–15,28].

In recent years, platelet-rich fibrin (PRF) has emerged as a valuable biomaterial in regenerative dentistry. PRF is a second-generation autologous platelet concentrate obtained through centrifugation of the patient's blood without the use of anticoagulants. It consists of a fibrin matrix enriched with platelets, leukocytes, and growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), and vascular endothelial growth factor (VEGF). These bioactive molecules promote angiogenesis, osteoblast proliferation, and soft-tissue regeneration, thereby enhancing the healing process [1–4,10–12].

Several studies have reported the beneficial effects of PRF in implant dentistry, particularly in challenging clinical situations such as infected extraction sockets, bone defects, and medically compromised patients [18–22]. By acting as a natural scaffold and releasing growth factors gradually, PRF can support tissue regeneration, improve early implant stability, and accelerate wound healing.

The present case report describes the successful management of a pathologically infected mandibular molar region involving teeth 46 and 47 using immediate implant placement combined with platelet-rich fibrin in a controlled diabetic patient, highlighting the clinical potential of PRF as a biological adjunct in implant therapy.

II. Case Presentation

A 42-year-old male patient presented to the Department of Oral and Maxillofacial Surgery with the chief complaint of pain and intermittent swelling in the lower right posterior region of the mandible. The symptoms had been present for approximately two weeks and were associated with difficulty during mastication.

CBCT showed a well-defined periapical radiolucency below 46,47.

The patient's medical history revealed Type II diabetes mellitus, diagnosed five years earlier. The patient was on oral hypoglycaemic medication and maintained good glycaemic control, with a recent HbA1c level of 6.5%. Following medical consultation, the patient was considered fit for minor oral surgical procedures.

Pre-operative image showing Decayed 46, and periapical pathology irt 47

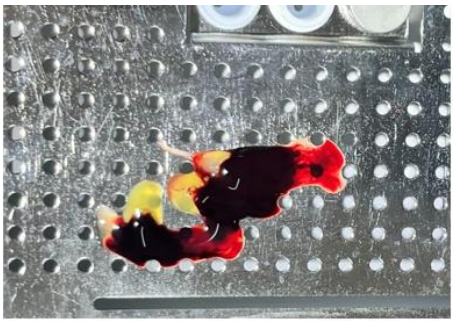
Clinical examination revealed a grossly decayed mandibular right first molar (tooth 46) with tenderness on percussion and a draining sinus tract on the buccal aspect. The adjacent mandibular right second molar (tooth 47) also exhibited tenderness on percussion, suggesting underlying periapical pathology.

Radiographic evaluation using intraoral periapical radiography (IOPA) demonstrated well-defined periapical radiolucencies associated with teeth 46 and 47, measuring approximately 6–7 mm in diameter, consistent with chronic periapical infection.

Considering the extensive destruction of tooth 46 and the presence of periapical pathology involving both 46 and 47, extraction of tooth 46 and 47 followed by implant-supported rehabilitation was planned. In order to reduce treatment duration and preserve alveolar bone, immediate implant placement was selected. The use of platelet-rich fibrin (PRF) was planned to enhance healing and support bone regeneration.

Radiograph showing implants placed after extraction of the infected teeth and

Surgical Procedure



PRF membranes prepared using patients blood.

The procedure was performed under local anaesthesia using 2% lignocaine with epinephrine (1:80,000). Atraumatic extraction of tooth 46 and 47 was carried out using periosteotomes and elevators to preserve the surrounding alveolar bone and socket walls.

Following extraction, the socket was thoroughly debrided to remove granulation tissue and infected debris. Special care was taken to preserve the integrity of the socket walls. The extraction socket was irrigated with sterile saline and chlorhexidine solution.

Approximately 10 mL of venous blood was obtained from the patient and centrifuged according to the Choukroun protocol to prepare platelet-rich fibrin (PRF) membranes.

Sequential osteotomy preparation was performed following the implant manufacturer's drilling protocol. Two DIo titanium implants measuring approximately 5.5 × 10 mm and 5 × 8 mm were placed in the sites corresponding to teeth 46 and 47, achieving primary stability of approximately 35 Ncm and 40Ncm.

Post operative image of the patient after giving stitches.

PRF membranes were placed around the implants to fill the peri-implant gap and promote bone regeneration. The surgical site was subsequently closed with resorbable sutures to achieve primary closure.

Post-operative Care

Postoperative medications included antibiotics, analgesics, and chlorhexidine mouth rinse. The patient was instructed to maintain strict oral hygiene and avoid chewing on the surgical site during the initial healing period.

The postoperative healing period was uneventful, and follow-up evaluation demonstrated satisfactory soft tissue healing and implant stability.

III. Discussion

Immediate implant placement offers several advantages, including preservation of alveolar bone, reduction in treatment time, and improved patient satisfaction. Despite these benefits, the placement of implants in infected extraction sockets has long been debated due to concerns about persistent infection and implant failure [6,17]. Recent studies, however, indicate that thorough socket debridement and careful surgical technique can significantly reduce bacterial contamination, allowing predictable osseointegration even in previously infected sites [17,27]. The present case supports these findings, as no postoperative infection or complications were observed during follow up.

Diabetes mellitus is often associated with delayed wound healing and impaired immune response. Nevertheless, multiple clinical studies have demonstrated that implant therapy in controlled diabetic patients can achieve success rates comparable to those in non diabetic individuals [13–15]. Adequate glycemic control and meticulous surgical technique are critical factors contributing to successful outcomes, as reflected in this case.

Platelet rich fibrin (PRF) has emerged as an effective biological adjunct in implant dentistry due to its regenerative potential. PRF gradually releases growth factors, promoting angiogenesis, osteogenesis, and soft tissue regeneration [1–4,10–12]. Systematic reviews have demonstrated that PRF enhances bone formation and improves implant stability during the healing phase [19–22,31–33]. In addition to its biological properties, PRF functions as a natural scaffold that supports cell migration and tissue remodeling. Its autologous nature eliminates the risk of immune reactions or disease transmission, making it a safe and cost effective biomaterial for regenerative procedures.

The successful outcome in the present case can be attributed to several factors, including proper case selection, effective infection control, and the regenerative properties of PRF. Together, these elements contributed to favorable bone healing and long term implant stability.

IV. Conclusion

Immediate implant placement in infected extraction sockets can be a predictable and successful treatment modality when proper surgical protocols and infection control measures are followed. The adjunctive use of platelet rich fibrin may further enhance healing by promoting angiogenesis, bone regeneration, and soft tissue maturation. In controlled diabetic patients, careful case selection and meticulous surgical technique can lead to excellent clinical outcomes. This case demonstrates that PRF can serve as a valuable biological adjunct in managing complex implant scenarios involving infection and systemic disease.

Declarations

Author Contributions

Dr. M. R. Haranadha Reddy provided overall supervision, expert guidance in surgical aspects, and critically reviewed the manuscript. Dr. Godvine contributed to surgical case management, manuscript refinement, and academic oversight. Dr. Sarah Fatima coordinated manuscript preparation, integrating clinical, radiological, surgical, histopathological, endodontic, and restorative sections, while ensuring academic rigor and seamless narrative flow. Dr. Phalguni K N assisted in literature review, drafting of the clinical background, and formatting. Dr. Ambatipudi Susmitha contributed to case documentation, patient follow up, and manuscript editing. Dr. Thota Sreeja supported data collection, case photography, and preparation of figures. Dr. Arwa assisted in literature search, manuscript structuring, and proofreading. Dr. B. Abhigna contributed to patient documentation, case history compilation, and drafting. Dr. Yagna Sri Gayathri, the corresponding author, assisted in manuscript drafting, reference validation, and coordinated the submission process. Dr. Lasya Snkp Duggirala contributed to literature review, case analysis, and manuscript editing. Nitya Madhurya Duggirala provided medical correlation, clinical interpretation, and manuscript proofreading. Dr. Israa Mohammed Younus contributed to manuscript formatting, ethical compliance statements, and final editing.

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Conflict of Interest

The authors declare that there are no conflicts of interest related to this manuscript.

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Ethical Statement

This manuscript is based on clinical observations and case documentation conducted in accordance with institutional ethical standards. Patient consent was obtained before inclusion, and all procedures adhered to the principles outlined in the Declaration of Helsinki.

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