GUIDED BONE REGENERATION USING INJECTABLE-PRF AND ALLOPLAST IN TREATMENT OF EARLY FAILING IMPLANT - A CASE REPORT

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Abstract:

Peri-implantitis is condition marked by inflammation and osseous resorption around dental implants, presents considerable complications in implant dentistry. Traditional treatment methods often involve mechanical debridement and surgical interventions, but recent advances suggest the potential of regenerative therapies using biologic agents and graft materials. An alloplast graft (beta-tricalcium phosphate) and injectable platelet fibrin(i-PRF) were used to treat peri-implantitis in 29-year-old male patient. Following mechanical debridement and antimicrobial therapy, a surgical approach was employed to decontaminate the implant surface. i-PRF mixed with alloplast graft, is placed into the peri-implant defect to enhance regeneration. Post-operative follow-up at 1, 3, and 6 months revealed significant improvement, including reduced probing depth, elimination of inflammation, and radiographic evidence of bone fill. This case highlights the synergistic effect of i-PRF and alloplast graft in promoting soft and hard tissue regeneration, offering a promising treatment modality for peri-implantitis management. Further research is warranted to establish standardized protocols and confirm the long-term success of this approach.

Peri-implantitis is characterized by inflammation and progressive bone loss around dental implants, posing a significant challenge in implant dentistry. Conventional management includes mechanical debridement and surgical intervention; however, regenerative approaches using biologic agents and graft materials show promising outcomes. This case report describes the treatment of peri-implantitis in a 29-year-old male using beta-tricalcium phosphate (alloplast

graft) combined with injectable platelet-rich fibrin (i-PRF). Following mechanical debridement and antimicrobial therapy, surgical flap access was performed to decontaminate the implant surface. The peri-implant defect was filled with a mixture of i-PRF and alloplast graft to promote regeneration. Clinical and radiographic evaluation at 1, 3, and 6 months demonstrated reduced probing depth, resolution of inflammation, and evident bone fill. The combined use of i-PRF and alloplast graft exhibited a synergistic regenerative effect on both hard and soft tissues. This approach may serve as a promising modality for peri-implantitis management, although long-term studies are needed to validate standardized treatment protocols.

Clinical Relevance to Interdisciplinary Dentistry

• Highlights the synergistic use of biologics (i-PRF) and synthetic grafts (β-TCP), integrating principles of periodontics, oral surgery, and regenerative dentistry.

• Provides a minimally invasive, cost-effective regenerative approach applicable in interdisciplinary treatment planning for peri-implantitis and early implant complications.

INTRODUCTION:

Dental Implant have become a major part of dentistry, in recent years with new advances in science and technology and as the awareness for patients increases, patients prefer implant over conventional fixed dentures, as dental implant has more advantage compared to FPD and partial dentures. However, though it successful, it is not free of complications, since surrounding structures of implant lacks the dentogingival fibres that run horizontally and circular, which act as a defence mechanism by preventing the spread of bacteria from plaque to the underlying structures

Peri-implantitis is a pathological condition linked to dental implants, marked by inflammation of peri-implant tissues and increasing osseous resorption. etiological factors - bacterial plaque, occlusal overload, improper surgical placement, trauma, faulty prosthetic design and host response, poor bone quality or insufficient volume of bone.

Risk factors for peri-implantitis include improper post implant care, smoking, poor treatment compliance, a history of periodontitis, systemic diseases affecting healing, iatrogenic risk factors such as cement left behind after crown cementation, keratinised gingiva deficiency, and a prior implant failure history.[1]

A 6-year retrospective analysis conducted by Nicolas Thiebot et al revealed that 4 senior practitioners put 376 implants in 202 patients between February 2014 and February 2019. The study found that 11 implants failed in total, with 5 male and 6 female ranging in age from 42 to 78 years (the mean age: 55.5±11.5). The study showed majority of failures occurred in short implant lengths of less than 8mm, and in maxilla compared to mandible, and in the posterior rather than anterior region, with bone quality type III/IV in the maxilla. 6 out of 12 implants failures were seen in pre-implant rehabilitated sites.[2]

A number of reasons can be considered in this case report for the early implant failures i.e plaque, infection, insufficient bone volume and quality, in type III/IV bone, under-drilling should be considered, over drilling offers little resistance to implant, which may lead to implant failure, according to Cohen et al., using low torque while over drilling circumstances enhanced the bone/implant contact area in the short term.[3]

Several case report and series have shown successful management of peri-implantitis using conventional treatment approaches including mechanical debridement, antimicrobial therapy – local and systemic and surgical interventions to manage infection and restore bone. This case report deals with management of a vertical bone defect in an implant site with i-PRF (Injectable Platelet-Rich Fibrin) and alloplast graft material.

i-PRF is a third-generation platelet-enriched liquid "blood concentrate" when compared to PRF, i-PRF provides larger concentration and longer growth factor release and also provides improved graft stability and mouldability by forming a polymerized fibrin matrix with a graft (sticky bone).[4] the aim of this case report is to demonstrate the efficacy of i-PRF with alloplastic graft in management of peri-implantits.

CASE REPORT:

A 29-year-old male patient presented just after one month of placing the implant in maxillary anterior region 22 with complaints of pus and bleeding around a dental implant. Patient is Non-smoker, systemically healthy, no history of allergies, other periodontal findings were normal. Extra oral examination shows no signs of swelling or no gross asymmetry, Intraoral clinical examination shows sinus opening with pus discharge, presence of peri-implant pocket (7 mm), and bleeding on probing, with no signs of implant mobility and radiographic examination shows vertical bone loss around the implant (Figure 1).

A two-stage treatment was planned, first stage involved non-surgical approach, second stage involved surgical intervention aimed at decontaminating the implant surface and regenerating lost bone using i-PRF and an alloplast graft. Non-surgical treatment involved a through subgingival curettage using plastic curette followed by chlorhexidine irrigation and subgingival doxycycline, the patient was prescribed Moxikind cv 625mg BD for 5 days and analgesic Hifenac -p BD for 3 days. Re-evaluation was done after a period of 6 weeks, the site showed closed sinus with no discharge but 7mm pocket persisted. Therefore, it was decided to go for regenerative approach to treat the particular defect. After induction of local anaesthesia, buccal and lingual sulcular incisions were made, a full thickness mucoperiosteal flap wad raised, a Through degranulation was done with plastic curettes (Figure 2), The implant surface was decontaminated using saline irrigation and CHX irrigation.

Alloplast graft mixed with i-PRF (sticky bone) was packed into the defect (Figure 3), i-PRF was prepared by drawing the patient's blood and centrifuging it at low-speed settings. The i-PRF rich in growth factors, was mixed with alloplast graft, placed into the peri-implant defect to stimulate soft tissue and bone healing.

A synthetic alloplast material (β-tricalcium phosphate) was placed into the bony defect to provide an osteoconductive scaffold for bone regeneration. The graft was mixed with the i-PRF to enhance its regenerative potential, membrane is secured to prevent soft tissue growth into the defect, the flaps were repositioned and secured with 4-0 vicryl suture (Figure 4), surgical area is covered with periodontal dressing (Figure 5), post operative instructions were given, A similar post-op protocol was given. The sutures were removed after two weeks. The healing were uneventful, Surgical wounds were irrigated thoroughly with 0.2% of chlorhexidine digluconate, and patients

were instructed to brush gently using soft toothbrush. Healing was reviewed in subsequent visits at 1 (Figure 6) 3 and 6 months. Periodontal indices were documented and intraoral periapical radiographs were taken at the 1,3,6 months (Figure 7a,7b,7c). Satisfactory results were obtained by the application of i-PRF in surgical peri-implant therapy. Periodontal pocket depth was reduced from 7 to 3 mm with no bleeding upon probing. Intraoral periapical radiographs, taken up to 1 year during 3 months of interval post–nonsurgical treatment, provide evidence of some improvement of the bone level. The reduction of periodontal pockets is probably due to re-epithelialization, with formation of a long junctional epithelial attachment.

DISCUSSION:

Numerous factors can lead to failure, including biological failures (related to the biological process), Mechanical failures (connecting screws, implant fracture, bridge frameworks, coatings, etc.), Iatrogenic failures (incorrect implant alignment, nerve damages etc.), and Inadequate or insufficient patient adaptation (psychological, aesthetical, and phonetical issues).[5]

Implant failures happening within 3 months are due to unsuccessful osseointegration and failure happening late after 3 months are due to loss of osseointegration. However, it is believed that most common causes of implant failure at an early stage include harsh surgical stress, operator experience, bacterial contamination, premature overloading with micromotion, and different local and systemic characteristics of the host.[6]

i-PRF enhanced cellular motility and mRNA expression of TGF-β, PDGF, and COL1a2. In contrast to PRP, i-PRF forms a little clot over time, perhaps because fibrin components functioning as a dynamic gel encapsulating the cell. Therefore, it is hypothesised whereas PRP had entirely dissolved after ten days, i-PRF could still be able to create growth factors.

Combining i-PRF with alloplasts creates a synergistic effect by integrating the biological advantages of i-PRF with the structural support of alloplast. The fibrin network of i-PRF entraps and stabilizes the graft material, preventing displacement while providing a conducive environment for cellular attachment and proliferation. This combination enhances angiogenesis, promotes the recruitment of progenitor cells, and accelerates bone formation.

Different bone graft materials (autogenous, allogenic, or xenogenic) possess inherent drawbacks, including unpredictable resorption, necessity for extra surgical sites, increased time, and cost of therapy.[7] To mitigate these drawbacks, synthetically manufactured bone substitute materials (i.e., alloplasts) were utilized to remove risk of disease transmission and procurement-related morbidity.

Beta tricalcium phosphate as well as hydroxyapatite and are most often utilised synthetic ceramic grafting materials. Among several bone replacements available, beta TCP is completely resorbed and substituted by natural local bone within an appropriate timeframe. Additionally, utilizing beta-TCP in humans has shown to enhance bone fill, raise clinical attachment levels (CALs) and decrease pocket depth.[8,9]

i-prf with alloplast combined with GTR membrane has shown a positive result to regenerate bone around implant. In this case, the synergistic effect of i-PRF and the alloplast graft contributed to

successful clinical and radiographic outcomes, offering a promising approach to managing peri-implantitis.

Conclusion:

The use of i-PRF and an alloplast graft in the management of peri-implantitis offers a minimally invasive, biologically driven method for tissue regeneration. This combination therapy resulted in successful resolution of inflammation, reduction of peri-implant pockets, and regeneration of bone in this case. Further studies are recommended to establish standardized protocols for the use of i-PRF and alloplasts in peri-implantitis treatment.

Data Availability Statement: Data will be available from the corresponding author upon reasonable request.

Conflict of interests: nil

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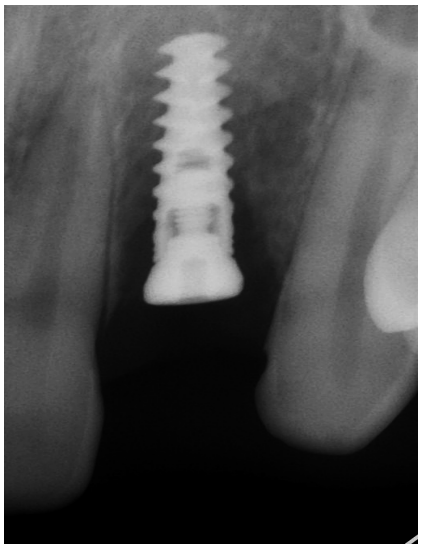

Figure 1: IOPAR showing vertical bony defect after one month of implant placement

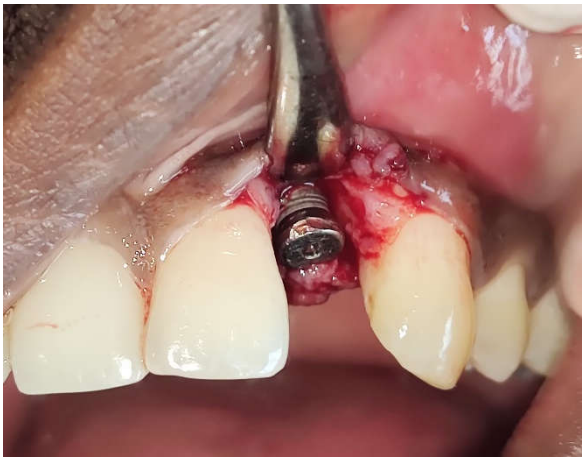

Figure 2: Defect after debridement

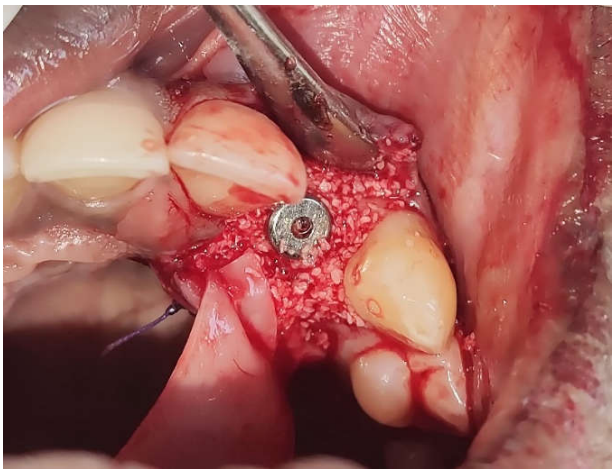

Figure 3: Graft mixed with i-PRF placed in the defect

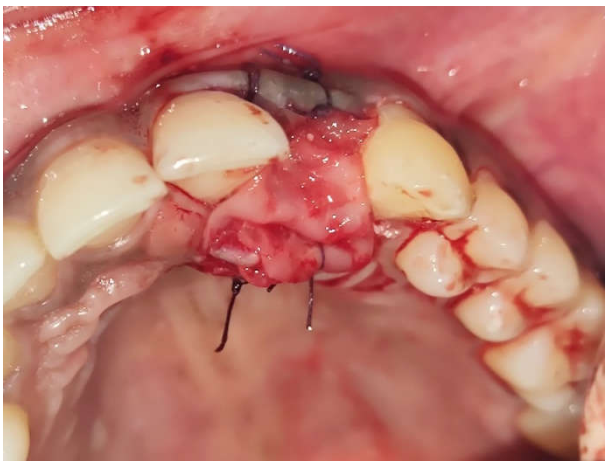

Figure 4: Primary wound closure achieved using resorbable 4-0 vicryl sutures

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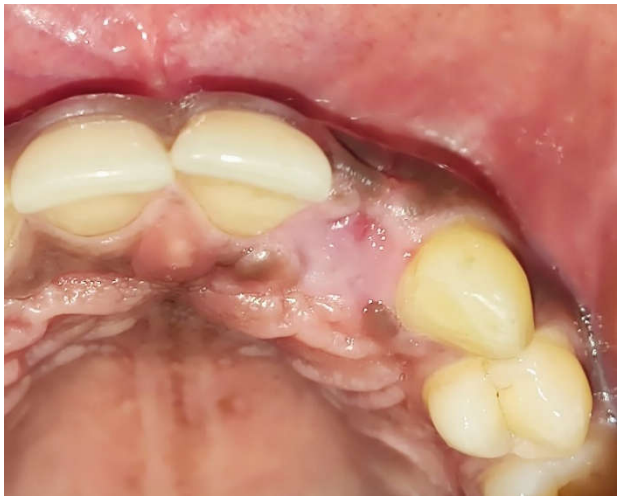

Figure 5: Surgical area covered with periodontal dressing

Figure 6: Post-op healing after one month

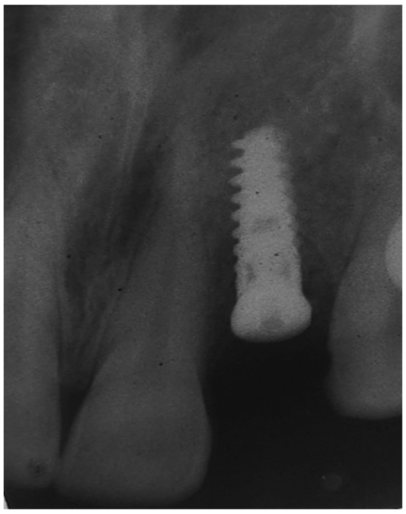

Figure 7a: Immediate post-operative IOPAR after graft placement

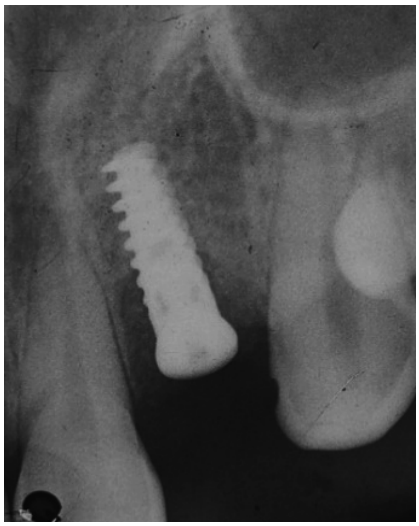

Figure 7b: 3 months post-operative IOPAR

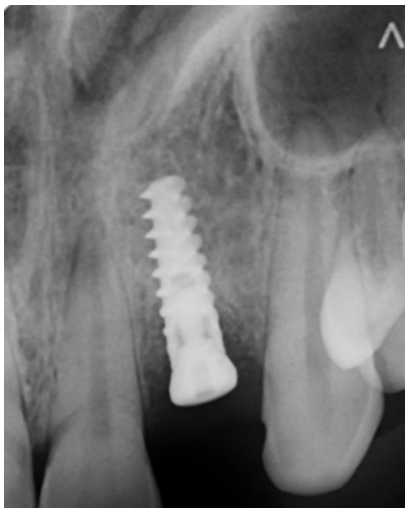

Figure 7c: 6 months post-operative IOPAR showing resolution of defect and bone regeneration