Platelet Rich Fibrin: An Adjuvant Therapy for Dental Implant

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Abstract

Placement of dental implants has evolved to a great extent. In the recent decade a number of adjuvants have become associated with it to enhance the success, esthetics and function of the implants. Amongst one is Platelet Rich Fibrin (PRF) obtained after fractionation of blood. PRF, a novel concept of Choukron has gained an immense popularity as an autogenous graft. Being easily available, most biocompatible and a very cost efficient product, it is highly preferred during implant placement.

Key Words: Dental implant, Osseointegration, Platelet Rich Fibrin, Platelet Rich Plasma.

Introduction

With the increase in the life expectancy there is a great rise in the demands from dentistry. One of them is to replace the missing teeth. These can be replaced by either giving fixed or removable options. The last development in this regard was the innovation of dental implants in the 20th century. Dental implants have improved a lot with the passage of time.

During the implant placement, osseo-integration occurs at the implant and bone interface. The peri-implant structures play the pivotal role in implant success. Implants have peri-implant soft tissue complex consisting of epithelium and connective tissue which covers the crestal bone. Berglund and Lindhe suggested that 3 mm of periimplant mucosa is required for maintaining the periimplant marginal seal. Also there are many adjuvant applications which have become associated with the dental implants. Amongst one is the PRFdescribed by Choukron of France in 2001. Platelet rich fibrin is an autologous source of growth factors obtained after the fractionation of blood.[1-3] It is easy to obtain, free of many adverse reactions like allergic response, graft rejection etc.It is obtained by centrifugating the blood at 2700rpm for 15 mins. Fibrin promotes angiogenesis by trapping the stem cells and giving protection from epithelial layer. PRF accelerates the proliferation of fibroblasts. It is a good source of growth factors.[4,5] In this case report it has been pointed towards the importance of healthy tissue around the implants for success and how biomimetic materials like PRF membrane can beincorporated in treatment plan as anadjuvant therapy.

Case Presentation

A 46year old female patient reported with the chief complaint of difficulty in chewing. Patient had a history of loss of tooth at the lower right back tooth region due to gradual decaying for 10 years. Patient was planned for fixed restoration using single endosseous two stage implant placement. A detailed medical and dental history was assessed along with pre-operative photographs and radiographs. Edentulous mandibular posterior region selected for dental implant placement was evaluated clinically for width and height. All vital signs were checked and a complete haemogram was done to evaluate the fitness of the patient for implant placement. A complete oral prophylaxisalong with the prescription to use 0.2% chlorhexidinegluconatemouthwash, twice daily for a period of 7 days, before implant placement and instructions for maintenance of oral hygiene were given to the patient.

Figure 1: Preoperative lateral view

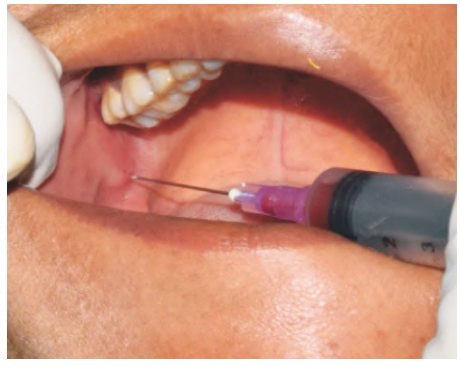
Figure 2: Preoperative frontal view

Figure 3: Preoperative intraoral view

Figure 4: Preoperative occlusal view

Properly sterilized surgical instruments were arranged on a surgical trolley. Subject was seated in the dental chair and prepared following the standard guidelines for asepsis. Inferior alveolar, lingual nerve block and buccal nerve blocks with 2% lidocaine (epinephrine 1:80000) were administered.

Figure 5: Local anesthesia administered



After confirming the effectiveness of local anesthesia, mid-crestal incision was given using surgical blade no. 11. The incision was extended to the mesial and distal teeth giving crevicular incision.

Figure 6: Crestal incision

Buccal and lingual full mucoperiosteal flaps were reflected with the help of mucoperiosteal elevator. Buccolingual dimensions of the alveolar ridge were assessed. Drilling was initiated with pilot drill using surgical guide. Drilling was done at a speed of 800 to 1200 rpm with continuous saline irrigation. Osteotomy preparation was completed by sequential drilling; till the final length of the implant. Paralleling tool was used to check parallelism with the adjacent teeth.

Figure 7: Parallelism checked with parallel tool

After determining the final length of osteotomy, the width of the osteotomy was increased with sequential drills till one number less than final diameter of the implant. A sterile manual implant connector was used to hold the selected dental implant. Dental implant connector assembly with the help of a torque wrench, implant was positioned in the osteotomy site flushing it with the margin of the crest.

Figure 8: Dental Implant placement in situ

Blood sample was collected from ante cubital vein without any anticoagulant in 10 ml tube, which was immediately centrifuged at 3000 rpm for 10-12 min. Blood centrifugation immediately after collection resulted in fibrin clot in the middle of the tube, just between the red corpuscles at the bottom and acellular plasma at the top. The fibrin clot thus obtained was separated from the RBC fraction and gently pressed between two layers of sterile gauze to form a membrane.The immediately prepared PRF membrane was placed at labial side of surgical site. The surgical site was properly cleaned and irrigated with 0.9% saline solution. 3-0 black braided silk was used for interrupted suture. Sutures were made water tight and knot was tied away from the incision line.

Figure 9: PRF obtained after centrifugation

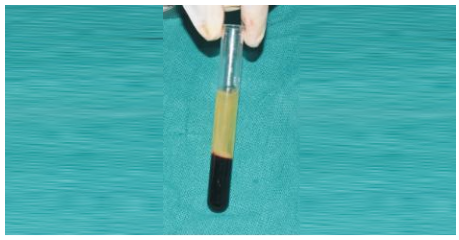


Figure 10: PRF membrane

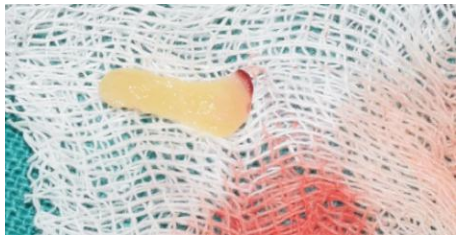


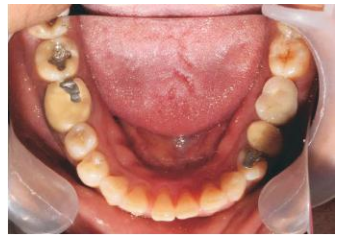
Figure 11: PRF membrane placement at the surgical site

Figure 12: Interrupted suture with 3-0 braided silk

Post-operative instructions were given to the subject regarding diet, oral hygiene and medications were prescribed as per requirement. Patient was recalled after 24 hours for review, after 7 days for suture removal and soft tissue evaluation. Prosthesis was delivered at the two weeks and regular follow up was scheduled. Soft tissue profile was well contoured around the implant supported prosthesis.

Figure 13: Post-operative intraoral view after crown cementation.

Figure 14: Post-operative occlusal view (mirror image) after crown cementation



Discussion

With the introduction of endosseous implants in the field of dentistry, restoring esthetics and function have been greatly revolutionised. Dental implants also prove to provide completely and partially edentulous patients, the function and esthetics they had with natural dentition that renders patients to regain normal masticatory function, smile, speech, esthetics, deglutition. A successful result must also include an esthetic and functional restoration surrounded by stable peri-implant tissue levels that are in harmony with the existing dentition. Maintenance of interdental soft tissue and the need for esthetics are being increasingly recognized as important criteria for implant success.Platelet rich fibrin is a simple, natural and inexpensive entity for the production of leukocyte and growth factors. As a strong solid fibrin membrane, it is particularly easy to use in implant dentistry. Additionally, it offers a protective effect both mechanical and biological to the grafted area. PRF is a good source of growth factors like transforming growth factor B1 (TGFB1), platelet derived growth factor AB (PDF-AB), vascular endothelial growth factor (VEGF) and matrix glycoproteins such as thrombospondin-1, insulin-like growth factor (IGF) and platelet-derived angiogenic factor. PRF has been found to show an increase in the levels of mRNA levels of PDGF, TGF-β, collagen1 and fibronectin.[5-7] It is a result of slow polymerization and can release growth factors sustainably over a considerable period of time. These growth factors are basically present in platelet alpha granules.

Since PRF causes sustained release of growth factors which promotes healing. The properties of PRF were explained by Gassling V et al. who proposed that metabolic activity and proliferation of human osteoblastic cells in vitro were supported to a significant higher extent by eluates from PRF membranes.[8] Proliferation was significantly higher on PRF membranes and PRF clotas pointed in the study conducted by Boora P.[9] PRF plays the role of an excellent healing biomaterial with potential beneficial effect on peri-implant soft and hard tissue and can be used as a therapeutic adjuvant.

Conclusion

The use of PRF in implant applications is in its initial stages. It promises to be an easy, inexpensive and biocompatible graft material. Also it eliminates the need for donor site morbidity and its associated complications. The fabrication of PRF may be encouragedas an adjuvant to osseointegration of dental implants in routine clinical practices.

References

References are availabile on request at editor@healtalkht.com