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Clinical Effectiveness of Platelet – Rich Plasma Therapy - Study on Various Clinical Applications

Dr.Maumita Bhattacharya[1], Dr.Jayanta Chattopadhyay[2], Dr.Rakshith Shetty[3], Dr.Subhalakshmi Sen[4], Dr.Surajit Bose[5], Aditi Bahal[6]

[1,4,5] *Reader, Department of Oral and Maxillofacial Pathology and Microbiology, Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal*

[2] *Professor and Head, Department of Oral and Maxillofacial Pathology and Microbiology, Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal*

[3] *Professor, Department of Oral and Maxillofacial Pathology and Microbiology, Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal*

[6] *Final Year Undergraduate Student, Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal*

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ABSTRACT: The main goal of the modern surgery is to get a low invasiveness and a high rate of clinical healing by regeneration of bone and maturation of soft tissue. Platelets play a crucial role as they are reservoirs of various growth factors and cytokines which are the key factors for regeneration. Platelet-Rich Plasma is a new application of tissue engineering and a developing area for clinicians and researchers because of the ease of application including reduction of bleeding and rapid healing, hold promise for further procedures and its beneficial outcomes accelerating the soft and hard tissue healing. The purpose of this study is to see and evaluate the clinical outcomes of effectiveness in treating various defects and their healing including reduction of bleeding and rapid healing, hold promise for further procedures.

I. INTRODUCTION:

Platelet rich plasma therapy is now addressed as one of the major breakthroughs of the 21st century in the field of oral and maxillofacial pathology and surgery. The therapy had advocated and the use of platelets (thrombocytes) to be an integral part of the major surgeries ranging from simple soft tissue transplants to bone grafting.[1] Platelets, as we all know, is that derivative of blood which has a job of coagulation by forming a mesh network with fibrin by utilizing many different growth factors passing through a complex hierarchy of coagulation cascade, thus not only helping in ceasing the blood flow through a but also covering the defect.[2] This type of healing is achieved through many growth factors such as platelet derived growth factor (PDGF), transforming growth factor – beta (TGF-beta), vascular endothelial growth factor (VEGF), platelet derived angiogenesis factor (PDAF), epidermal growth factor (EGF), platelet derived endothelial growth factor (PDEGF), epithelial cell growth factor (ECGF), insulin like growth factor (IGF), interleukin-1 (IL-1), platelet factor-4 (pf4) and fibroblast growth factor (FGF).[3,4] The fact that platelet rich plasma therapy is majorly employed in bone grafting and bone regenerative procedures is based on the utility of osteocalcin (Oc), osteonectin (On), fibrinogen (Fg), vitronectin (Vn), fibronectin (Fn), thrombospontin-1 (TSP-1) in the same mechanism.[5]

The main goal of dental treatment is the maintenance of the natural dentition in health and for optimum comfort function, and esthetics. After any surgery, healing usually occurs by repair or regeneration.[6] Regeneration has been defined as the reproduction or reconstitution of a lost or injured part to restore the architecture and function of the periodontium. It is possible to achieve bone regeneration by using autografts and biomaterials.[7,8] Both have presented high rates of success. Regenerative surgery including the use of barrier membrane, graft material, can support the formation of tissue and allow regenerative rehabilitation and also functional reconstruction.[9]

The regenerative process of human body is enhanced by utilizing the patient's own blood. After any operative surgery, the blood clots initiate healing and regeneration of hard and soft tissues.[10] Here, platelet rich fibrin (PRF) comes up as a unique biological revolution in dental field. Using PRF, is a way to accelerate and enhance the body's natural wound-healing mechanisms. PRF represents a similarity to the natural healing process adopted by a thrombocyte for repair of a tissue, with the application of multiple growth

factors.[11] Growth factors are those biologically active substances that are involved in tissue-repair mechanism such as chemotaxis, cell proliferation, angiogenesis extracellular matrix deposition, and remodeling. PRF contains and releases at least seven different growth factors (cytokines) that stimulate bone and soft tissue healing.[12] An easy, cost-effective way to obtain high concentrations of growth factors for tissue healing and regeneration is autologous platelet storage via PRF.[13]

HISTORY:

PRP has been investigated since the early 1990s and is not new; use of autologous PRP was first used in 1987 by Ferrari et al. Today, several advancements in this innovative area of therapy are growing rapidly and gaining attraction.[14,15]

Platelet-rich fibrin (PRF) described by Choukroun et al. is a second-generation platelet concentrate which contains platelets and growth factors in the form of fibrin membranes pre- pared from the patient's own blood free of any anticoagulant or other artificial biochemical modifications.[16] The PRF clot forms a strong natural fibrin matrix, which concentrates almost all the platelets and growth factors of the blood harvest and shows a complex architecture as a healing matrix with unique mechanical properties which makes it distinct from other platelet concentrates. PRF enhances wound healing and regeneration and several studies show rapid and accelerated wound healing with the use of PRF than without it.[17,18] PRF is superior to other platelet concentrates like PRP due to its ease and inexpensive method of preparation and also it does not need any addition of exogenous compounds like bovine thrombin and calcium chloride. It is advantageous than autogenous graft also because an autograft requires a second surgical site and procedure.[19] Thus, PRF has emerged as one of the promising regenerative materials in the field of periodontics.

PRP & PRF IN DENTISTRY:

Platelet rich plasma therapy has paved a wonderful path in every field of medicine ranging from dermatological procedures to musculoskeletal deformities, from a simple hair loss to condition such as diabetic ulcer and assisted reproduction.[20]

Platelet rich plasma (PRP) is a new approach to tissue regeneration: it is widely used in various surgical fields, including head and neck surgery, otolaryngology, cardiovascular surgery, and maxillofacial surgery. PRF has been successfully used with different graft materials, with and without guided tissue regeneration, in the treatment of human periodontal infrabony defects.[21] Bioactive glass promotes bone formation by ionic dissolution of ceramic material such that a silica gel layer forms over the particles in contact with body fluids. Over the silica gel layer, a calcium phosphate layer forms which is quickly converted into hydroxycarbonate apatite layer. This apatite layer is identical with bone mineral and has provided surface for osteoblast cell attachment and bone dissolution.[22] Platelet rich plasma also behaves like TGF-ß to alter cell proliferation in a specific manner which been shown to inhibit the epithelial cells while stimulating osteoblast and periodontal ligament cells. Fibrinogen converted to fibrin in combination with growth factors present in PRP thereby promoting wound healing at the site of injury.[23,24] In addition to this, PRF due to its high fibrin content also works as a hemostatic and stabilizing agent for the stability of the bone graft and blood clot. It has also been shown that periodontal infrabony defects in combination with PRF and tricalcium phosphate ß (B-TCP) graft material has got significant clinical improvement.[25] Kim et al. had observed rapid bone formation, remodeling, and calcification in rabbits in the second week in combination with PRF and B-TCP than the ß-TCP alone. Presently it has been observed that at 3, 6, 9 and 12 months follow-up after the surgical treatment of large chronic periapical lesion, PRF combined with ß-TCP resulted in outstanding clinical and radiographic bone regeneration.[26] Besides promoting wound healing, bone growth and maturation, PRF with bone graft have the advantages of graft stabilization, wound sealing, hemostasis and improved handling properties.However, like other case reports, this study also has limitations like short follow-up period of 12 months and a need for histological evaluation to confirm regeneration.[27]

Another case report by Jathal et al (JISP 2008) used Fibrin glue in periodontal surgery. The results had shown easier & quicker usage than sutures, it had provided better hemostasis and enhanced wound healing.[28] Another study by Manimegalai (JISP 2010) had done a comparison on the efficacy of a commercially available fibrin adhesive & silk suture on wound closure following periodontal surgical procedures and observed that fibrin sealants showed superior results in all parameters such as hemostasis and fixation of tissues.

PRF preparation:

PRP can be obtained in various ways. The primary protocol developed by Choukroun et al. had been used as a guide for PRF preparation.

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Systems for preparation:

1. One touch automated PRP system (Example includes: Harvest SmartPREP) It provides comprehensibility in any procedure and may provide a good platelet count before plasma resuspension.[29] This system involves 50ml blood for procurement and do not sense the Plasma/ Blood Interface and hence may seldom yield low platelet count.
2. Plasmapheresis: Another system of PRP preparation which requires approximately 450ml of blood from which 20-60cc of PRP is obtained. This method of cell separation is used only when large quantities of PRP are obtained and needed for any procedure. The processed blood can be auto-transfused to the patient. The use of platelet concentrates obtained from blood banks by the non-continuous plasmapheresis method is limited because of high cardiovascular stress to the recipient, known health risks and high production costs.[30] These result in many adverse effects of the patient thereby making it contraindicated in some cases.
3. Manual PRP systems: End User can manually recover the maximum amount of platelets up to counts of 4 to 10 times the patient's baseline value using this system. Since there is no needed resuspension of platelets, the final product has a high concentration of platelets. Some examples include: Curasan (Pharma Gmbh AG, Germany), Medtronic Sequestra, 3I PCCS (3i Implant Innovations, Florida), Haemonetics Cell Saver. It is actually the best way to produce a true platelet rich plasma product.[31,32,33]
4. There is also simple chairside technique for PRP procurement. It is the method of procuring PRP with the help of a general purpose tabletop laboratory centrifuge by the following method. It is simple and cost-effective method for producing PRP in an in-office environment. Patients are selected based on the absence of any blood abnormalities or use of anti-coagulants. This is the method which was adopted in the following case report:

Just before surgical procedure, intravenous blood was collected in 10ml sterile test tubes without anticoagulant. It was then immediately centrifuged at 3,000 revolutions for 10 minutes. This immediate centrifugation after collection leads to the formation of a structured fibrin clot in the middle of the tube, RBCs at the bottom and platelet-poor plasma (PPP) at the top. Platelet rich fibrin was easily separated from RBC base preserving a small red blood cell layer using a sterile tweezer and scissor after removal of PPP and then transferred onto a sterile container.

CASE REPORT:

CASE 1:

A 32 year old female patient reported to the Department of Oral and Maxillofacial Pathology and Microbiology of Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal, India had a chief complaint of pain and food lodgment in the lower left back tooth region since 1 year. Patient had not reported any relevant medical history and was not suffering from any significant systemic condition that could interfere with wound healing process. No significant previous dental procedure history or any trauma to the concerned area was reported. Patient also had no oral deleterious habit history. No significant family history was reported. The patient brushes twice daily with a hard bristled toothbrush in a horizontal motion using a non-fluoridated toothpaste. Clinically on intraoral examination it was found that there was generalized bleeding on probing elicited and no swelling and pus exudation was noticed. The probing pocket depth on the distobuccal aspect of #36 was 6mm and periodontal attachment level was 4.5mm. There was no mobility detected in relation the addressed tooth and no fremitus was established thus excluding the possibility of any trauma to the tooth.

An intraoral periapical radiograph (IOPAR) was taken which revealed the presence of interproximal bony defect in relation to the tooth #36.

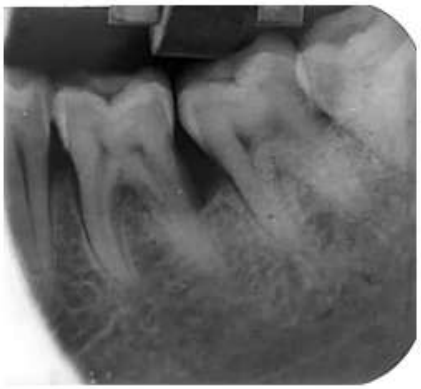

FIGURE 1: Intraoral periapical radiograph revealing the presence of interproximal bony

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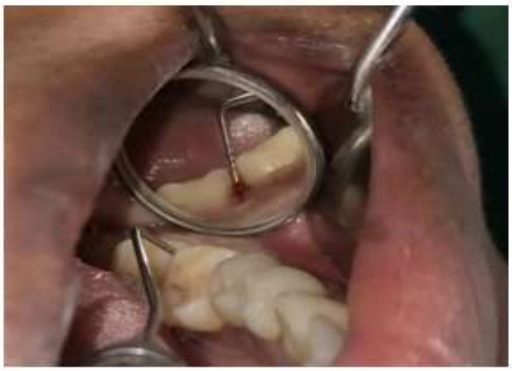

FIGURE 2: Deep periodontal pocket on the distobuccal aspect of the mandibular left 1st molar

Treatment plan: Depending on the obtained clinical examination and radiographical findings, the treatment plan was followed according to the following stages:

1. **Phase 1 therapy:** Proper oral hygiene instructions were demonstrated to the patient with correct brushing techniques. Chlorhexidine 0.2% mouthwash was prescribed to the patient. Non surgical periodontal therapy of conventional scaling and root planing after a period of 2 weeks was done. The patient was recalled after every 1 week and re-examined after the completion of healing after 6 weeks following non-surgical periodontal therapy. The probing pocket depth and periodontal attachment level were measured every week for six weeks after the non surgical periodontal therapy and they were still found to be 6mm and 4.5mm respectively.
2. **Phase II therapy:** Surgical periodontal therapy was done 2 weeks after the re-examination of the patient after completion of healing following non-surgical periodontal therapy.

METHOD:
Prior to planning for the periodontal surgical procedure, patient's RBC count (4.0 million/mm3), WBC count (6300 thousand/mm3), platelet count (1,77,000 lac/cu mm), Haemoglobin (11.6 mg/dl), Bleeding time (2 min 00 sec) and Clotting time (4 min 45 sec) were assessed and found to be within normal limits to ensure no systemic contraindications of would healing procedure employed in PRP therapy.

PRF preparation: Just before surgical procedure, intravenous blood was collected in 10ml sterile test tubes without anticoagulant. It was then immediately centrifuged at 3,000 revolutions for 10 minutes. This immediate centrifugation after collection leads to the formation of a structured fibrin clot in the middle of the tube, RBCs at the bottom and platelet-poor plasma (PPP) at the top. Platelet rich fibrin was easily separated from RBC base preserving a small red blood cell layer using a sterile tweezer and scissor after removal of PPP and then transferred onto a sterile container.

FIGURE 3: Patient's blood collection intravenously from antecubital vein

FIGURE 4: 10ml blood collected

FIGURE 5: Collected blood is centrifuged in a centrifugation machine at 3000rpm for 10 minutes

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FIGURE 6: After centrifugation, RBCs settle at the bottom with platelet poor plasma at the top

Surgical procedure:

Prior to any surgical procedure, intraoral antisepsis was performed with 0.2% chlorhexidine digluconate rinse. Extra oral antisepsis was done using iodine solution. Following administration of local anaesthesia, buccal and lingual sulcular incisions were made and mucoperiosteal flaps were reflected (figure 8) and care was taken to preserve as much inter-proximal soft tissue as possible.

Meticulous defect debridement and root planing were carried out using ultrasonic instrument and area specific curettes. No osseous recontouring was carried out and PRF of the required size was filled into the interproximal bony defect was used to cover the defect. The mucoperiosteal flaps were repositioned and secured in place using 3-0 non-absorbable black silk surgical suture with simple interrupted sutures. The surgical area was protected and covered with periodontal dressing.

Post operatively, suitable antibiotics and analgesics (amoxicillin 500 mg four times per day for 5 days and ibuprofen 800 mg three times per day) were prescribed, including chlorhexidine digluconate rinses (0.2%) twice daily for 2 weeks. Periodontal dressing and sutures were removed 2 weeks later and surgical wounds were gently cleansed with 0.2% of chlorhexidine digluconate and patient was instructed for gentle brushing with a soft toothbrush. Patient was reinstructed for maintenance of proper oral hygiene measures postoperatively and examined weekly up to 1 month after surgery and then 3 and 6 months. No subgingival instrumentation was attempted at any of these appointments. Re-examination at 6 months after the periodontal surgery revealed a reduction in probing pocket depth (from 6 mm to 5 mm) and periodontal attachment level (from 4.5mm to 3 mm) with no sign of bleeding on probing and significant radiographic bone formation in the interproximal periodontal bony defect.

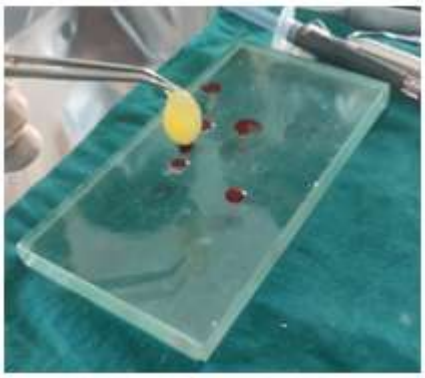

FIGURE 7: Platelet rich fibrin was easily separated from RBC base preserving a small red blood cell layer using a sterile tweezer and scissor after removal of PPP.

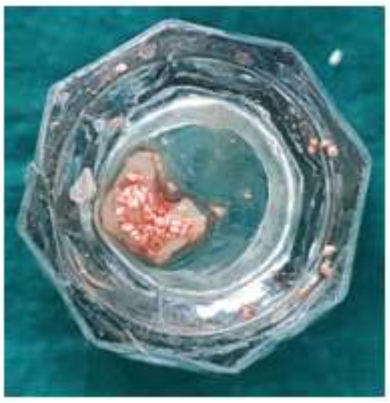

FIGURE 8: Platelet rich fibrin

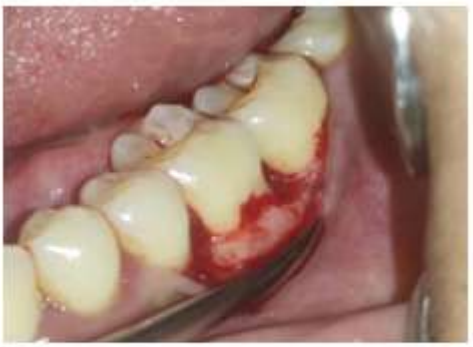

FIGURE 9: The mucoperiosteal flap was raised reflecting the interproximal bony defect.

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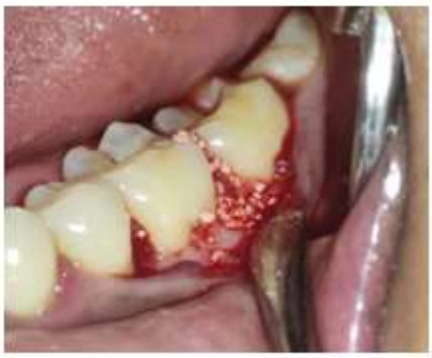

FIGURE 10: Platelet rich fibrin is filled into the defect.

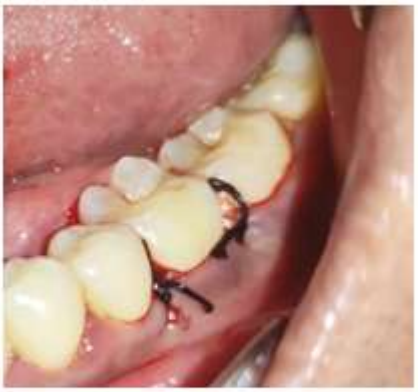

FIGURE 11: The mucoperiosteal flaps were repositioned and secured in place using 3-0 non-absorbable black silk surgical suture with simple interrupted sutures.

CASE 2:

A 48 year old male patient reported to the Department of Oral and Maxillofacial Pathology and Microbiology of Kusum Devi Sunderlal Dugar Jain Dental College and Hospital, Kolkata, West Bengal, India had a chief complaint of missing teeth in the right upper front tooth region since 2 years and wanted to get it replaced. The patient gives a history of an occlusal trauma which had let to tooth mobility and ultimately tooth extraction 2 years back. The patient was using a removable partial denture and was insistent on replacement with a fixed prosthesis. The patient had not reported any relevant medical history and was not suffering from any significant systemic condition that could interfere with wound healing process. Patient also had no oral deleterious habit history. No significant family history such as any bleeding dyscrasias were reported. The patient brushes twice daily with a medium bristled toothbrush in a horizontal motion using a fluoridated toothpaste.

Clinically on intraoral examination, Siebert's classification class III in relation to #13 with a clinical attachment level (CAL) i.e., distance from the CEJ to the base of the sulcus is 5mm. The mucosa overlying the residual alveolar ridge was firm and resilient in consistency and there was an inadequate alveolar ridge width of 4mm and height 7mm.

Treatment plan: Depending on the obtained clinical examination findings, the treatment plan was to increase the bone height and width by guided bone regeneration, followed by an endo-osseous implant placement as a staged preparatory phase approach including a full mouth scaling and polishing 1 week prior to the surgical procedure with an oral hygiene instruction.

METHOD:

Prior to planning for the periodontal surgical procedure, patient's RBC count (4.9 million/mm3), WBC count (7200 thousand/mm3), platelet count (1,68,000 lac/mm3), Haemoglobin (15.4 mg/dI), Bleeding time (1 min 45 sec) and Clotting time (4 min 30 sec) were assessed and found to be within normal limits to ensure no systemic contraindications of would healing procedure employed in PRP therapy.

PRF preparation: Just before surgical procedure, 10ml of intravenous blood was collected through a venipuncture in the antecubital vein and was then transferred to a sterile test tube containing 1ml of 10% trisodium citrate anticoagulant solution. It was then immediately centrifuged at 3,000 revolutions for 10 minutes.

This immediate centrifugation after collection leads to the formation of a structured fibrin clot in the middle of the tube, RBCs at the bottom and platelet-poor plasma (PPP) at the top. Platelet rich fibrin was easily separated from RBC base preserving a small red blood cell layer using a sterile tweezer and scissor after removal of PPP and then transferred onto a sterile container. Then the coagulation of platelet rich plasma was obtained by adding 1ml of batroxobin and 1ml of 10% calcium gluconate. Within a few seconds, a sticky gel like consistency was obtained to be mixed with a bone graft and applying it at the surgical site. A demineralized bone matrix material (osseograft) was mixed with PRP and kept ready.

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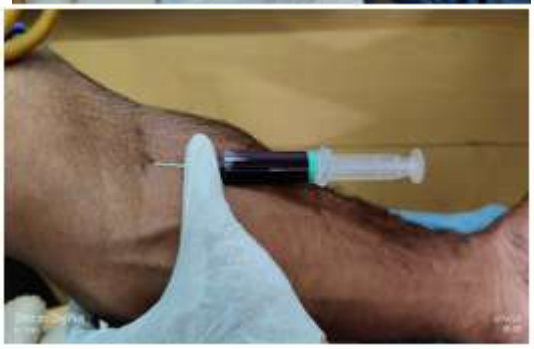

FIGURE 12 & 13: Patient's blood collection intravenously from

FIGURE 14: 10ml blood was collected

FIGURE 15: Test tubes kept in centrifugation machine

FIGURE 16: Collected blood is centrifuged in a centrifugation machine at 3000rpm for 10 minutes

FIGURE 17: After centrifugation, RBCs settle at the bottom with platelet poor plasma at the top

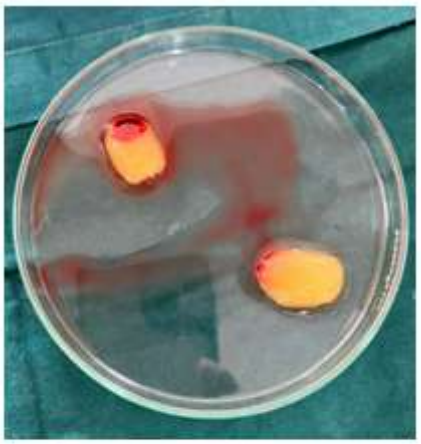

FIGURE 18: PRP is mixed with demineralised bone matrix material

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Surgical method:

Prior to any surgical procedure, intraoral antisepsis was performed with 0.2% chlorhexidine digluconate rinse. Extra oral antisepsis was done using iodine solution. Following administration of local anaesthesia, full thickness flap was raised by giving crestal incision palatally in the region of tooth #13 and continued by giving sulcular incision to the adjacent teeth for proper accessibility of the region. Following complete debridement and isolation, bony defect was found to be both of horizontal and vertical pattern falling Siebert's Class III of volumetric bone and soft tissue deficit within the alveolar process.

The DMBM – PRP mixture was then placed in the defect, taking care of not overfilling the grafted area. The resorbable guided tissue regeneration collagen membrane was stabilized by giving periosteal suturing, Finally, the flap was closed by simple interrupted sutures and periodontal dressing over the surgical site.

FIGURE 19 & 20: Placement of demineralized bone matrix - PRP mixture into the bony defect after raising the flap

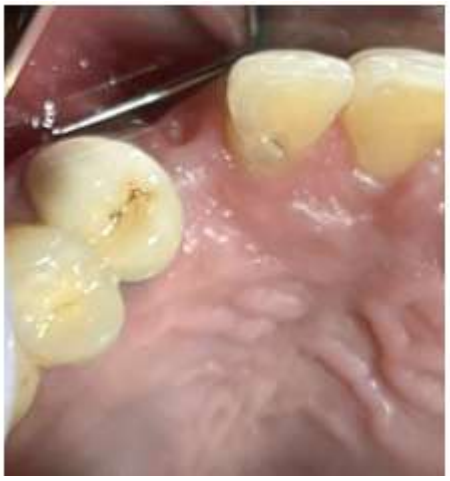

FIGURE 21: Significant improvement in the residual alveolar ridge both vertically and labio-palatally

Postoperative instructions were given and also advised Amoxicillin (500mg), three times daily for 5 days, Ibuprofen (400mg) thrice daily was prescribed for 3 days along 10ml of chlorhexidine (0.2%) mouthwash for 30 seconds twice daily for 14 days. The patient was recalled after 1 week for suture removal which revealed that healing was satisfactory with no postsurgical complications. He was recalled after 1 and 6 months for further evaluation and follow up which revealed appreciable improvement in ridge both vertically and labio-palatally. At the 6 month postoperatively follow up, clinical examination showed the treated ridge defect showed significant improvement of alveolar ridge in both aspects of height and width of about 2 mm and a gain in CAL to about 6.5mm to baseline values.

II. DISCUSSION:

Platelet rich fibrin (PRF) is a wonderful tissue engineering product and has gained much popularity due its promising results in wound healing bone induction. The features of this product are an attribute of platelets, which, after cellular bondings, release growth factors.[35,36] Platelet rich plasma is an autologous source of concentrated suspension of the growth factors found in platelets. Activated PRP releases growth factors, enhancing wound healing and wound strength.[37] Growth factors derived from platelets initiate connective tissue healing, bone regeneration and repair, promote development of new blood vessels, and stimulate the wound healing process.[38] Periodontal wound healing involves gingival fibroblasts, gingival epithelial cells, periodontal ligament fibroblasts and osteoblasts, all of which are important for tissue repair and hard-tissue

regeneration. A series of well-orchestrated cell to cell interactions is initiated after injury. Disruption of the vasculature as a result of injury leads to fibrin formation and platelet aggregation.[39,40] Several growth factors are then released into the tissue from the platelets and from the adjacent cells after injury. Platelet Derived Growth Factor (PDGF) is a very powerful regulatory growth factor and a sentinel growth factor that begins nearly all wound healing.[41] PDGF's main function is to stimulate cell replication (mitogenesis) of healing capable stems and pre-mitotic partially differentiated osteoprogenitor cells, which are part of the connective tissue-bone healing cellular make-up.[42] PDGF also causes replication of endothelial cells, causing budding of new capillaries (angiogenesis).

The first case report of this article evaluated the clinical efficacy of PRF in the treatment of IBD. Decrease in PPD, IBD and gain in PAL are the major clinical results measured to determine the success of any periodontal treatment. In the present case report, a significant reduction in PPD and PAL gain was found.[43,44] The report also showed the significant radiographic bone formation in the periodontal intrabony defect, supporting the role of various growth factors present in the PRF in accelerating the soft and hard tissue healing.[45] Also as it was a 3-wall IBD, it provided the best spatial relationship for defect bridging by vascular and cellular elements from the periodontal ligament and adjacent osseous wall.[46] Space maintenance is provided by the defect walls to minimize membrane collapse and/or provides protection and retention of the grafts. Osteoblasts cultured with PRF showed an initiation in the mineralization process by using light and scanning electron microscopy and PRF leukocytes showed proliferation and interaction with osteoblasts.[47] An in-vitro study showed that PRF is superior to PRP, considering the expression of alkaline phosphatase and induction of mineralization, caused markedly by release of TGF-ß1 and PDGF-AB. Additionally there are many advantages of using PRF over the PRP. Preparation of PRF is quite easy and fast and has simplified processing minus artificial biochemical modification than PRP, which takes more time.[48] The PRF preparation process creates agel like fibrin matrix polymerized in a tetramolecular structure that incorporates platelets, leukocyte, and cytokines, and circulating stem cells. PRF would be able to progressively release cytokines during fibrin matrix remodeling; such a mechanism might explain the clinically observed healing properties of PRF.[49,50] It is also found that PRF organized as a dense fibrin scaffold with a high number of leukocytes concentrated in one part of the clot, with a specific slow release of growth factors (such as transforming growth factor-1ß, PDGF-AB, and vascular endothelial growth factor) and glycoproteins (such as thrombospondin-l) during >7 days.[51]

The transforming Growth Factor (TGF) are responsible for regulating proliferation and differentiation of multiple cell types. TGF found in platelets is subdivided into TGFß1 and TGFß2, which are the more generic connective tissue growing factors involved with matrix formation influencing osteoblasts to lay down bone matrix through the process of osteogenesis.[52,53] Also, cells activated by TGFß1 and TGFß2 include fibroblasts, endothelial and osteoprogenitor cells, chondroprogenitor cells and mesenchymal stem cells. A chondro-progenitor cell will further differentiate and produce the matrix for cartilage, Y mesenchymal stem cell stimulated to mitosis provides wound-healing cells.[54] In vitro, TGF-B has been observed to promote extracellular matrix production in many cell types, such as periodontal ligament fibroblasts. TGF-ß1, used alone or in combination with PDGF-BB. stimulates the proliferative activity of periodontal ligament fibroblasts.[55] Insulin Growth Factor (IGF) is also important in wound healing, and stimulates both proliferation and differentiated function in osteoblasts. IGF has 2 forms, Il, and I each of which has 2 single chain peptides. IGF binds to the same receptors as insulin and is involved in the development of many tissues, including the teeth. In the area of periodontal regeneration, more research has been done on IGF-1.[56,57] This form of IGF is chemotactic for periodontal ligament cells, and it has strong effects on periodontal ligament fibroblasts and protein synthesis.[58] IGF-I stimulates bone formation by proliferation and differentiation, and it is synthesized and secreted by osteoblasts. Epidermal Growth Factor (EGF) is responsible for cell differentiation and stimulates re-epithelization, angiogenesis and collagenase activity.[59] Vascular Endothelial Growth Factors (VEGF) have potent angiogenic, mitogenic, and vascular permeability-enhancing activities specific for endothelial cells.

The second case report of this article emphasized on the most commonly seen localized alveolar ridge defects i.e., combined Class Ill defects (56% of cases) followed by horizontal Class I defects (40% of the cases). Vertical defects were reported to be found in 4% of the patients. Large vertical and horizontal bone defects pose a prosthodontic challenge as it is difficult to restore esthetics and function along with the complete

closure of the defect.[60,61] Such clinical conditions are not successfully treated by conventional fixed or removable prosthesis alone. Guided bone regeneration can be successfully used in either a simultaneous approach or a staged approach.[62] Platelet rich plasma, as used in this study, may affect the wound healing not only by a release of PGFs from platelets, but also because of other physical and chemical properties.[63] The PRP preparation, because of its high fibrin content, presents a "sticky" characteristic that works as a hemostatic and stabilizing agent and may aid blood clot and bone graft immobilization in the defect area.[64] In this case the combined use of DMBM and PRP making use of collagen membrane in GBR was much sufficient to fill the alveolar ridge defect in terms of both length and width with appropriate healing and regeneration thereby making the area suitable for an implant placement.[65]

Thus, the aim of periodontal therapy is to arrest and control the periodontal infection and ultimately regenerate lost periodontal structures. Newer approaches to periodontal therapy include regenerative procedures that aim to restore lost periodontal ligament, bone, cementum, and the connective tissue.[66] Complete regeneration of the periodontium after periodontal treatment modalities has been difficult to achieve because of differences in the healing abilities of different periodontal tissues.[67,68]

In recent times, the local application of biologic modifiers, such as growth factors, has been investigated for use in the promotion of periodontal regeneration and healing. These agents act by augmenting the wound healing process through anabolic bone formation, angiogenesis, cementogenesis, osteoblast differentiation, mitosis, chemotaxis, and other processes that improve the healing environment.[69,70] Biologic modifiers, including enamel matrix derivative (EMD), platelet- derived growth factor (PDGF), bone morphogenetic protein (BMP), platelet-rich plasma (PRP), PRF, fibroblast growth factor (FGF), and parathyroid hormone (PTH), have all shown promise in enhancing regeneration.[71] At present, one of the most widely used periodontal regenerative modalities is bone therapy. Unfortunately, the application of bone graft materials derived from the host or other living tissues may be limited by their inherent limitations. Finally, it is also important to weigh the cost/benefit ratio because many of these biologic adjuncts have additional costs associated with their use.[72] Consequently, over the past few decades, dental research and industry have increasingly focused on biologically inert, synthetic, and autologous materials too thereby making this therapy exceedingly easier.[73,74,77]

CONCLUSION:

The platelet rich fibrin and platelet rich plasma therapy belongs to the new generation of platelet concentrates with new possibilities for enhanced healing and functional recovery. Natural polymerization process of the PRF fibrin network allows physiologic architecture of the fibrin matrix, which further supports the PRF advantages in the healing procedure.[75] Due to its simple and rapid production and low costs, along with it representing completely autologous platelet concentrate, PRF has been successfully used in regenerative medicine. By using different methods, it is possible to get various PRF types, enabling the versatility in the applications of this platelet concentrate.[76,78,79] Although the growth factors, ideal ratios of the components and exact mechanisms, still are being investigated, more clinical research and long-term results is needed.

Most importantly, this autologous product eliminates concerns about the immunogenic reactions and disease transmission. PRP may become a routine therapeutic modality for all the periodontal disorders in future.[80,81] However, platelet and inflammatory effects and their significance of this biomaterial remain to be clarified, and further studies are required to better understand the additional benefits of this second-generation platelet concentrate. PRF with its beneficial outcomes and fantastic inputs will definitely revolutionize surgical dentistry in the near future.

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