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Immediate Placement of Dental Implants into Fresh Extraction Socket of Periapical Lesion with Bone Augmentation Using Growth Factors (PRGF) and Graft Bone (Bio-Oss)

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Keywords:

PRGF;
immediate
implantation;
periapical
lesion;
automatic
extraction;
Bio-Oss

Abstract.

Immediate implant placement and loading can be done in a compromised bone. Curettage, cleaning of the whole area up to good bone quality and primary stability are the main necessities for success. The effect of local application of scaffold-like preparation rich in growth factors (PRGF) on bone regeneration in artificial defects and the potential effect of humidifying titanium dental implants with liquid PRGF on their osseointegration were investigated. The PRGF formulations were obtained from venous blood of three goats and applied either as a 3D fibrin scaffold (scaffold-like PRGF) in the regeneration of artificial defects or as liquid PRGF via humidifying the implants before their insertion. PRGF can accelerate bone regeneration in artificial defects and improve the osseointegration of titanium dental implants. The stability and healing around implants immediately placed into extraction sockets and augmented with different bone graft materials were evaluated. Comparative analysis of implants subjected to immediate functional loading and immediate nonfunctional loading compared to a conventional loading protocol was made.



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Problem statement and analysis of the recent research

Traditional implant protocols advocated leaving extraction sites for 12 months to allow complete healing of the socket [1, 7]. This paradigm has challenged within the last decade due to the reduction in time between tooth extraction and implant placement. Other protocols have been developed in which implants are placed at the time of extraction of the tooth, or soon after, before significant bone resorption occurs, known as immediate implants [2-5]. These procedures save bone and periodontal tissues from damage using atraumatic extraction and Graft bone (Bio-Oss) mixed with Growth factor (PRGF) to make bone sticky. These grafting procedures stimulate bone regeneration around the implant using different growth factors (PDGF, IGF, VEGF, EGF, TGF).

The objective of the research was to determine the success rate of implants placed immediately into fresh extraction socket and removal of the periapical lesions evaluating clinically and radiographically the soft tissue and hard tissue changes that occur up to 9 month following placement of implants.

Materials and methods

Growth factors are a soluble protein contained in platelets responsible for transmitting signals to the cells telling them to begin to form new tissue. This will initiate the healing process of connective tissue, the process of regeneration and repair of bone, promoting the development of new blood vessels and stimulating the wound healing process. Plasma Rich Growth Factor (PRGF) is an acronym for Plasma rich in Growth Factors. It is a technique used to regenerate bone and soft tissue using a small amount of autologous blood. New technology and the PRGF technique separates certain plasma proteins from your blood which are used to stimulate healing, foster new bone synthesis and repair the soft tissue in surgical sites. These GF (platelet derived growth factors PGDF, transforming growth factor beta TGF, and insulin-like growth factor ILGF)(VEGF)(EGF)(TGF,b1) function to assist the body in repairing itself by stimulating stem cells to regenerate new tissue.

Atraumatic extraction methods are deemed to be important to minimize alveolar bone loss after tooth extraction and to facilitate subsequent implant restoration and optimal esthetic outcomes.

Graft bone Geistlich Bio-Oss® is the leading bone substitute for regenerative dentistry worldwide. The outstanding osteo-conductive properties of Geistlich Bio-Oss-lead to effective and predictable bone regeneration.

Radiography, computed tomography CT, orthopantomography, radiovisiography are used to determine whether the patient is a good candidate for implants.

Histological method of diagnostics were used to study the microscopic anatomy and structure of cells and tissues using a trephine which is a cylindrically shaped core of bone (or bone biopsy) obtained with a bone marrow. The samples are sectioned and examined under a microscope. They are stained and mounted on a microscope slide.

Results

A total of 25 implants were placed in jaws of 6 patients (3 males and 3 females). The average age of patients was 28-45 years. Out of 11 implants, 8 implants were successful.

Case 1. A 38-year-old male patient had a cyst around the root of the 36th molar and the 35th premolar. The size of the mass was around 2.5 cm. Treatment plan included the extraction of the molar, socket curettage, measurement of cavity depth and immediate placement of 3 dental implants in the socket. Post-extraction socket was wide due to cyst defect. We used growth factors PRFG mixed with graft bone (Bio-Oss). 3 months after surgery an X-ray was made demonstrating completely defect healing and osseointegration around the body of implant was successful. Then, an abutment was screwed into the implant and a final crown was made.

Case 2. A 44-year-old male patient was diagnosed with periapical lesions around the upper incisor and root fracture. Treatment plan included tooth extraction, socket curettage, immediate post-extraction socket irrigation with liquid of growth factors PRGF, measurement of the socket, immediate loading of post-extraction dental implants, placement of one dental implant and making temporary crown. Two months after placement of temporary crown it was replaced with a permanent one.

Case 3. A 29-year-old female patient suffered from local periodontitis Stage III in the 26th molar diagnosed by digital X-ray. Treatment plan included tooth extraction, socket curettage, immediate loading of post-extraction dental implants, measurement of socket depth, placement of three dental implants and covering the implants with membrane of PRGF. 6 months after surgery an X-ray was made to find whether resorption process stopped as well as to make dental impression and fix the final crown.

Case 4. A 33-year-old female patient had the 24th and 25th upper teeth extracted about 5 years ago due to incorrect root canal treatment. According to CT scan the bone density was of type D3. There was bone atrophy due to long term of teeth extraction. Treatment plan included placement of 2 dental implants and bone augmentation using graft bone and growth factors to make bone sticky. Local anesthesia was used. We cut the gum at the site of the bone graft and created a flap, placed dental implants and covered them with membrane of PRGF. After this procedure another CT scan was made to diagnose if the bone converted to D2. Then, we fixed the temporary crown and in a week the final crown was fixed.

Case 5. A 55-year-old male patient underwent the extraction of teeth from the lower jaw and upper jaws and was placed complete removable denture. He missed the 34th, 35th, 36th teeth. On another side in the area of the 45th and 46th teeth a cyst 3 cm in diameter was observed due to broken endodontic instruments in the roots canal. The condition was diagnosed by CT scan and panoramic X-ray. Treatment plan included the extraction of the 45th and 46th teeth, socket curettage, cyst removal. When measuring the socket depth there was revealed a severe defect – so, we filled up the socket with sticky bone and covered it with membrane of PRGF. One and a half months digital X-ray was made. Atrophy was observed but there was enough level of bone to allow dental implants to be inserted. Treatment plan included the placement of 3 dental implants in area of the 45th, 46th teeth and 3 dental implants in the area of the 34th, 35th, 36th teeth, immediate-loading temporary crowns on both sides. One and a half months after placement of temporary crown it was replaced with a permanent one.

Case 6. A 59-year-old female patient lost all her teeth in the lower jaw and had partial denture in the upper jaw. She has been wearing complete removable dentures in the lower jaw for 7 years. Severe atrophy was detected in her lower jaw. The condition was diagnosed using CT scan. Treatment plan included the insertion of 10 dental implants, preparation rich in growth factors (PRGF) and sticky bone. 3 months after CT scan was made. 4 implants were not osseointegrated and failed. Perfect osseointegration and very good adhesion were observed in the rest implants. Then, she was given 6 implants and a 10-unit bridge.

The overall success rate of implants in this study was 92%. Clinical and radiological parameters were recorded in all the cases. The statistical analysis software SPSS 15.0 state 8.0, MedCalc 9.0.1 and Microsoft word excel were used to generate a graph.

Conclusions

Bone graft combined with autologous blood products were used allowing to improve the results of bone healing as well as to shorten treatment time, since in immediate placement it was not necessary to wait 6-9 months for healing and bone formation of the socket. The results of this study suggest that this protocol allows successful and predictable long-term successful functional

outcomes regarding alveolar bone regeneration and implant rehabilitation. Immediate implants are increasingly predictable and as illustrated in this case, with all parameters being favorable to success can provide esthetically superior results at least in the short-term follow-up period. Bone regeneration was significantly greater with the use of PRGF after one month ($p=0.005$), though no differences were recorded after the second month. In the histomorphometric analysis one month after surgery, the defects filled with autologous bone plus PRGF showed a greater percentage of neoformed bone (35.01 ± 5.31) than the control defects (22.90 ± 12.23), though the differences were not significant. Two months after surgery, the defects filled with autologous bone showed greater regeneration ($46.04 \pm 10.36\%$) than the control defects ($30.59 \pm 5.69\%$), though the differences were not significant.

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