EXTERNAL SINUS LIFT USING THE TECHNOLOGY PRGF ENDORET: A CASE REPORT

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EXTERNAL SINUS LIFT USING THE TECHNOLOGY PRGF ENDORET: A CASE REPORT (Abstract): The purpose of this case report is to evaluate the clinical results of sinus lift procedure using lateral window antrostomia in the left sinus using PRGF technology and inorganic bone substituents (Cerabone, Botiss) and healing time assessment. The patient aged 41 years was presented at the Private Dental Office „Dr. Anca Rusu” Bucharest to rehabilitate edentulous maxilla and mandible. Residual bone height was class D (1-3mm) in the left sinus. It was decided to perform a sinus lift with a lateral approach in the left sinus. Simultaneous insertion of the implants could not be performed the same session due to the low height of residual bone. The results of this case report indicates that PRGF-Endoret technology can be successfully used to achieve regeneration technique of sinus lift with lateral approach, is not an expensive procedure and it can be used in patients who can not afford expensive regenerative therapies. Conclusions: PRGF-Endoret induces regenerative activity in sinus augmentation and shortens the healing time which demonstrates the therapeutic potential. Key words: EXTERNAL SINUS LIFT, PRGF-ENDORET, BONE SUBSTITUTES.

INTRODUCTION
Loss of teeth in the posterior maxilla can induce expansion of the maxillary sinus as a result of pneumatization, through a positive air pressure created during breathing. It is not uncommon for maxillary sinus floor to be present close to the alveolar ridge. The tendency towards sinus pneumatization is significantly higher after molar extraction compared to that generated by the extraction of premolars (1). Moreover, the residual alveolar ridge is reduced due to centripetal resorption of the alveolar bone at the level of maxilla, especially in the buccal area.

Insertion of implants in the posterior maxilla can be problematic due to small amounts of subsinusal bone as a result of resorption, progressive pneumatization of the maxillary sinus and reduced bone density. Maxilla consists mainly of cancellous bone, being one of the least dense bone structures of the oral cavity (2).

Available bone volume and bone quality determine the type of the implant and the used surgical technique, having a vital role in the success of treatment (3).

External lateral sinus lift
Sinus floor augmentation is a technique for reconstruction of bone anatomy and is used to develop a sufficient bone volume in order to improve long-term retention of the implant (4). The technique of “sinus lift” consists in increasing vertically the alveolar ridge of maxillary posterior area by interposing different types of bone grafts between Schneider sinusal membrane and the floor of the maxillary sinus (5).

In the technique of sinus lift, the maxillary sinus mucous membrane is raised through a small window drilled in the bone and is created a submucoperiosteal cavity (7) and the bone substitute material is inserted between the mucous membrane and the remaining bone and it will turn into bone in 4-8 months. This tech-
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Technique reduces the possibility of sinus damage during implant placement, a new bone is formed that replaces the one resorbed and creates adequate support for implants.

In the sinus lift technique a small external window is created in the lateral wall of the maxillary sinus via a vestibular sulcular incision, then the sinus membrane is elevated and the bone substitute material is inserted through the window between the membrane and the floor of the sinus. This technique allows a greater bone augmentation of atrophic maxilla, because the access is wider (8). It is used when the ridge height is 4-6 mm. This procedure can cause postoperative complications (hematoma, pain, transient sinusitis, longer healing time) (9). This technique can be carried out in a single surgical step (implants are placed in parallel with the rise of Schneider membrane) or two-stage surgery (implants are inserted in a few months after sinus augmentation). When the residual bone height is between 1 and 3 mm is recommended the two-stage insertion of the implant (10).

A very good knowledge of the arterial blood supply of anterolateral wall of the maxillary sinus is absolutely necessary to perform this surgical procedure. In the cortical bone of the lateral wall of the sinus is present an intra-bony anastomosis between the dental branch of posterior superior alveolar artery also known as antral alveolar artery and infraorbital artery (11). Alveolar antral artery vascularizes the sinus membrane and the anterolateral wall of the sinus and, as a consequence, it can be affected during the lateral osteotomy causing bleeding (12), and the more residual alveolar ridge is resorbed, the better the chances that this artery to be injured.

PRGF Endoret technology

Improving the regeneration of the human body by using the patient’s own blood is a unique concept in dentistry.

A biotechnological alternative for bone regeneration is filling the resulted bone defect with a preparation rich in growth factors (PRGF) that was obtained from patient’s blood. PRGF was introduced by Anitua (13,14). Growth factors play a central role on cell migration, cell proliferation and angiogenesis in the tissue regeneration phase (15). These growth factors are localized mainly in blood plasma and platelets. Platelets contain a large amount of growth factors, such as transforming growth factors β-1 (TGFβ-1), growth factor derived from platelets (PDGF), epithelial growth factor (EGF), insulin-like growth factor type I (IGF-I) and vascular endothelial growth factor (VEGF), basic fibroblast growth factor (bFGF) that stimulates the cell proliferation and regulate the angiogenesis (16,17,18).

BTI Institute for Biotechnology and Regenerative Medicine in Spain for consecutive years has developed innovative technologies for dentistry, designed to exponentially increase the quality of care and improve patients’ experience with dental treatments. PRGF®-Endoret Technology and all elements and components were specifically developed for obtaining plasma rich in growth factors.

With PRGF®-Endoret technology we can separate from the patient’s blood, the plasma containing proteins that hasten the regeneration process. Once the therapeutic dose is applied in the area of treatment, regeneration process is accelerated considerably. Because the white blood cells are not included in the formulation, pro-inflammatory action thereof is removed.

To achieve this regeneration process, it is necessary to harvest a small amount of blood from the patient. The volume of blood used is variable (up to a maximum of 9 ml) and suitable for every application. The blood is centrifuged once and processed to obtain the proteins necessary for the regeneration. It only requires a single centrifugation because several spins could cause premature activation of platelets and even generate adverse effects (18).

These proteins are then applied in the area where tissue regeneration is required. PRGF®-Endoret speed up healing and tissue regeneration, while reducing inflammation and the risk of infection or post-surgery complications. Using this technology guarantees significant improvements in the regeneration process, no pain and rapid recovery of the patient.

Concentrated growth factors (CGF) are produced by centrifugation of venous blood and can be used as a barrier membrane to accelerate healing of soft tissue or mixed with bone graft to accelerate new bone formation. CGF does not require any chemical or allergenic additives such as bovine thrombin or anticoagulants, so it cannot transmit viral diseases (19).
Sticky bone or autologous concentrated growth factors enriched bone graft provides stability of the bone graft in defect, and, therefore, accelerates the healing of tissue and minimizes loss of bone mass during the healing period. A mixture of bovine anorganic bone and PRGF can be used as graft material. The use of this biological graft in sinus lift not only provides a pool of growth factors to the local environment but also facilitates the handling, manipulation, and administration of the anorganic bone particles, and increases the overall volume of the graft (20).

The purpose of this case report is to evaluate the clinical results of sinus lift procedure using lateral window antrostomia in the left sinus using PROF technology and inorganic bone substituents (Cerabone, Botiss) and healing time assessment.

**CASE REPORT**

The patient aged 41 years was presented at the Private Dental Office „Dr. Anca Rusu” Bucharest due to neuromuscular disorders, masticatory, phonation, changes of the mandible position, vertical dimension and profile as a result of bilateral edentulous maxilla and mandible.

It was absolutely necessary to evaluate preoperatively the medical and dental history of the patient. The patient was carefully evaluated from a medical, clinical, radiological point of view in order to assess the current health status and to identify any conditions that would require preliminary treatment or contraindications to implant therapy and sinus lift procedures (fig.1).

It was removed the prosthetic work and odontal and periodontal clinical examination was performed in the vicinity of maxillary sinus to detect any lesion that could cause odontogenic maxillary sinusitis. Edentulous area is characterized by an atrophic alveolar ridge, low in height class D (1-3 mm) which makes impossible the placement of implants without bone addition procedures.

OPT radiographic examination (fig.2) and a preoperative CT scan were performed for the evaluation of possible anatomical deformations (partial or total sinus septa) or the existence of sinus pathology (rhinosinusitis, sinusitis of odontogenic origin, cysts, pseudocysts, polyposis,
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It was found that in the left maxillary sinus the volume of residual bone at alveolar process level is insufficient in quality and quantity to ensure primary initial stability of implants.

It was decided to perform a sinus lift with a lateral approach in the left sinus using PRGF technology and Cerabone bone substitutes. Simultaneous insertion of implants cannot be performed in the same session because of the low height of residual bone.

The patient received detailed explanations on surgical procedures that will be performed and informed consent was obtained from her.

The following laboratory tests were performed: complete blood count (red cells, white cells, globular value, leukocytes, platelets, hemoglobin), bleeding and coagulation time, clot retraction time, hematocrit, coagulogram.

Antibiotic prophylaxis was performed 1 hour before the start of the procedure at a dose of 1000 mg Amoxiklav, then local anesthesia. Antibiotic administration continued after surgery 1 tablet every 8 hours during the first 2 days, and in the next 5 days to 1 tablet every 12 hours.

After local anesthesia a crestal incision was made, supplemented by two vertical incisions and the detachment of a trapezoidal vestibular flap in order to expose the lateral wall of the sinus (fig. 3).

The osteotomy was practiced with the achievement of a lateral window to open the sinus using globular atraumatic burs at the right first molar level. It was fractured the well-defined bone fragment and pushed very carefully inward and superior in order to not perforate the sinus Schneider membrane, that covers the sinus floor (fig. 3).

There were collected 9 ml of venous blood from antecubital vein of the patient. Blood collection was performed in four tubes containing sodium citrate as anticoagulant. Thus, platelets were well preserved.

The blood was centrifuged once in a specially designed centrifuge and processed to obtain the proteins necessary for the regeneration. PRGF-Endoret has activated plasma with those proteins from the blood responsible for tissue healing (fig.4,5).

The centrifuge has specific parameters to maximize the production of platelets and keep the plasma leukocyte free. After centrifugation, the following 3 typical layers are obtained: a yellowish top layer, the plasma, which contains a gradient of platelets, with maximum concentration of those platelets above the buffy coat, the leukocyte layer, or buffy coat, is located below of plasma layer and the bottom layer is the layer containing the red cells.

In terms of volume of plasma were obtained empirically two different fractions, depending on the concentration of platelets. The top fraction will contain a similar number of platelets with the peripheral blood, while the bottoms fraction will contain 2 to 3 times the concentration of platelets in comparison with the blood.

Fine-grained bovine bone particles (0,5-1mm) (xenograft with natural bone substitutes Cerabone) were mixed with the fraction 2 containing platelet concentrate and it was ac-
complished a bone graft enriched with concentrated growth factors (sticky bone) (fig. 6, 7).

Sticky bone has been applied in the left sinus beneath sinus mucosa through the lateral window created to correct the bone deficiency. This sticky bone does not migrate due to the interconnected strong network of fibrin, so that the loss of bone in the defect during the healing process is minimized.

The lateral window was covered with a resorbable collagen membrane (Membrane Jason Botiss) of 15/20 mm size and after was made the suture of soft tissue (fig. 8).

Antisectic solutions for oral irrigation with Chlorhexidine 0.12% were indicated to reduce the plaque accumulation of in the area of implantation after surgery.

It were recommended anti-inflammatory pills, analgesics, nasal decongestant to improve permeability osteo-meatal complex, cold water compresses, antibiotics. The patient was instructed not to blow his nose for 7 days after surgery, to cough with open mouth to avoid increased pressure in the operated sinuses and to sleep upright.

RESULTS

At 24 hours after surgery was noticed that a moderate edema of the area that was gradually reduced during the first 7 days. There were not found clinical signs of postoperative sinusitis. At an interval of 10-14 days the sutures were removed.

Postoperative assessment was made at one month, two months and three months to notice any pain, gingival inflammation, swelling and increase of bone height. It has been noted the increasing of the bone height and the bone support was provided for further insertion of implants (fig. 8).

This result confirms that PRGF-Endoret induces the regenerative activity in sinus augmentation and shortens healing time a fact that indicates the therapeutic potential. The intervention was carried out without postoperative complications and showed good acceptance by the patient.

DISCUSSIONS

One of the latest technology is the use of plasma rich in growth factors (PRGF-Endoret) (21). This type of biological treatment mimics the natural pathways of wound healing (22) trying to optimize and reduce healing time. This is accomplished by driving to the affected area of proteins from platelet-rich plasma (PRP) that will be involved in the repair of damaged tissues. In this way, all the proteins necessary for tissue repair are released locally. PRGF®. Endoret® is the first technology on the market that is 100% autogenous.
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tains a moderated platelet concentration, a two-third-fold increase compared with peripheral blood, a dosage shown to induce optimal biological benefit (23).

PRGF-Endoret technology mimics the natural healing mechanisms, but with two special features: trying to avoid loss of function of tissues and shortening of healing time. PRGF-Endoret therapy accelerates and improves local tissue healing by delivery of bioactive autologous molecules and contributing with a temporary scaffold of first line (24). This autologous toolkit consists in the use of platelets as a the reservoir and vehicle of a vast repertoire of protein (25,26).

There are two major processes related with the potential of this technology. First is the release of hundreds of proteins and growth factors from platelets that actively stimulate tissue regeneration. This pool of factors is added to the biologically active molecules already present in human plasma. Second is the formation of a three-dimensional fibrin matrix that retains and later releases part of the growth factors, and which also acts as a temporal nesting scaffold for the cells (27).

Versatility is the aspect that differentiates the most the PRGF®-Endoret® technology from any other systems that use platelet-rich plasma (PRP). It is possible to obtain in a single collection of blood, up to four different therapeutic formulations depending on the level of coagulation and activation of samples (fibrin membranes, clot, liquid and filtered liquid). Fibrin membrane is elastic, dense and hemostatic with growth factors incorporated being one of the best biomaterials from regenerative medicine. The clot is a perfect structure for cells and can be used to fill the defects or for the autologous or heterologous bone formation. The liquid is used to wet the surface of implants before screwing and the filtrate can be used in cell culture in the laboratory, including stem cells (27).

Some studies have reported beneficial results when a platelet-rich product was combined with various substitutes bone (autologous, allogenic or alloplastic) for sinus floor elevation (28,29,30,31,32,33). In this case report by using PRGF-Endoret was achieved a lower healing time, eliminating the risk of inflammation, infection and postoperative complications.

The results of this case report indicates that PRGF-Endoret technology can be successfully used to achieve regeneration technique of sinus lift with lateral approach, is not an expensive procedure and it can be used in patients who can not afford expensive regenerative therapies.

CONCLUSIONS

PRGF-Endoret technology speeds up the healing process, as shown in our case report, being effective to obtain a more reliable bone regeneration and a higher quality of bone from biomechanical point of view in lateral sinus lift, also has a lower morbidity for the patient as compared to traditional methods.

REFERENCES


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