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Case Report

Maxillary Reconstruction with the Use of CGF Combined with the Simultaneous Use of Stem Cells CD34 and Bone Graft: "IPG-DET Technique"

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Abstract

Introduction: Platelet concentrates are autogenous regenerative preparations, obtained through the centrifugation of a blood sample from the patient [1]. In 1998, the initial production of platelet-rich plasma (PRP) was presented and in 2000 the second platelet rich fibrin (PRF) was introduced as well. The Concentrated Growth Factor (CGF) is a novel second generation platelet concentrate which was developed by Sacco in 2006 and was obtained from blood samples through a simple and standardized separation protocol by means of a specific centrifuge [2].

CGF is fibrin rich organic matrix which can stimulate cell proliferation, regeneration, chemotaxis and angiogenesis and contains growth factors in the platelets such as [3]:

1. Platelet-derived growth factor (PDGF)
2. Transforming growth factors (TGF-β1)
3. Epidermal growth factor (EGF)
4. Fibroblast growth factor (FGF)
5. Insulin growth factor-I (IFG-I)
6. Vascular endothelial growth factors (VEGF)
7. Leukocytes and CD34+ stem cells.

Case Report: This article presents the "IPG-DET" Technique, an innovative technique by which the rapid placement of implants in the sinus cavity by means of intentional perforation of the sinus membrane (following a certain clinical protocol). In other words,

the sinus floor elevation procedure is not necessary anymore provided the clinician follows the surgical protocol of this innovative technique. The "IPG-DET", involves the simultaneous placement of concentrated growth factors CGF and stem-cells-CD34+ as well as bone grafting within the osteotomy site and through immediate implant placement the sinus adjusts to the new state of affairs without any complications [4].

Conclusion: "IPG-DET" technique proves that minimal invasive implant placement without applying sinus floor elevation has plenty benefits with minimum complications [4].

Keywords: *Concentrated Growth Factors (CGF); Immediate Implant Placement; Cone Beam Computed Tomography (CBCT); Liquid Phase Concentrate Growth Factors (LPCGF)*

Abbreviations

CGF: Concentrated Growth Factors. They accelerate new bone formation; CD34: A transmembrane glycoprotein expressed extensively on blood vessels and hematopoietic stem cells; IPG-DET: Placement of implants inside the sinus cavity with international perforation of the sinus membrane and simultaneous placement of concentrated growth factors and bone graft material of our choice

Introduction

Concentrated Growth Factors consisting of a pure biomaterial, with many special properties can be obtained from the patient's venous blood. The use of CGF indicates a high regenerative performance on both bone and on soft tissues [5]. This article evaluates and represents the accelerated healing effect that the use of Concentrated Growth Factors (CGF) and Stem Cells CD34 combined with the simultaneous use of bone graft can have on the sinus membrane following intentional perforation.

Case Report

Presented in this case report is the placement of 6 implants [TC-R MultySystem, Italy] in the atrophic posterior and anterior areas of the maxilla of a 65 years old female patient. Full and detailed intra-oral and extra-oral examination was conducted prior to the procedure and a close examination of the Panoramic X-ray and CBCT scan was performed for pre-assessment and precise.

Figure 1 and 2: *Pre-op clinical images.*

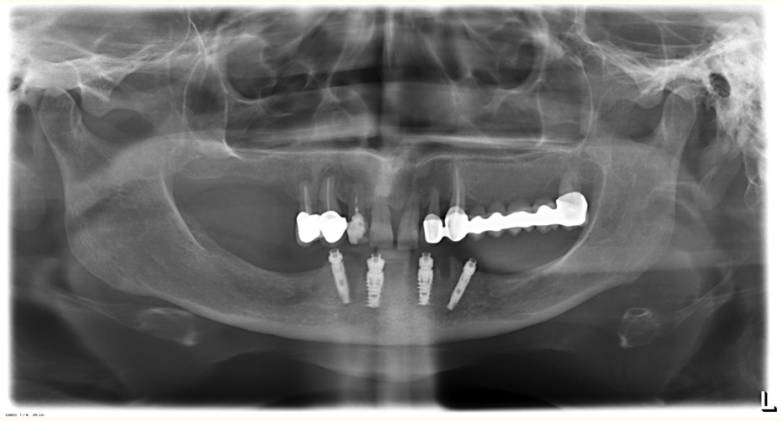

Figure 3: *Pre-op panoramic X-ray.*

Both CBCT and Panoramic X-ray confirmed alveolar ridge deficiency in both maxillary sides, with a minimum ridge height and generalised bone atrophy. Furthermore, following close scrutiny of the CBCT (Figure 4) no pathological findings in the posterior segments of the maxilla were detected; therefore precise planning of the sites for implant placement was carried out. Existing teeth in the maxilla were #11, #12, #13, #14, #21, #22#, #23, #27. We decided to place 6 implants in the following areas #11 #13, #14, #16, #23 and #25. The placement of the implants was completed using a minimally invasive technique.

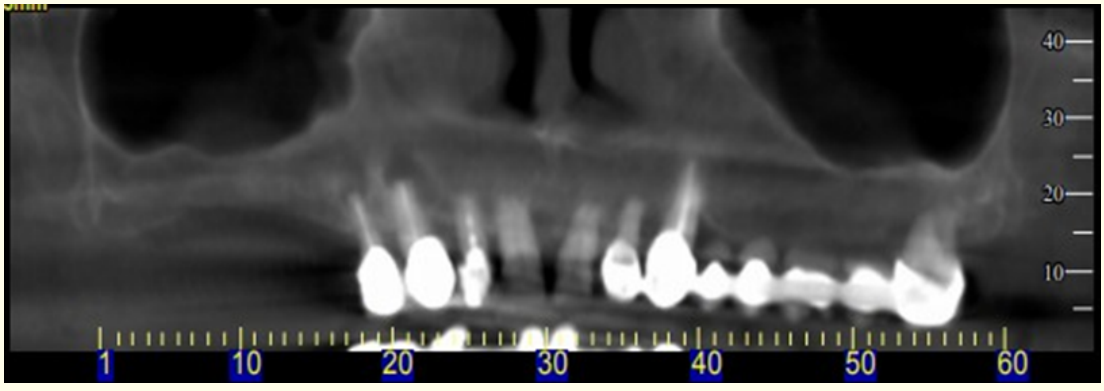

Figure 4: *Pre-op cone beam computed tomography (CBCT) of the upper jaw.*

Materials and Methods

The first step was the venous blood collection from the patient (Figure 5) using six 9 ml sterile glass tubes (N. 100 Silfradent, Italy) according to the CGF protocol. The patient's blood was centrifuged in Medifuge MF200 device (Figure 6, Silfradent, Italy), resulting in 6 CGF filled tubes ready for use.

Figure 5: *Blood collection.*

Figure 6: *Medifuge MF200 device (Sifradent, Italy).*

Povidine iodine (Betadine) was used for extra-oral disinfection to reduce the possibilities of microbial contamination of the surgical site. Immediately thereafter, 2 per cent lidocaine with 1:100,000 epinephrine was administered. Complete clearance of the upper remaining teeth was carried out followed by disinfection with Laser (Figure 7 and 8).

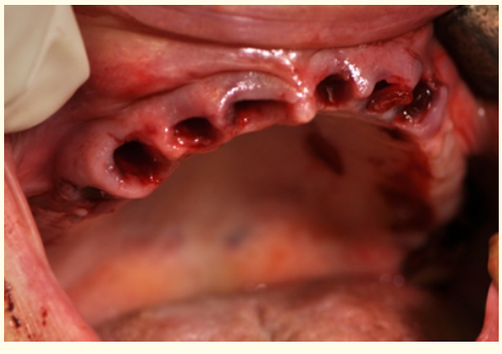

Figure 7 and 8: *Clinical images after extractions.*

During the surgical procedure the osteotomy extended up to the point where the sinus membrane was perforated. Following sinus membrane perforation the CGF matrix generated from the centrifugation was inserted within the osteotomy site into the sinus, through the perforated sinus membrane using the fibrin injector instrument (Figure 9 and 10; CGF Kit, Silfradent, Italy).

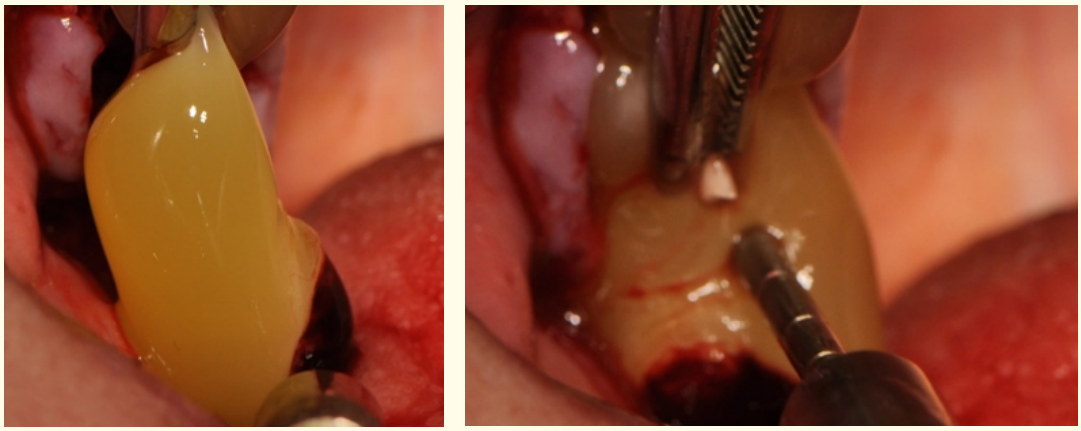

Figure 9 and 10: *Clinical images of CGF insertion into the osteotomy site by the aid of the fibrin injector (Silfradent, Italy).*

Bone graft material ("Re-Bone", MultySystem, Italy) was subsequently mixed with the rest of the CGF matrix which was cut into small pieces and placed in the osteotomy site (Figure 11-13).

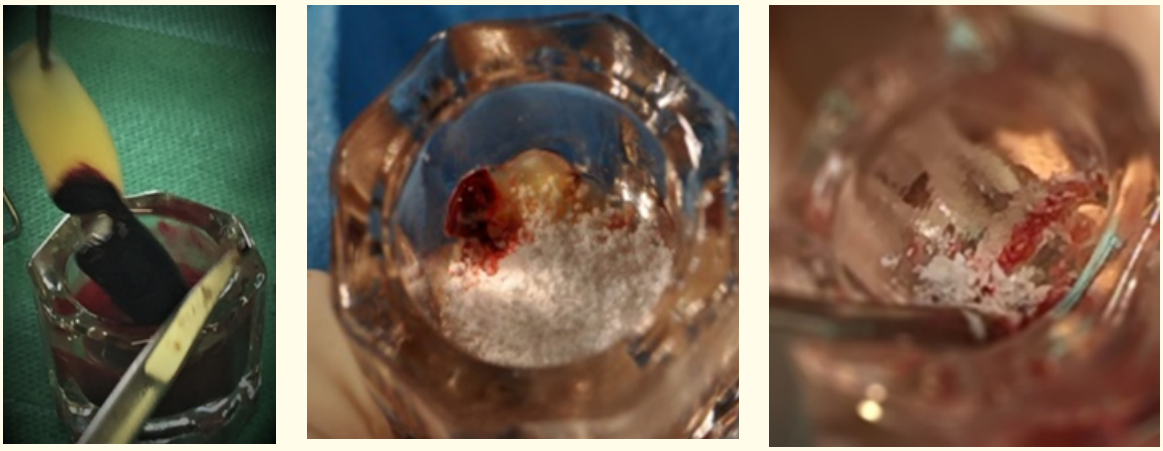

Figure 11 - 13: *Bone graft material mixed with CGF matrix prior to placement into the osteotomy site.*

Prior to placement of each individual implant into the osteotomy sites, immersion of each implant into the LPCGF (Liquid Phase Concentrate Growth Factors) from a strerilized container was carried out in order for a bioactive membrane to be formed around all 6 TC-R [MultySystem, Italy] implants (Figures 14). Moreover, a CGF membrane was created with the aid of CGF Forceps (Silfradent, Italy) (Figure 15) through squeezing one CGF matrix.

Figure 14: *Immersion of implants into the liquid phase concentrate growth factors.*

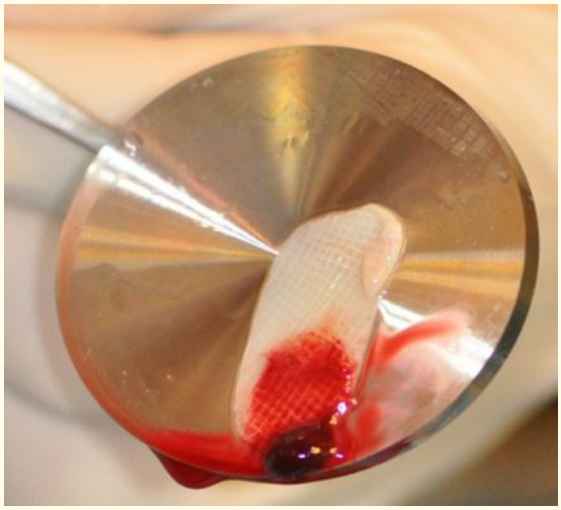

Figure 15: *CGF membrane created by CGF-forceps.*

All implants were placed 1mm below the maxillary alveolar bone (Figure 16 and 17) with the help of a hand wrench (Multysystem, Italy). The insertion torque was measured to be between 20 - 25 Ncm^2. The primary stability of each implant was estimated with a low ISQ value, as expected.

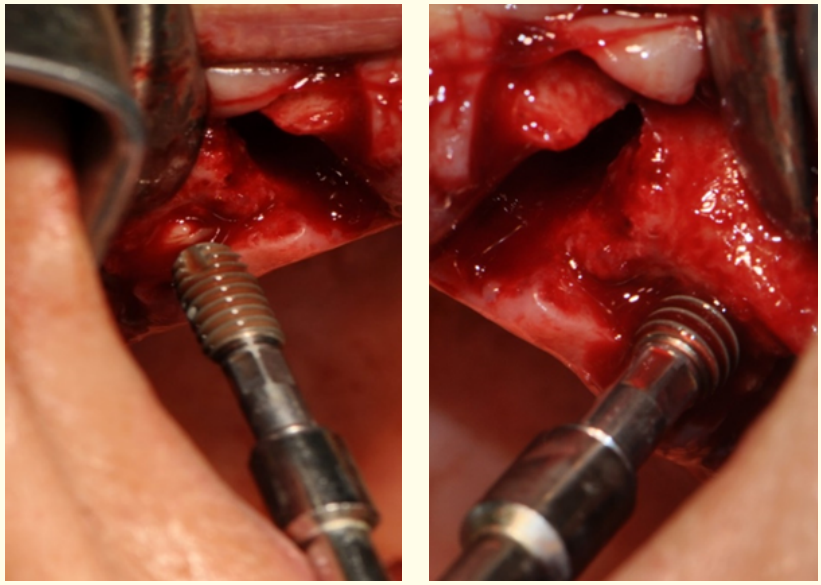

Figure 16 and 17: *Implant placement into the osteotomy sites with the use of a hand wrench.*

Finally, a cover screw was placed into 4 implants (Figure 18 and 19). The remaining 3 implants were loaded on the same appointment to facilitate the fit of a temporary implant over-denture.

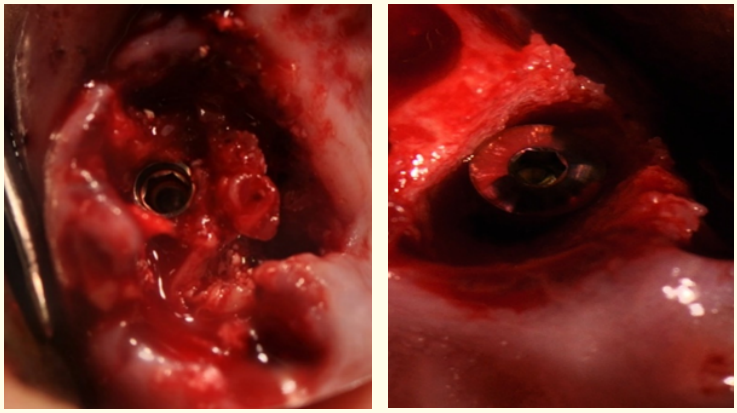

Figure 18 and 19: *Placement of the cover screw.*

Bone graft material ("Re-Bone", MultySystem, Italy) was placed into the space between the implants and the fresh extraction sites. Furthermore, small pieces of CGF matrix were cut and mixed with bone graft for immediate placement below the membrane (Figure 20 and 21).

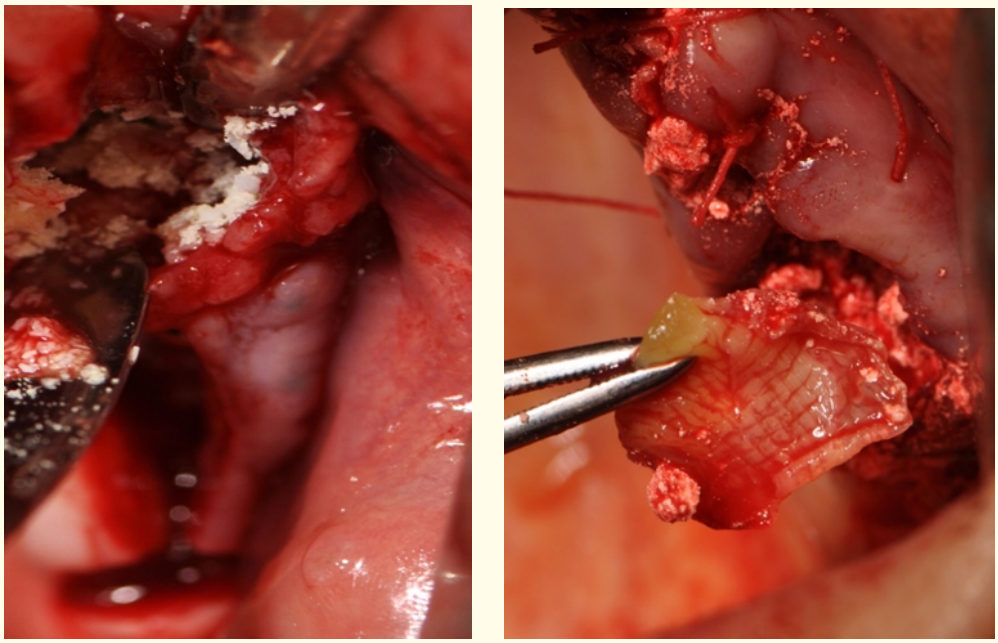

Figure 20 and 21: *CGF and bone graft material placement into the space between the implant and extraction sites.*

Following placement of the OT biologic abutments [MultySystem, Italy] for immediate implant loading (Figure 22 and 23), an impression was taken with the aid of OT transfers [MultySystem, Italy] (Figure 24-26).

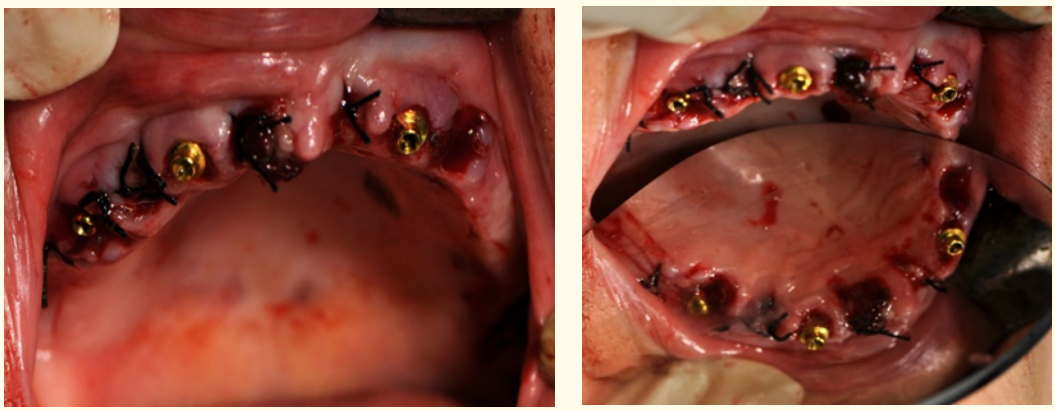

Figure 22 and 23: *OT biologic abutments and preparation for impression.*

Figure 24: *OT transfers insertion for impression taking.*

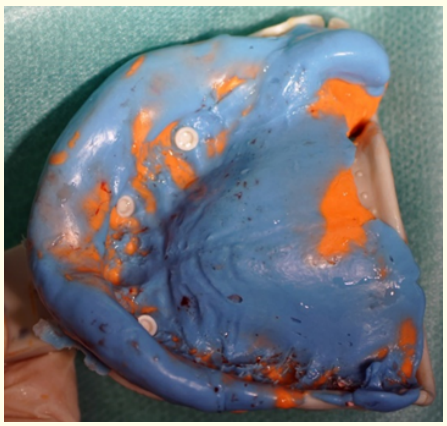

Figure 25: *Impression.*

Figure 26: *Implant temporary overdenture ready to fit.*

Following surgery, during the various stages of the healing process, radiological examination was used to assess the increase and maturation of bone structure formed around the implants and over the sinus floor. The sinus membrane was able to be embedded and reconstructed over the newly formed bone. The permanent fixed implant retained prosthesis was inserted exactly 9 months after implant placement which allowed enough time for new bone growth to occur around the implants (Figure 27).

Figure 27: *Permanent implant prosthesis 9 months post-surgery.*

Results

Evaluation of post-operative Panoramic (Figure 28) and CBCT scan revealed full formation of new bone around the 7 implants placed in both maxillary sinuses. Moreover, clinically ISQ values between 65 and 69 were estimated with the use of Ostell. More importantly, following months from their placement, the implants showed excellent stability.

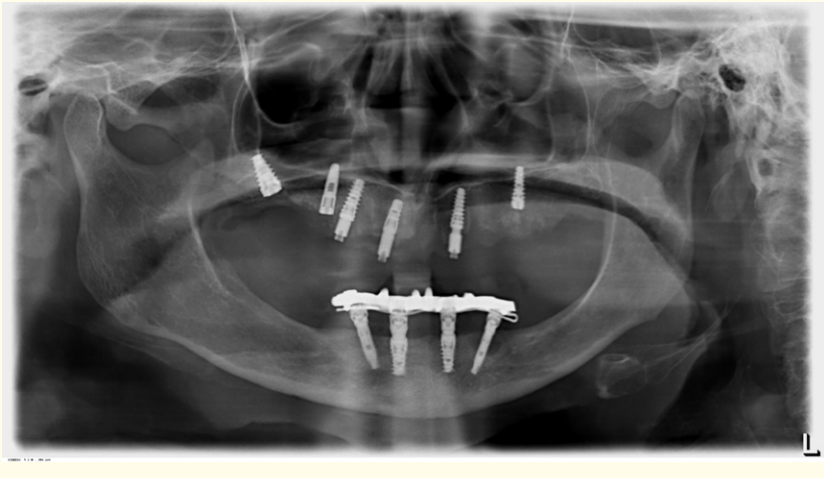

Figure 28: *Post-op panoramic X-ray.*

Discussion

Sinus lift is a commonly used complicated procedure which requires big cost, time, extended surgery and unfortunately carries many post-operative risks which cannot be always avoided [6]. The "IPG-DET" is an innovative technique which involves the utilization of Concentrated Growth Factors and stem cells CD34+ together with bone grafting material, which are directly placed into the sinus with intentionally perforation of the Schneiderian membrane in order to allow an atraumatic implant placement. This allows the implants to be placed into the maxillary bone without any need for classical sinus floor elevation procedure [4]. The use of Concentrated Growth Factors (CGF) is essential, because pseudo-legs are contained in them and in this way it is achieved an immediate anchorage of the platelets on the surface of the membrane following slight haemorrhage after penetration [7]. And as new bone is formed in the sinus it will slowly be covered by a new sinus membrane, while the existing sinus membrane under the new bone is believed to disintegrate slowly. The authors consider the "IPG-DET" technique as a safe procedure with minimum post-operative complications involving the sinuses [7].

Conclusion

In conclusion, the results of the "IPG-DET" technique support strongly the concept of a single and atraumatic procedure in maxillary implant placement through the sinus membrane perforation in cases where there is ridge deficiency and only after the written, informed and valid consent of the patient. It is strictly important that the correct protocol - "IPG-DET" technique - should always be used by dentists who are properly trained in the procedures of this technique [4]. To sum up, the "IPG-DET" is a safe, reliable and faster procedure and can be used as an alternative method to the sinus floor elevation.

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