



October 2016

Published by Global Dental Implant Academy

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Dental Implant CASE REPORT

Utilization of Decalcified Autologous Tooth Block Bone and Powder Bone for Ridge Augmentation in Implant Dentistry

Part I Simplified three-dimensional ridge augmentation performed with “Ring technique”, utilizing decalcified autologous tooth block



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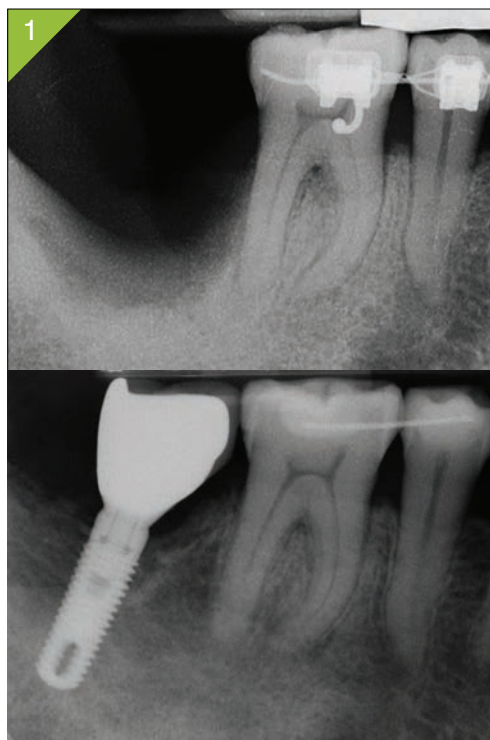


Figure 1a-b. a) Pre-operative radiograph, b) 2 years post-operative radiograph

Background and Aim

Bone graft materials play an important role in regenerating the atrophic edentulous alveolar bone. There are various type of bone grafts: autogenous graft, decalcified autologous tooth bone, allograft, and xenograft. The best choice of graft is autogenous bone because it has both osteoinductivity and osteoconductivity. However obtaining autogenous bone requires second surgery site causing morbidity to the patient with extended surgical and healing time.

Hence for some time, other graft materials such bovine bone or synthetic bone have been an alternative choice over autogenous bone grafting. However these substitutes are osteoconductive and mainly function as space makers with volume preservation. Autologous tooth bone is recently introduced as the best new alternative to autogenous bone graft as it has osteoinductivity. An extracted tooth from the patient can be utilized as bone graft material after appropriate



preparation and decalcification process, in block or powder form. The decalcification process can be effective under vacuum pressure and ultrasonic vibration, allowing the tooth to still retain its protein contents and collagen structures that aid in bone regeneration.

A Case Report

A 40 years old male visited the department requiring his lower right 2nd molar tooth extracted. Due to chronic periodontitis, severe bone resorption with class III mobility were present. Along with the 2nd molar extraction, it was decided that the lower left 3rd molar should also be removed and prepared as bone graft material for future implant surgery.

To ensure appropriate preparation of bone graft material from the 2nd right molar tooth, the amalgam filling and pulp tissues were completely removed using a high speed bur. The extracted tooth was crushed with a mallet and particulate tooth bone graft was prepared after 10 min-decalcification process. In addition, the extracted lower left 3rd molar tooth was prepared as a block form. Tooth block bone was prepared after 20 minutes of decalcification.

Both extracted teeth were buffered and treated with sterilization solution, then placed in a machine and reagents (VacuaSonic® and DecalSi-DM®; Cosmobiomedicare, Seoul, Korea) to undergo vacuum compression and ultrasonic vibration.

Six weeks after extraction, healthy soft tissue healing was achieved but due to severe ridge resorption, required vertical and horizontal augmentation with implant placement. (Fig. 2,3)

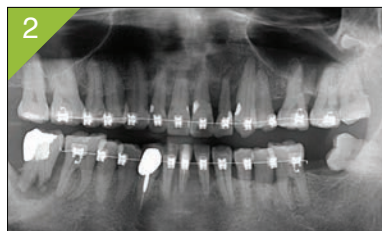


Figure 2. Preoperative orthopantomogram showing hopeless lower right 2nd molar. This tooth and lower left 3rd molar was extracted to prepare for bone grafting in powder and block form.



Figure 3. A radiograph showing severe vertical and horizontal bone resorption after 6 weeks post extraction.

The apical portion of the tooth block graft was resected, before positioning the implant fixture directly through the crown portion of the tooth block. Centering the implant fixture directly into the desired position and allowing the block graft to house the fixture achieved great stability with vertical and horizontal augmentation at the same time. This “Ring technique” allowed simplified ridge augmentation for a case that is often more challenging. (Fig. 4-6)



Figure 4. Autologous tooth powder bone prepared from extracted lower right 2nd molar.



Figure 5. Autologous tooth block bone prepared from extracted lower left 3rd molar.



Figure 6. Tooth Block Bone-implant complex. The “Ring technique”, where the fixture is engaged to the block bone graft in desired position.

Series of Clinical Views



Figure 7. The tooth block bone-implant complex placed into the socket site with good apical stability of the implant.



Figure 8. The defect between implant and extraction socket was grafted with sticky tooth bone and covered with CGF membrane.

The implant surgery was performed under local anesthesia. Patient's venous blood was taken from the forearm to make autologous fibrin glue (AFG) and concentrated growth factors membrane (CGF). The patient's venous blood is placed in the centrifuge machine (Medifuge™, Silfradent s.r.l., Sofia, Italy) using non-coated vacutainers to obtain AFG. After drawing the AFG portion with a syringe it is mixed with tooth bone particulates to form polymerization for 5-10 minutes. AFG was used to prepare Sticky Bone™. The beauty of sticky bone is that the graft material does not separate or fall apart, even with shaking due to its interlinked fibrin networks. Use of Sticky Bone™ prevents migration of bone graft material when correcting defects and the healing period is also minimized. This convenient graft form does not require bone tack or titanium mesh to stabilize or secure the graft as it is self-holding. CGF membrane was also prepared using four glass coated test tubes excluding anticoagulants. The blood in the vacutainers were placed in a special centrifuge at 2400-2700 rpm with a rotor turning at alternated and controlled speeds for 12 minutes.

Granulation tissue at the extraction socket of lower right 2nd molar was completely curetted prior to osteotomy. Under-preparation with osteotomy ensured apical stability of the implant and secured the tooth block bone-implant complex.

Remaining gaps between the socket and the implant block graft was filled with sticky tooth bone. CGF membrane was placed covering the bone graft to accelerate wound healing. Finally, primary closure with tension free sutures were placed to allow good healing and regeneration. (Fig. 7-10)

The final restoration was delivered after 5 months healing. (Fig. 11,12)

Discussion and Conclusion

Implant supported dental restoration has become a major option in the treatment of edentulous alveolar ridge for the past several decades. Extensive loss of alveolar bone presents a complex challenge for reconstruction. To reconstruct a three-dimensional ridge defect, autologous bone block procedure or conventional GBR techniques can be utilized. When particulate bone graft is used, titanium mesh is required to contain particulate bone graft during healing but these procedures are surgically time consuming, and technique sensitive. Early exposure of titanium mesh can cause bone loss and infection hindering regeneration of bone.

To stabilize particulate bone grafts, the use of AFG is recommended and it has several advantages, such as fast tissue regeneration, simplified ridge augmentation and reduced surgical time. Autologous bone is considered gold standard for bone grafting procedures because of its osteoinductivity, especially when three-dimensional ridge augmentation is required.

But this technique has several disadvantages such as early exposure of bone graft, neurosensory disturbance, increased postoperative pain, delayed surgical time, additional surgery from donor site and costs.

Decalcified tooth bone has similar components as human bone and is known to release diverse growth factors, and contains type I collagen after appropriate decalcification.^{1,2}



Figure 9. Primary closure with tension free sutures.



Figure 10. A postoperative radiograph showing implant and bone graft at extraction socket.



Figure 11. Mature bone regeneration after 5 months of healing.



Figure 12. Radiograph, 2 years postoperative, note stable alveolar crestal height and volume.

Recently, a method to prepare decalcified tooth block and powder bone by chairside was introduced. A machine (Vacuasonic®, Cosmobiomedicare Co, Seoul, Republic of Korea) that produces vacuum compression and ultrasonic vibration to control decalcification, along with buffering and sterilization process. This machine is able to transform a patient's extracted tooth into osteoinductive bone in block and powder form at the same time directly chairside.

In comparison with other bone graft types, autologous tooth bone has several advantages:

1. No risk of cross contamination from animal and human bone origin.
2. Faster bone regeneration due to its osteoinductivity.
3. Tooth block is malleable, easy to handle, and provides substantial stable volume.
4. Similar components as human bone.
5. Avoids need for autologous block bone harvesting, reducing morbidity for patients.
6. The clinician is able to prepare graft material by chairside.

Therefore, it is highly recommended to utilize the patient's extracted tooth for immediate or future surgery that may require ridge augmentation. After proper decalcification process, an extracted tooth can be reformed into noble osteoinductive bone graft for the patient.

References

1. I.D. Yeomans and M.R Urist. Bone induction by decalcified dentine implanted into oral, osseous and muscle tissue. Archs oral Biol. Vol. 12, 1967, pp.999-1008.
2. K. Bessho, T. Toshiro and M. Murata. Purification of rabbit bone morphogenic protein derived from bone, dentin, and wound tissue after tooth extraction. J Oral Maxillofacial Surg. 48;162-169, 1990.

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