β-tricalcium phosphate used with onlay graft for horizontal bone augmentation yielded preferable result: a case report

Yaqian Chen, Qingqing Wu, Yi Man
State Key Laboratory of Oral Diseases, West China Hospital of Stomatology, Sichuan University, China

Introduction

Rehabilitation of teeth lost due to disease, trauma, surgery or congenital problems with implant-supported prosthesis has become a common practice worldwide. (1) However, various bone defects often exist in implant area. In some severe atrophic cases, alveolar bone must be restored before or in combination with implant placement. Bone augmentation using onlay bone grafts which are harvested from either intraoral or extraoral sites is currently one of the most reliable techniques with potential success rate. (2,3) However, the use of autografts only as onlay grafts has some drawbacks such as the high morbidity at the donor site, limited bone graft supply and the need for multiple surgical sites. (4,5) Therefore, synthetic bone graft materials have become a popular choice for bone augmentation during last decade and the application of different bone substitutes has been described in different oral surgeries. (6,7,8,9) Recently, the synthetic bone graft based on β-tricalcium phosphate which can be completely absorbed in 6 to 9 months has been reported to be used in different oral surgeries such as alveolar preservation and periodontal defects with satisfactory clinical and histologic results. (10,11,12) Tricalcium phosphate grafts has structural characteristics which is similar to bone tissue, moreover, during reabsorption it can provide ion calcium and magnesium for surrounding tissue, thus creating a correct ionic environment, which could activate more alkaline phosphatase for further bone synthesis. (13) The purpose of this case report is to present clinical and radiographic results for a patient treated with β-TCP bone substitute with autogenous bone block harvested in situ as onlay grafts for horizontal bone augmentation.
Case Report

A 36 year-old healthy male with good oral hygiene required implant supported prosthesis for his two maxillary central incisors and right lateral incisor (tooth 11,12,21). (Fig.1,2) Presurgery radiographic examination showed insufficient bone volume for placement of implants 3.3 mm in diameter. (Fig.3)

After administration of local anesthesia, crestal and vertical incisions were made to expose the labial surface of the absorbed alveolar ridge and two autogenous bone block was harvested apical to the recipient site from the basal base and β-TCP bone graft (RTR Syringe package, Septodont, France) was placed in the donor site and dressed on the autogenous block. (Fig.4-9) Then the incision was closed after a titanium mesh and a barrier membrane was covered. (Fig.10) Routine anti-inflammatory therapy and prophylactic antibiotics were prescribed.

Six months later, a reentry surgery was performed. The bone graft material has been replaced by new formed bone which is an inspiring result as compared with six months ago. Two implants were inserted at tooth 12 and 21 with good primary stability. (Fig.11-13) CBCT examinations presented favorable outcome of the horizontal bone augmentation. (Fig.14-15)
**Fig. 6:** Use the filter of the syringe package sucking blood in surgical area.

**Fig. 7:** Fix two blocks on the alveolar ridge with titanium screws.

**Fig. 8:** Inject R.T.R. graft into the donor site.

**Fig. 9:** Finish dressing R.T.R. graft on the blocks.

**Fig. 10:** Flap closed with a releasing incision.

**Fig. 11:** Occlusal view six months later.

**Fig. 12:** Horizontal alveolar ridge was augmented by new formed bone.

**Fig. 13:** Two implants were placed in the anterior maxillary.

**Fig. 14:** CBCT of tooth 12 immediately after bone augmentation, six month later and immediately after implantation.

**Fig. 15:** CBCT of tooth 21 immediately after bone augmentation, six month later and immediately after implantation.
Discussion

This case report showed the potential advantage of β-tricalcium used with onlay graft for bone augmentation. The clinical and radiographic results show that this synthetic graft has been replaced by new formed bone six months later. Among all the graft materials, tricalcium phosphate is of special interest because it is a resorbable and osteoconductive biomaterial. (15) The in vivo osteoconductivity of synthetic bone graft is dependent on several properties including surface morphology, chemical composition and geometry at both the macro- and micro-scale. The pore size and interconnectivity of biomaterials can significantly influence the exchange of fluids through grafts and the delivery of ions, nutrients within and through the bone substitute. (16,17,18)

The bone graft used in this case consists of pure β-tricalcium with an appropriate macro- and micro-scale which turn to be good osteoconductivity and make this graft a potential scaffold for osteoblasts. Moreover, pure β-TCP can be totally absorbed in 6 months thus leaving no residuals in the implant area which may influence the remodeling of bone regeneration. (15) β-TCP used with autogenous bone block as onlay graft for anterior bone augmentation in this case gained inspiring result which is a motivation for more oral surgeons to conduct similar cases. Despite the favorable result of the primary surgery, long term observation is still needed for a series of clinical cases.

Authors:
Yi Man
From 2007 up to date: Clinical Lecturer of Implant Center, West China College of Stomatology, Sichuan University, China.
From 2010.09 – 2012.07: Clinical instructor, Clinical Lecturer of Tufts University School of Dental Medicine, Boston, USA.
From 2011.6-2012.7: Research Scholar of Massachusetts General Hospital of Harvard University, Massachusetts, USA.
From 2012.6 up to date: Standing Committee Member of Special Committee of Implant, Medical Society of Sichuan province, China.
From 2012.7 up to date: Associate professor of Oral Implantology Department, West China School of Stomatology, Sichuan University, China.
From 2012.9 up to date: Standing Committee Member of Committee of Implantology, Medical Society of China.
From 2013.2 up to date: Chair of Oral Implantology Department, Chair of Educational and research section of Oral Implantology, West China School of Stomatology, Sichuan University, China.
From 2014.11 up to date: International team for Implantology fellow.

Yaqian Chen
Resident of Department of Implantology, West China Hospital of Stomatology, Sichuan University, China.

Qingqing Wu
Resident of Department of Implantology, West China Hospital of Stomatology, Sichuan University, China.
References