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### Case Report

# AUTOLOGOUS OSTEOBLAST IMPLANTATION – A BOON TO BONE AUGMENTATION – A CASE REPORT

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## ABSTRACT

**Introduction:** Autologous osteoblast implantation is a newer technique employed in osteogenesis and has turned out to be a great boon in bone augmentation. It is a unique option available in bone augmentation when donor site has a limitation to offer the required volume. This article throws light on the fact that somatic cells can be harvested from a person, multiplied outside his body using bio-engineering principles and technologies and later introduced into a tissue defect. Thus tissue engineering is poised to have a major impact on cranio-maxillofacial surgery in near future.

**Materials and Methods:** We are reporting a case in which cyst was enucleated and the cavity was filled with autogenous osteoblast derived from anterior iliac crest bone marrow using Jamshidi needle – 11 Gz & 10 cm (care fusion) which was collected in a bottle with Dulbecco's Modified Eagle Medium (DMEM) and was harvested for 4 weeks after which it was implanted in the bony cavity.

**Results:** As per the serial radiographs taken the result was excellent and the bony cavity was adequately filled with woven bone.

**Conclusion:** Thus, Autologous osteoblast implantation, although a bit expensive, is a reliable technique for reconstruction of bony defects.

**Keywords:** Autologous Osteoblast Implantation, Ossron, Maxillary And Mandibular Reconstruction, Tissue Engineering, Bio-Engineering Stem Cells, Bone Marrow Grafting.

## INTRODUCTION

Autologous bone graft is considered to be the gold standard in the reconstruction of bony defects. However the inherent limitations associated with this method has directed the attention of investigators to new technologies such as bone tissue engineering.

Tissue engineering is an interdisciplinary field that applies the principles of engineering and life sciences towards the development of biological substitutes that restore, maintain or improve tissue function or a whole organ.

With diminishing resources, everyone today wants to do prudent investments for a better future. Scientific technology has taken a leap forward wherein today one can invest in one's own cells which can be cultured and used at a later date.

In Oral and Maxillofacial Surgery, there are many pathologies associated with bone, after eradicating which there may be residual bony defects which require reconstruction.

When cultured cells of a patient are used instead of bone graft, problems like donor site morbidities<sup>1,10</sup> during autografts,

immunologic problems<sup>6,8</sup> from allografts and implant loosening can be solved and thus, induce a natural regeneration<sup>8</sup>.

## CASE REPORT

A 25 years old male patient came with the chief complaint of swelling in the upper front region of mouth since past 3 months (Fig 1).

On examination there was intraoral swelling in the maxillary anterior region in relation to root pieces of 11, 21 and 22. There was Grade I mobility with 22. All involved teeth showed non vitality with electric pulp tester Radiographic investigation included IOPA, OPG (Fig 2) and maxillary occlusal view which showed unilocular, ovoid radiolucent lesion extending from 11 to 23 suggestive of periapical radicular cyst.

Treatment Planning comprised of harvest of bone marrow stem cells from iliac crest, endodontic treatment with 11, 21, 22, 23. Enucleation of cyst was done followed by implantation of bony defect with cultured osteoblasts.



Figure 1: Pre-operative frontal view



Figure 2: Pre-operative OPG

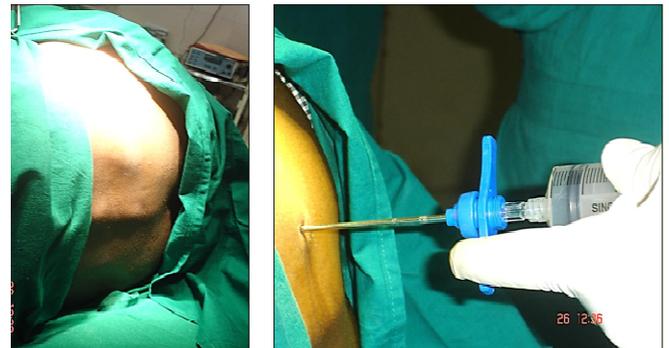


Figure 4: Harvest of Autologous Bone Graft



Figure 3: Pre-Operative occlusal view

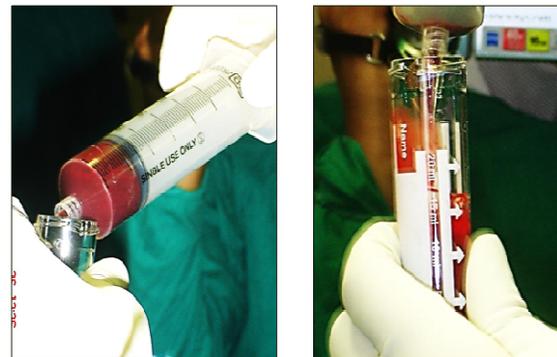


Figure 5: Culture Media

## MATERIALS AND METHOD

### A] Harvest of Bone marrow:

The surgical site –Anterior Iliac crest was prepared with standard surgical protocol. Local anaesthesia was infiltrated. Stab incision was taken on the anterior iliac crest. Jamshidi Needle - 11 Gz X 10 cm (Care Fusion) was inserted and bone marrow was harvested (Fig 4) and was collected in a bottle with DMEM (Fig 5).

In the mean while endodontic treatment was carried out with 11, 21, 22, 23.

B] Enucleation and implantation of bony defect with osteoblast.

After 4weeks, when the osteoblasts were ready to be implanted in the defect, patient was taken under sedation.



Figure 6: Bony Defect

The surgical site was prepared as per standard surgical protocol. Local anaesthesia was infiltrated. Full thickness trapezoidal mucoperiosteal flap was reflected from distal of 12 to mesial of 24.

The underlying bone was shaved with burs to expose the cystic lesion. The cystic lining was dissected from the surrounding bone and enucleated in toto.

The bony cavity was irrigated and isolated (Fig 6). Injection of “cell gel mixture” which was cultured in the laboratory from the harvested bone marrow (Fig 7) was introduced into the cavity and allowed to set for 8 minutes until it solidified (Fig 8). Flap was repositioned and interrupted sutures were given with 3-0 vicryl.

Patient was kept under observation and radiographs were taken at regular intervals in the follow up period.

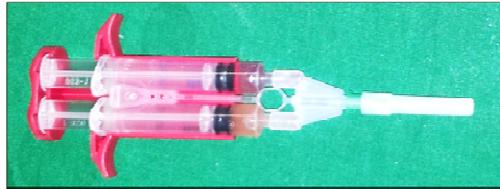


Fig 7: Cultured Osteoblasts ready for Implantation



Figure 8: Cystic Cavity Injected with the Cell Gel Mixture

## RESULTS AND DISCUSSION

Gradual deposition of healthy bone is seen in the post operative radiographs and also mobility associated with the involved teeth had reduced (Fig 9).

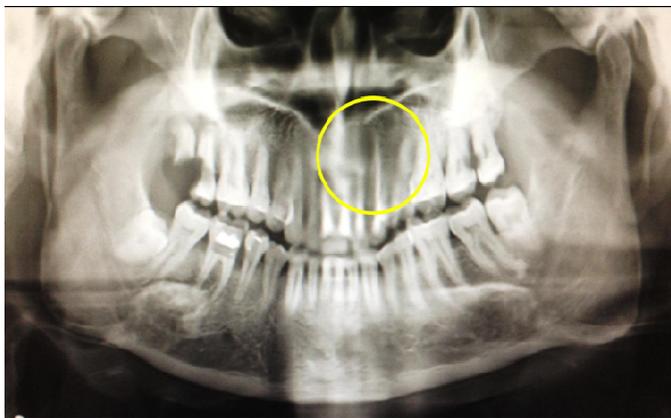


Figure 9: Post-operative OPG

Among the short comings of autologous bone graft, donor site morbidity, post-operative discomfort and possible infection at the donor site, need for blood transfusion, increased operative time, sometimes limits its application and hence there is an on-going search on the newer techniques for bone reconstruction. It is known experimentally that bone marrow stromal cells can differentiate into osteoblasts, chondroblasts, fibroblasts and fat cells according to the environment of the surrounding

tissues<sup>2,9,11</sup>. But the bone marrow stromal cells are very limited in number, so cell culture is essential in order to use them<sup>4,5</sup>. When these cells which have potential differentiative abilities are massively amplified and transplanted in fracture sites or sites that need bone formation, an anticipation that this will help in the healing is possible<sup>15</sup>.

It was hypothesized that newly formed bones are close to cancellous bones and that the number of osteoblasts that are in these bone tissues are evenly distributed by Vashishth et al and when converted into volume units, it is calculated that  $4.07 \times 10^5$  osteoblasts exist in 1 cm of bone<sup>16</sup>. Thus the theoretical volume that 12 million osteoblast can constitute about 30 cm<sup>3</sup>.

Autologous Osteoblast Implantation, though not cost effective is a simpler technique, leaving less morbidity at the donor site, reducing the chance of infection, better healing and promotes new bone formation. Greater bone defect created by a large cystic cavity or resection of jaw bones forms the ideal cases for considering this technique.

## CONCLUSION

In Oral and Maxillofacial surgery, autologous bone graft is considered more superior than allograft, however the quantity of autograft that can be obtained is limited and there is a risk of high morbidity, pain and possible infection of donor site. Therefore, many diseases and lesions leaving bony defects behind can be treated with autologous osteoblast implantation which yields excellent results.

Though, the technique is expensive, time consuming, but still it is a very simple procedure, easy to handle, good healing which has a bright future in treating such bony defects.

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