**CASE REPORT**

**Combined Use of Alveolar Distraction Osteogenesis and PRP in Anterior Vertical Ridge Augmentation followed by Dental Implants: A Case Report**

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**ABSTRACT**

Vertical defects of the anterior alveolar ridge are challenging in implant dentistry. The nature of the deficiency may present an obstacle to ideal implant positioning by compromising aesthetic and prosthetic needs. Various techniques, such as onlay bone grafting, segmental osteotomy (SO), guided bone regeneration (GBR), use of alloplastic materials and alveolar distraction osteogenesis (ADO) have been suggested to manage those situations. Each of these modalities has its advantages and disadvantages. When using an autogenous bone graft, donor site morbidity is unavoidable and some resorption of the bone graft does occur. ADO has an advantage of being capable of enhancing both hard and soft tissue simultaneously. The combination of ADO with platelet-rich plasma (PRP) during the consolidation phase of distraction can produce a stable aesthetic reconstruction of the alveolar bone and attached mucosa. This case report shares our experience in alveolar ridge augmentation using a central extraosseous alveolar distraction device with PRP followed by dental implant placement.

**KEYWORDS** alveolar distraction osteogenesis, platelet-rich plasma, vertical ridge augmentation, consolidation phase, dental implants, transport segment

**CASE REPORT**

A 30-year-old male patient presented at the OPD at the Department of Oral and Maxillofacial Surgery with chief complaint of missing teeth in the anterior region of the lower jaws and wanted a replacement for the same.

A detailed case history was taken which revealed a history of trauma as a result of a road traffic accident which resulted in a dentoalveolar fracture of the lower anterior region of mandible 8 months ago. There was a loss of the mandibular anterior teeth and reduced vertical ridge height as a result of the same (Fig. 1).

The extraoral and general examinations revealed no other abnormalities and the patient's medical history was unremarkable.

The intraoral examination of the mandibular arch revealed missing teeth; 41, 42, 43, 44 and loss of bone resulting in reduced vertical height of alveolar ridge in the same region. The vestibular depth was also insufficient.

An orthopantomogram (OPG) was advised and alginate impressions of both the arches were made, following which the casts were analysed. Models were essential for the prediction of the amount of bone augmentation needed at a gross level.

Pre-operative measurements were done on clinical models and OPG, and the alveolar height deficiency of approximately 6 mm was calculated. The vestibule–crestal height was measured on the models.

Based on the investigations, the following treatment options were available:

- Bone grafting techniques for alveolar ridge reconstruction prior to dental implant placement are well established.1
  - Autogenous bone grafting has many advantages over other techniques but is not without risks and potential complications, including wound dehiscence, infection, partial or total loss of the bone graft and donor site morbidity.1
  - However, autogenous bone graft has the risk of donor-site morbidity with the harvesting of the bone graft and graft resorption.2,3
- Guided bone regeneration has also been presented as a reliable solution for correcting atrophic ridges.3
  - But this technique may result in unpredictable bone formation or infection from membrane exposure.3

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Alveolar distraction osteogenesis and PRP

- Alveolar distraction osteogenesis (ADO)\(^2\)\(^,\)\(^6\) with platelet-rich plasma (PRP)\(^7\)
  - A corticotomy is used to fracture the bone into two segments, and the two ends gradually moved apart during the distraction phase, allowing new bone to form in the gap. When the desired or possible length is reached, a consolidation phase follows in which the bone is allowed to heal. Distraction osteogenesis has the benefit of simultaneously increasing the bone length and the volume of the surrounding soft tissues.
  - The PRP is an easily accessible source of growth factors to support bone and soft-tissue and to accelerate the healing. It is derived by methods that concentrate autologous platelets and is added to surgical wounds or grafts and to other injuries.\(^6\)

The treatment advised/recommended for the patient was alveolar ridge distraction to increase the vertical height along with PRP placement and the rehabilitation by dental implants followed by the prosthesis.

Informed consent was obtained from the patient. The procedure was done under local anaesthesia. A crestal incision with releasing incisions was taken from 41 to 44 regions. The labial mucoperiosteal flap was reflected and the ridge was visualised. The distractor was positioned and markings were done prior to osteotomy, screws were drilled in the same position for guidance later. The segment in the edentulous region was separated and the osteotomy was performed with a bar with two vertical cuts and one parallel horizontal cut to the edentulous ridge (Fig. 2). The osteotomy was completed with a thin osteotome. An intraoral central extraosseous alveolar distractor was placed after osteotomy. The distractor was positioned in the already marked position and fixed in place with monocortical screws (Fig. 3). The transport segment was mobilised, although it remained attached to the lingual periosteum. The device was activated to test the mobility of the transport disc without any hindrance. The system was returned to its initial position and the flap was sutured. The sutures were removed on the 10th postoperative day. Suitable antibiotics and analgesics were prescribed for 5 days.

The distraction procedure consisted of a postsurgical latency period of 5 days, followed by distraction for 6–7 days at the rate of 0.5 mm every 12 hours (1 mm/day).\(^8\) Platelet-rich fibrin was then prepared by taking 30 ml of venous blood by standard protocol and placed in the same region at the start of consolidation phase (Fig. 4). After a consolidation phase of 12 weeks, when there was radiographic evidence of good bone formation, the distractor was removed. Postoperative recovery of the patient was uneventful with satisfactory healing of the ridge.

A post-operative OPG was taken (Fig. 5). A gain in height of the ridge of 6 mm was noted. Three endosseous titanium dental implants (Osstem implants) were then placed in the distracted ridge of appropriate size (Fig. 6).
The prosthesis was then given to the patient 3 months after implant placement. An IOPA radiograph was taken (Fig. 7).

DISCUSSION

Vertical alveolar bone deficiencies are challenging cases for dental implantology. They create aesthetic and functional problems associated with increasing crown-to-implant ratio of the prosthesis. A range of surgical techniques have been suggested to address these problems, including guided bone regeneration, autogenous particulate or block bone grafts, and DO.

Alveolar distraction has traditionally been used for vertical augmentation of the alveolar ridge, but horizontal and segmental alveolar distraction have also been described. The main indication for alveolar distraction is to manage the vertical defects in the anterior maxilla and mandible. Posterior maxillary defects are best addressed with traditional techniques such as sinus lift or bone grafts. Vertical defects of the posterior mandible can be treated with alveolar distraction but, if the defect also has a horizontal component, a more traditional approach with an onlay bone graft or guided tissue regeneration is recommended.

Several clinical indications for ADO have been reported in the literature. Alveolar reconstruction in preparation for dental implant placement continues to be the most common indication.

General indications of ADO:
- Moderate to severe vertical alveolar bone defects
- Segmental deficiencies of the alveolar ridge
- Narrow alveolar ridges
- Adjuvant to other bone graft techniques
- Gradual vertical movement of ankylosed teeth
- Gradual vertical movement of an osseointegrated implant together with the surrounding alveolar bone

Advantages of ADO:
- Simple technique
- Simultaneous augmentation of bone and soft tissues
- Less resorption than traditional bone grafts
- Transport segment can include teeth or implants, facilitating the correction of occlusal or prosthetic defects
- Elimination of donor-site morbidity
- Shorter treatment times compared with traditional bone grafting techniques
- Allows the implementation of complementary techniques when results are not optimal

The technique has some disadvantages and can lead to complications, such as break of the distraction device, nerve injury or paresthesia, fracture of transport bone, haematoma, wound dehiscence, severe bleeding and even jaw fractures. Deviation of the TS from the
distraction path is another undesired situation. The rigidity of the device, the width of the mucosa, the volume of the transport and anchor segments, and the amount of augmentation can affect vector deviation.19

In the above case report, an adjunctive technique to improve the outcome of ADO by use of autologous PRP has been done. PRP is an easily accessible source of growth factors to support bone and soft-tissue and to accelerate the healing.20 PRP contains fibrin, fibronectin and vitronectin which are known to act as cell adhesion molecules for osteoinduction and as a matrix for bone connective tissue and epithelial migration.20 It is derived by methods that concentrate autologous platelets and is added to surgical wounds or grafts and to other injuries.7 Concentrated PRP made from the blood of patient was injected at the distracted site at the start of the consolidation phase.

In conclusion, the use of ADO for atrophic ridge along with PRP as an adjunctive method for vertical ridge augmentation has added an advantage in rapid healing of bone and soft tissue with the early consolidation of bone.

REFERENCES