

Segmental Osteotomy, Implants, and Restorative Procedures for the Treatment of an Extruded Maxillary Alveolar Segment

Abstract

This case report highlights a case of full-mouth rehabilitation in a 38-year-old female. Extrusion of the right posterior maxillary alveolar segment had resulted due to the presence of an opposing edentulous mandibular span, which had led to complete absence of restorative space in the lower arch. Maxillary posterior segmental osteotomy was carried out to obtain adequate space for placing an implant-supported prosthesis in the opposing edentulous mandibular span. The procedures before the surgery consisted of articulation of the diagnostic casts on to a semi-adjustable Hanau™ Wide-View articulator and a mock surgery on the upper cast to assess the amount of segmental osteotomy necessary to accommodate an implant-supported prosthesis in the lower edentulous region. Other procedures included implant placements, root canal treatment, post and core build-up, and full-crown placement on various teeth.

Keywords: *Implant, interarch space, porcelain fused to metal, post and core, posterior maxillary segmental osteotomy*

Introduction

After the extraction of mandibular posteriors, there is a tendency for supraeruption of the opposing maxillary posterior dentoalveolar segment, resulting in inadequate interarch space for the placement of any dental prosthesis in the edentulous span in the lower arch.^[1-3] In severe cases of supraeruption, extraction of the supraerupted maxillary molar teeth is often proposed.^[2,4] However, posterior maxillary segmental osteotomy (PMSO) is an effective procedure for obtaining sufficient interarch restorative space in these cases.^[1,3] This technique has also been recommended for obtaining space for placing implant-supported fixed or removable prosthesis in the mandibular molar region.^[5-7] This case report highlights a case where full-mouth rehabilitation comprising of PMSO, mandibular implant, post and core, and porcelain fused to metal (PFM) crown procedures were carried out to restore esthetics and function.

Case Report

A 38-year-old female patient reported to the Department of Prosthodontics with the complaint of broken anterior

teeth [Figure 1a]. Her maxillary arch contained all teeth except the third molars and the right first premolar, while the mandibular arch was devoid of molars on both sides and premolars on the left side [Figure 1b and c]. The upper central incisors were found to be nonvital with coronal discoloration and loss of tooth structure (Ellis class IV fracture). The edentulous span in the lower arch on the right side had resulted in supraeruption of the opposing dentoalveolar segment consisting of teeth 15, 16 and 17, leading to complete absence of restorative space on the lower arch [Figure 1d]. However, supraeruption of the left maxillary posterior dentoalveolar segment had not occurred [Figure 2a]. Although her only requirement was to have esthetic restorations on her upper central incisors, the importance of posterior rehabilitation to prevent excessive forces in the anterior region was explained to her. Informed consent was obtained from the patient after the full-mouth rehabilitation treatment plan was explained. A computed tomography scan was obtained to assess the periodontal and endodontic status of 15, 16, and 17 and the alveolar bone height and width of the corresponding mandibular edentulous

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span [Figures 2b-d]. Alginate impressions were made of both the arches, and the diagnostic casts obtained were articulated on to a semi-adjustable Hanau™ Wide-View articulator. Acrylic teeth (34, 35, 36, and 46) were placed using wax over the edentulous regions on the lower cast with reference to the occlusal plane. A mock surgery was carried out on the upper cast by cutting and lifting up the entire right posterior segment along with teeth to assess the amount of segmental osteotomy necessary to accommodate an implant-supported prosthesis in the lower-right edentulous region [Figure 3a and b]. It was decided to shift the right posterior maxillary alveolar segment containing 15, 16, and 17 to a posterior-superior direction by approximately 7 mm. Under general anesthesia, after administering local anesthesia, a buccal full-thickness flap was raised [Figure 3c]. Horizontal osteotomy was performed from the second premolar till the maxillary tuberosity, on the right side [Figure 3d]. A vertical osteotomy was carried out between 13 and 15, followed by a palatal osteotomy. The maxillary posterior segment was then separated and shifted as planned and was fixed

using plates and screws [Figure 4a]. Intraoral resorbable vicryl sutures [Figure 4b] were placed and intermaxillary fixation was carried out. After 2 weeks, the sutures and the intermaxillary fixation were removed. Six weeks after the segmental osteotomy was carried out, root canal treatment was performed for 11 and 21, and post space was created. Root canal impressions were made with pattern resin, using the direct technique [Figure 4c]. Cast metal posts and cores were then fabricated and cemented [Figure 4d], followed by temporary crown placement over 11 and 21 [Figure 5a]. A ridge-split procedure using micro-saw and ridge expanders (Esset kit; Ostem) had to be performed since the width of the alveolar ridge was found to be inadequate [Figure 5b]. Implant placement was done in place of 34, 36, and 46 [Figure 5c]. In the upper arch, tooth preparation was carried out for 16, 15, 13, 12, 11, 21, and 22 to receive PFM crowns [Figure 5d]. In the lower arch, the second-stage surgery was performed, cover screws were exposed, and abutments were placed. After tooth preparation was carried out for 44 and 45 to receive PFM crowns [Figure 6a], final abutment level impressions were made using Aquasil (Dentsply) addition silicone [Figure 6b]. PFM crowns were fabricated

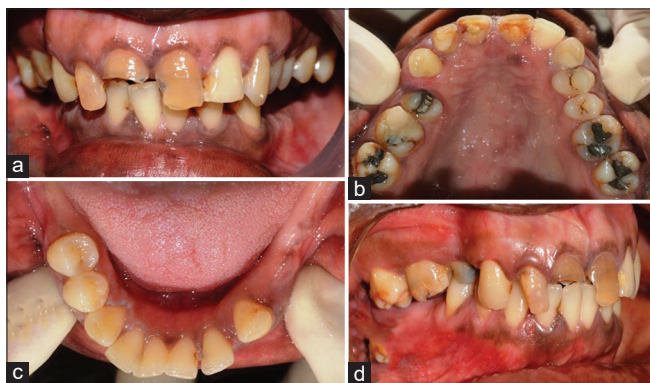


Figure 1: (a) Anterior view, (b) maxillary occlusal view, (c) mandibular occlusal view, (d) right lateral view

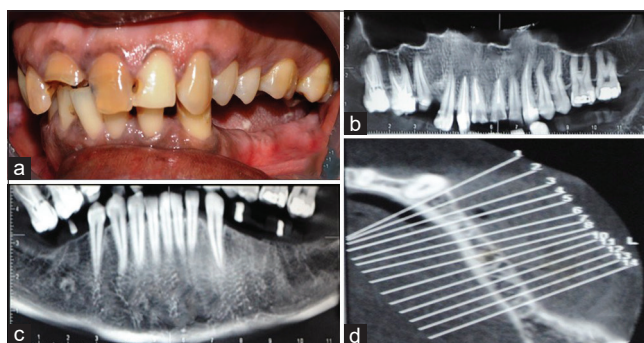


Figure 2: (a) Left lateral view, (b) computed tomography scan showing upper arch, (c) computed tomography scan showing lower arch, (d) computed tomography scan showing the narrow alveolar bone width of the lower-right arch

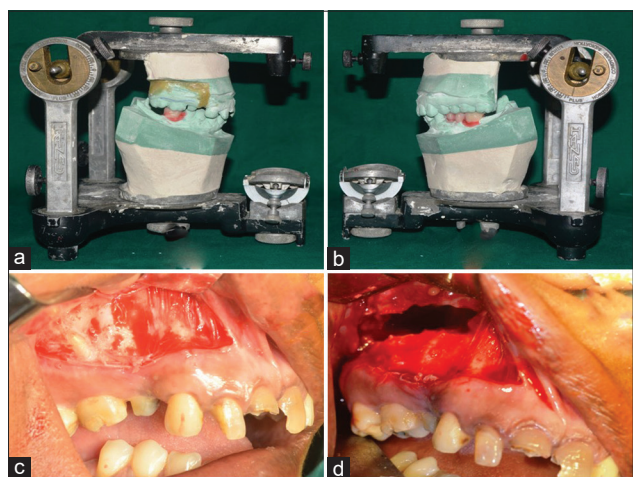


Figure 3: (a) Articulated diagnostic casts (right side) showing the mock surgery in the maxilla and acrylic tooth (46) on the lower arch, (b) articulated diagnostic casts (left side) showing acrylic teeth (34, 35, and 36) on the lower arch, (c) buccal full-thickness flap raised, (d) horizontal osteotomy

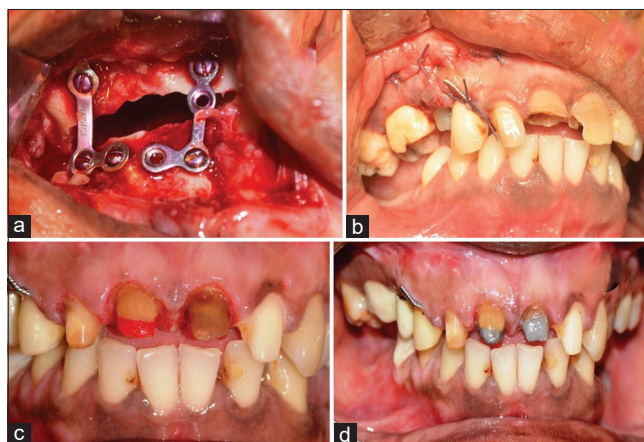


Figure 4: (a) Fixation with plates and screws after segmental osteotomy, (b) sutures placed after segmental osteotomy, (c) root canal impressions made with pattern resin, (d) cast metal posts and cores cemented

and cemented [Figures 6c, d and 7a], and a posttreatment orthopantomograph was obtained [Figure 7b]. The patient

was esthetically and functionally satisfied. One year posttreatment evaluation showed no esthetic or functional changes.

Discussion

PMSO is a procedure that changes the position of maxillary alveolar bone fragments containing teeth to improve or correct skeletal malocclusion. The procedure may also be done in the anterior maxillary region.^[8,9] PMSO has also been recommended for the treatment of open bite and deep bite in the molar region.^[1] PMSO has various advantages such as preservation of teeth contained in the segment, creation of sufficient interarch space for any dental restoration, reestablishment of occlusion, cost-effectiveness, and minimization of edentulous space.^[10] PMSO may result in complications such as postoperative infection, loss of vitality of concerned teeth, bone necrosis, hemorrhage, root damage, and inflammatory root resorption.^[11] However, none of the above complications occurred after the procedure, neither was there any root damage or loss of vitality in relation to 15. The removal of a tooth or teeth in the region of the vertical osteotomy is usually necessary to carry out segmental osteotomy. However, in this case, removal was not required, since vertical osteotomy could be easily carried out between 13 and 15 since 14 was absent. No conclusive protocol has been suggested with regard to whether maxillary segmental osteotomy and mandibular implant placement may be carried out during the same appointment or not.^[6,7,12] However, if both procedures are performed during the same appointment, the duration of treatment would get shortened.^[4] If the supraeruption is minimal, coronoplasty may be done to reduce maxillary molar height, sometimes coupled with endodontic treatment and crown lengthening. Forced orthodontic intrusion may also be attempted in certain cases.^[13] However, patient compliance, root resorption, and extrusion of anchorage teeth are the disadvantages of carrying out orthodontic intrusion.^[14] Moreover, carrying out maxillary segmental osteotomy decreases the treatment time as compared with orthodontic intrusion.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.



Figure 5: (a) Temporary crown placement, (b) ridge-split procedure using micro-saw, (c) Implant placement, (d) tooth preparation in the upper arch

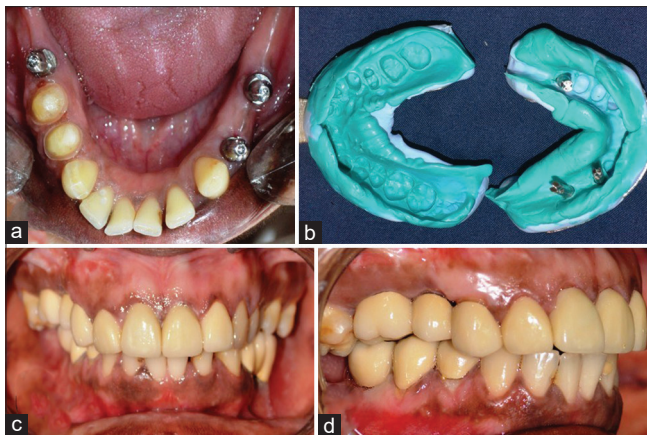


Figure 6: (a) Tooth preparation in the lower arch, (b) final impressions of both arches made using addition silicone, (c) porcelain fused to metal crowns cemented (anterior view), (d) porcelain fused to metal crowns cemented (right lateral view)



Figure 7: (a) Porcelain fused to metal crowns cemented (left lateral view), (b) posttreatment orthopantomograph

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