

Segmental Alveolar Osteotomy by Palatal Approach to Correct Excessive Angulated Dental Implants in Anterior and Posterior Maxilla

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ABSTRACT

Dental implants have been used for a long time to achieve better prosthetic and health conditions in the mouth. With the increase in their usage, more complications have occurred, and methods of solving these problems have been developed. One complication is insertion of the implant in the wrong direction. The aim of this case report is to describe an osteotomy technique to reposition a malpositioned dental implant. A female patient, aged 38 years, and a male patient aged 48 years, were referred complaining of the malpositioned osseointegrated implants, which had been placed in the region of the left maxillary first premolar and molar tooth, and in the region of the left maxillary lateral incisor. Due to severe buccal positioning of the implant fixtures, acceptable prosthetic treatment was not possible. Alveolar osteotomy procedure was used to reposition the implants. Satisfactory results were obtained by osteotomy for 18-month of follow up. We conclude that inadequately axially inclined implants can be successfully treated by alveolar osteotomy. The preservation of marginal gingiva permits obtaining better prosthetic results. To avoid the recession of attached gingiva, palatal approach technique may help the clinicians.

Keywords: Angulated abutment, Alveolar bone resorption, Dental implant malposition

CASE REPORT 1

A 38-year-old female patient, was referred complaining of the two malpositioned osseointegrated implants, which had been placed in the region of the left maxillary first premolar and molar tooth at a private practice, one year prior to this evaluation. The patient's dentist recommended removal of the implant and reconstruction of the region by bone graft. The patient was not satisfied and was referred to our clinic to solve the problem. We have determined that the severely angulated two implants would not support acceptable prosthetic treatment. However, when the gingiva formers were applied, it could be seen more clearly that the two implants were placed too buccally [Table/Fig-1]. We concurred with the referring dentist's advice to remove the implant and reconstruct the region by bone graft. The patient refused this option because of the time (about 9-10 months) and trouble involved, as well as the cost. Therefore, alveolar osteotomy was planned to reposition the implants.

The stone cast model was prepared for preoperative model surgery. The new position of alveolar segment with the two implants was simulated by using the sectioned stone cast model and diagnostic waxing. A prefabricated acrylic resin surgical splint was fabricated on the maxillary cast to be used during surgical procedure to determine the definitive position of alveolar segment [Table/Fig-2]. In addition, this splint was used to fix bone segments for four weeks after surgery.

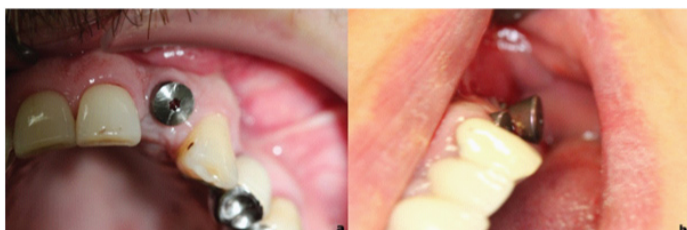
CASE REPORT 2

A 48-year-old male patient, was referred by his dentist to our clinic complaining of a malpositioned implant in the region of tooth 22. In clinical examination, adequate bone and soft tissue healing was observed [Table/Fig-1]. Therefore, osteotomy was planned to replace the implant.

Surgical Procedure

Since planned osteotomy consist of one or two teeth the most probable complication is thought to be necrosis of the bone segment. To avoid this complication blood supply of bone segment not only be disturbed but also had to be kept highest level. Therefore some measures were taken: 1-surgical procedure was achieved by palatal approach to avoid the marginal gingival recession and alveolar bone resorption and maintaining the marginal gingival harmony; 2-osteotomy segment was brought in to desired position by green stick fracture rather than complete mobility; 3-the buccal periosteal attachment remained intact through the entire surgery.

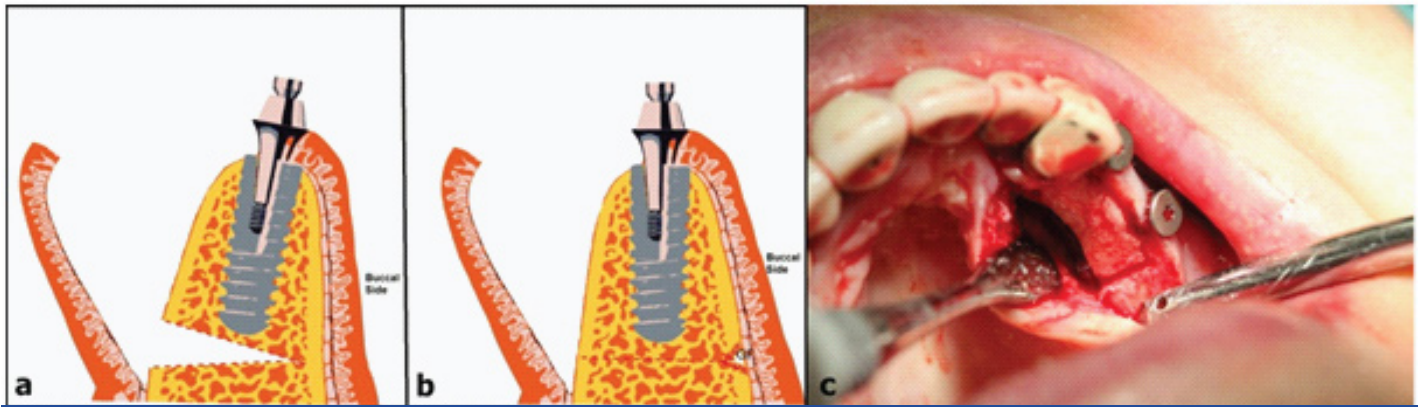
Surgical procedure was performed under local anesthesia (Ultracaine 2% with 1:150.000). For case 1, a full-thickness mucoperiosteal flap between the left maxillary lateral tooth and posterior alveolar ridge was elevated on palatal side through sulcular incision. For case 2, a mucoperiosteal flap between the canine and central teeth was made.



[Table/Fig-1]: Excessive labially/buccally angulations of dental implants
a. Preoperative intraoral view of Case 2.
b. Preoperative intraoral view of Case 1.



[Table/Fig-2]: a. Angulations of the posterior maxillary dental implants can be seen in stone cast model. b. After the new position of alveolar segment was simulated by using the sectioned stone cast model, a prefabricated acrylic resin surgical splint was fabricated. To provide better prosthetic planning, the temporary crowns were used in preparation of splint



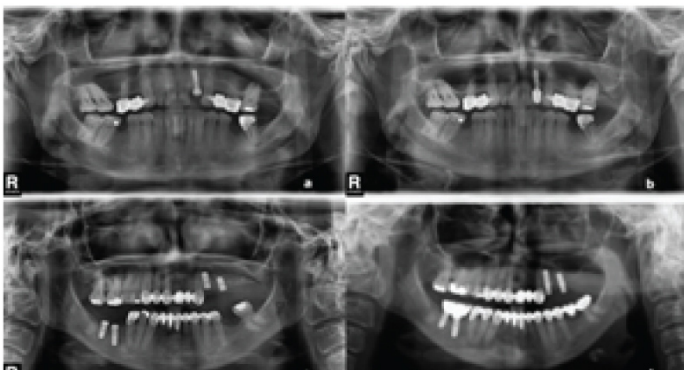
[Table/Fig-3]: a. Illustration of the green-stick fracture on the buccal cortical bone was accomplished by finger pressure
b. Horizontal osteotomy line is shown in illustration. (GF= Green fracture zone)
c. Intraoperative view of the horizontal and vertical osteotomy of the block with implants in Case 1



[Table/Fig-4]: a. New position and wire fixation of the implant in Case 2
b. New positions of the implants in Case 1



[Table/Fig-5]: a. Intraoral view of the Case 2 after prosthetic rehabilitation
b. Intraoral view of the Case 1 after prosthetic rehabilitation



[Table/Fig-6]: Preoperative (a) and one year later postoperative panoramic views (b) of Case 2. Preoperative (c) and one year later postoperative panoramic views (d) of Case 1. It can be clearly seen that the length of the projection of the implants on the postoperative panoramic view were increased according to preoperative view

Later, three osteotomies were performed by an OT7 piezoelectric scalpel with thickness of 0.55 mm: one horizontal (apically to the implants) and two vertical osteotomies located laterally at least 2 mm away from the implant-surrounding bone by the palatal approach. The buccal periosteal attachment remained intact through the entire surgeries. The vertical osteotomies were done only monocortically. Using a thin interdental osteotome, the vertical osteotomies were then completed towards to buccal side with care taken not to cause trauma to root of the adjacent teeth. On the horizontal osteotomy line, a 5 mm width cortical osteotomy was also made for drawing up the alveolar segment with the implants [Table/Fig-3]. A green-stick fracture on the buccal cortical bone was accomplished by finger pressure. The new position of mobilized segment was controlled [Table/Fig-4].

For case 1, the surgical splint fixation was carried out for 4 weeks, after which no mobility was present at the bone segments. Prosthetic rehabilitation was finished 6 months after osteotomy. Both clinical and radiographic examination revealed good healing of both soft and hard tissues [Table/Fig-5,6].

For case 2, the mobilized segment was stabilized by ligature wire to adjacent teeth [Table/Fig-4]. Wire fixation was carried out for four weeks, after which no mobility was present at the bone segments. Prosthetic rehabilitation was finished six months after osteotomy. Both clinical and radiographic examination revealed good healing of both soft and hard tissues [Table/Fig-5,6].

DISCUSSION

Dental implants can be placed poorly positioned as a consequence of some surgical difficulties, such as inadequate alveolar bone and restricted mouth opening or losing one's orientation during surgery [1,2]. Treatment modalities for malposed dental implants have been reported previously to overcome such conditions comprising hybrid prosthesis, customized abutments, overdentures supported by a milled bar or modifying size and form of crown placed over fixture [3,4]. Unfortunately, only moderate malpositions can be treated by these alternatives. In severely malposed cases, clinician is obliged to left implants buried position or to remove malposed implant and replace with a new implant inserted in the proper position [5]. Surgical removal of dental implant often causes challenging defects, especially in hard tissues requiring subsequent bone grafting methods [6].

Severely malposed dental implants have been treated by using segmental alveolar osteotomies for many years reported in the literature [5,7]. This technique has been initially used to treat ankylized maxillary canine and close one-tooth diastemas [8]. Unfortunately, it is not suitable for all cases, which requires primer stabilization of segments that cannot be provided properly [2,5,7]. In such cases, malposed implant can be left submerged especially in multiple implant rehabilitations, in which situation the support of the malposed implant is negligible. Removal of implant often requires hard tissue augmentation to allow placement a new one [6].

The maintenance of the periosteum is an important factor that affects the success of repositioning [5]. Most authors claimed that flap design must preserve as much as possible the vascularization of segmented alveolar bone [2,4]. Palatal periosteum and vessels are the main source of vascular nourishment of maxillary alveolar bone but not the only one. Buccal periosteum, also contributes nutritional irrigation of segmented bone [9]. In many cases that had one malposed dental implant, buccal approach was preferred for the alveolar segmental osteotomies. According to these reports, malposed dental implant especially requiring vertical and horizontal movement to get correct position can be easily treated by means of buccal approach [2,4,10]. However, excessive buccally or labially

angulated implants are more challenging cases for clinicians because of osteotomy and grafting requirements on the apical region of the segmented bone [5,11]. Furthermore, on obtaining autogenous block bone graft from mandibular ramus or symphysis increases patient discomfort [2,10,12]. To avoid harvesting a bone graft, in present case, palatal approach to the alveolar bone segment with two implants was preferred.

Marginal gingiva adjacent to the implant is a risky area and may jeopardize obtaining satisfactory prosthetic outcome. In the case reported by Tavares et al., [2], a marginal gingiva left attached labially was planned to provide a better marginal harmony between crown and gingiva. Semilunar incision to approach an alveolar bone, proposed by Olate et al., [12], is performed as an alternative technique to maintain a more esthetic gingiva. In many reported cases, an alveolar bone resorption was seen and left untreated after segmental osteotomy procedure [4,5,11]. We thought that buccally elevated surgical flaps may increase alveolar bone resorption as well as cause marginal gingival recession. Thus, in present case, we preferred palatal approach to avoid such aesthetic problems.

The stability of the mobilized block is another important factor that the segment needs for adequate bone healing. The plates and screws, the prefabricated cast-metal substructure was cemented onto the central incisors and screwed directly into the head of the implants and prosthesis of the implant attached to the neighboring teeth with steel wire and resin are the fixation techniques of the segmented block with implants in the literature [5,13,14]. In a few reported case, authors fixed the mobilized bone segments by means of only a bone block graft obtained from the mandibular ramus [10,12].

CONCLUSION

Inadequately axially inclined implants can be successfully treated by segmental alveolar osteotomy. The preservation of marginal gingiva permits obtaining better prosthetic results. To avoid the recession of attached gingiva, palatal approach technique may help the clinicians. Additionally, segmental alveolar osteotomy procedure may prevent implant removal and replacement, especially in esthetic cases where removal of an implant might cause bony defects that are difficult to treat without subsequent surgical procedure.

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