Segmental osteotomy for the correction of a malpositioned single implant: An 8-year follow-up

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This case report is an 8-year follow-up of a malpositioned single implant, which was treated with segmental osteotomy, to confirm the treatment’s characteristics, indications, and advantages. Deep buccal positioning of an endosseous implant placed in the maxillary left central incisor area did not permit acceptable prosthetic rehabilitation, despite its favorable bone insertion with no significant marginal bone loss. The surgical procedure included osteotomy and block movement performed toward the lingual and cervical position, fixed with a provisional prosthesis and miniplates and mini-implants. A connective tissue graft was necessary for esthetics optimization and was performed in a second stage. Advantages including the prevention of alveolar ridge damage, the improvement of gingival contour, and the use of an already integrated implant are presented. Clinically satisfactory hard and soft tissue stability permitted us to consider segmental surgery as a reliable alternative for malpositioned osseointegrated implants. (Quintessence Int 2011;42:xxx–xxx)

Key words: dental implants, malpositioned implant, prosthetic rehabilitation, segmental osteotomy

The increased use of endosseous implants to replace lost teeth has been accompanied by a number of complications related to both planning and execution. Malpositioned implants can make prosthetic rehabilitation impossible, even with the wide range of available prosthetic components. In addition, the combination of a malpositioned implant and gingival smile can result in an unacceptable esthetic result, which becomes even worse if compared to a conventional fixed prosthesis. Removal of an implant usually results in alveolar ridge bone loss, requiring further reconstruction of the area and involving both soft and hard tissue, as well as an attempt to insert a new implant, which is considered a complex procedure that carries risky, nonstable results. Kassolis et al1 proposed segmental surgery an alternative to make use of the already osseointegrated implant to correct its own positioning from the basal bone. Martin et al,2 Raghoebar et al,3 Jensen et al,4 and Basa et al5 also suggested this possibility and emphasized the criteria for its indication, including the presence of available physical space for osteotomies, enough basal bone for osteosynthesis, and stable and favorable soft and hard peri-implant tissue. Once there is the movement of stable structures, segmental surgery may be as predictable as orthognathic surgery.

Orthognathic surgery in combination with orthodontics presents long-term stability6,7 in both large and small segments. Similarly, when indicated, distraction osteogenesis has presented satisfactory results for both natural teeth and implants.8,9 These modalities are particularly interesting when it is necessary to gain soft tissue. In conventional situations, the previously cited procedures can bring risk and disadvantages compared to procedures that immediately correct discrepancies.

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CASE REPORT

A 21-year-old woman presented with a 3.75 × 15 mm malpositioned standard machined surface implant (Nobel Biocare) in the maxillary left central incisor area in a deep buccal position (Figs 1a and 1b), according to established pattern positioning. In a previous attempt to execute a prosthetic rehabilitation, a personalized abutment with pink ceramic was used, but led to an unsatisfactory result. The situation was compromised due to wide exposure of the area while the patient smiled. A periapical radiograph presented no bone loss around the implant and a satisfactory insertion level of the proximal area of the adjacent teeth, permitting the maintenance of the soft tissue (papilla). The bone structure in the apical area of the implant was also analyzed for segment stabilization.

Cast surgery planning and surgical template and provisional prosthesis preparation

A cast for the setup was obtained after casting the 4.1-mm implant platform and external-hexagon connection. Cuts simulating osteotomies were performed, making movement of the segment toward the palate and in the cervical direction possible. The use of an implant replica in the cast and a nonrotational UCLA prosthetic component made it possible to build a surgical template on the cast, which combined distinct functions. By extending incisal support and due to the possibility of screwing the implant, a template was made to be used during surgery to guide the cervicoapical and buccopalatal positioning of the segment until its fixation. Using the same template and composite, the immobilization of the segment in the incisal level was possible, bonding it to the neighboring teeth. The provisional prosthesis was prepared following the anatomical contour of the cervical and incisal surfaces of the incisors. The contact point between implant and teeth was prepared with a 5-mm distance from the bone crest, permitting gingival tissue in the interproximal spaces to form the papilla. In this way, the template also served as a provisional prosthesis during healing (Figs 2a and 2b). The provisional nonrotational component in the template base facilitated the adaptation to the implant platform during surgical manipulation.

Surgical-prosthetic procedure

Surgery was performed under general anesthesia, starting with a sulcular incision in the region of the implant and adjacent teeth and followed by oblique incisions that permitted a wide mucoperiostal reflection for buccal cortical bone exposure. The osteotomy was performed using an oscillating thin saw to make thin cuts around the implant (Fig 3a). The separation of the segment in the apical level was made using...
chisels, respecting the nasal cavity walls. The segmental alveolar process and implant were separated, and care was taken to avoid reflection of the palatine flap. The template was adapted with the screwing of the provisional prostheses, permitting stabilization of the block when positioned on the neighboring teeth. For the apical osteosynthesis, a miniplate with three 1.0-mm mini-implants was used (Fig 3b). A small block of bone graft was retrieved from the retromolar area to fill the apical gap that remained due to the vertical displacement of the segment. After using the light-cured composite to bond the template to the teeth, the soft tissue was sutured. After 40 days, the coronal splint was removed. The provisional prosthesis was removed and reshaped for a new fixation. Three months passed for the maturation of the peri-implant tissue; meanwhile, esthetic contouring of the maxillary right central and left lateral incisors was performed. Before constructing the definitive prosthesis, optimization of the gingival projection was planned with a connective tissue graft retrieved from the hard palate. Buccal surgical access permitted the removal of the plate and mini-implants as well as the ability to perform (at a more cervical level) the gingival graft. After 2 months with the implant in function with the provisional prosthesis, as well as the accommodation of the surrounding tissues, the definitive prosthesis was prepared.

**Fig 2** (a) Surgical template serving as a guide for implant repositioning. (b) Provisional prosthesis, bonded to neighboring teeth with a metallic wire, also presenting the satisfactory conditions of the osseointegrated implant.

**Fig 3** (a) Segmental osteotomy performed with a saw. (b) Segmental fixation with miniplates and mini-implants.
Rehabilitation with a customized abutment on the maxillary left central incisor and Procera system (Nobel Biocare) copings involving the maxillary right and left central incisors and left lateral incisor were executed. After ceramic application and crown construction, a satisfactory esthetic and functional result was achieved. After an 8-year follow-up, no intervention was performed, attesting to the treatment’s stability. Clinical and radiographic examination showed no peri-implant bone loss or injuries within the gingival contour (Figs 4a to 4c).

DISCUSSION

A malpositioned implant usually leads to severe esthetic and functional disturbances. According to Stacchi et al., there are three surgical options to resolve this situation: burying, repositioning, or removing the implant. Burying the implant requires another type of rehabilitation, such as the use of a fixed prosthesis, leading to frustration for a patient initially eager for an implant-supported prosthesis. As such, the latter two options are desirable, considering that the removal of the implant usually leads to loss of bone tissue. Implant repositioning has been the first option; however, all the described requirements suggested in literature must be considered (Fig 5).

A distance of at least 3 mm between the tooth and implant or between implants must be respected. Segmentation in narrower areas can cause root exposure of neighboring teeth. The maintenance of a very thin bone structure can result in impaired vascularity, leading to a disturbance in fracture consolidation and making necrosis and peri-implantar tissue collapse possible.
The necessity of maintaining biologic distances around implant platforms must be understood. An interface of at least 2 to 3 mm is permitted in this type of implant design, considering bone loss until the second thread is normal. As a result, implant removal may be the best option. It is also very important to analyze the crestal bone level of adjacent teeth and implants. Periodontal maintenance will favor the future esthetics of the implant prosthesis, especially in relation to natural teeth. If a deficit in crestal bone level is detected, even with adequate keratinized gingiva, technique indication must be careful, due to a possible limitation of the segment vertical movement and lack of predictability of soft tissue condition.

Remaining bone structure at the apical level must exist above the implant apex to permit segment stabilization. In addition, the distance in relation to noble structures such as the maxillary sinuses, nasal antrum, and neural-vascular bundle should be observed.

In face of an unfavorable peri-implant mucosa condition, the possibility of performing gingival grafts before segmentation must be considered, temporarily burying the implant. In the same way, coronal repositioning of soft tissue is relevant as well as the maintenance of the palatal insertion of the bone or implant segment for tissue repair.

Correction of the implant positioning must be carefully planned, since the possibility of error is higher compared to traditional treatment.5

Segmental surgery in implant areas presents fewer risks when compared to segmental surgery in dentate areas. This is because of a lack of periodontal ligament and dental pulp, which decreases the risk of inflammation while taking into account the possibility of degenerative changes and pulp necrosis.13

Adequate surgical training is extremely important for treatment success. Segmental surgical procedures are useful when prior treatments fail. Nonetheless, they are considered invasive, demanding ability and respect for the conditions.

**CONCLUSION**

Segmental osteotomy as a surgical approach can correct malpositioned implants when a satisfactory peri-implant condition exists. Although considered a complex procedure, the technique presented was predictable and stable in the reported case. Further long-term studies including a larger number of patients are necessary to support the present result.

**REFERENCES**


