Segmental Osteotomy to Reposition a Malposed Dental Implant in the Anterior Maxilla: A Clinical Report

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Abstract

A dental implant may be positioned unfavorably for a variety reasons. Solutions involve various prosthetic alternative treatments or surgical approaches, such as removing the implant and replacing it with bone grafting. This case report describes the use of a segmental osteotomy for repositioning a malposed dental implant. A 24-year-old man was referred with an unrestorable osseointegrated dental implant that had been placed in the region of the maxillary right central incisor. The implant was repositioned using a segmental osteotomy. The segment was stabilized with orthodontic brackets, a miniplate, and screws. Six months later, the brackets were removed and a permanent restoration was fabricated. This technique has been used for many years to reposition natural dentition; however this is the only report which has been used orthodontic brackets for stabilization the segment. It provides the dental practitioner with a treatment alternative that is time-effective, cost-effective, and predictable.

Key Words: Osteotomy, Orthodontics, Dental Implant

Introduction

Teeth and bone are frequently lost in the traumatized anterior maxilla and the traumatized area often requires bone augmentation to provide appropriate dental implant support [1]. Various bone graft techniques can be used to manage bone and soft tissues in these traumatized areas, such as the crestal split technique, interpositional bone grafting, onlay bone grafting, and guided bone regeneration [2-5]. It is essential that the treatment team (prosthodontist, surgeon, periodontist, and dental technician) and patient understand all of the variables involved to avoid potential complications or failure. Like an ankylosed tooth, an endosseous dental implant has no periodontal ligament and cannot be repositioned orthodontically. Inadequate presurgical planning or poor surgical technique can result in the use of compromised prosthetic treatments (custom/angled abutment, porcelain overcontouring, long crowns, high crown-to-root ratio, etc.) or surgical treatments (removal and replacement implant, secondary bone grafting, etc.). In extremely compromised cases, segmental osteotomy, an established orthognathic surgical procedure, is an important treatment alternative for correcting an otherwise non-restorable maxillary anterior region [6,7]. This case report describes the correction of a malpositioned endosseous implant using a maxillary anterior single-implant segmental osteotomy.

Case Report

A healthy 24-year-old man was referred complaining of an unrestorable osteointegrated dental implant (*Figures 1A and 1B*). An endosseous dental implant had been placed in the region of the maxillary right central incisor approximately 5 months earlier, after the tooth had been lost in a traffic accident. Following osseointegration, the restoring dentist examined the implant and found it to be positioned excessively palatally, making the tooth unrestorable, even with the use of an angled abutment. The treatment options were discussed with the patient and a decision was made to reposition the implant by performing a segmental osteotomy.

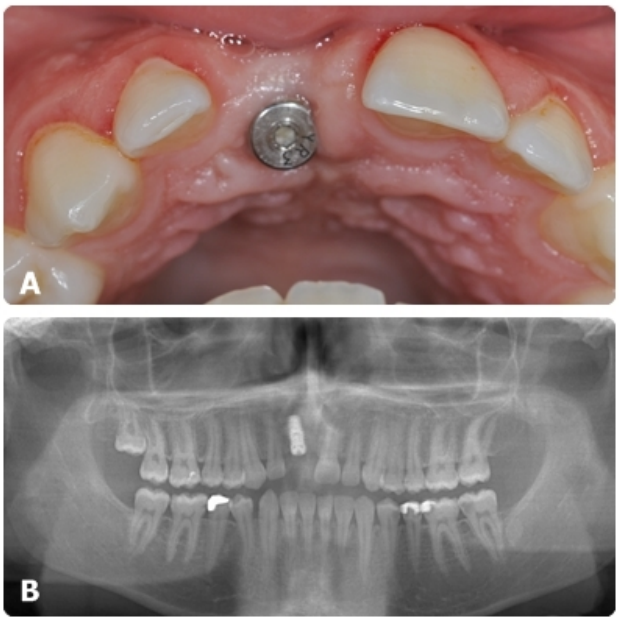

Figure 1. *Preoperative examination; A. Intraoral view of the palatinal positioned implant; B. Panoramic radiograph.*

Preoperatively, the impression was taken with closed tray technique with the impression cap over the implant and model was poured. The metal trial was carried out and fist of all metal crown framework was fabricated as to be passive fitted to the abutment, than regardless of considered implant position the veneer porcelain was produced for proper implant cite and an orthodontic bracket was bonded on the labial surface of the crown (*Figure 2A*). The brackets also have been bonded on the all maxillary anterior teeth in order to stabilize the segment after the segmental osteotomy (*Figure 2B*).

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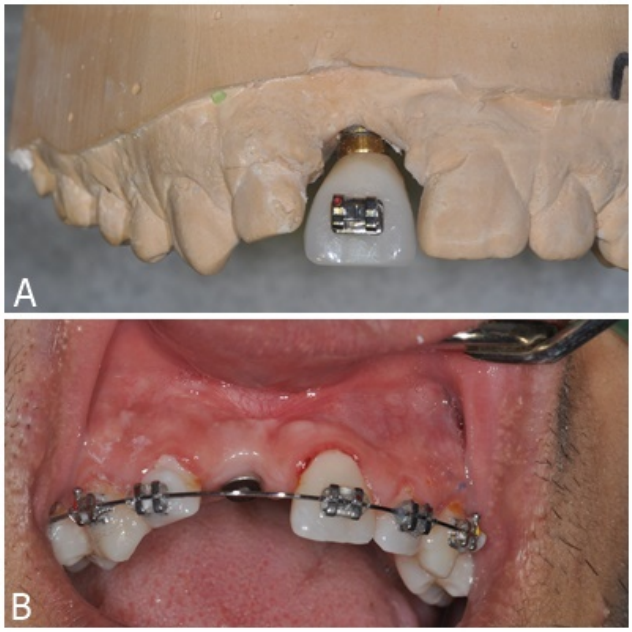

Figure 2. *Preoperative prosthetic procedures; A. A metal substructured porcelain crown was fabricated onto the new positioned implant and an orthodontic bracket was bonded on the labial surface of the crown; B. The orthodontic brackets were bonded to the maxillary anterior teeth.*

Just before the operation, the healing abutment was removed, the permanent abutment was inserted, and then the crown was cemented to the implant (*Figure 3A*). Under intravenous sedation and local anesthesia, a vestibular incision was made and the periosteum was elevated cautiously to ensure good vascularization of the osteotomized segment. Two vertical and one horizontal (apically to the implant) osteotomies were made in the cortical bone using a Piezosurgery handpiece (W&H Piezomed) (*Figure 3B*).

The implant and surrounding bone were mobilized with osteotomes (*Figure 3C*). The implant was repositioned in a more labial position. It was stabilized coronally using orthodontic wire and a bracket to adjacent teeth and apically with microplates and microscrews (plates 0.6 mm in profile and screws 5 or 7 mm long and 1 mm in diameter) (*Figures 3D and 3E*). The flap was sutured with 4/0 Vicryl.

The postsurgical period was uneventful. The orthodontic brackets were removed and prosthetic rehabilitation was completed 6 months after the osteotomy (*Figure 4*). Clinical and radiographic examinations revealed good healing of both soft and hard tissues (*Figure 5*).

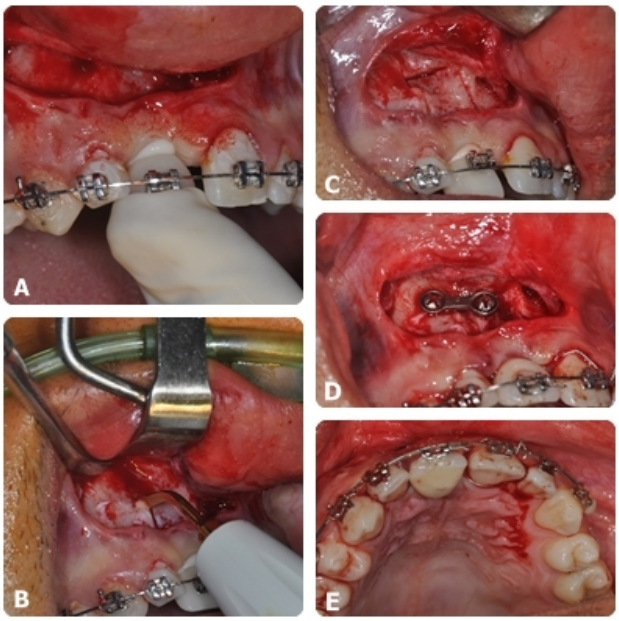

Figure 3. *Surgical repositioning of dental implant; A. The crown was cemented onto the implant; B. Two vertical and one horizontal (apically to the implant) osteotomies were made into cortical bone using a Piezosurgery handpiece (W&H Piezomed); C. The implant was repositioned in a more labial position; D. Microplate and microscrews are used to secure the segment in the ideal position; E. The crown was attached to adjacent teeth with orthodontic brackets and wire.*

Figure 4. Radiographic view six months after the surgery.

Figure 5. Final Prosthetic treatment.

Discussion

Surgical implant repositioning using a segmental osteotomy and rigid fixation in the ideal position with microplates and microscrews is an alternative treatment for improving such clinical situations. For many years, severely malposed dental implants have been treated using segmental alveolar osteotomies [8,9]. This technique was initially used to treat ankylosed maxillary canines and to close one-tooth diastemas [10]. The flap must preserve as much of the vascular supply as possible to the segmented alveolar bone [11]. Palatal periosteum and vessels are the main source of vascular nourishment of maxillary alveolar bone, but not the only source. Buccal periosteum also supplies nutrients to segmented bone [12]. The surgical procedure requires delicate surgery with minimal periosteal stripping to ensure good blood supply to the segment, which promotes faster healing and discourages necrosis, fibrosis, or malunion. Extra care must be taken with segmental osteotomies to protect the blood supply, especially with small segments.

Success of the segmental osteotomy is critically dependent on optimal preservation of blood supply to the mobilized alveolar segment. Therefore periosteal attachment to a mobilized segment is preserved wherever possible. In the maxilla, partial or complete downfractures can be created, repositioned and secured with fixation appliances. Honig et al. described the Wassmund technique as an approach that did not involve buccal or palatal mucoperiosteal flap elevation. Instead osseous cuts were accomplished by tunneling underneath the periosteum in an effort to protect collateral circulation [13]. Ahmed described the Wunderer technique as an approach preserving blood supply to the buccal tissues that involved only elevation of a palatal flap using a transverse incision. In contrast, Ahmed also described the Cupar technique, which included elevation of a mucoperiosteal flap to accomplish the buccal osteotomies whereas selective tunneling was used to establish the palatal osteotomies with minimal disruption to blood supplies [12]. Regardless of surgical design, assurance of adequate collateral circulation to the segmented portion is considered essential.

The stability of the mobilized block is another important factor to ensure adequate bone healing8. Olate et al. suggested a semilunar incision to approach the alveolar bone as an alternative to maintain a more esthetic gingiva [14]. Many authors prefer a buccal approach for alveolar segmental osteotomies to reposition one malposed dental implant. A malposed dental implant that requires vertical and horizontal movement to obtain the correct position can be treated easily using a buccal approach [15]. In this case, only a horizontal incision was used, which enhanced the vascularization of the soft tissues and avoided compromising the interdental papillae.

The bone osteotomy can be performed with a handpiece and bur, oscillating micro-saw, laser, or Piezosurgery. Each technique has its advantages and disadvantages. To avoid soft tissue damage and to protect the blood supply, we used a Piezosurgery system, with handpieces with different angulations to make the cut easier and safer. The titanium material used for rigid fixation is micro-sized and was placed strategically in a position that did not require postsurgical removal. The clinical course of healing following the segmental osteotomy was similar to that in other limited orthognathic procedures, requiring 4–6 weeks for completion. Although clot stabilization and callus formation occurred within the first postoperative week, mobility of the segmented jaw may be discernible clinically for 3 weeks. Functional continuity of the segmented and adjacent bone is generally achieved within 6 weeks. Radiographic evidence of the osteotomy wound margins disappears at 6–9 months [16]. In this case, clinical and radiographic healing occurred within 6 months. The orthodontic brackets were removed and a permanent restoration was fabricated.

In summary, this case report describes another option for managing malposed dental implants using a segmental osteotomy with the orthodontic bracket stabilization technique which has been used first time in this case. This technique has predictable, time-effective results, which may ultimately prevent implant removal and replacement, furthermore using orthodontic brackets is more protective for the periodontal tissues.

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