Use of Distraction Osteogenesis for Repositioning of an Osseointegrated Implant: A Case Report

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This report presents a clinical case in which distraction osteogenesis was used for the vertical repositioning of an implant already osseointegrated in the maxillary right central incisor area. An adhesive prosthesis was cemented over the neighboring teeth to accomplish this procedure. The prosthesis was made with a temporary cylinder directly over the implant to guide its repositioning. After incision and osteotomy, the area that contained the implant was fixed with an implant mount screw. After initial gingival healing (7 days), activation of the distraction was begun. The screw was activated with a full turn thrice a day, for a total of 1.0 mm per day for 7 consecutive days. Thereafter, the bone was allowed to heal for 3 months. Distraction osteogenesis led to a better implant-crown relationship, even after the osseointegration of the implant, thus improving the esthetic results. Int J Oral Maxillofac Implants 2008;23:551–555

Key words: *distraction osteogenesis, osseointegrated implants, vertical osseous defects*

Osseointegrated dental implants have been used for the past 40 years as a predictable treatment with respect to implant stability.[1,2] However, achieving optimal esthetics in the anterior region remains a problem, as deficiencies in the gingival and bony contour may limit and influence the final result. Augmentation techniques have been developed for the restoration of bone defects preceding implant placement.[3] When the defect exceeds a certain limit of vertical bone loss, however, gingival tissue cannot cover the region.[4]

Distraction osteogenesis was first used by an orthopedic surgeon[5,6] to correct maxillofacial defects[7]; since 1996, it has been used to correct vertical defects of alveolar ridges.[8–19] In most cases, alveolar distraction osteogenesis simultaneously corrects vertical osseous and gingival tissue defects. There is no need for a donor site. The procedure enables simultaneous gains in osseous and gingival tissue.

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This report illustrates a case in which distraction osteogenesis was used for the vertical repositioning of an implant already osseointegrated in the maxillary right central incisor area. An acrylic resin–bonded prosthesis was made to help accomplish this objective.

CASE REPORT

A 24-year-old man had an osseointegrated implant 11.5 mm long and 3.75 mm wide in the maxillary right central incisor region. Before its placement, 3 attempts at ridge augmentation were made, with little success. The surgical team and the patient agreed to place the implant (Fig 1) and make the prosthesis with a gingival, ceramic extension to correct the longer tooth, but by the time of the prosthetic restoration, the clinician noted that the excessive length of the crown was visible when the patient smiled because of a high lip line. The patient was not satisfied with the esthetic result; however, the crown was temporarily cemented (Fig 2).

At that time, distraction osteogenesis using the implant as the alveolar distraction device was proposed to the patient. After obtaining patient consent for the procedure and examining the patient for the surgery, an impression was made of the section of maxillary bone with the implant. An acrylic resin–bonded prosthesis was created. The pontic contained a UCLA abutment (Neodent Implante Osteointegravel, Curitiba, PR, Brazil) positioned so that it was not connected directly to the implant

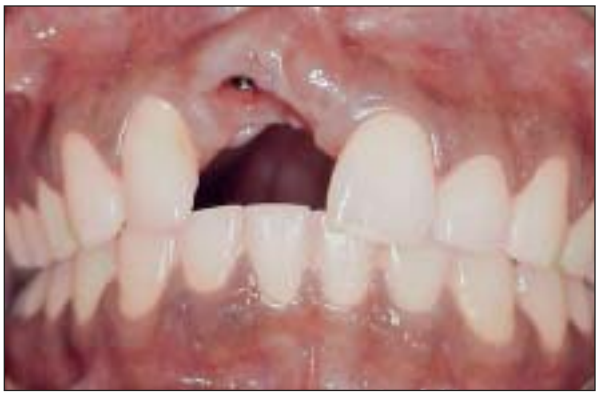

Fig 1 Frontal view of the implant. Note the implant position.

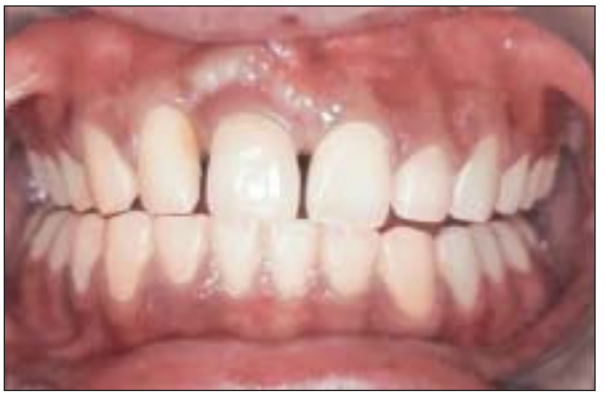

Fig 2 Metal ceramic crown made with ceramic gingiva.

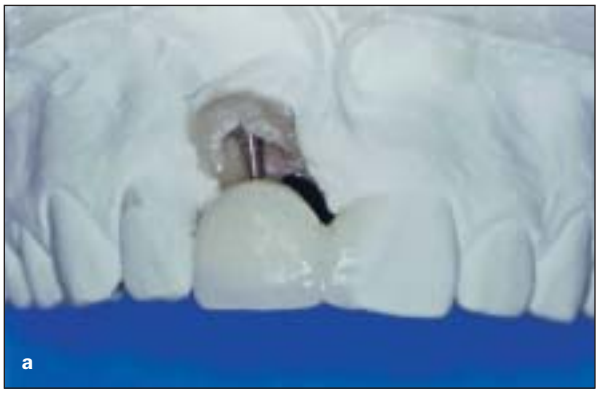

Fig 3 Acrylic resin–bonded prosthesis for the implant osteogenic distraction procedure. *(a)* Frontal view. *(b)* Lingual view.

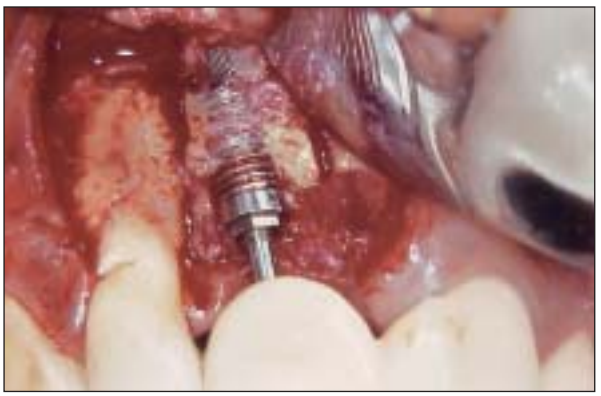

Fig 4 Surgical procedure of osteotomy in preparation for distraction osteogenesis.

head (Fig 3). The implant was used as the first part of the alveolar distraction device, and the prosthesis served as the second part.

The maxillary anterior area was anesthetized with mepivacaine (1:100,000 epinephrine), and a horizontal incision was made at the alveolar crest. A full-thickness flap was raised in an apical direction until the nasal floor was visible. Subperiosteal preparation mesial and distal to the neighboring teeth was required for sufficient overview and safe placement of the lateral osteotomies. Care was taken not to expose the alveolar bone beyond this point and to avoid compromising the palatal soft tissue, as this was of major importance for the vascularization of the bone segment to be distracted. A careful examination was carried out before osteotomy to prevent damage to the neighboring teeth. A horizontal cut was made 2 mm beyond the apical level of the implant. Vertical cuts were carried out at a distance of 1 mm to the adjacent teeth and converged slightly toward the horizontal osteotomy. The outline of the planned osteotomies was marked with a fissure bur. The vertical and horizontal cuts were carried out as planned with an oscillating microsaw. The final separation of the bone segment was performed with a fine chisel.

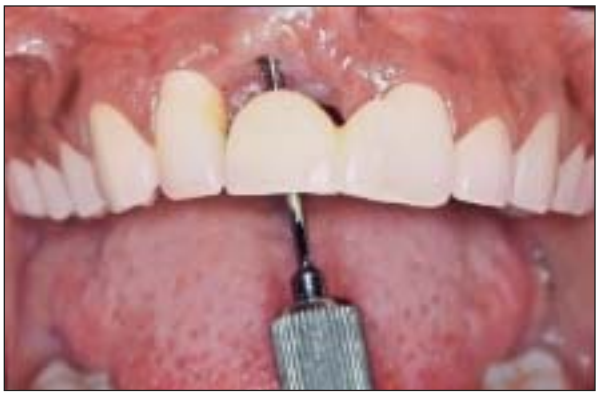

Fig 5 Beginning of the activation process 7 days after surgery.

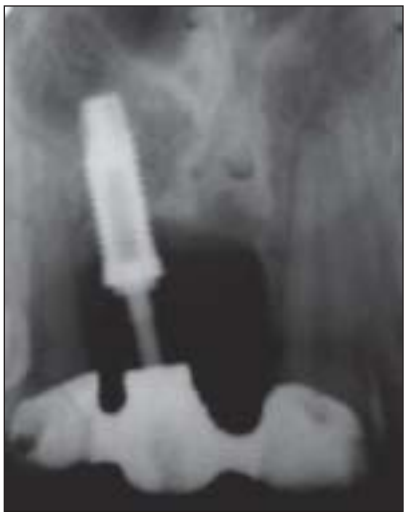

Fig 6 Radiograph obtained prior to starting distraction osteogenesis.

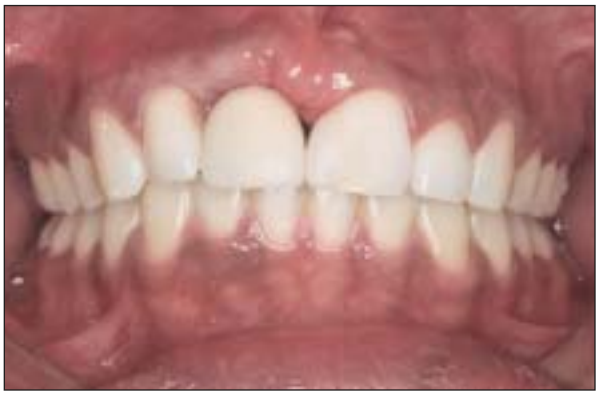

Fig 7 Buccal view of the definitive restoration.

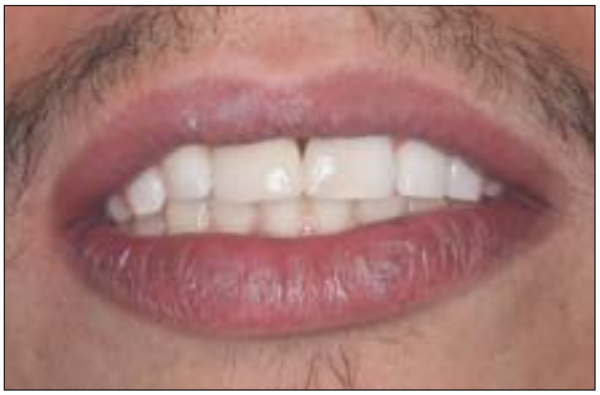

Fig 8 Patient smile—definitive restoration.

The prosthesis was tried out, and the abutment screw was tested prior to adaptation to the implant head. Since the abutment base was not close to the implant head, it was necessary to use a longer screw to connect the implant and abutment (Fig 4). A 3i regular-platform implant mount screw was used. The prosthesis was bonded with a composite acrylic resin luting agent. A test distraction was performed to ensure free mobility of the segment in a vertical direction. The prosthesis position ensured correct 3-dimensional movement. Mucosal closure was accomplished with interrupted 4.0 horizontal mattress sutures with a running 4.0 gut oversew (Vicryl; Johnson & Johnson/Ethicon, Somerville, NJ). Postoperative healing was uneventful.

After a latency period of 7 days, the sutures were removed. The distraction rate was 0.33 mm 3 times a day for a total of 1 mm/d (Figs 5 and 6), which resulted in a total device activation of 7 mm over 7 days. The prosthesis was then maintained in position for 3 months while the callus between the basal bone and the distracted segment matured. The implant was not fully adapted to the abutment base because it was placed too coronally and such adaptation would have created esthetic problems, making the crown smaller than the adjacent teeth.

After the latency period, the temporary crown was adapted over the implant head, and a composite acrylic resin restoration was made mesial to the maxillary left central incisor. For the final restoration of the implant, an individual metallic abutment was fabricated and torqued to 32 Ncm. The final prosthetic restoration was cemented to the abutment with zinc phosphate cement and was well-integrated into the esthetic segment (Figs 7 to 9). Comparison of the radiograph obtained prior to delivery of the definitive restoration and the radiograph obtained at the follow-up control examination showed that a little vertical bone loss occurred during the distraction process, probably due to the type of flap used (Figs 6 and 10).

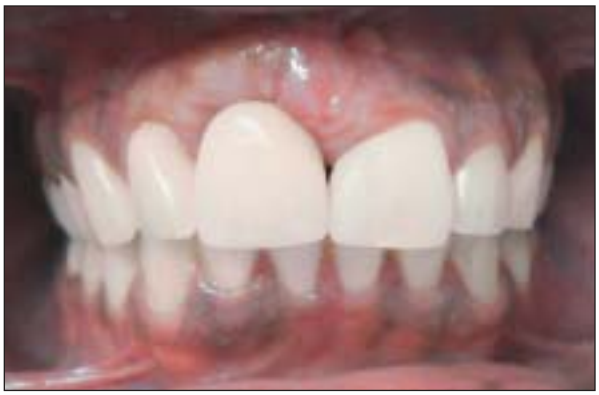

Fig 9 One-year follow-up examination.

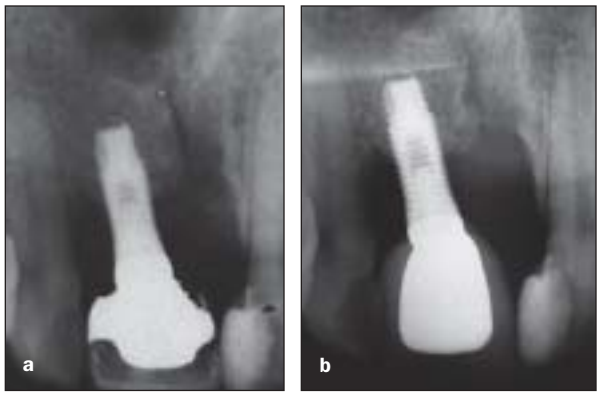

Fig 10 *(a)* Radiograph obtained upon the end of distraction osteogenesis. *(b)* One-year follow-up.

DISCUSSION

Osseointegrated implants are a very predictable treatment with respect to stability. However, sometimes esthetic results are not as predictable. In the case presented herein, after several attempts in increasing bone volume, an osseointegrated implant was placed at the site of the maxillary right central incisor. Ridge augmentation is not very predictable or easy to achieve when large vertical increases are needed. The greater the amount of hard tissue to be augmented in a vertical direction, the greater the amount of soft tissue required to be mobilized from the buccal area for tension-free primary closure over the graft material.[13] Lack of gingival tissue makes this surgery more complicated. Distraction osteogenesis allows a more predictable management of osseous and gingival tissues. The main advantage of this procedure is the possibility of augmentation of alveolar bone without the need of a donor site for autogenous grafting and/or the need for grafting materials.

In this case, a resin-bonded prosthesis was designed to work as a distraction osteogenesis device, since the implant had been placed when distraction osteogenesis techniques were not available to dental practice. This device allowed the implant to be distracted, bringing also the gingival tissue necessary for esthetics. This proved to be a good alternative to implant removal, a traditional distraction osteogenesis procedure, and placement of a new implant. Vertical bone loss was observed in this case, because of the type of flap used; this possibility should be taken into consideration during treatment planning.

Further clinical investigation is required to determine the predictability of this complex treatment. However, previously published clinical outcomes of augmentation techniques and distraction osteogenesis procedures make this treatment a reliable option for the patient. The procedure adopted in this case saved time and allowed improvement of the esthetic results by improving the implant-crown ratio.

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