VERTICAL ALVEOLAR DISTRACTION OSTEOGENESIS WITH COMPLICATIONS IN A RECONSTRUCTED MANDIBLE

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KEY WORDS

Vertical distraction osteogenesis
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We report here a case of vertical alveolar distraction osteogenesis with many complications that required further surgical interventions. A 54-year-old man underwent mandibular resection followed by iliac bone grafting as the result of large mandibular odontogenic keratocyst. Eleven months later, alveolar vertical distraction osteogenesis was applied to the patient for prosthetic rehabilitation. Fracture of the basal bone occurred in the consolidation period, and the fracture was fixed by the titanium miniplate system. Radiographic examination after completion of distraction osteogenesis confirmed a radiolucent area in half of the distracted area between the basal bone and the transport segment, and when the distractor was removed the radiolucent area was filled with fibrous granulation tissue. The granulation tissue was removed and endosteal implants were inserted together with a bone graft. Ultimately, all implants were osseointegrated, and adequate esthetics and function of the implant-supported prosthesis were achieved.

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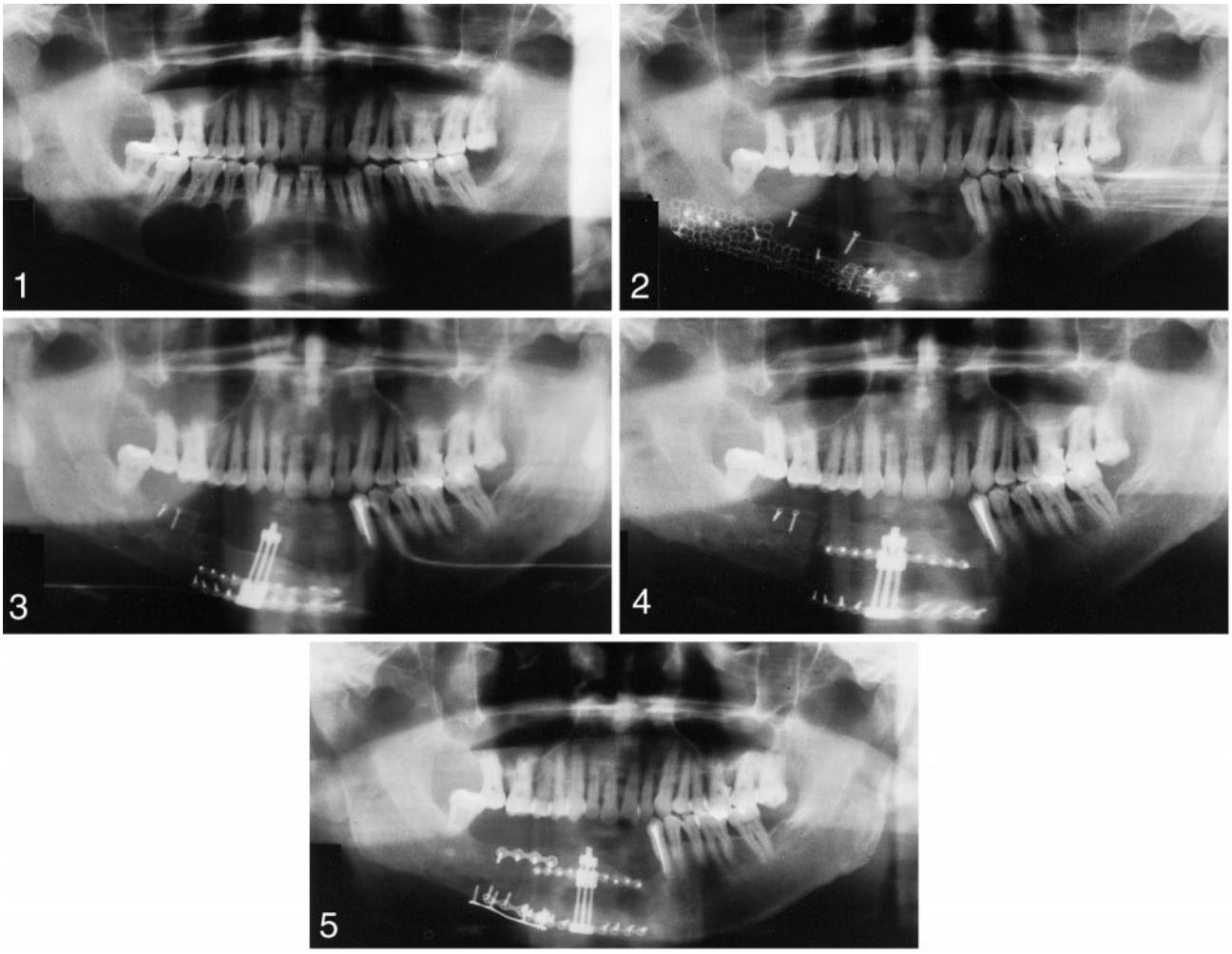
INTRODUCTION

Distraction osteogenesis has been applied to the maxillofacial region.[1–6] Recently, vertical distraction osteogenesis has been used in cases of atrophic loss of bone volume in order to improve alveolar bone height for dental implant placement.[1,3–5] Although distraction osteogenesis is a promising method, it can have complications.[7]

This report presents a case of intraoral vertical distraction osteogenesis with complications for implant placement after mandibular reconstruction.

CASE REPORT

A 54-year-old man was referred to our division for swelling of the right mandible. A panoramic radiograph and computed tomography scan showed a cystic radiolucency from the left canine to the right second molar region of the mandible (Figure 1). Microscopic examination of the biopsy specimen showed odontogenic keratocyst of the mandible. Under general anesthesia, mandibular segmental osteotomy was performed extraorally. Immediate reconstruction with a titanium recon-

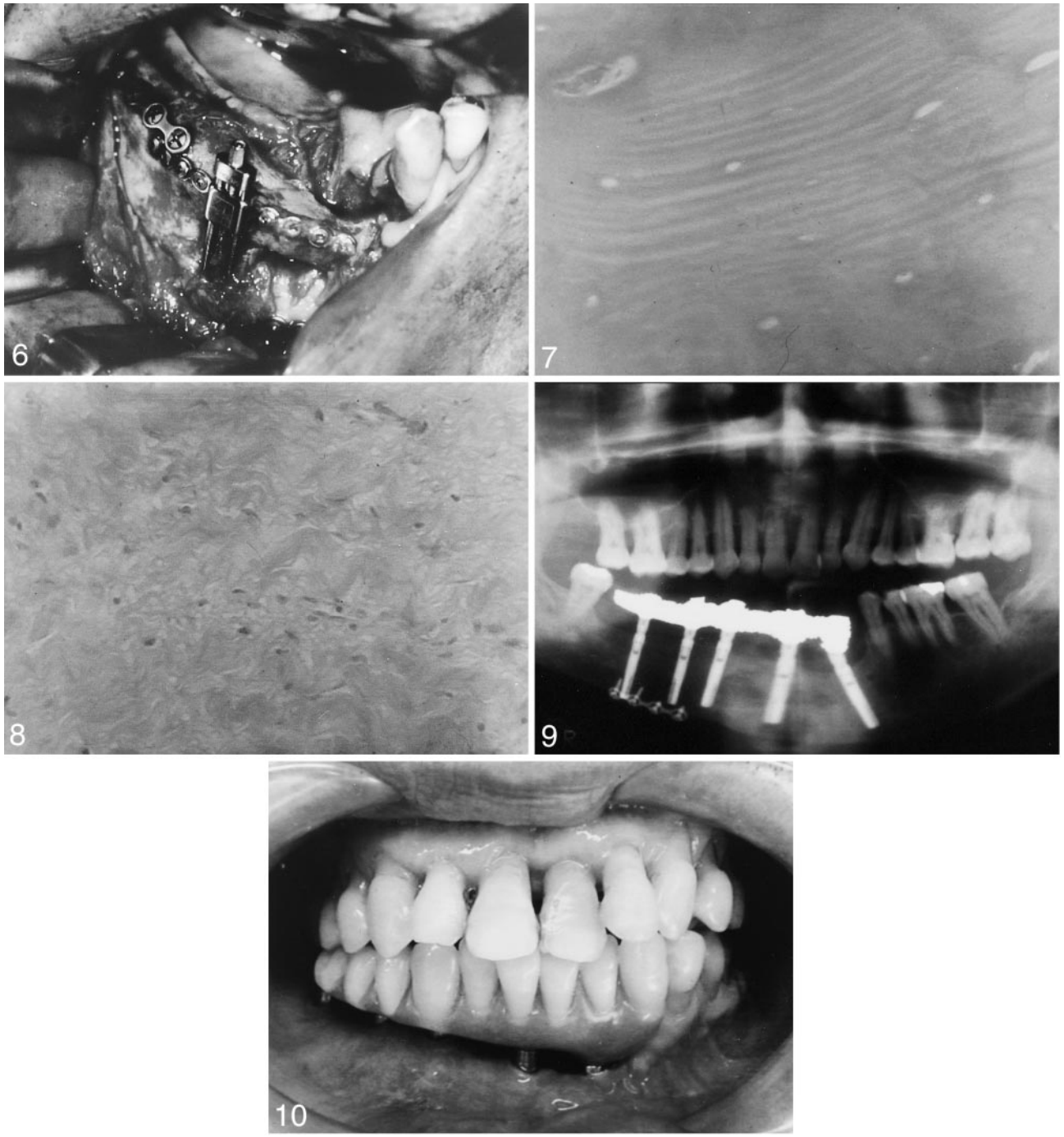


FIGURES 1–5. FIGURE 1. Preoperative panoramic X-ray. FIGURE 2. Panoramic radiograph 11 months after reconstruction with titanium mesh plate and particulate cancellous bone and marrow taken from the ilium. FIGURE 3. Panoramic radiograph immediately after the distraction device was fixed. FIGURE 4. Panoramic radiograph 3 weeks after distraction. A fracture was seen in the basal bone. FIGURE 5. Panoramic radiograph 9 months after distraction showing a radiolucent area between the transport segment and the basal bone.

struction plate and a cortico-cancellous bone block from the ilium was also performed simultaneously. Eight months later, radiographic examination confirmed severe resorption and pathologic fracture of the grafted bone. Therefore, a second reconstruction with a titanium mesh plate and particulate cancellous bone and marrow from the ilium was performed to restore the resorptive mandible. Eleven months later, the radiographic examination revealed the correct take of the graft (Figure 2). The patient wished to undergo implant therapy. However, from a prosthetic point of view, a significant increase in vertical intermaxillary distance and the defect present on the alveolar ridge in the grafted area made implant treatment difficult. For these reasons, correction of the alveolar bony defect was planned using distraction osteogenesis with an intraoral alveolar vertical distractor (MOD; Gebruder Martin GmbH & Co, Tuttlingen, Germany).

The patient was put under general anesthesia and, through both the extraoral and intraoral incision, careful subperiosteal dissection was performed to preserve the lingual mucoperiosteum. The grafted bone was exposed, and the titanium mesh plate and screws previously used for reconstruction were removed. The distraction device was adjusted and preplated before osteotomy. A vertical osteotomy in the deficient part of the grafted bone was then performed with a reciprocating saw to completely separate the transport segment from the basal bone. The distraction device was fixed to both the transport segment and the basal bone (Figure 3). The function of the distractor was then checked for any bony interferences. The surgical incision was closed, leaving part of the distractor passing through the intraoral incision.

One week after surgery, distraction was performed at a rate of 1.0 mm per day (0.5 mm in the morning and 0.5 mm in the evening). The gain obtained in 13 days was 13 mm in the vertical direction with optimal correction of the



FIGURES 6–10. FIGURE 6. Granulation tissue was seen in half of the distracted area. FIGURE 7. Histologic specimen (hematoxylin-eosin stain) obtained from the ossification area in half of the distracted area. Mature bone consisting of lamellae was observed. FIGURE 8. Histologic specimen (hematoxylin-eosin stain) obtained from the granulation (radiolucent) area in half of the distracted area. Fibrous tissue was observed. FIGURE 9. Panoramic radiograph 1 year after final prosthetic rehabilitation. FIGURE 10. Intraoral view after final prosthetic rehabilitation.

deficient area. Three weeks after distraction, a panoramic radiograph showed a fracture in the basal bone, and the fracture was fixed by the titanium miniplate system (Figure 4). Radiographic examination at 9 months confirmed a radiolucent area in half of the distracted area between the 2 segments (Figure 5).

The distractor was removed, and good ossification was recognized in half of the distracted area, but the radiolucent area was filled with granulation tissue (Figures 6–8). The granulation tissue was removed, and 5

screw-type 17 mm long dental implants (Astra Tech AB, Göteborg, Sweden) were inserted, 4 in the distracted area and the other in the existing bone. Cancellous bone chips obtained from the mandibular ramus were grafted to the bone defect that was filled with granulation tissue. Primary stability of all implants was achieved. Four months later, the implants were uncovered and abutments installed for final prosthesis. All implants were osseointegrated, and adequate aesthetics and function of the implant-supported prosthesis was completed (Figures 9 and 10). Two years after implant insertion, the implant-supported prosthesis was stable, and there are no clinical or radiographic signs of recurrence and bone loss around the implants.

DISCUSSION

A vertically deficient alveolar ridge of the mandible limits the placement of endosteal dental implants. To resolve this problem, 2 main solutions have been proposed: onlay grafts using autogenous bone, and guided bone regeneration (GBR) with semipermeable barriers.[3,4] However, autogenous bone grafts increase patient morbidity, and GBR may result in unpredictable bone formation or infection from membrane exposure.

Recently, distraction osteogenesis has been applied to alveolar ridge augmentation.[1,3–5] This procedure has 2 advantages: no need for additional bone graft or GBR, and simultaneous lengthening of the surrounding soft tissues. The disadvantages, however, include a long treatment period and danger of infection.[8] On the other hand, some complications have also been reported: fracture of the transport segment, difficulties in finishing the osteotomy on the lingual side, excessive length of the threaded rod, incorrect direction of distraction, perforation of the mucosa by the transport segment, suture dehiscence, and bone formation defects. However, Garcia et al.[7] reported that most of these complications could be considered minor and were readily avoided or resolved by the use of appropriate procedures.

In this case, fracture of the basal bone occurred in the postdistraction period. This complication was considered as an operative complication by the surgeon or weakness of the bone property. In either case, this complication must be avoided by a precise procedure. A radiolucent image was still seen at 9 months after distraction in half of the distracted area, and when the distractor was removed granulation tissue was recognized in that area. The granulation tissue may be caused by infection through the portion of the distractor, which was exposed to the oral cavity. This complication might be avoided by a slower distraction rate and/or additional membrane techniques.[5,7] Fortunately, all implants were osseointegrated and prosthetic rehabilitation was achieved. However, many surgical interventions imposed a severe burden on the patient.

Distraction osteogenesis will likely become more useful in oral and maxillofacial surgery. In our limited experience, however, vertical distraction osteogenesis for implant placement appeared to have serious risks and not minor complications in a reconstructed bone. Ultimately, most complications were solved by continual efforts in this case. Therefore, further study might be needed to determine the applications and limitations of vertical alveolar destruction osteogenesis for implant placement in a reconstructed bone.

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