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Problems with dental implants that were placed on vertically distracted fibular free flaps after resection: A report of six cases

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Abstract

We report the clinical outcome of dental implants placed on vertically distracted fibular free flaps that were used to reconstruct maxillary and mandibular defects after resection. Distraction osteogenesis (DO) of fibular free flaps was used for six patients (5 men, 1 woman) a mean of 19 months (range 11–38) after 5 mandibular and 1 maxillary reconstructions. A mean of 5 months (range 2–11) after removal of the distractor, 35 implants were inserted and loaded with implant-supported fixed prostheses. The mean (range) follow-up period was 39 (17–81) months. The course of the DO and the clinical and radiographic outcomes of the implants were assessed.

Of six vertically distracted fibular free flaps, there was one case of vector lingual tipping during the consolidation phase and a fracture of the basal fibular cortex that necessitated additional grafting with iliac bone to stabilise the distracted area. The mean (range) vertical bone gain was 14 (12–15) mm. Four of 35 implants (11%) failed during the follow-up period. The mean peri-implant bone resorption was 2.5 mm. Cumulative implant survival was 31/35 (89%) and survival after loading 31/33 (94%).

Distraction osteogenesis of fibular free flaps caused a remarkable number of complications and pronounced resorption of bone around the implants, probably as a result of the formation of granulomatous tissue; a careful peri-implant follow-up and the maintenance of oral hygiene are essential.
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Keywords: Fibular free flaps; Distraction osteogenesis; Fixed implant-borne prosthetic rehabilitation

Introduction

During the past few years there have been remarkable outcomes after implants have been placed in jaws that have been reconstructed with microvascular fibular grafts.[1–4] The lack of height of the fibula, however, presents a problem for an adequate prosthetic crown:implant ratio, particularly in patients who have healthy dentition. Recently, distraction osteogenesis (DO) has been used to deal with this problem,[5–7] because it overcomes the drawbacks of other techniques such as the "double-barrel technique"[8] or onlay grafting. To our knowledge, no studies have reported results of implants from distracted fibulas. This study presents the clinical outcomes at a mean (range) of 39 (17–81) months after loading of dental implants that had been placed in vertically distracted fibular free flaps to rehabilitate patients after resection.

Patients and methods

During a 7-year period (1998–2005), six patients (5 male, 1 female) aged between 15 and 53 years (mean 27), who had previously had resections of the maxillofacial complex for malignant tumours or severe osteomyelitis, followed by subsequent reconstruction with an osteomuscular fibular free

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flap, had a distraction procedure to obtain adequate bony height for the fibula.

Patients were included if they had: a good prognosis after resection of a tumour, no signs of recurrence, good oral hygiene, no periodontal disease affecting the residual dentition, and a desire to be rehabilitated with an implant-bearing fixed prosthesis. All patients had residual dentition in the healthy portion of the reconstructed jaw. The mean interval between the reconstruction and DO was 19 (11–38) months.

All DO procedures were done under general anaesthesia by the same surgical team (Oral & Maxillofacial Unit, S. Orsola Hospital, Bologna, Italy) using the techniques of Levin et al.[5] and Klesper et al.[6] The fibula was exposed after a buccal incision, and the lingual mucoperiosteal attachment was preserved. The distraction osteotomies were done in the classic manner.[9] After a 7–10-day latency period, the distractor was activated at a rate of 1 mm/day, 2–4 turns/day, until the desired distraction (12–15 mm) had been obtained. The distraction device was then left in position for a 3–4-months' consolidation period. Finally, the distractor was removed under local anaesthesia. The procedures were evaluated radiographically (orthopantomograms and lateral cephalograms) at the end of the distraction phase (Fig. 1), and the patients were checked clinically each month until the implants were placed.

The wide range, 2–11 months (mean 5), before placement was the result of the different durations of healing and the need for additional procedures. Thirty-five implants, 11–18 mm long [18 XiVE implants, Friadent (Mannheim, Germany), Maestro Biohorizons implants (Birmingham, AL) ($n = 5$), Branemark implants (Nobel Biocare, Goteborg, Sweden) ($n = 7$), and 3i Osseotite implants (3I, Palm Beach, FL) ($n = 5$)], were placed in the distracted areas under local anaesthesia by different clinicians. All the implants were submerged and uncovered 3–6 months later for healing screws and abutments to be inserted. All patients were rehabilitated with a screw-retained provisional fixed denture, and after 6–12 months, a definitive prosthesis was inserted.

Routine clinical assessments were made 1, 2, and 6 months after prosthetic loading and annually thereafter. They included visual and digital inspection of the implants and prosthetic rehabilitation, and torquing of the abutment screw in case of a lost prosthesis. Routine radiographs consisted of panoramic radiographs taken preoperatively, after placement of implants, at the time of prosthetic loading, and annually thereafter until the end of follow-up (Fig. 2).

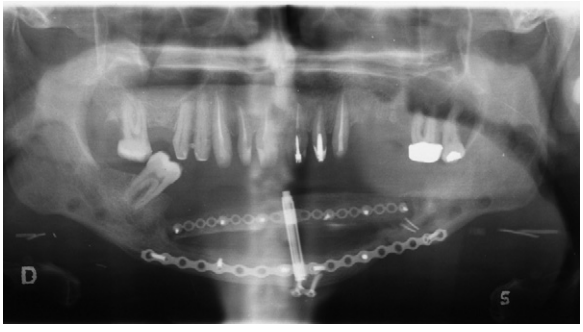

Fig. 1. Orthopantomographic assessment at the end of the distraction phase in case 1.

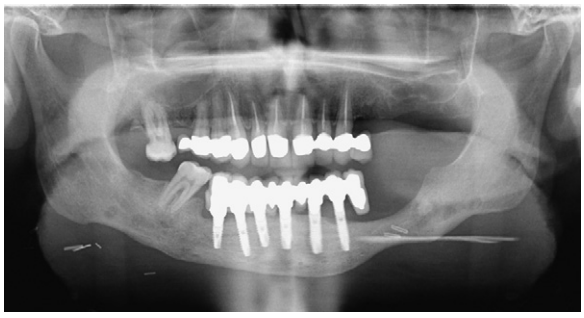

Fig. 2. Orthopantomographic assessment at the end of follow-up in case 1.

The peri-implant bony resorption was assessed radiographically by comparing panoramic radiographs. After digitalising the radiographs, the change in bone concentration was evaluated mesially and distally to each implant using Digora® software (for Windows 2.1), and measuring the distance (mm) between the top of the head and shoulder of the implant and the most coronal point of direct bone-to-implant contact. Dimensional distortion between the different panoramic radiographs was corrected by comparison with the dimensions of the actual implant. The bone concentration measured on the panoramic radiograph taken immediately after placement of the implant was considered to be the baseline for further measurements. The mean of the mesial and distal values was considered to be the crestal bone resorption of each implant. Panoramic radiographs were chosen instead of intraoral ones because intraoral radiographs were not always feasible as the oral floor often lacked depth after a tumour had been resected.

Successful implants were characterised using the following criteria described by Albrektsson et al.[10]: no persistent pain, no peri-implant infection, no mobility, no continuous peri-implant radiolucency, and peri-implant resorption of bone of less than 1.5 mm in the first year of function and <0.2 mm in subsequent years. Survival of an implant was characterised using similar criteria described by Albrektsson et al.[10] with a peri-implant resorption of bone of more than 1.5 mm in the first year of function and then 0.2 mm in the subsequent years.

Results

The mean gain in the vertical height of bone obtained with the distraction procedure was 13.6 (12–15) mm. DO was uneventful in four cases. In one case (case 5), lingual tipping of the distraction vector in the posterior mandible occurred during the distraction phase. This required a subsequent osteotomy of the newly formed bone and transport segment

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