Long-Term Follow-Up of Severely Resorbed Mandibles Reconstructed Using Tent Pole Technique Without Platelet-Rich Plasma

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Purpose: To investigate the results of edentulous patients with severely resorbed mandibles who were treated with a modified tent pole procedure.

Patients and Methods: Twenty-two edentulous patients (3 men, 19 women; mean age, 62 yr; range, 51 to 72 yr) with a history of conservative prosthodontic treatment failures were included this study. Using a transcutaneous submental approach, 4 endosseous dental implants were placed in the anterior mandible of each patient and covered with autogenous bone grafts harvested from the posterior iliac crest without the addition of platelet-rich plasma. Follow-up ranged from 3 to 9 years.

Results: The postoperative course of the patients was uneventful, without any surgical infections. At 3 months postoperatively, the density of the grafted bone appeared to closely resemble that of the surrounding alveolar bone on panoramic radiographs. The average alveolar augmentation was 6.3 mm (standard deviation, 1.59 mm; range, 4 to 10 mm) and long-term follow-up showed no bone resorption around the endosseous implants.

Conclusions: The modified tent pole technique without the addition of platelet-rich plasma is a safe and effective method to reconstruct the severely resorbed mandible.

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Management of the severely resorbed mandible is problematic for prosthodontists and oral and maxillofacial surgeons because of the minimal amount of available bone volume and the continuous progressive resorption of the alveolar ridge.[1] Many augmentation procedures have been used to try to create a sufficient bone volume for endosseous dental implants.[2-8] However, many of those procedures may lead to different morbid complications, including bone graft failure, persistent infections, fistulas, progressive bone resorption, pathologic fracture, chronic pain, or sensory nerve disturbances.

Marx et al[9] in 2002 advanced the approach of soft tissue matrix expansion using corticocancellous bone grafting with dental implants to treat severely resorbed mandibles that were shorter than 6 mm and

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classified as Cawood-Howell type VI.[10] Using this transcutaneous submental approach, 4 to 6 dental implants were placed to act as "tent poles" to maintain the height of the overlying mucosal soft tissue and prevent it from sagging around the iliac crest graft. In all cases, concentrated platelet-rich plasma (PRP) was added to the bone grafts, with satisfactory results and healing of the bone grafts.[9]

Several human and animal studies have documented the effectiveness of reconstruction using PRP in bone grafts,[11-17] but the use of PRP in the maxillofacial region remains a controversial issue, and there are numerous conflicting studies in the literature.[18-22]

The purpose of this study was to analyze the long-term data of 22 patients with severely resorbed mandibles who underwent a modified tent pole procedure without using PRP.

Patients and Methods

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and with the approval of the ethical committee of the Oulu University Hospital institutional review board. The study included 22 healthy patients (3 men and 19 women) who satisfied the inclusion criteria of having a resorbed edentulous mandible of 6-mm vertical height or less at the shortest dimension measured on a preoperative panoramic radiograph (orthopantomogram; Instrumentarium Dental, Tuusula, Finland). All patients reported a history of conservative prosthodontic treatment failures. None of the patients had any of the exclusion criteria, including a history of head and neck cancer, radiotherapy, chemotherapy, tobacco use, or oral infections. The ages of the patients ranged from 51 to 72 years (mean, 62 yr).

The previously described surgical procedure of Marx et al[9] was slightly modified. Four endosseous dental implants per patient were placed in the alveolar ridge of the anterior mandible and covered with cancellous bone harvested from the posterior iliac crest without the addition of PRP to the bone grafts. Eighteen patients received Straumann ITI 4.1- × 12- to 14-mm dental implants (Institute Straumann AG, Basel, Switzerland) and 4 patients received Xive 3.8- × 13- to 15-mm dental implants (Friadent GmbH, Mannheim, Germany). Before soft tissue closure, the bone graft was layered with Tisseel fibrin glue (Baxter Healthcare Corporation, Deerfield, IL). The 22 operations were performed from March 2003 through March 2009 in the authors' institution by the same surgeon. Prospective follow-up ranged from 3 to 9 years, with postoperative visits initially at 2 weeks, 3, 6, and 12 months, and annually thereafter. The mucosa over each dental implant was removed, abutments were placed, and the implants were loaded with an overdenture-retained prosthesis 6 to 8 months after the initial bone graft surgery. Vertical alveolar bone heights were determined at the shortest part of the mandible on panoramic radiographs taken preoperatively, immediately after surgery, and 12 months postoperatively.

Results

Most patients (86%) with severely resorbed mandibles were women. The mean time in the hospital was 2.7 days (range, 2 to 5 days). The average acute pain level on the first postoperative day was 2.5 (range, 1 to 4.5) determined by using a 10-cm linear visual analog scale. The postoperative courses of the patients were uneventful. No surgical infections of the mandible or iliac crest sites were observed during follow-up. Examination of the patients' oral mucosa showed a normal color without ulceration or breakdown after the operation. There were no bony dehiscences. Three months after the operation, panoramic radiographs showed that the grafted bone density was close to that of the surrounding alveolar bone. The total bone height was found to be the same height as the height of the dental implants at the crest of the alveolar ridge (range, 12 to 15 mm; Fig 1A, B). The mean alveolar ridge augmentation was 6.3 mm (standard deviation, 1.59 mm; range, 4 to 10 mm; Fig 2A, B). During follow-up, there was no resorption of bone around the dental implants (Fig 2C).

Although there were few complications, all patients had mental nerve paresthesia immediately after surgery. Only 2 patients reported mild long-term changes consisting of unilateral nerve sensibility disturbances for longer than 1 year after surgery. In total 88 dental implant fixtures had been placed, with 86 fixtures having a correct axial inclination. Two of the 88 dental implants (2.3%) were removed during the follow-up period because of over-labial positioning. The 2 implants were successfully reimplanted in the correct orientation immediately after their removal. At the time of vestibular re-entry to uncover the dental implants, 5 of the 88 sites (5.6%) required removal of hyperplastic soft tissue for optimal abutment placement and hygiene.

Although the ridge width was not a measured parameter in this case series, the ridge form produced by the tent pole procedure at the time of implant fixture uncovering was observed to be consistently broad and wide, similar to the residual mandibular basal bone that supported the bone grafts and dental implants. There were no peaked or knife-edge ridges; rather, the ridges were wide in the anteroposterior plane. No procedures to increase the amount of attached mucosa around the uncovered dental implants were required in this case series.