Is Immediate Reconstruction of the Mandible With Nonvascularized Bone Graft Following Resection of Benign Pathology a Viable Treatment Option?

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Purpose: The purpose of this study was to address the following clinical question: Is immediate reconstruction of the mandible with a nonvascularized bone graft after resection of benign pathology a viable treatment option? Another purpose was to determine whether any variables affect the success of this treatment approach.

Materials and Methods: The authors implemented a retrospective cohort study from a sample of patients diagnosed with a benign tumor of the mandible who were treated with segmental resection and primary reconstruction with an autogenous nonvascularized bone graft. The predictor variables were age, gender, lesion size, and diagnosis, and the outcome variable was graft success determined by re-establishment of mandibular continuity with sufficient bone for implant placement. The χ^2 test was used for statistical analysis of the categorical data and *P* values less than .05 were considered statistically significant.

Results: Twenty patients with benign mandibular tumors were treated with transoral resection and immediate reconstruction with nonvascularized bone grafts. The mean age was 28.3 years (range, 9 to 63 yr) and 55% (11 of 20) were men. The most common lesion type was ameloblastoma (13 of 20) and all patients underwent reconstruction with autogenous anterior iliac crest bone grafting. Ninety percent of patients (18 of 20) had successful reconstruction. Ten patients underwent successful implant placement and restoration.

Conclusions: Using careful patient selection, treatment of benign pathology with transoral resection and immediate reconstruction with a nonvascularized bone graft from the anterior iliac crest can be successful. In addition, the total treatment time from implant restoration to return to preoperative function is minimized. Therefore, this method of treatment is a viable treatment option and an alternative to delayed reconstruction or reconstruction with vascularized bone flaps.

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Successful reconstruction of mandibular continuity defects is a challenging yet essential component in the treatment of benign and malignant pathology. The mandible influences facial esthetics through dental and lip support, cheek support, and definition of the jaw line. It also plays a role in mastication, swallowing, speech, and airway patency and contains the only ginglymoarthrodial joint in the human body. Odontogenic tumors, such as ameloblastoma and odontogenic myxoma, are unique to the jaws. Despite their histologically benign nature, certain odontogenic tumors behave more aggressively and possess a high

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rate of recurrence when treated by methods other than resection. The resulting mandibular continuity defect requires reconstruction owing to the complex function of the mandible as outlined earlier.

Traditionally, these defects were "bridged" with rigid plates and screws while awaiting secondary reconstruction months or years later. One reason cited for delayed reconstruction has been to allow for tumor surveillance. The treatment of benign pathology with appropriate surgical resection margins results in an exceedingly low recurrence rate. Carlson and Marx[1] reported a 0% recurrence rate in the treatment of 82 ameloblastoma cases. Another purported reason in favor of secondary reconstruction is an unacceptably high rate of failure for grafts exposed to the oral cavity.[2-6] Despite the success of intraoral bone grafting techniques for ridge reconstruction before implant surgery, including the placement of xenografts, alloplasts, and allografts, reconstruction of a continuity defect does not appear to have the same level of support in the literature.[7]

Owing to the benign nature and often odontogenic origin, these tumors tend to occur in relatively young, healthy, and active individuals, leaving them with major mandibular ablative defects for some period and affecting their quality of life because of the associated functional and esthetic limitations. Postoperative malocclusion, limitations in mastication, speech incompetence, and noticeable and unacceptable facial asymmetry are among the main disadvantages of secondary reconstruction.[8] In addition, delays in bony reconstruction of continuity defects can be complicated by plate fractures, loosening screws, metal exposure, or infection.[9]

The literature is replete with articles discussing secondary reconstruction with nonvascularized bone grafts (NVBGs), including multiple Clinical Controversy sections in the *Journal of Oral and Maxillofacial Surgery*.[2-6,10-25] Nevertheless, very few have discussed primary reconstruction in the context of the patient with a benign lesion and excluding patients with malignancy, radiation therapy, or major soft tissue defects. Frequently cited articles by Millard et al[2] in 1969 and Lawson et al[3] in 1981 reported high failure rates for immediate reconstruction. If these articles are closely reviewed, it becomes apparent that their method of treatment is rarely used today and the means of fixation have advanced considerably. In addition, very few articles have discussed immediate grafting through a strict transoral approach, and most have used a combined intraoral and extraoral approach, or a strict extraoral delayed procedure. If a method of immediate grafting is found to be successful, it has the potential to decrease the number of surgical procedures a patient has to undergo and will decrease total treatment time.

The purpose of this study was to address the following clinical question: Is immediate reconstruction of the mandible with a NVBG after resection of benign pathology a viable treatment algorithm? The authors hypothesized that careful selection of patients for immediate reconstruction with nonvascularized bone grafting after resection of benign pathology could be a successful treatment approach. The specific aims of this study were to design a retrospective cohort study composed of patients treated with resection and immediate reconstruction to determine whether it is successful and to determine whether any variables, such as age, gender, lesion size, or diagnosis, affect the success of this treatment option.

Materials and Methods

STUDY DESIGN AND SAMPLE

To address the research purpose, the authors designed and implemented a retrospective cohort study composed of all patients who underwent transoral resection of benign pathology of the mandible and immediate reconstruction with NVBGs. The study population was composed of patients treated by the Department of Oral and Maxillofacial Surgery at the University of Illinois at Chicago from December 2008 to January 2014.

To be included in the study sample, patients must have had a biopsy completed by or confirmed by the Department of Oral and Maxillofacial Surgery at the University of Illinois at Chicago before resection. Only patients with a diagnosis of benign pathology of the mandible were included. Patients were excluded from the study if they were treated with radiation, had a diagnosis of malignancy, were undergoing grafting for reasons other than benign pathology, such as nonunion or osteomyelitis, had an extraoral approach or staged reconstruction, underwent reconstruction with vascularized flaps including soft tissue flaps, or did not follow up with the department. In addition, patients were excluded if data collection was incomplete or adequate records could not be located for review. This project was reviewed and approved by the Office for Protection of Research Subjects at the University of Illinois at Chicago.

Since December 2008, all patients with a diagnosis of benign pathology of the mandible requiring segmental resection and bony reconstruction were considered for a transoral resection and immediate reconstruction with nonvascularized bone. Any patient with a tumor of such a size or extent that it would make transoral resection substantially difficult or if the senior author (A.K.) was not confident that proper margins could be obtained by a transoral approach was not included in this study. In addition, all patients with extensive soft tissue involvement or extensive