

Does Ultrasonic Resorbable Pin Fixation Offer Predictable Results for Augmentation Eminoplasty in Recurrent Dislocations?

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Purpose: To assess the outcome of interpositional calvarial block grafting fixed with an ultrasonic resorbable system (SonicWeld, KLS Martin, Mühlheim, Germany) for augmentation eminoplasty in chronic recurrent condylar dislocations.

Patients and Methods: We designed and implemented a retrospective cohort study. Eight female patients (mean age 48 years) were treated. The primary predictor variable was time (preoperative vs postoperative). The primary outcome variable was cessation of dislocation. The secondary outcome variables were the height of the articular eminences (HAE), maximum interincisal opening, pain score (visual analog scale [VAS]), postoperative magnetic resonance imaging (MRI) findings, and facial nerve paralysis.

Results: All 8 patients had been experiencing recurrent dislocations a mean of 10 times each month preoperatively. None of the patients had experienced a dislocation at 2 years postoperatively. The preoperative mean HAE was 5.75 and the VAS score for pain was 72.5. The mean vertical HAE was 15.75 mm, and the mean VAS score for pain was 11.2 at 12 months postoperatively. Complete resorption of the SonicWeld pins was observed on the first year follow-up computed tomography scans. Of the 8 patients, 3 presented with disc displacement without reduction and 2 with disc displacement with reduction on the postoperative MRI scan, and none of the patients had a facial nerve deficit at 24 months of follow-up.

Conclusions: Fixation of cortical calvarial grafts using the ultrasonic resorbable system for augmentation eminoplasty provided sufficient stabilization and favorable outcomes. Degradation of the osteosynthesis material and the absence of intermaxillary fixation were the most advantageous parts of the technique.

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J Oral Maxillofac Surg 72:1468-1474, 2014

Patients with recurrent chronic dislocation (RCD) can present with variations in articular anatomy, severe internal derangement, and myofascial disorders. Management of dislocations can be grouped basically under blocking and nonblocking procedures. The blocking procedures have included titanium miniplates,¹ Silastic implants (Dow Corning, Midland, MI), metallic eminence prostheses, eminence grafting with autogenous grafts,²⁻⁶ the Leclercq procedure,⁷ Dautrey's procedure,^{8,9} capsular plication, and

stabilization of the condyle to zygomatic arch with anchors.²

Nonblocking options have included midline mandibulotomy, eminectomy with or without discectomy or discoplasty,¹⁰ arthroscopic eminectomy or thermal capsulorrhaphy,¹¹ sclerosing agents, intermaxillary fixation (IMF), bandaging, and a soft diet.¹² Ramus osteotomies (bilateral sagittal split osteotomy, intraoral vertical ramus osteotomy, and inverted L osteotomy) have been mainly performed in prolonged cases with

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Received March 14 2013

Accepted March 27 2014

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0278-2391/14/00366-8\$36.00/0

<http://dx.doi.org/10.1016/j.joms.2014.03.030>

serious fibrosis, hindering closure of an open bite and obtaining occlusion.¹³ Augmentation eminoplasty (AE) can be achieved with inlay or onlay bone grafts using wire, titanium hardware, or resorbable systems. The Lindemann-Norman technique is an old technique performed as an oblique osteotomy with an interpositional graft tapped into the glenotemporal osteotomy to augment the deficient eminence.²

The use of nonresorbable titanium screw and plate osteosynthesis has been questionable for augmentation of the articular eminence because of the risk of graft resorption and screw loosening. These can result in loosening and additional complications with the fixation material inside the joint cavity.¹

The purpose of the present study was to determine whether resorbable pin usage in the fixation of inlay calvarial bone grafts for augmentation eminoplasty can provide optimal outcomes and resistance against dynamic forces of the condyle. We hypothesized that usage of ultrasonic fixation for the Lindemann-Norman procedure would be a predictable method. The specific aims of the present study were to offer a new technique for an older procedure and to evaluate the outcomes and effects on the temporomandibular joint (TMJ) complex.

Patients and Methods

STUDY DESIGN AND SAMPLE

To address our research purposes, we designed and implemented a retrospective cohort study. The study sample was derived from the population of patients presenting to the University of Marmara Faculty of Dentistry from 2008 to 2012 for the evaluation and management of RCD. The patients included in the present study had a documented diagnosis of RCD. The participants were limited to those patients who had undergone surgery for RCD within the previous 4 years. The data were collected directly from the patient records. Patients without both preoperative and postoperative recorded measurements of the outcome variables were excluded. The clinical research ethics committee of Istanbul Yeditepe University approved the present study, which was in compliance with the World Medical Association's Declaration of Helsinki as it relates to medical research protocols and ethics.

STUDY VARIABLES

The primary predictor variable in the present study was time (preoperative vs postoperative). The primary outcome variable was the cessation of dislocation. The secondary outcome variables were the height of the articular eminences (HAE), the maximum interincisal opening (MIO), visual analog

scale (VAS) score for pain, postoperative magnetic resonance imaging (MRI) findings, and facial nerve deficit. The preoperative and 1-year postoperative HAEs were measured and compared with the findings from the computed tomography (CT) scans (Fig 1). Postoperative MRI scans were obtained for all patients at 24 months. The pain scores were recorded using a VAS, and facial nerve paralysis was classified using the grading system of House and Brackmann. The preoperative measurements were taken at the visit before surgery, and the postoperative measurements recorded at the 12- and 24-month follow-up visits.

PATIENT SELECTION AND TREATMENT

All patients had experienced recurrent episodes of condylar dislocations monthly (mean frequency 10 times) and had required medical assistance for manual reduction. All patients were American Society of Anesthesiologists Class I. The preoperative assessment was performed from CT scans (Digital Imaging and Communications in Medicine file format), and data processing was performed using Mimics software (Materialise, Leuven, Belgium).

All patients underwent surgery under nasotracheal anesthesia. Preauricular access with an Al Kayat and Bramley modification ($n = 1$) and a short temporal extension ($n = 7$) was performed, and dissection was developed to skeletonize the articular eminences. A transverse osteotomy of the articular eminence was performed with a sagittal saw (NSK Nakanishi, Kanuma, Japan), and all eminences were green fractured completely in the lateromedial direction, preserving attachment of the medial periosteum (Fig 2).

The monocortical calvarial grafts were harvested through a 4-cm-long parietal scalp incision using fine burs and chisels. In 1 patient, the calvarial graft was harvested through a cranial extension of the Al Kayat-Bramley flap to avoid a secondary approach. The grafts were shaped in pyramidal form and tapped into the osteotomy sites (Fig 3). At least 1 SonicWeld pin (KLS Martin, Mühlheim, Germany), 12 mm long, was used to fix the inferior stump (the articular segment of the AE) to inlay the calvarial grafts and the remaining upper border of the zygomatic arch (Fig 4). Three eminences had insufficient bone volume (<6 mm in height) to obtain adequate fixation. An extra pin was inserted in each of those 3 cases, requiring additional stability from the upper pole, which was generally the root of the zygomatic arch.

Dietary restrictions and a soft diet (regimen 1) were prescribed to all patients for 4 weeks. No IMF was used, and all patients were advised to have minimal mouth opening during the early recovery period.

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