SCIENTIFIC ARTICLE

Metaphyseal Versus Diaphyseal Ulnar Shortening Osteotomy for Treatment of Ulnar Impaction Syndrome: A Comparative Study

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Purpose To compare the clinical and radiographic outcomes and complication rates of diaphyseal and metaphyseal ulnar shortening osteotomies for the treatment of ulnar abutment syndrome.

Methods We performed a retrospective study comparing 35 patients who underwent either a metaphyseal (n = 14) or diaphyseal (n = 21) osteotomy. Radiographic and clinical outcomes were compared. Complication rates including infection, hardware removal, and reoperations were also assessed.

Results There were no differences in patient characteristics, ulnar variance, or pain and functional scores between groups. Metaphyseal osteotomy surgery time was shorter (45.5 vs 71.7 minutes) and resulted in greater ulnar shortening (4.8 vs 3.4 mm) compared with diaphyseal osteotomies. At an average 19.2-month follow-up, metaphyseal osteotomies were associated with greater improvement in pain and *Quick*—Disabilities of the Arm, Shoulder, and Hand questionnaire scores. The need for implant removal was the same in both groups. There were no complications in either group.

Conclusions Results from this study suggest that metaphyseal osteotomies are a safe and effective alternative to diaphyseal osteotomies for the management of ulnar abutment syndrome. Although improved surgical time and postoperative outcomes are encouraging, further large-scale and properly powered studies with long-term outcomes will help characterize the benefit of one technique over another. Ultimately, the decision between a metaphyseal and diaphyseal osteotomy may be surgeon preference. *(J Hand Surg Am. 2017;■(■):1.e1-e8.*

Type of study/level of evidence Therapeutic IV.

Key words Ulnar shortening osteotomy, ulnar impaction syndrome, metaphyseal osteotomy, diaphyseal osteotomy, hook plate.

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Ulnocarpal abutment syndrome (UAS) is well-known to result from increased mechanical load on the ulnar side of the wrist, causing symptoms of pain that may lead to degenerative changes if left untreated. Multiple techniques have been described to unload the ulnar side of the carpus, but ulnar-shortening osteotomy (USO) has long been considered the reference standard.[1–11]

The most common site for the osteotomy is the diaphysis, and although short- and mid-term outcomes have been encouraging,[12–16] several complications have been reported to be associated with this technique, including unintended residual positive variance,[17] problems with hardware removal,[18–21] delayed union or nonunion,[22–25] and complex regional pain syndrome.[25,26]

Alternatively, UAS can be treated with distal metaphyseal USO.[21,27–30] A distal metaphyseal osteotomy has the perceived advantages of a greater likelihood of bone healing and ease of surgery and does not require additional specialized equipment.[29,31,32] In addition, biomechanical studies reported a similar reduction on the load across the ulnocarpal joint after either diaphyseal or metaphyseal osteotomies.[33] In 2012, our group published a case series on the use of a transverse USO at the metaphysis and osteosynthesis using a low-profile, 2.0-mm, locking compression distal ulna plate.[30] This initial report demonstrated that a metaphyseal USO was a safe and effective alternative to traditional diaphyseal osteotomies for the management of UAS. The current study assessed the clinical and radiographic outcomes associated with metaphyseal USO and compares these results with diaphyseal osteotomy. The purpose of this study was 2-fold: (1) to compare radiographic and functional outcomes between metaphyseal and diaphyseal USO for the management of UAS, and (2) to assess the incidence of complications associated with each surgical technique.

MATERIALS AND METHODS

After we received institutional review board approval from the Wake Forest School of Medicine, we performed a retrospective review of data from all patients who underwent surgical intervention for the management of UAS between 2008 and 2014. Patients were included in this study if they met the following criteria: adult patients (aged older than 18 years) with UAS who had previously failed nonsurgical treatment for 6 months and underwent primary USO. Ulnocarpal abutment syndrome was diagnosed by the presence of positive ulnar variance greater than 2 mm on wrist radiographs with the forearm in neutral rotation, ulnar-sided wrist tenderness to palpation, and reproduction of pain with forearm pronation, wrist ulnar deviation, and axial loading. Magnetic resonance imaging was obtained in cases in which the diagnosis was unclear. Nonsurgical measures included anti-inflammatory medication, local steroid injections, and wrist immobilization. Patients with degenerative joint disease, osteoporosis, and an immature skeleton, determined by open distal radius or ulnar physes, and those in whom a previous ulnar osteotomy had been performed or surgeries were performed for congenital abnormalities were excluded. Patients were further stratified based on the location of the osteotomy, either metaphyseal or diaphyseal. The sample was not randomized and the decision regarding which surgical technique was to be used was made by the patients after a discussion with the surgeon about risks and benefits of each option; however, the advantages of each technique were likely skewed by the 2 senior authors' preferences.

In patients in whom the diagnosis of UAS was unclear after clinical examination and radiographic analysis, magnetic resonance imaging (MRI) was obtained before USO. Those with an MRI-proven intact triangular fibrocartilage complex (TFCC) did not undergo wrist arthroscopy; all others underwent diagnostic wrist arthroscopy at time of the ulnar shortening procedure. In these patients, the presence of TFCC injury was noted.

Surgical techniques

For a metaphyseal USO (Fig. 1A–C) a longitudinal ulnar wrist incision 6 to 8 cm long was made from the tip of the ulnar styloid and continued proximally. A plane was developed between the flexor carpi ulnaris and extensor carpi ulnaris to expose the ulna subperiosteally. Care was taken to protect the dorsal cutaneous branch of the ulnar nerve. The locking compression distal ulna plate (Synthes, West Chester, PA) was placed on the exposed ulnar surface with the hooks engaged on the ulnar styloid; once the desired position was achieved, a 1.5-mm drill bit was used to mark the distal drill holes and the osteotomy site in the metaphysis was marked. The plate was removed and 2 transverse parallel osteotomies were made to obtain radius-ulna leveling (1- to 2-mm ulna-negative variance after osteotomy). The plate was locked back into place using the previously marked drill holes and the osteotomy was closed using a combination of point reduction forceps and dynamic compression with a self-tapping cortical compression screw. We completed proximal fixation with 2 more screws including at least one locking screw.

A diaphyseal USO (Fig. 2A–C) was performed via a 10-cm midaxial incision, in which an oblique