

Ulnar Impaction Syndrome: Ulnar Shortening vs. Arthroscopic Wafer Procedure

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J Wrist Surg 2014;3:98–100.

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Abstract

Keywords

- ▶ ulnar impaction
- ▶ shortening osteotomy
- ▶ arthroscopy
- ▶ TFCC
- ▶ wafer

The outcome of ulnar shortenings was compared with that of arthroscopic wafer resections for ulnar impaction (or abutment) syndrome in patients with a positive ulnar variance. The outcome was measured by DASH score, visual analog scale for pain, and working incapacity. The mean DASH score in the ulnar shortening group was 26; in the wafer group it was 36. The VAS scores were respectively 4.4 and 4.6. The working incapacity was 7 months in the ulnar shortening group and 6.1 months in the wafer group. The differences between the two groups were not statistically significant.

The basis of treatment of ulnar impaction¹ is mechanical decompression of the ulnocarpal articulation by decreasing ulnar variance. Shortening of the ulna or resection of the distal ulna significantly decreases forces across the ulnar wrist.^{2,3}

Various surgical procedures have been proposed to treat this ulnar impaction syndrome. They are all based on decompression of the ulnocarpal joint. Biomechanical studies of Palmer et al have shown that 18% of the loading pressure across the wrist is borne by the ulnocarpal articulation and that, by shortening the ulna 2.5 mm, this loading pressure is decreased to 4.3%.² The ulnar shortening osteotomy is an extra-articular technique and has the theoretical advantage of maintaining the distal radioulnar joint (DRUJ) and the peripheral aspect of the triangular fibrocartilage complex (TFCC). The outcomes of ulnar shortening osteotomy, described in the literature, were good or excellent in the majority of the cases.^{4–17} The wafer resection of the distal ulna also decreases the pressure on the ulnocarpal joint. Only a limited number of open cases have been reported.^{18–20} With the development of arthroscopic resection techniques, a new interest in this technique emerged.^{21–23}

In our patients, however, the results of ulnar shortening were not as positive.¹⁴ The overall outcome was not that good, and ulnar shortening osteotomy did not always seem to be the ultimate successful procedure for ulnar abutment. Complica-

tions were procedure linked and not related to an incomplete diagnosis of ulnar wrist pain. In recent years we performed an arthroscopic resection of the distal ulna with similar results. This article will summarize the results of a retrospective case-control series. The data of these surveys has been reported in previous papers.^{14,16,17}

Ulnar Shortening

In this survey we studied the outcome in 28 patients (22 women and 6 men) following an ulnar shortening osteotomy for ulnar impaction. The mean age at operation was 38 years (range 16–61). The dominant hand was affected in 13 patients, 17 of them were treated previously with an arthroscopic débridement.¹⁵ For the shortening osteotomy, the distal ulna was approached through a dorsoulnar longitudinal incision between the extensor carpi ulnaris (ECU) and flexor carpi ulnaris (FCU). The dorsal branch of the ulnar nerve was protected and the ulna was exposed in an extraperiosteal fashion. A seven-hole, 3.5-mm AO dynamic compression plate (DCP)- was used. A longitudinal saw cut along the plate was made as a rotational marker. The plate was swung away and two parallel osteotomies were performed, either transverse or oblique. In this series there were 19 transverse and 9 oblique osteotomies. The plate was aligned again, and bicortical screws were introduced, three distal and three proximal

to the osteotomy. Mobilization was allowed immediately postoperatively. The follow-up was 29 months on average (range 7 to 60 months). The mean Disabilities of the Arm, Shoulder, and Hand (DASH) score improved from 40 to 25.78 (SD 18.3). ($p < 0.001$, paired t -test). The Mayo wrist score was excellent in 11 patients (39%), good in 10 (35.7%), fair in 6 (21.4%), and poor in 1 (3.5%). The postoperative VAS score for pain was 4.4 (SD, 1.99); the preoperative VAS score was not noted in the files; nor were the ranges of motion. The ulnar variance preoperatively was +1.7 mm (range -1 to +4 mm); postoperatively there was a mean shortening of 3.5 mm. The postoperative ulnar variance was -1.8 mm (range -4 to +0.5 mm). However, 27 secondary operations in 21 patients were required: one patient was converted to a Sauvé-Kapandji procedure; there were three nonunions, which were treated with iliac crest bone grafting; 22 hardware removals; one cubital tunnel release; one tendon graft stabilization of the DRUJ; one arthrolysis of the DRUJ; and one wrist arthrodesis. The mean time out of work was 7 months (range 0.5 to 30 months); six patients could not return to their previous occupation.

Arthroscopic Wafer Resection

We also studied 12 patients (8 women and 4 men) following an arthroscopic wafer resection for ulnar impaction. The mean age was 46 years (range 31–66 years). The dominant hand was involved in 6 patients. The mean preoperative ulnar variance was +2.7 mm (range -3.5 to +5mm). For the wafer resection a standard wrist arthroscopy set-up was performed. The 3–4 portal was used for visualization, the 6R for instrumentation. After general inspection the synovium in the ulnar compartment of the wrist was removed with soft tissue shavers; all wrists where a central TFCC tear was present were debrided with arthroscopic forceps and shavers. Two mm of the ulnar head was removed with an arthroscopic burr. The portals were not closed; the wrists were packed in a bulky dressing, and mobilization was allowed between pain limits. The DASH was 34 (SD, 19.4) The final DASH wrist score was excellent in 4, good in 3, and fair in 5 patients. The mean VAS for pain was 4.6 (SD 2.65); the preoperative VAS score was not noted in the files; nor were the ranges of motion. One patient ultimately underwent an ulnar shortening osteotomy. One patient had a Blatt capsulodesis for dynamic scapholunate instability. The mean duration out of work was 6.1 months (range zero to 26 months). The postoperative ulnar variance was unchanged on plain radiographs because only the protruding dome of the ulna was removed.

Discussion

The number of patients was too small to form any conclusions between the two groups in postoperative disability (t -test, $p = 0.4$ for the mean value and chi-square ($p = 0.3$) and Fisher exact test (0.45) for the repartition) and the pain evaluation (t -test, $p = 0.11$). The duration of time off work was significantly lower in the arthroscopic group (t -test,

$p < 0.001$). Secondary procedures were significantly more numerous in the osteotomy group (chi-square, $p = 0.003$).¹⁷

The outcomes of both procedures have been reported by several authors, including our department. The results after an ulnar shortening osteotomy for static or dynamic ulnocarpal abutment (– **Table 1**) are satisfying: 75% of the patients were pleased with the outcome, although nonunions did occur, requiring further surgery, and there was a high incidence of symptomatic hardware removal. For the wafer resection, outcome studies are sparser. Feldon et al¹⁸ had 12 good results in 13 patients. Schuurman and Bos¹⁹ obtained five good results in seven wrists. The largest series is the one by Tomaino and Shah²⁰: 26 cases with 23 completely satisfied. With regards to an arthroscopic resection, Feldkamp²¹ reported 8/10 excellent or good result. Tomaino and Weiser²² published a series of 12 cases; 8 were completely pain free and 4 had minor symptoms, but all patients were satisfied. Bernstein et al²³ had 9 excellent and good results in their 11 cases and a better outcome as compared with an extra-articular shortening. Recently Meftah et al²⁴ reported 26 cases with 22 excellent and good outcomes.

We could not confirm that there was a better outcome following arthroscopic débridement and wafer resection compared with standard ulnar shortening. The groups were not large enough for a detailed statistical analysis, and further studies are required. We did find, however, that the time off work was shorter in the arthroscopically treated patients and that secondary procedures were much less numerous than in the open osteotomy group. Although we did not routinely remove the hardware, the vast majority of patients requested it. Last but not least, the 10% nonunion rate cannot be ignored. Secondary surgery for nonunion is a major procedure that cannot be taken lightly.

Table 1 Summary data on reported series of ulnar shortening osteotomies

	Year	N	Satisfied/ excellent + good
Darrow et al ⁷	1985	36	28
Boulas et al ⁵	1990	10	9
Chun and Palmer ⁶	1993	30	28
Köppel et al ¹¹	1997	47	37
Hulsizer et al ⁹	1997	13	12
Minami and Kato ¹³	1998	25	23
Loh et al ¹²	1999	23	17
Jain et al ¹⁰	2000	20	13
Van Sanden and De Smet ¹⁶	2001	11	7
Beak et al ⁴	2005	31	29
Moermans et al ¹⁴	2006	28	21

Conflict of Interest

None

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