Outcomes of Ulnar Shortening Osteotomy after Distal Radius Malunion: A Comprehensive Analysis

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Abstract

Ulnar shortening osteotomy (USO) is a surgical intervention often performed to correct ulnar impaction syndrome, particularly following malunion of a distal radius fracture. This retrospective study examines the outcomes of 14 cases of USO, focusing on patient demographics, surgical techniques, and long-term results. The study found significant pain relief, improved range of motion, and enhanced grip strength in all patients. The average extension increased from 45 degrees preoperatively to 70 degrees postoperatively, and the average flexion improved from 40 degrees to 65 degrees. Grip strength increased from 60% to 90% of the contralateral side. Radiographic analysis revealed successful correction of ulnar variance in all patients, with an average reduction of 3.5 mm. Complications were rare, with only one case of superficial infection and one case of hardware irritation. The study underscores the efficacy of USO in treating ulnar impaction syndrome secondary to distal radius malunion, highlighting the importance of careful preoperative planning, precise surgical technique, and diligent postoperative care in achieving optimal results.

Keywords: Ulnar Shortening Osteotomy, Distal Radius Malunion, Ulnar Impaction Syndrome, Surgical Outcomes

Introduction

Ulnar shortening osteotomy (USO) is a surgical intervention often performed to correct ulnar impaction syndrome, particularly following malunion of a distal radius fracture. The ulnar impaction syndrome (UIS) is a cause of painful degenerative wrist condition caused by the impaction of the ulnar head in cases of distal radial fracture malunion [1, 2]. This retrospective study examines the outcomes of 14 cases of USO, focusing on patient demographics, surgical techniques, and long-term results.

Surgical Techniques

The surgical approach for USO involved several standardized steps, ensuring precision and minimization of complications. All procedures were performed by 2 senior orthopaedic surgeons using a dorsal approach.

Preoperative Planning

Preoperative assessment included detailed imaging radiographs and CT to evaluate the extent of malunion and ulnar variance. Preoperative planning involved templating to determine the precise amount of ulnar shortening required.

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Surgical Procedure

All procedures were performed under brachial block. Incision: A dorsal longitudinal incision was made over the ulna. A transverse osteotomy was performed at the desired level, followed by removal of the determined bone segment. The osteotomy was stabilized using a dorsal locking plate and screws. Layered closure was performed with meticulous attention to minimizing soft tissue disruption.

Postoperative Care

Postoperative management included immobilization in a cast for 6 weeks, followed by a period of physiotherapy to restore range of motion and strength. Patients were regularly monitored for signs of complications such as nonunion, infection, or hardware irritation.

Results

The 14 patients included in this study comprised of 8 women and 6 men, with an average age of 45.7 years (range: 35-65 years). All patients had a history of distal radius fracture malunion, with varying degrees of functional impairment and pain. The duration between the initial fracture and USO ranged from 6 months to 2 years, with an average duration of 14 months.

The follow-up period ranged from 12 to 36 months, with an average follow-up duration of 24 months. The outcomes were assessed based on pain relief, range of motion, grip strength, and radiographic evaluation of ulnar variance and union.

Pain Relief

All patients reported significant pain relief postoperatively, with 12 out of 14 patients achieving complete resolution of pain. The remaining 2 patients experienced occasional mild discomfort, which did not interfere with daily activities.

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Range of Motion

Improvement in wrist range of motion was observed in all patients. The average extension increased from 45 degrees preoperatively to 70 degrees postoperatively, and the average flexion improved from 40 degrees to 65 degrees.

Grip Strength

Grip strength was measured using a dynamometer, with improvements observed in all cases. The average grip strength increased from 60% of the contralateral side preoperatively to 90% postoperatively.

Radiographic Evaluation

Radiographic analysis revealed successful correction of ulnar variance in all patients, with an average reduction of 3.5 mm. All osteotomies achieved complete union within 3 to 6 months postoperatively.

Complications

Complications were relatively rare and included one case of superficial infection, which resolved with antibiotic treatment, and one case of hardware irritation necessitating plate removal. But the osteotomy site had satisfactorily united by that time allowing the safe removal of the hardware.

Discussion

The significant pain relief, improved range of motion, and enhanced grip strength observed in our patients underscore the efficacy of this procedure. Specifically, 12 out of 14 patients achieved complete resolution of pain, with the remaining 2 experiencing only occasional mild discomfort. Additionally, the average extension and flexion of the wrist improved significantly postoperatively, and grip strength increased from 60% to 90% of the contralateral side [3].

When comparing our findings with previous studies, several similarities and differences emerge. For instance, Palmer's classification of triangular fibrocartilage complex lesions and Sachar's evaluation of ulnar-sided wrist pain both highlight the importance of addressing ulnar variance in managing ulnar impaction syndrome [1, 2]. Our study aligns with these findings, as we observed successful correction of ulnar variance in all patients, with an average reduction of 3.5 mm.

Moreover, the complication rates in our study were relatively low, with only one case of superficial infection and one case of hardware irritation. This is consistent with previous studies that have reported similar complication rates for USO procedures. However, our study's follow-up period ranged from 12 to 36 months, which is longer than some previous studies, providing a more comprehensive assessment of mid-term outcomes [4, 5].

In conclusion, our study adds to the growing body of evidence supporting the efficacy of ulnar shortening osteotomy for treating ulnar impaction syndrome secondary to distal radius malunion [6]. The favorable outcomes observed in our patients, combined with the low complication rates, highlight the importance of careful preoperative planning, precise surgical technique, and diligent postoperative care in achieving optimal results.

Conclusion

Ulnar shortening osteotomy is an effective surgical procedure for treating ulnar impaction syndrome secondary to distal radius malunion. The favorable outcomes observed in this study, including significant pain relief, improved range of motion, and enhanced grip strength, underscore the procedure's efficacy. Careful preoperative planning, precise surgical technique, and diligent postoperative care are critical to achieving optimal results.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

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