Ultrasound-Assisted Closed Reduction of Distal Radius Fractures

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Purpose To assess the accuracy and ability of ultrasound for monitoring closed reduction for distal radius fractures.

Methods Consecutive patients undergoing ultrasound-guided closed reduction of acute, displaced distal radius fractures between January 2003 and December 2006 at our department were enrolled. The control group was extracted from patients who underwent a closed reduction for similar fractures under fluoroscopy or without any imaging assistance. To confirm the accuracy of the ultrasonography measurements, displacement distance values were compared with those on radiographic imaging before and after reduction. X-ray parameters for pre- and postreduction, reduction time, total cost, and success rate were compared between the ultrasound-guided and the control groups.

Results The ultrasound-guided group consisted of 43 patients (mean age, 68 y) and the control group consisted of 57 patients, which included 35 patients (mean age, 74 y) with fluoroscopic reduction and of 22 patients (mean age, 72 y) with reduction unaided by imaging. There were no significant displacement differences between radiographic and ultrasound measurements. In x-ray parameters for pre- and postreduction, there were no significant differences between the 2 groups. Ultrasound-guided reduction took longer than the other 2 methods. The success rate of the ultrasound and the fluoroscopic groups were similar (95% and 94%, respectively).

Conclusions Our data suggest that ultrasound assistance can aid reduction of distal radius fractures as well as fluoroscopy. *(J Hand Surg Am. 2014;39(7):1287–1294.*

Type of study/level of evidence Therapeutic II.

Key words Ultrasound examination, distal radius fracture, closed reduction, conservative treatment.

Management of a distal radius fracture, one of the most common fractures encountered by orthopedic surgeons, is extremely variable and includes both surgical and nonsurgical treatment options.[1–3] Although recent development of volar locking plates for unstable or comminuted fractures has widened the surgical indications for internal fixation,[4,5] conservative treatment with closed reduction and cast immobilization remains the most common form of definitive treatment.[6,7] In addition, even when a distal radius fracture requires surgery, successful initial closed reduction and cast immobilization is important to reduce pain and swelling. Thus, accurate primary reduction is valuable for management of a distal radius fracture and essential in nonsurgical cases.

Displaced distal radius fractures are usually managed with closed reduction by manual manipulation or finger

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Received for publication October 30, 2013; accepted in revised form February 22, 2014.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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0363-5023/14/3907-0007$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2014.02.031

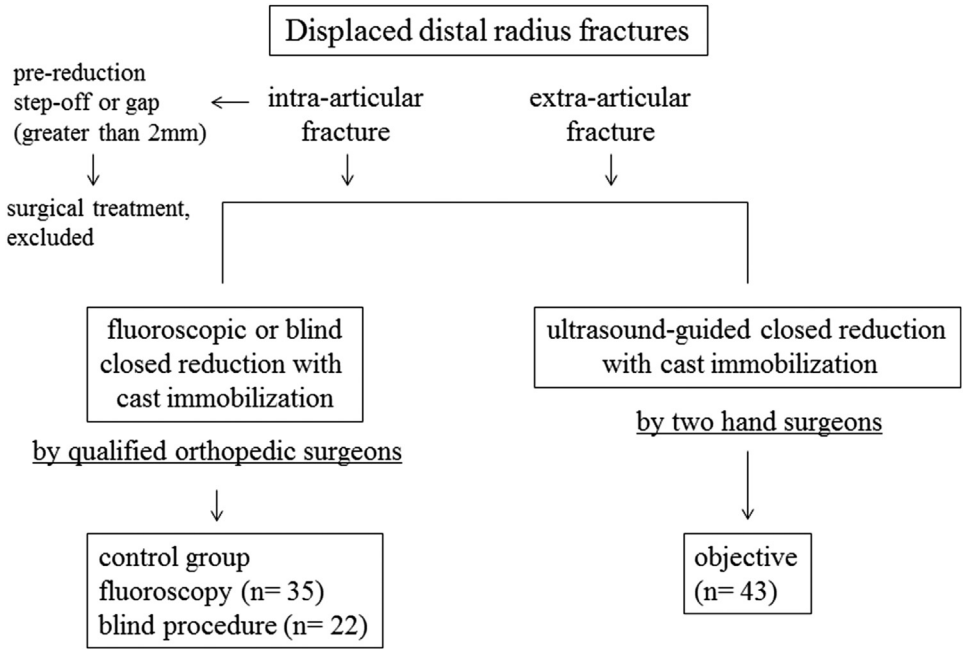

FIGURE 1: Flowchart representing patient selection. Patients requiring surgical treatment with intra-articular stepoff or gapping (> 2 mm) were excluded. Only cases treated conservatively with cast immobilization were included in this study. The significant displacement was defined as radial shortening > 2 mm, volar tilt < −5°.

trap traction under blind manual palpation or fluoroscopic guidance. Postmanipulation radiographs are then obtained to assess the adequacy of the reduction.[8] However, multiple inadequate reductions under blind manipulation can result in prolonged anesthesia time, increased radiation exposure, and patient discomfort.[9]

Ultrasound examination is widely available in many departments and provides dynamic images in real time. In addition, this method can be easily used in both emergency room and outpatient settings. Recent reports have noted that ultrasound is increasingly used for the detection and management of hand injuries.[10,11] However, few studies have examined ultrasound-guided reduction of displaced distal radius fractures.[12–14]

The purpose of our study was to assess the accuracy of ultrasound in monitoring closed reduction of distal radius fractures.

MATERIALS AND METHODS

Patients

This was a prospective study of a group of patients in whom ultrasound was used to monitor the closed reduction of distal radius fractures and compared with a retrospective control group in whom fracture reduction was performed under fluoroscopic guidance or unassisted by imaging. The present study was undertaken after receiving approval from our institutional review board. Consecutive patients undergoing ultrasound-guided closed reduction of an acute displaced distal radius fracture between January 2003 and December 2006 at our department were enrolled. Adults older than 18 years with displaced distal radius fractures requiring closed reduction were prospectively recruited. The decisions regarding major displacement of each fracture and requirement for closed reduction were made by 2 hand surgeons (N.K. and Y.T.) in our department, both of whom were qualified by the Japanese Society for Surgery of the Hand. Major displacement was defined as radial shortening greater than 2 mm and volar tilt less than -5°. Only cases treated conservatively with cast immobilization were included in this study. In addition, patients with prereduction intra-articular stepoff or gapping greater than 2 mm were excluded. The retrospective control group was extracted from patients who underwent a closed reduction for a similar fracture during the same time period under fluoroscopic guidance or without imaging assistance. All procedures in the control group were performed by orthopedic surgeons (not hand surgeons) qualified by the Japanese Orthopaedic Association. The flowchart representing patient selection is shown in Figure 1.

Methods

All ultrasound-guided closed reduction procedures were performed on an acute displaced distal radius fracture by the 2 hand surgeons (N.K. and Y.T.) in