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Proximal radial diaphyseal segment resection for posttraumatic proximal radioulnar synostosis: a prospective study of 15 cases

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Background: Proximal radioulnar synostosis is a complication after elbow injuries. Various treatment methods have been reported and are associated with unpredictable outcomes. In a prospective study, we evaluated the medium-term effects of proximal radial resection on wrist and elbow function and forearm rotation in 15 cases.

Methods: We treated 15 patients with posttraumatic proximal radioulnar synostosis by resection of 1 cm of the proximal radial diaphysis. On the preoperative examination and last follow-up, the Mayo Elbow Performance Score, grip force, visual analog scale for elbow and wrist score, radiographic ulnar variance changes, and elbow range of motion were measured. The Disabilities of the Arm, Shoulder, and Hand (QuickDASH) score and the general satisfaction of the patients were assessed at the final follow-up.

Results: The mean duration of follow-up was 31 ± 13 months. The mean active postoperative supination/pronation arc was 101° ± 45°. The mean increase measured in the ulnar variance at the final follow-up was 3.3 ± 1.5 mm ($P = .02$). The mean final QuickDASH score was 13.3 ± 12.1. The preoperative and final Mayo scores were 57 ± 10 and 91 ± 7, respectively ($P = .01$). The general satisfaction with the results of the operation was 86.6%.

Conclusions: We suggest that proximal radial resection for the treatment of posttraumatic proximal radioulnar synostosis shows acceptable results in adults regarding the recovery of range of motion and patient satisfaction. This technique might be considered as a salvage procedure, particularly in cases with previous failed heterotopic resection at the proximal radioulnar joint, resulting in disturbed anatomy.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Proximal radioulnar joint; synostosis; heterotopic ossification; radial resection; QuickDASH score; Mayo Elbow Performance Score; ulnar variance; satisfaction

Ethical committee approval: The Ethical Committee of the Orthopaedic Department of Tehran University approved this study (No. 87712), and informed consent from the patients was obtained after explanation of the available treatment options before the study.

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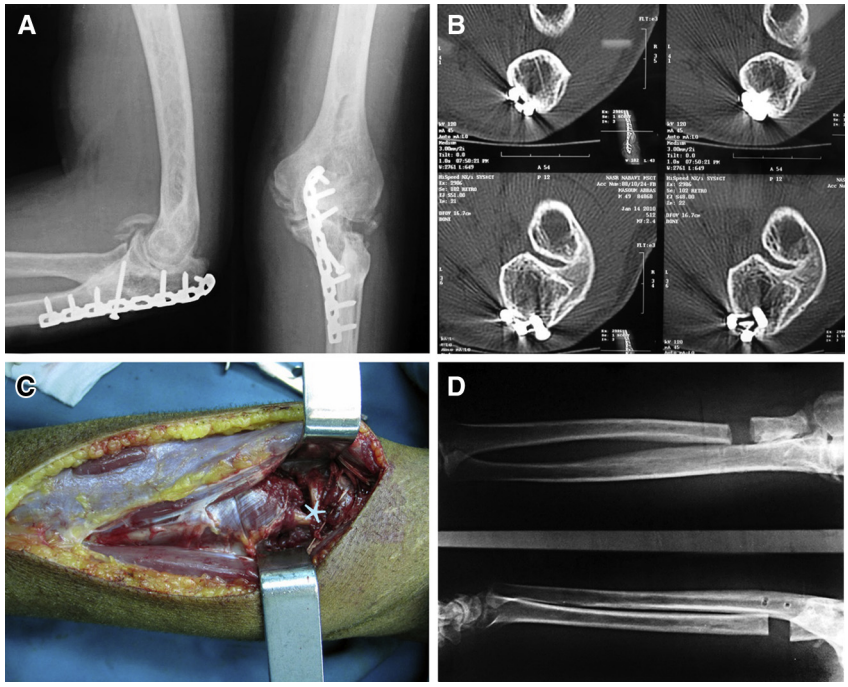

Figure 1 Case number 8. (**A**) Preoperative radiograph. (**B**) Preoperative axial computed tomography scan showing extensive synostosis. (**C**) Operative approach; *asterisk* indicates radial resection site. (**D**) Immediate postoperative radiograph.

Posttraumatic proximal radioulnar synostosis is a rare but serious complication after severe elbow injuries that could lead to functional disability from a limitation of forearm rotation.[14] Because of extensive anatomic distortion and the proximity of the neurovascular structures, treatment of proximal radioulnar synostosis is difficult and associated with unpredictable outcomes.[8] Treatment methods have included excision of the synostosis with soft tissue or synthetic material interposition, excision of the proximal radius, screw insertion to distract the radius from the ulna, and rotational osteotomy of the radius.[16] Reports of varying degrees of improvement in forearm rotation are inconclusive because of the small number of cases and different evaluation methods.[5,6,17]

Kamineni et al[7] reviewed 7 cases treated by proximal radial resection to create a new axis of forearm rotation. The aim of this prospective study was to evaluate the medium-term effects of proximal radial resection on wrist and elbow function and forearm rotation in cases with proximal radioulnar synostosis.

Materials and methods

Patients

In a prospective study between May 2007 and January 2012, we treated posttraumatic proximal radioulnar synostosis with a proximal radial diaphyseal segment resection in 19 patients (16 men and 3 women), including 10 patients with injuries on the left and 9 patients with injuries on the right forearm. Patients who had signs of distal radioulnar joint instability were excluded from this study. The dominant limb was involved in 10 of the patients. All of the patients presented with limited rotational forearm motion. The mean age of the patients was 31 $\pm$ 13 years (range, 12-56 years). Eleven cases were traffic accident injuries, and 8 were fall injuries. Seven patients underwent elbow contracture release surgery in a separate operation to improve the flexion arc. Six patients had a fracture-dislocation (1 had a concomitant scaphoid fracture), 3 had a radial head fracture, 5 had a proximal ulnar fracture, 4 had fractures of both forearm bones, and 1 had extensive soft tissue injury with a skin defect. The radial resection procedure was performed 31 $\pm$ 15 months (range, 5-55 months) after the initial injury.

Assessments

At the preoperative examination and last follow-up, the following assessments were conducted. The flexion/extension and supination/pronation range of motion were measured by a goniometer, and elbow stability was examined. All of the patients were assessed with the Mayo Elbow Performance Score[11] and the visual analog scale (VAS) for the elbow and wrist[18]; the grip force was measured by a grip dynamometer (Jamar device; Patterson Medical, Warrenville, IL, USA). At the final follow-up, the Disabilities of the Arm, Shoulder, and Hand (QuickDASH) score was calculated for all of the patients, and the patients' general satisfaction was assessed. The ulnar variance changes were calculated from the preoperative and follow-up wrist radiographs. We defined synostosis recurrence as new heterotopic bone formation at the osteotomy site visible on the final elbow radiographs, bridging between proximal and distal stumps (resulting in fixed forearm rotation).