

# Arthroscopic-Assisted Treatment of Coronoid Fractures

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**Purpose:** Little information exists regarding arthroscopic treatment of coronoid fractures; this study reports outcomes in a series of patients. **Methods:** Forty-one coronoid fractures were identified by retrospective chart review; 7 were treated arthroscopically; 6 with >12 months of available follow-up. Regan–Morrey fracture types were II (n = 4) and III (n = 3). The age of the patients averaged 37 years; the mechanism of injury was a fall in 6 patients and a motocross accident in 1 patient. Fracture fixation included: plate-and-screws following arthroscopic reduction (1); screws (2) and threaded Steinmann pins (2); 2 fractures were debrided. Three patients had immediate (2) or delayed (1) lateral ulnar collateral ligament repair. **Results:** Follow-up averaged 31.8 months. The range of motion averaged 9° to 133° in flexion–extension and 87°/79° in prono-supination. Mayo Elbow Performance scores were 100 in 5 of 6 patients and unavailable in 1 patient. Complications included asymptomatic heterotopic ossification (1) and delayed ulnar neuropathy (1). **Conclusions:** In our series of coronoid fractures treated with arthroscopic means, all patients had a functional, pain-free result. All patients returned to preoperative avocations and occupations. **Level of Evidence:** Level IV, therapeutic case series. **Key Words:** Arthroscopy—Coronoid fractures.

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Until recently, fractures of the coronoid process of the elbow have received little attention. However, it has been recognized that the coronoid plays an important role in maintaining bony stability of the elbow joint, and recent interest has focused on restoring this role in the setting of the fractured coronoid.

Fractures of the coronoid process are generally believed to occur by axial loading of the elbow, and are frequently associated with posterior dislocation of the elbow.<sup>1</sup>

Schneeberger et al<sup>2</sup> found the contribution of the coronoid to stability of the elbow to be significant: in a cadaveric study, posterolateral rotatory displacement of the ulna was investigated after radial head resection and simulated coronoid fractures. Elbows with intact ligaments, a 50% to 70% loss of the coronoid, and

radial head resection were unstable, and stability could not be restored by radial head replacement alone. Repair of the coronoid, however, restored stability.<sup>2</sup>

Closkey et al<sup>3</sup> investigated the role of the coronoid process in providing stability to the elbow joint in a cadaveric series. They found a significant difference in posterior displacement of elbows with a >50% loss of coronoid (simulated type III fractures) at all flexion angles relative to intact elbows, or those with type I or II simulated fractures. This effect was most prominent at flexion angles of 60° to 105°, suggesting that the coronoid provides an important role in stability of the elbow to posterior distraction, particularly at these angles.<sup>3</sup>

Arthroscopic surgery has assumed a more prominent role in the setting of trauma surgery, with roles in both diagnosis and treatment. Arthroscopic assisted reduction of fractures of the distal radius, the proximal tibia, and the distal tibia and other periarticular fractures have become more common, and are even routine in many centers.<sup>4-7</sup> Arthroscopy is useful to minimize soft tissue damage and dissection,<sup>4-6</sup> assess and optimize anatomic reduction of the articular surface,<sup>6</sup> and to evaluate concomitant intra-articular injuries or

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pathology, such as loose bodies, cartilaginous lesions, or interposed soft tissue.<sup>6</sup> Others have utilized arthroscopic debridement of fracture fragments to treat intra-articular fractures<sup>8-9</sup>; however, there is little information to date regarding arthroscopic treatment of coronoid fractures.<sup>9</sup> The purpose of this manuscript is to present results from a series of patients treated with arthroscopic treatment of fractures of the coronoid.

## METHODS

Appropriate institutional review board approval was obtained prior to the current study. A computerized search was performed to find isolated fractures of the coronoid process of the ulna from the years 2001 to 2005. Subsequently, over the 4-year study period, 41 patients (41 elbows) with isolated fractures of the coronoid process were identified; 7 of these were treated arthroscopically. One case was excluded because the follow-up period was shorter than 12 months, leaving 6 patients for evaluation. Fracture types were classified according to the Regan–Morrey classification system. Information regarding the patient's mechanism of injury, treatment program, and medical course were abstracted from the medical records. Range of motion was measured using a goniometer. Mayo Elbow Performance Scores<sup>10</sup> (Table 1) were calculated based upon the medical record and/or telephone interview if needed. Likewise, injury and

post-treatment radiographs were reviewed. The average duration of follow-up was 31.8 months (range, 15 to 47 months).

## Surgical Technique

The patient was positioned in a lateral decubitus position with the affected side up and the arm draped over the side.<sup>11,12</sup> The arm was placed in a padded arm holder, and a non-sterile tourniquet was placed at the level of the armholder. The arm was positioned slightly superior to the level of the shoulder and secured to the armholder. The table was then tilted 5° to 10° towards the surgeon to facilitate flexion intraoperatively.<sup>12</sup> The elbow was then prepared and draped in the usual sterile fashion, elevated, exsanguinated, and the standard arthroscopic portals established.<sup>12</sup> The fracture was addressed based upon intraoperative findings and fracture pattern. Fractures that were too comminuted or small to be fixed were debrided arthroscopically (n = 2). Others were reduced arthroscopically using an anterior cruciate ligament (ACL) guide or reduction clamp placed typically through the medial portal while viewing through the lateral portal (Figure 1). Once reduction was confirmed, fixation was achieved by placing a guide wire through the ACL guide posteriorly up into the fragment. The pin could be visually confirmed to be in the coronoid fragment as it exited the anterior tip of the coronoid. A cannulated screw (Synthes, Paoli, PA) could then be placed over the pin to secure fixation (Figure 2). Intraoperative fluoroscopy was then used to confirm satisfactory reduction and fixation. One patient had arthroscopic reduction, but fixation required a limited anterior incision for placement of a plate. Following fracture fixation, instability was addressed if necessary, with 3 patients having immediate (n = 2) or delayed (n = 1) lateral ulnar collateral ligament (LUCL) imbrication (Figure 3).

## RESULTS

According to Regan–Morrey classification, 4 fractures were type II and 3 were type III. Average age at time of injury was 37 years (range, 12 to 46 years). Mechanism was a fall in 6 patients (2 from a height of 12 to 15 feet; 4 from a ground-level height), and a motocross-related injury in 1 patient. There were 2 right elbows and 5 left elbows. Duration of time from date of injury to index surgical procedure was 8 days (range, 0 to 23 days).

TABLE 1. Mayo Elbow Performance Scores

Criterion	Possible Points	Descriptor	Points Awarded
Pain	Total 45	None	45
		Mild	30
		Moderate	15
		Severe	0
Motion	Total 20	Arc >100°	20
		Arc 50° to 100°	15
		Arc <50°	5
Stability	Total 10	Stable	10
		Mild instability	5
		Gross instability	5
Function	Total 25	Comb hair	5
		Feed self	5
		Perform hygiene	5
		Don shirt	5
		Don shoes	5
Scoring classifications	Excellent	>90	
	Good	75-89	
	Fair	60-74	
	Poor	<60	

Data from Shih et al.<sup>7</sup>

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