

Closed Treatment of Displaced Radial Neck Fracture in an Adult

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ABSTRACT

Making up 1.5% to 4.0% of all fractures, radial head and neck fractures are typically treated based on the severity of angulation at the radial neck or if range of motion (ROM) is blocked. In this study, we present a case of a 43-year-old woman with a Mason Type 2 radial neck fracture, successfully treated with closed reduction and one week of immobilization, resulting in near anatomic radial neck angulation without the need for operative intervention. The patient returned to work within two weeks and regained full ROM by six months, maintaining near anatomic reduction throughout.

Keywords: Elbow Injury; Radial Neck Fracture; Radius Fracture

INTRODUCTION

Radial head and neck fractures are relatively common, accounting for approximately 33.0% of elbow fractures and 1.5% to 4.0% of all fractures.¹ The radial head was once thought to be expendable and fractures were often treated with excision. The radial head has since been recognized for its key role in the biomechanics and stability of the elbow and forearm. The radial head is a critical secondary valgus stabilizer of the elbow, particularly in the setting of a medial collateral ligament injury.² Furthermore, Rabinowitz et al³ found that the radial head is a primary forearm stabilizer by demonstrating up to 7 millimeters of proximal radial migration after radial head resection in cadaveric models. Unrecognized forearm instability resulting from radial head and neck fractures often results in limited range of motion (ROM), wrist deformity, and chronic pain.⁴ An intact and appropriately angulated radius is paramount to wrist, forearm, and elbow stability and function.

An improved understanding of the functional anatomy and kinematics of the elbow has demonstrated that ideal treatment of radial head and neck fractures is vital. In general, non-operative management is recommended for Mason Type 1 fractures, which are nondisplaced or minimally displaced (<2 millimeters). In contrast, operative management is often used for Mason Type 2 fractures, which are displaced (>2 millimeters), and for Mason Type 3 comminuted fractures.⁵

Appropriate treatment of Mason Type 2 radial neck fractures remains controversial as these fracture patterns may be associated with either stable or unstable fracture

fragments and may or may not have an associated mechanical block to motion.⁶ Although closed reduction is well described for pediatric radial neck fractures, there are no reports of closed reduction without internal fixation for Mason Type 2 radial neck fractures in adult patients.⁷ We present the case of an otherwise healthy 43-year-old woman with a Mason Type 2 radial neck fracture, successfully treated nonoperatively with a near-anatomic reduction in the emergency department.

CASE REPORT

A 43-year-old right-handed, athletic woman presented to the emergency department with an acute left radial neck fracture, sustained in a mountain biking accident when she fell onto her outstretched arm. She had no significant past medical history. The left upper extremity was neurovascularly intact and the fracture was closed. She was exquisitely tender over the radial head. Elbow ROM was slightly limited when compared to the contralateral extremity, with approximately 5° of limitation in both pronation and supination. The patient had no other significant injuries and denied any prior injuries to the left elbow.

Initial radiographs of the elbow and forearm revealed a radial neck fracture with approximately 20° of apex ulnar angulation and a compromise in the congruency of the radiocapitellar joint line (Figure 1). We informed the patient that the fracture angulation could be addressed through closed reduction, with the aim of preventing further displacement and potentially avoiding the need for operative fixation. She opted to proceed with closed reduction, and Ketamine was used

avoiding the need for operative fixation. She opted to proceed with closed reduction, and Ketamine was used for pain management. We reduced the radial head using the Israeli/Kaufman maneuver in which the forearm was supinated and pronated while the elbow was held at 90° of flexion with direct pressure over the radial head.⁸

Improved alignment was demonstrated on miniature C-arm fluoroscopy and the patient was placed in a well-padded sugar tong splint with the elbow positioned at 90°. A mold was applied over the radial head to maintain the reduction. She tolerated the procedure well. Formal radiographs and a computed tomography scan were obtained to further evaluate the elbow injury, which demonstrated that the radial neck was now in near anatomic alignment (Figures 2-4).

The patient was seen one day later in the hand-specialty clinic. Due to her near anatomical fracture alignment, we decided to proceed with conservative management in the splint for an additional week. After one week, the splint was removed and the patient transitioned to a sling to begin light ROM exercises to prevent stiffness. Three weeks later, the patient was seen in clinic, and new three-view elbow radiographs showed that the alignment of the radial neck fracture was maintained (Figure 5). Her elbow ROM was limited to 30° to 100°. She lacked approximately 10° of supination and 20° to 30° of pronation. She was otherwise neurovascularly intact. The patient returned to work but was limiting herself to desk work. At this point, we recommend she discontinue the sling and slowly progress to all activities as tolerated. Six months post-injury, she had full ROM equal to the contralateral side without pain or tenderness.

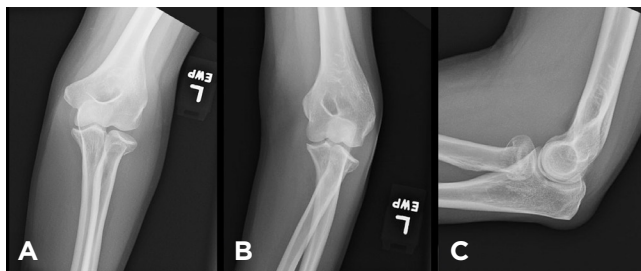


Figure 1. A) Anteroposterior; B) oblique; C) lateral left elbow injury radiographs showing an angulated left radial neck fracture with radiocapitellar joint line incongruency notable on all three views.

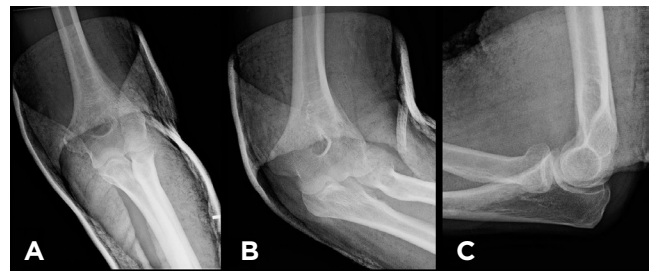


Figure 2. A) AP; B) oblique; C) lateral left elbow post-reduction radiographs showing improved alignment of the radial neck fracture and radiocapitellar joint line congruence.

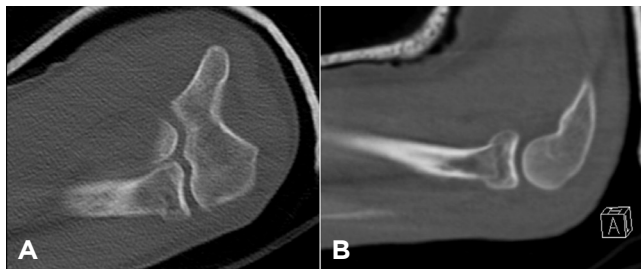


Figure 3. A) Coronal and B) sagittal computed tomography scan slices of the left elbow, post-reduction, showing improved alignment of the radial neck fracture and elbow joint line congruence.

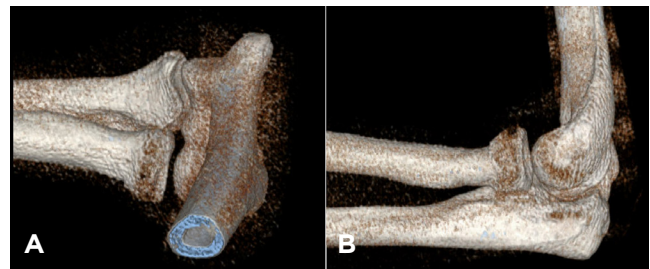


Figure 4. A) Coronal and B) sagittal views of a 3D reconstruction of the left elbow, post-reduction, showing improved alignment of the radial neck fracture and elbow joint line congruence.

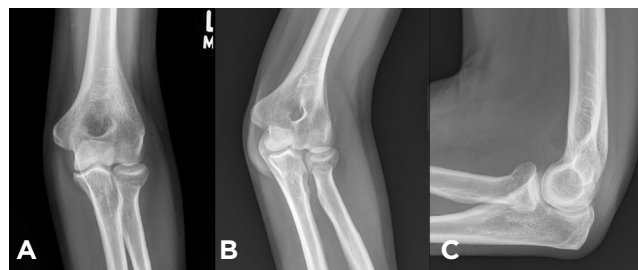


Figure 5. A) AP; B) oblique; C) lateral left elbow radiographs, three weeks after injury, showing a healing left radial neck fracture with maintained radiocapitellar joint line congruence.

DISCUSSION

The complex articulation of the radial head in both the radiocapitellar and proximal radioulnar joints highlights the importance of proper management of radial head and neck injuries to preserve optimal function. These radial neck fractures are often classified using the Mason classification system in which Type 1 fractures are non-displaced or minimally displaced (<2 millimeters), Type 2 fractures are displaced (>2 millimeters), and Type 3 fractures are highly comminuted.⁵ Mason fracture Types 1 and 2 may be treated conservatively with exercise alone, yielding good to excellent outcomes in the majority of patients.^{5,9-11}

In a prospective study of 237 patients, Duckworth et al¹⁰ followed 156 radial head and 81 radial neck fractures, finding that 93.0% of patients achieved excellent or good Mayo Elbow Scores. Specifically, Mason Type 1 and 2 fractures had mean scores classified as “excellent.”¹⁰ In comparison, Herbertsson et al¹¹ demonstrated that, among 100 radial head and neck fractures, injured elbows exhibited mean flexion and extension deficits of 2° and 4°, respectively, compared to uninjured elbows, with a mean follow-up of 19 years. Although outcomes of nonoperatively managed radial head and neck fractures are generally well tolerated, patients may experience deficits in their elbow ROM compared to both their contralateral extremity and their pre-injury state.

Radial neck fracture reductions are frequently performed in the pediatric population. While these reductions are not frequently performed in adults, minimally displaced pediatric radial neck fractures tend to result in excellent outcomes if they remain adequately reduced. For this reason, the general recommendation is to attempt closed reduction for isolated, closed pediatric radial neck fractures. Operative intervention is then considered if this reduction is inadequate or not maintained in the following weeks.⁷

Although the patient’s radial neck injury in this study was mild and could be treated conservatively without reduction, we recommended closed reduction due to her high-demand occupation, in an effort to maximize the recovery of her elbow ROM. We used the Israeli/Kaufman maneuver, which is frequently used to reduce pediatric radial neck fractures. The maneuver involves supination and pronation of the forearm while the elbow is held in 90° of flexion and direct pressure is held over the radial head.⁸

One week after reduction, the patient in this case was able to transition out of her splint and return to work. At six-month follow-up, she had regained full ROM equivalent to her contralateral extremity. While conservative management (without reduction) may

result in acceptable elbow function for Mason Type 1 and 2 radial neck fractures, closed reduction to improve radial head angulation to more anatomic parameters may be considered in high-function patients, with the goal of maximizing recovery of elbow ROM, and ultimately, function.

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