

Case Reports

Ipsilateral Radial Shaft, Head, and Medial Epicondyle Fractures

*Nickolaos A. Darlis, *Elias S. Kotsovolos,
†Charalampos G. Zalavras, and *Alexander N. Mavrodondidis

*Department of Orthopaedic Surgery, University of Ioannina, School of Medicine, Ioannina, Greece, and †Department of Orthopaedic Surgery, University of Southern California, Los Angeles, California

Summary: A patient with a unique combination of ipsilateral midradial shaft (AO/OTA 22-A2), radial head (21-A2), and medial epicondyle (13-A1) fractures, without a recorded elbow dislocation or distal radioulnar joint disruption, is presented. The injury was treated surgically with a dorsal approach to the forearm and a lateral approach to the elbow through a single dorsolateral skin incision. The radial shaft fracture was stabilized using a 3.5-mm limited contact, dynamic compression plate; the radial head, using a 1.2-mm Luhr plate; and the medial epicondyle, using a partially threaded cancellous screw through a limited medial approach. The shaft fracture consolidated by 10 weeks, whereas radiographic consolidation of the radial head fracture was seen at 7 months. At the 15-month follow-up, the patient had achieved an excellent functional result. Awareness of the possibility of double injuries even in yet-unrecognized patterns is warranted when evaluating forearm and elbow trauma.

Key Words: forearm fractures, radius fractures, radial head fractures, medial epicondyle fractures, Luhr plate

The simultaneous occurrence of radial shaft and radial head fractures (with intact ulna) has been reported rarely in the literature, in association with an Essex-Lopresti injury.^{4,11,12} In those reports, the radial shaft fracture was located at its distal third in association with a distal radioulnar joint (DRUJ) dislocation (ie, a combination of Galeazzi and Essex-Lopresti injuries). We present a patient with a unique combination of ipsilateral midradial shaft, radial head, and medial epicondyle fractures without a recorded elbow dislocation or DRUJ disruption. To the best of our knowledge, this injury has not been reported in the literature and demonstrates the possibility and importance of multiple injuries to the forearm and elbow with regards to accurate diagnosis and appropriate management.

CASE REPORT

A 63-year-old woman sustained a closed injury of the right dominant upper extremity after a ground-level fall consisting of 1) an isolated radial shaft fracture (OTA/AO 22-A2), 2) a subcapital radial head fracture

(OTA/AO 21-A2), and 3) a medial epicondyle fracture (OTA/AO 13-A1) (Fig. 1). Radiographic and clinical examination revealed a stable DRUJ, which demonstrated no tenderness, ecchymosis, or hematoma. The coronoid process was intact, and no elbow dislocation was recorded. No neurovascular impairment or congenital anomaly of the radial head was present.

The injury was treated surgically with a dorsal (Thompson) approach of the forearm and a lateral (Kocher) approach of the elbow through a single dorso-lateral skin incision (from proximal to the lateral epicondyle to the distal third of the radius) without detaching the supinator muscle. To protect the posterior interosseous nerve, the forearm was maintained in pronation, and no retractors were placed in contact with the proximal radius. The part of the interosseous membrane that was visualized during exposure of the radial shaft was found to be intact. The shaft fracture was fixed using a 3.5-mm limited contact dynamic compression plate (Synthes-Stratec, Oberdorf, Switzerland) and six screws, and the radial head fracture was fixed using a 1.2-mm Luhr plate (Howmedica, Kiel, Germany) and four screws. The subcapital defect that was created after the reduction of the impacted radial head was filled with processed xenograft (Lubboc, Ebedent, Athens, Greece). The medial epicondyle was approached through a limited medial approach (Hotchkiss) and was fixed using a 4.0-mm partially threaded cancellous screw.

The postoperative course was uneventful. The arm was immobilized in a removable long arm splint for 1 week. The patient followed an active physical therapy protocol for the following 2 weeks.

The shaft fracture consolidated by 10 weeks, whereas radiographic consolidation of the radial head fracture was seen at 7 months. A clinically insignificant heterotopic ossification developed about the radial head (Hastings and Graham⁹ class I). At 15 months' follow-up (Fig. 2), the elbow function was rated excellent in the Broberg and Morrey² functional rating scale. Elbow range of motion was 0° to 130° without instability or pain. A 5° valgus carrying angle was present. Forearm pronation and supination were 80° and 70°. The wrist had full range of motion and was symptom-free. Grip strength, measured with a Jamar (Sammons Preston, Bolingbrook, IL) hydraulic dynamometer, was 82% of the contralateral uninjured side.

DISCUSSION

The anatomic relationships between the wrist, forearm, and elbow are so complex that the forearm can be



FIGURE 1. Preoperative radiographs show a transverse midradial shaft fracture, an ipsilateral subcapital radial fracture, and a medial epicondyle fracture without elbow dislocation or distal radioulnar joint disruption.

considered as a ring, consisting of two separate bones united by ligaments and joints. Injury to one element (either osseous or ligamentous) of this ring is rare. Usually double or multiple injuries occur depending on the magnitude and the direction of the force that is applied. These injuries cover a wider spectrum than the classic Galeazzi, Monteggia, and equivalent fracture patterns.⁷

Simultaneous radial shaft fractures and elbow injuries in the form of radial head fracture or dislocation are rare. There have been three reports of radial head and distal third radial shaft fractures combined with DRUJ dislocation.^{4,11,12} In the reports of combined Galeazzi and Essex-Lopresti injuries, the radial shaft fracture was treated with open reduction and internal fixation (ORIF), and the radial head was excised,¹¹ removed and replaced with a Silastic prosthesis,⁴ or internally fixed with Herbert screws and a K-wire.¹² Radial shaft fracture with radial head dislocation also has been reported in the literature.^{3,5,8,11,13,15,17,18} Apart from ORIF of the radial shaft, closed reduction of the dislocated radial head was performed in all but three^{3,13} of these cases. To the best of our knowledge, the patient presented here constitutes the first report of midradial shaft and radial head fracture

without a recorded elbow dislocation or DRUJ disruption.

In addition to a rare double forearm injury (midradial shaft and radial head fracture), our patient sustained a double elbow injury (radial head and medial epicondyle fracture) rendering the forearm and the elbow unstable. Although the patient could not accurately describe the position of the upper extremity during the fall, she could recall injury to her arm on ground contact and on contact with the pavement edge. A similar double blow mechanism was described in a case report of a radial head dislocation associated with a radial shaft fracture.¹⁸ A fall on an outstretched hand and a direct blow to the pronated forearm producing a valgus stress to the extended elbow could account for this combined injury in our patient. The decision for ORIF of the radial head fracture was based on the valgus instability resulting from the medial epicondyle fracture¹⁴ and the lack of consistently better results of radial head arthroplasty compared with osteosynthesis.⁶

The impacted radial head was elevated and supported by xenograft. Buttress plating was performed to counteract longitudinal loads, and the Luhr low-profile plate was selected to minimize restriction of pronosupination. This plate did not prove rigid enough, however, to withstand the full load to the radial head and was driven to minor



FIGURE 2. Postoperative radiographs at 15 months.

plastic deformation, which did not compromise the stability of the elbow. The lack of rigid fixation may have contributed to the delayed radiographic union of that fracture, although delays of more than 1 year in the radiographic union of radial head fractures have been reported.^{1,16}

The simultaneous occurrence of radial shaft and radial head fractures has been associated with an Essex-Lopresti injury.^{4,11,12} In the current patient, the DRUJ remained stable during the whole course of treatment, however, and the visualized part of the interosseous membrane was intact. Nevertheless, a partial proximal rupture in the interosseous membrane could not be ruled out. Inspection under direct vision was not possible because the supinator mass was not detached during surgery, and no further imaging studies were performed to evaluate the integrity of the proximal interosseous membrane. The effect of plaster immobilization in interosseous membrane healing is uncertain,¹⁰ so a program of early active mobilization of the extremity was used.

Combining the Thompson and Kocher approaches through a single incision permitted optimal visualization of both fracture sites of the radius. Anatomic reduction and rigid internal fixation in conjunction with an early mobilization protocol can lead to an excellent functional result.

This case report vividly demonstrates the concept of double injuries to the forearm and the elbow. Awareness of the possibility of double injury even in a yet-unrecognized pattern is warranted when evaluating forearm and elbow trauma to diagnose accurately and treat effectively these unstable injuries.

Accepted April 11, 2003.

No financial support of this project has occurred. The authors have received nothing of value.

The fixation devices that are the subject of this manuscript are FDA approved and are commercially available in the United States. The processed xenograft is not FDA approved.

Correspondence and reprints: Nickolaos A. Darlis, MD, 31 Mesologiou Str, 45221 Ioannina, Greece. E-mail: me00301@cc.uoi.gr.

REFERENCES

1. Billet DM. An uncommon fracture dislocation of the radius. *J Trauma*. 1977;17:243-244.
2. Broberg MA, Morrey BF. Results of delayed excision of the radial head after fracture. *J Bone Joint Surg Am*. 1986;68:669-674.
3. Cobb TK, Beckenbaugh RD. Nonunion of the radial neck following fracture of the radial head and neck: case reports and review of the literature. *Orthopaedics*. 1998;21:364-368.
4. Eglseder WA, Marshall Hay LCDR. Combined Essex-Lopresti and radial shaft fractures: case report. *J Trauma*. 1993;34:310-312.
5. Evans ME. Pronation injuries of the forearm with special reference to the anterior Monteggia fracture. *J Bone Joint Surg Br*. 1949;31:578-588.
6. Furry KL, Clinkscales CM. Comminuted fractures of the radial head: arthroplasty versus internal fixation. *Clin Orthop*. 1998;353:40-52.
7. Goldberg HD, Young JWR, Resnik CS, et al. Double injuries to the forearm: a common occurrence. *Radiology*. 1992;185:223-227.
8. Haddad FS, Mankelaw AR, Dorrell JH. Radial head dislocation with radial shaft fracture. *Injury*. 1995;26:502-503.
9. Hastings H, Graham TJ. The classification and treatment of heterotopic ossification about the elbow and forearm. *Hand Clin*. 1994;10:417-437.
10. Hotchkiss RN. Fractures of the radial head and related instability and contractures of the forearm. *Instr Course Lect*. 1998;47:173-177.
11. Jupiter JB, Kour AK, Richards RR, et al. The floating radius in bipolar fracture-dislocation of the forearm. *J Orthop Trauma*. 1994;8:99-106.
12. Khurana JS, Kattapuram SV, Becker S, et al. Galeazzi injury with an associated fracture of the radial head. *Clin Orthop*. 1988;234:70-71.
13. Mehara AK, Bhan S. Ipsilateral radial head dislocation with radial shaft fracture: case report. *J Trauma*. 1993;35:958-959.
14. Morrey BF. ICL: complex instability of the elbow. *J Bone Joint Surg Am*. 1997;79:460-469.
15. Rao SB, Patrick J. Isolated fracture dislocation of the proximal radius: a previously undescribed injury. *Injury*. 1991;22:484-485.
16. Ring D, Psychoyios VN, Chin KR, et al. Nonunion of nonoperatively treated fractures of the radial head. *Clin Orthop*. 2002;398:235-238.
17. Shukur MH, Ali Noor M, Moses T. Ipsilateral fracture dislocation of the radial shaft head associated with elbow dislocation. *J Trauma*. 1995;38:944-946.
18. Simpson JM, Andreshak TG, Patel A, et al. Ipsilateral radial head dislocation and radial shaft fracture. *Clin Orthop*. 1991;266:205-208.