



ELBOW

# Outcomes using the extensor digitorum communis splitting approach for the treatment of radial head fractures



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**Background:** Surgery on the radial head is usually performed via the Kocher interval. Iatrogenic injury to the posterior interosseous nerve (PIN) and lateral ligamentous complex are known complications of lateral elbow approaches. The extensor digitorum communis (EDC) splitting approach for lateral elbow exposure is known to provide better access to the anterior half of the radial head while reducing the risk of injury to the lateral ligaments. The aim of this study was to provide clinical outcome data for the EDC splitting approach.

**Methods:** Thirteen patients with closed radial head fractures underwent internal fixation or replacement via the EDC splitting approach. Patients were evaluated using the Mayo Elbow Performance, American Shoulder and Elbow Surgeons (ASES), and Disabilities of Arm, Shoulder and Hand scores. Clinical assessments of the elbows were also performed.

**Results:** Ten patients underwent open reduction and internal fixation of their radial heads, and 3 underwent radial head replacements. At final follow-up, all patients achieved good to excellent Mayo Elbow Performance scores, with a mean score of 90 (range 80-100). They had a mean ASES elbow score of 89.6 (range 77-97) and a mean Disabilities of Arm, Shoulder and Hand score of 12.8 (range 6.67-25.8). Patients reported a mean overall ASES satisfaction score of 8.5 (range 6-10). There were no significant surgical complications, including iatrogenic damage to the PIN or the lateral ligaments.

**Conclusion:** The EDC splitting approach is a feasible method of exposing the lateral elbow, providing safe and reliable access to the radial head.

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

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**Keywords:** Direct lateral approach to elbow; radial head fracture; extensor digitorum communis splitting approach; posterior interosseous nerve; clinical outcomes

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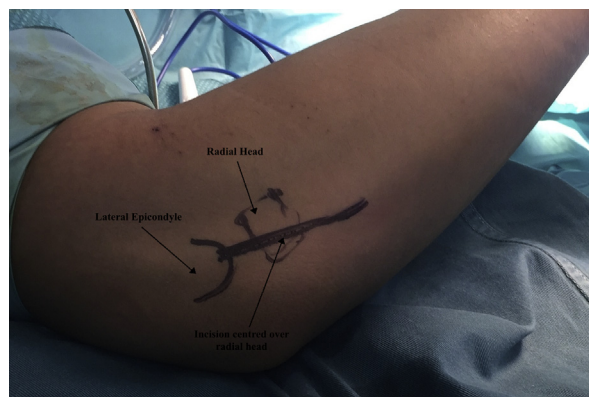
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Fractures of the radial head account for approximately 20% of all elbow fractures.<sup>13</sup> Surgical treatment of radial head fractures—whether by open reduction and internal fixation (ORIF) or by radial head replacement—results in satisfactory outcomes.<sup>9,15,18,28,29</sup> There are several possible approaches when performing surgery for radial head fractures, with the choice ultimately dependent on surgeon preference and the injury-specific fracture configuration. Because radial head fractures most commonly involve the anterolateral aspect of the radius,<sup>12,27</sup> the Kocher approach to the radial head is frequently used. This approach uses an interval between the anconeus and extensor carpi ulnaris (ECU). Alternatively, an approach using the Kaplan interval—between extensor carpi radialis brevis and extensor digitorum communis (EDC)—has also been described for access to the radial head.

Surgery of the radial head entails risk of injury to the posterior interosseous nerve (PIN), due to its proximity to the PIN, anatomic variation of the nerve, and the lack of clear intermuscular planes.<sup>26</sup> Furthermore, there is also the risk of injury to the lateral ulnar collateral ligament (LUCL), particularly with the Kocher approach, which could lead to elbow instability.<sup>4</sup> Proximal extension of the Kocher approach involves detachment of the common extensor origin, which further destabilizes the elbow. Radial head fractures have a relatively low incidence, accounting for only 1.5% to 4% of all fractures in adults, and not all need to be treated surgically.<sup>8,13</sup> The potential lack of familiarity with lateral elbow approaches among orthopedic trainees may further increase the risk of iatrogenic damage to the elbow.

The EDC splitting approach for lateral elbow exposure was first described by Hotchkiss<sup>17</sup> and could provide more reliable access to the anterior aspect of the radial head.<sup>6,24</sup> The approach is more anterior and reduces the risk of injury to the LUCL. To date, all previous studies related to this approach have been anatomic cadaveric studies, which have reported promising results in terms of better access to the radial head with potentially reduced injury to the LUCL<sup>6</sup> while maintaining a similar safe distance to the PIN compared with the Kocher approach.<sup>24</sup> No clinical studies have assessed the feasibility of this surgical approach in the treatment of patients with radial head fractures.

To the best of our knowledge, our study is the first to report clinical outcomes with the use of this approach in the surgical treatment of radial head fractures. Our aim was to determine if this approach could be used to provide adequate access for internal fixation or replacement of the radial head, while avoiding iatrogenic damage to the elbow, in particular, PIN palsy and LUCL damage leading to elbow instability. Outcome data were obtained in objective postoperative clinical examination findings as well as subjective patient-reported scores.



**Figure 1** Skin incision with the arm pronated.

## Methods

This retrospective case series reviewed patients with closed isolated radial head fracture who underwent ORIF or radial head arthroplasty via the EDC splitting approach between 2011 and 2014. The study excluded patients for whom postoperative clinical evaluation data were not available (ie, lost to follow-up) or those with a follow-up period of less than 12 months. Thirteen patients were eligible and included in the final analysis.

Indications for ORIF of radial head fractures in our cohort included patients with Mason type II radial head fractures with a block to motion, when anatomic reduction and restoration of articular congruity with stable fixation could be achieved, and in younger patients whenever possible. Radial head replacement was performed in patients with comminuted intra-articular fractures for which stable fixation could not be performed.

## Operative technique

Surgery was performed under general anesthesia in all cases with the administration of prophylactic perioperative intravenous antibiotics at induction and for a further 24 hours postoperatively. All surgeries were performed using the EDC splitting approach. Patients were positioned supine with their elbow flexed and fully pronated on a hand table to increase the distance between the site of incision and the PIN.<sup>26,28</sup> A proximal arm pneumatic tourniquet was applied and used in all patients.

A longitudinal skin incision was made directly over the radial head, palpating it through the substance of the EDC, extending from the central portion of the origin of the EDC at the lateral epicondyle down along the EDC muscle belly (Fig. 1). Dissection was continued down to the level of fascia to expose the EDC origin. The fibers of the EDC were split over the radial head, not more than 5 cm distal to the radiocapitellar joint along length of proximal radius (Fig. 2), and the capsule and annular ligament were incised to visualize the radial head and neck (Figs. 3 and 4). A conscious effort was made to ensure retractors were not placed with excessive force to avoid injury to the PIN. If visualized, the PIN was protected. In all cases using this approach, the LUCL was not encountered or injured. At the end of the procedure, the capsule was repaired and the skin closed in layers.

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