

Successful Surgical Management of Bilateral Terrible Triad Elbow Injuries: A Rare Case Report

Dr. Sushil Kamal¹, Dr. Gaurav Vatsa², Dr. Saurabh Suman³,
Dr. Shubham Singla⁴

¹ Assistant Professor, Department Of Orthopaedics, Narayan Medical College & Hospital, Sasaram, India

² PG Resident, Department Of Orthopaedics, Narayan Medical College & Hospital, Sasaram, India

³ PG Reesident, Department Of Orthopaedics, Narayan Medical College & Hospital, Sasaram, India

⁴ Senior Resident, Balaji Cure And Care Hospital, Jaipur, India

Abstract:

Background: Bilateral terrible triad injuries to the elbow are rare and challenging clinical scenarios characterized by a complex combination of posterolateral elbow dislocation, radial head fracture, and coronoid process fracture.

Case Report: This study presents a case of a 21-year-old female with bilateral terrible triad injuries resulting from a fall, emphasizing the efficacy of early surgical intervention and highlighting the management strategies and outcomes. The patient's presentation included acute pain, swelling, and restricted elbow movement following the fall, necessitating surgical intervention with open reduction internal fixation. Radiographic imaging confirmed bilateral elbow dislocations, Mason type IV radial head fractures, Regan Morrey type 2 coronoid process fractures, and a proximal ulna fracture on the left side. Surgical management involved distinct approaches for each elbow, with reduction and fixation of the radial head, proximal ulna, and coronoid process..

Result: This case underscores the significance of timely surgical intervention and highlights the need for multidisciplinary approaches to manage bilateral terrible triad elbow injuries effectively. Post-operative assessment at 6 months revealed successful reduction and fixation, with the patient demonstrating good range of motion and stability in both elbows

Discussion: Discussion focuses on the rarity of bilateral terrible triad injuries, their complex pathophysiology, and the importance of comprehensive surgical reconstruction. Early intervention, appropriate surgical techniques, and meticulous post-operative care are essential for optimizing functional outcomes and minimizing complications in such cases.

Keywords: Bilateral terrible triad injuries; Posterolateral elbow dislocation; Radial head fracture; Coronoid process fracture

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I. Introduction

In 1966, Hotchkiss introduced the term "terrible triad" to describe a particularly challenging scenario involving a complex postero-lateral elbow dislocation accompanied by fractures of the radial head and coronoid process.¹ This combination of injuries destabilizes the elbow significantly, earning the moniker "terrible" due to the severe loss of both ligamentous and bony stability. Left untreated, these injuries often lead to recurrent instability and can result in a "terrible" outcome characterized by poor bone healing and limited range of motion. Historically, the majority of cases were managed conservatively due to the pessimistic prognosis and high rates of treatment failure, including persistent instability, elbow arthritis, and functional limitations. However, recent advancements have shown that early surgical intervention can lead to improved functional outcomes in these cases.²

A rare case involving a 21-year-old female with bilateral terrible triad injuries is presented here. The management of this case, along with its outcome, is discussed, highlighting the challenges associated with these injuries and the potential benefits of early surgical intervention.

II. Case Report

The case report describes a 21-year-old female student who suffered bilateral elbow injuries after falling from the first floor. She presented with acute pain, swelling, and an inability to move both elbows. Clinical examination revealed dislocated elbows with disrupted 3-bone-point relationships but intact skin. The elbows were grossly reduced with traction and posterior slabs in the emergency department, and the patient was scheduled for surgical intervention with open reduction internal fixation. Radiographs and 3-D CT scans confirmed bilateral elbow dislocations, Mason type IV radial head fractures, Regan Morrey type 2 coronoid process fractures, and a proximal ulna fracture on the left side.



Figure 1: Plain Radiographs of left elbow on presentation (Left: AP, Right: Lateral)



Figure 2: Plain Radiographs of right elbow on presentation (Left: AP, Right: Lateral)

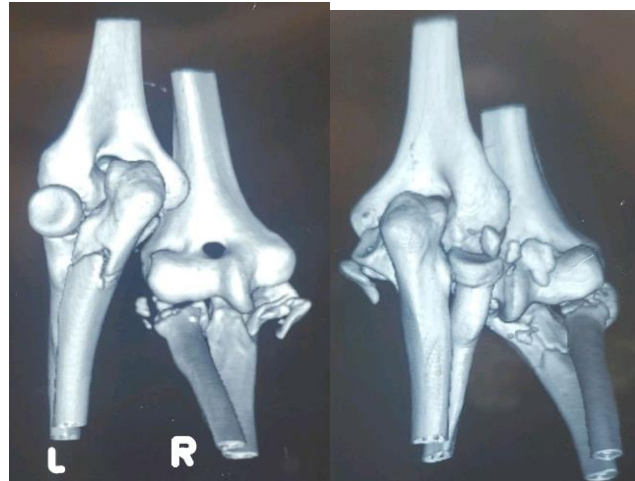


Figure 3: 3D CT imaging of left and right elbows

Boyd's approach, a surgical technique involving the anterior exposure of the radius and the anterior and lateral exposure of the elbow joint, was employed for the left elbow in this case. Through this approach, the radial head and proximal ulna were reduced. The reduction was then maintained by securing these structures with a locking compression plate. In addition, the lateral ligament complex was repaired. This complex is crucial for the stability of the elbow joint. The repair was accomplished with absorbable trans-osseous sutures, sutures that are passed through the bone and are designed to be absorbed by the body over time. Temporary stabilization of the joint was then achieved with the insertion of one radio-capitellar and one ulno-humeral Kirschner wire.

For the right elbow, both Kaplan's posterolateral approach and a medial approach were used. Kaplan's approach involves incising the skin on the back and outer side of the elbow, allowing for the exposure of the radial head. A small fragment of the radial head was removed, or excised, and fixation was performed with a radio-capitellar Kirschner wire. The anteromedial facet of the coronoid, an important bony landmark in the elbow, was then reduced and fixed. This was achieved with two Herbert screws, which are headless, double-threaded screws commonly used for the fixation of small bone fragments. The use of these specific screws allows for a more stable and low-profile fixation, reducing the risk of hardware irritation.

Post-operative radiographs showed successful reduction and fixation of both elbows. Functional outcomes, particularly elbow range of motion, were assessed at 3-month intervals for 6 months post-surgery.

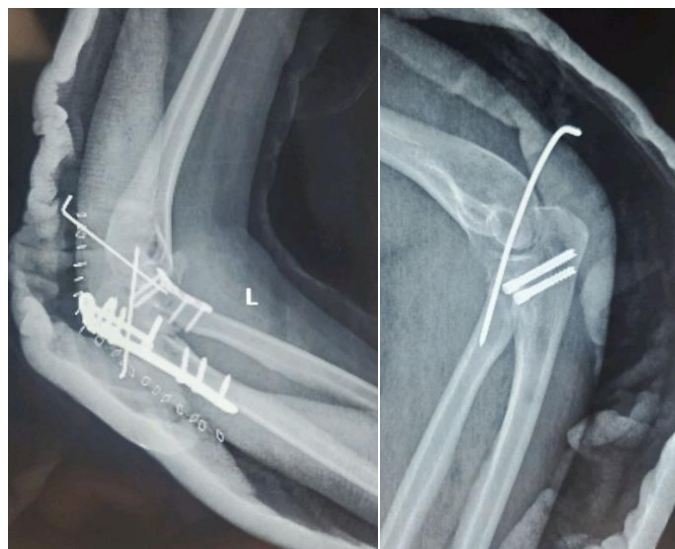


Figure 3 A

Figure 3 B

Figure 3 A: Post operative Plain Radiograph of left elbow

Figure 3 B: Post operative Plain Radiograph of right elbow

III. Results

At the three and six-month follow-ups, the patient demonstrated gradually improving ROM in both elbows, indicating significant improvement compared to the initial presentation. Achieving good ROM is indicative of successful surgical reduction and stabilization of the injured elbows. It suggests that the surgical intervention effectively restored the integrity of the elbow joint and surrounding structures, allowing for proper movement and function.

Furthermore, the absence of instability in both elbows at the follow-ups is a positive outcome. Instability in the elbow joint can lead to recurrent dislocations or subluxations, compromising function and causing ongoing pain and limitations. The fact that the patient did not experience instability suggests that the surgical techniques employed, including reduction and fixation of the radial head, proximal ulna, and coronoid process, were successful in restoring stability to the elbows.

Additionally, the assessment of functional outcomes included the evaluation of the Oxford Elbow Score (OES), a validated measure used to quantify elbow function and quality of life. The OES encompasses various aspects of elbow function, including pain, range of motion, and ability to perform daily activities. The observed improvements in the OES suggest that the surgical intervention not only restored physical function but also positively impacted the patient's overall well-being and quality of life. Throughout the six-month follow-up period, the patient exhibited notable improvements in their OES (32 at immediate post op, 60 at three months follow up and 88 at six months follow up), reflecting enhanced functionality and overall satisfaction with the surgical outcome.

This case highlights the importance of early surgical intervention and appropriate management techniques in achieving favorable functional outcomes for patients with bilateral terrible triad elbow injuries. Additionally, it underscores the need for meticulous post-operative care and rehabilitation protocols to optimize recovery and minimize complications.

IV. Discussion

Bilateral terrible triad injuries to the elbow are exceedingly rare, with only five reported cases found in the literature. Among these cases, the report by *Bennani et al*³ and *Zha et al*⁴ stands out as the only one documenting a bilateral terrible triad injury with the additional complication of a unilateral olecranon fracture, mirroring the presentation in the case under discussion.

The mechanism of injury in terrible triad injuries typically involves a posterolateral rotatory load, often occurring during a fall onto an outstretched hand. *O'Driscoll et al* elucidate how this mechanism leads to disruption of multiple soft tissue structures, including the lateral collateral ligament complex, elbow joint capsule, and common extensor and flexor-pronator tendons.⁵ During the fall, axial loading on the grounded forearm combined with supination and valgus stress from internal rotation of the body over the stationary elbow leads to disruption of these capsuloligamentous structures from lateral to medial.

The sequence of injury involves the avulsion of the lateral ulnar collateral ligament (LUCL) due to sudden supination, followed by radial head subluxation and subsequent fracture under axial load. The shearing force on the tip of the coronoid process occurs as a result of posterior-inferior subluxation of the larger sigmoid notch relative to the distal humerus, leading to coronoid fractures. Excessive posterolateral displacement may further compromise the medial collateral ligament (MCL) complex.

Treatment of these complex injuries necessitates reconstruction of each component, often requiring surgical intervention. Gaining adequate exposure is crucial, and release of the common wrist extensors from the lateral condyle may be necessary to improve visualization of the coronoid process during surgery. Internal fixation of radial neck fractures typically involves compression screwing; with noncomminuted fractures secured using oblique screws or radial neck plates in cases of comminution or poor bone quality. Replacement arthroplasty may be considered in cases of extensive radial head comminution or neck involvement. Repair of the lateral collateral ligament (LCL) on the lateral epicondyle can be achieved using the transosseous technique. Repair of the MCL may not be necessary if the elbow remains congruous through a range of motion. Temporary stabilization with a transarticular Steinmann pin may be employed.

Post-operative rehabilitation typically involves a gravity-assisted overhead protocol and static progressive extension splinting during the night, aimed at optimizing functional recovery while minimizing complications.

References

- [1]. Hotchkiss Rn. Fractures And Dislocations Of The Elbow. Fractures In Adults. 1996:929-1024.
- [2]. Laumonerie P, Mansat P. Terrible Triad Injury Of The Elbow: A Spectrum Of Theories. Jses International. 2023 Apr 15.
- [3]. Bennani, Mourad, Et Al. "Bilateral Radial Head Fracture With Unilateral Terrible Triad Injury In A Military." Archives Of Clinical And Medical Case Reports 7.1 (2023): 89-94.
- [4]. Zha G, Niu X, Yu W, Xiao L. Severe Injury Of Bilateral Elbow Joints With Unilateral Terrible Triad Of The Elbow And Unilateral Suspected Terrible Triad Of The Elbow Complicated With Olecranon Fracture: One Case Report. International Journal Of Clinical And Experimental Medicine. 2015;8(8):14214.
- [5]. O'driscoll Sw, Morrey Bf, Korinek S, An Kn. Elbow Subluxation And Dislocation: A Spectrum Of Instability. Clinical Orthopaedics And Related Research (1976-2007). 1992 Jul 1;280:186-97.