International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 3, March 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.3.2025.118

CASE REPORT

Terrible triad of the elbow with concurrent humerus shaft fracture and arm compartment syndrome: A rare case report

[1]Dr. Kirankumar P M, [2]Dr. S K Saidapur, [3]Dr. Ravi S Jatti, [4]Dr. Aditya Pratap, [5]Dr. Tathagata Samanta

[1,4,5]Junior Resident, Jawaharlal Nehru Medical College, KAHER, Belagavi, Karnataka, India
[2,3]Professor, Department of Orthopaedics, Jawaharlal Nehru Medical College, KAHER, Belagavi, Karnataka, India

Corresponding Author
Dr. Tathagata Samanta
Junior Resident, Jawaharlal Nehru Medical College, KAHER, Belagavi, Karnataka, India

Received: 22 January, 2025 Accepted: 21 February, 2025 Published: 17 March, 2025

ABSTRACT

Background: The term "terrible triad" of the elbow represents an especially challenging combination of injuries: elbow dislocation associated with fractures of the radial head and coronoid process [1]. This case represents a rather rare and technically demanding condition, and adding to it a concomitant humeral shaft fracture and arm compartment syndrome further complicates it [2]. The management had a stepwise surgical plan that included urgent decompression and temporary external fixation all the way to definitive internal fixation, radial head replacement, and ligament reconstructions. It is in such cases where the importance of timely surgical intervention, early identification of nerve injuries, and methodical rehabilitation is highlighted [3]. **Case Presentation:** A 59-year-old male patient presented to the hospital after a high-impact motor vehicle collision, suffering severe trauma to his right upper extremity. Examination revealed a midshaft humeral fracture, posteriorly dislocated elbow and radial head fracture, and acoronoid tip fracture-a triad of injury known as the terrible triad of the elbow. He was also noted to have clinical findings consistent with compartment syndrome and had preoperative evidence of radial nerve neuropraxia.

He had three stages of surgery:(1). Emergency fasciotomy with an elbow spanning external fixator for compartment pressure control and initial stabilization. (2). Open reduction and internal fixation by an intramedullary nail for the fracture of the shaft of the humerus. (3)Radial head replacement and ligament repair for functional restoration of elbow stability.

Postoperative immobilization later transformed into a hinged elbow brace, accompanied by supervised physiotherapy. Gradually, this patient made excellent improvements regarding elbow mobility and neurovascular status. **Conclusion:** This case underlines the difficulties of a "terrible triad" elbow injury with the humeral shaft fracture, compartment syndrome and radial nerve neuropraxia. It requires stepwise and careful staging to allow successful outcomes. This article is marked by early decompression of the compartments, solid fixation, careful repair of the ligaments, and close follow-up for recovery of nerves and stability of the joint.

Keywords: Terrible triad of the elbow; Humerus shaft fracture; Compartment syndrome; Radial nerve neuropraxia; Radial head replacement; Elbow instability

INTRODUCTION

Elbow fracture-dislocations have involved the typical injury within the so-called "terrible triad" of elbow injuries, which consists of: (a) an elbow dislocation, (b) a radial head fracture, and (c) a fracture of the coronoid process[1].When this injury is accompanied by a fracture of the shaft of the humerus and an acute compartment syndrome of the arm, the potential severity of injury is increased [2]. If this were not properly managed, it would lead to a potentially unstable elbow and complications [3]. It has been associated with significant morbidity and unique challenges in diagnosis and treatment.

The presence of concomitant nerve injuries, such as neuropraxia of the radial nerve, could significantly affect recovery and make a difficult case potentially worse [4]. Thus, early recognition, appropriate surgery, and thoughtful rehabilitation will become crucial in optimal clinical outcomes.

This paper will describe the case of a patient who presented with a terrible triad elbow fracture-dislocation complicated by a humeral shaft fracture and an arm compartment syndrome. All the

DOI: 10.69605/ijlbpr_14.3.2025.118

aforementioned injuries were treated through staged surgical interventions, along with relevant review of literature for managing these extremely complex injuries.

CASE PRESENTATION

Patient Profile

A 59-year-old male with no remarkable past medical history arrived at the emergency department following a high-speed motor vehicle crash. He complained of severe pain, swelling, and an evident deformity of the right upper limb over arm and elbow with abrasion of size 3 x 1.5 cm over the anteromedial aspect of elbow. Global restriction of movements over shoulder and elbow joint.

Evidence of radial nerve neuropraxia (wrist drop, impaired finger extension) noted pre-operativelywith intact distal pulses.

Patient was vitally stable and SpO2 was found to be around 97% at room air in his right upper limb

Radiographic and CT Findings (Figure 1, Figure 2)

- **Right elbow X-ray:** Demonstrated a comminuted mid-shaft humeral fracture, a displaced radial head fracture, and a small fracture of the olecranon.
- **CT scan of the right elbow (5 mm and 3 mm axial slices):** Confirmed a displaced mid-shaft humeral fracture, radial head fracture, and an olecranon fragment. The medial and lateral epicondyles were intact.

Fig.1

Fig.2

Operative Management

The patient underwent three operative procedures.

Operation	Day	Procedure	Key Notes
1	POD 0	- Emergency fasciotomy of the arm - Spanning external fixator across the elbow	- Decompression for acute compartment syndrome - Addressed unstable dislocation - Radial nerve neuropraxia unchanged post-op
2	POD 08	ORIF with titanium intramedullary (IMIL) nail for humeral shaft fracture	- Right brachial plexus block - Achieved stable fixation
3	POD 12	- Radial head replacement - Brachialis repair to coronoid via suture anchor - Lateral collateral ligament (LCL) repair	- Right brachial plexus block - MCL treated non-operatively - Established elbow stability

Operation 1

Indication: Acute compartment syndrome and an unstable fracture-dislocation at the elbow.

Procedure: The surgical team performed an immediate fasciotomy to relieve compartment pressures. A spanning external fixator was applied to maintain elbow alignment and stability

Note on Neuropraxia: The patient displayed radial nerve palsy signs (wrist drop) before surgery, suggestive of radial nerve neuropraxia from the initial trauma.

Operation 2 – POD 8

Indication: Definitive surgical fixation of the mid-shaft humeral fracture.

Procedure: Open reduction and internal fixation using a titanium intramedullary interlocking nail

Outcome: Adequate fixation was achieved. The radial nerve neuropraxia remained and ongoing clinical monitoring was performed.

DOI: 10.69605/ijlbpr_14.3.2025.118

Operation 3 – POD 12
Indication: Definitive management of the elbow pathology—specifically the radial headfracture and associated soft-tissue injuries.

Procedures
1. Radial head replacement
2. Brachialis tendon reattached to the coronoid using a 3 mm suture anchor.
3. Lateral collateral ligament (LCL) repair using a 5 mm suture anchor.

Because the medial collateral ligament (MCL) was deemed functionally stable, no immediate repair was performed. Intraoperative testing confirmed adequate elbow stability.

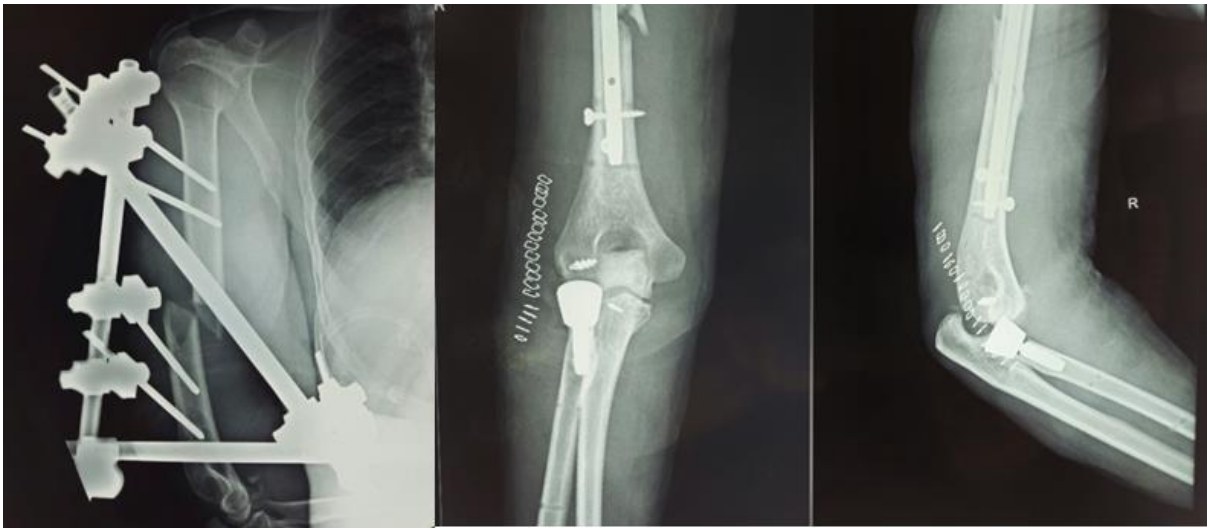

Fig.3 Immediate ppost op radiological images

1.5 months post-operative x-ray

Postoperative Course and Rehabilitation
- **Immobilization and Dressings:** A protective elbow slab was maintained for four weeks to protect the repair and allow soft tissues to recover.
- **Physiotherapy:** After four weeks, the patient began wearing a hinged elbow brace and started a supervised range-of-motion program. Gradual strengthening was introduced in accordance with comfort and stability.
- **Medications:** He received a combination of antibiotics (piperacillin-tazobactam, amikacin, linezolid), analgesics and anti-inflammatory agents. Low-molecular-weight heparin was administered based on risk stratification for venous thromboembolism. Patient was also started on indomethacin to prevent the risk of heterotopic ossification.
- **Neurological Recovery:** The radial nerve neuropraxia demonstrated recovery of finger and wrist extension over three months, consistent with an improving neuropathic process.

DOI: 10.69605/ijlbpr_14.3.2025.118

- **Follow-Up and Outcome**
- **6 Weeks Postoperatively:** The patient reported reduced pain levels, mild elbow stiffness, and gradual radial nerve functional return. Elbow motion exercises were advanced with emphasis on regaining extension and flexion.
- **12 Weeks Postoperatively:** Follow-up radiographs indicated callus formation around the humeral fracture and a well-seated radial head implant. The elbow had a 10–110° range of motion, and clinical examination revealed stable collateral ligaments with no marked MCL laxity.

DISCUSSION

The "terrible triad" of the elbow encompasses fractures of the coronoid and radial head along with elbow dislocation [1]. This pattern is prone to instability and is highly sensitive to suboptimal repair. When a humeral shaft fracture is added, surgical complexity increases further due to the need to restore proper alignment at both the shaft and the elbow joint. In the present case, acute compartment syndrome demanded immediate fasciotomy and temporary fixation before definitive management.A decision that significantly reduced the risk of long-term neurovascular compromise.

Radial nerve deficits often occur with humeral shaft fractures, with rates as high as 18% [4,5]. Many cases nearly 70 %resolve over time; however, clinical follow-up and electrodiagnostic studies remain paramount to detect instances where exploration might become necessary [5]. In this patient, function gradually improved, which validated the conservative approach to the radial neuropathy.

A staged operative plan allowed the surgical team to prioritize life- and limb-saving interventions first, followed by thorough fixation when tissues were better prepared. Intramedullary nailing offers stable fixation for humeral shaft fractures with relatively limited soft-tissue disruption [6]. After stabilizing the shaft, focus shifted to repairing the structural and ligamentous elements of the elbow, including radial head replacement, coronoid reattachment, and lateral collateral ligament repair [7]. As the MCL appeared intact under valgus stress, conservative treatment was done.

Postoperative rehabilitation significantly influences final outcomes. Early motion exercises supervised by physiotherapists, combined with a hinged elbow brace, help avert severe stiffness[8,9]. Indomethacin was given to prevent heterotopic ossification [10]. In the reported case, the patient regained a functional motion arc and demonstrated progressive nerve recovery by 12 weeks. Literature suggests that a comprehensive approach to repair both bony and ligamentous structures is fundamental for restoring elbow stability and preventing chronic impairment[11].

CONCLUSION

This case describes the management of a "terrible triad" elbow fracture-dislocation complicated by a humeral shaft fracture, acute compartment syndrome, and radial nerve neuropraxia. Through the use of a three-stage surgical approach-urgent fasciotomy and external fixation followed by intramedullary nailing of the humerus-and lastly, by radial head replacement and collateral ligament repairs-a stable reconstruction with a good outcome was achieved. Early diagnosis and decompression of compartment syndrome, thorough evaluation of nerve deficits, and integrated rehabilitation after surgery will help achieve optimal results for the patient. Incomplete nerve function or the onset of instability in the ligaments may require additional follow-up.

REFERENCES

1. Zeiders, Glenn J., & Patel, Manish K. (2008). Management of unstable elbows following complex fracture-dislocations—The "terrible triad" injury. *The Journal of Bone & Joint Surgery (American Volume)*, 90(Suppl 4), 75–84.
2. Ulnick, Kevin, Robertson, Robert, Gray, Andrew, & Tan, Samuel. (2018). Early recognition and management of acute compartment syndrome in high-energy trauma. *Clinical Orthopaedics and Related Research*, 476(10), 2062–2070.
3. Lee, Yun Sung, Kim, Jin Soo, Park, Hyun Woo, & Choi, David E. (2012). Elbow dislocation and its complications. *Journal of Orthopaedic Trauma*, 26(4), e44–e47.
4. Korompilias, Anastasios V., Payatakes, Alexander H., Kostas, Gregorios E., Vekris, Michael D., &Katsaros, Andreas. (2010). Radial nerve palsy associated with humeral shaft fractures: Treatment and outcome. *Acta OrthopaedicaBelgica*, 76(2), 145–149.
5. Pollock, Francis H., Drake, David, Bovill, Edward G., Day, Linda, & Trafton, Philip G. (1981). Treatment of radial neuropathy associated with fractures of the humerus. *The Journal of Bone & Joint Surgery (American Volume)*, 63(2), 239–243.
6. Lin, James, Chen, Kevin, Wu, Lisa, & Chang, Peter. (2002). Operative treatment of humeral shaft fractures: A comparison of plate and intramedullary nail fixations. *The Journal of Trauma*, 52(3), 538–546.
7. Forthman, Christopher, Henket, Merete, & Ring, David C. (2007). Elbow dislocation with intra-articular fracture: The importance of medial side stability. *Journal of Shoulder and Elbow Surgery*, 16(2), 213–217.
8. Pugh, Daniel M., Wild, Laurie M., Schemitsch, Emil H., King, Graham J. W., & McKee, Michael D. (2004). Standard surgical protocol to treat elbow dislocations with radial head and coronoid fractures: The "terrible triad" injury. *The Journal of Bone & Joint Surgery (American Volume)*, 86(6), 1122–1130.
9. Garrigues, Grant E., Niver, Gretchen E., Greene, William B., & Ricci, William M. (2009). Acute operative fixation of the terrible triad of the elbow: Early clinical results. *The Journal of Bone & Joint Surgery (American Volume)*, 91(4), 730–737.
10. Atwan Y, Abdulla I, Grewal R, Faber KJ, King GJW, Athwal GS. Indomethacin for heterotopic ossification

DOI: 10.69605/ijlbpr_14.3.2025.118

prophylaxis following surgical treatment of elbow. *Journal of Orthopaedic Trauma*, 31(9), 431–435.

11. B. Chemama, N. Bonnevialle, O. Peter, P. Mansat, P. Bonnevialle,Terrible triad injury of the elbow: How to improve outcomes?Orthopaedics & Traumatology: Surgery & Research, Volume 96, Issue 2,2010,147-154,