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# Management of a Terrible Triad Variant Injury of Elbow with Mason IV Radial Head Fracture and Regan–Morrey I Coronoid Fracture and Using Radial Head Arthroplasty and Lateral Collateral Ligament Repair: A Case Report

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**KEYWORDS**

Elbow Dislocation; Radial Head Fractures;

**ABSTRACT:**

Background: Terrible-triad injuries of the elbow, characterized by posterior dislocation with associated radial head and coronoid fractures, pose significant management challenges due to their inherent instability. Mason IV comminuted radial head fractures with ligament disruption are particularly difficult to reconstruct, often requiring radial head arthroplasty. This case highlights a complex terrible-triad variant managed with a combined approach including radial head

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Arthroplasty; Coronoid Fractures; Lateral Collateral Ligament; Terrible Triad Injury.

replacement, coronoid anchor repair, and reconstruction of the lateral collateral ligament (LCL), resulting in early restoration of elbow stability.

Case Presentation: A 39-year-old male presented with left elbow pain and functional impairment following a road-traffic accident. Imaging revealed posterior elbow dislocation with a comminuted Mason Type IV radial head fracture and a Regan–Morrey Type I coronoid process fracture. Initial closed reduction provided only temporary stability. Definitive surgical management was performed through the Kaplan anterolateral approach and included radial head arthroplasty (21-mm metallic prosthesis), coronoid fixation using an anchor-suture technique, and repair of the LCL complex. Postoperative care included immobilization followed by graded physiotherapy.

Outcome/Follow-up: The patient demonstrated uneventful wound healing, improved elbow stability, and progressive recovery of range of motion during follow-up. No postoperative complications, recurrent instability, or neurovascular deficits were noted.

Conclusion: Radial head arthroplasty combined with coronoid fixation and LCL repair provides a reliable method for restoring stability in complex terrible-triad variant injuries involving non-reconstructable Mason IV fractures. Early stabilization facilitates safe mobilization and improves functional outcomes.

**Introduction:**

Terrible-triad injuries of the elbow consist of posterior elbow dislocation, radial head fracture, and coronoid process fracture with associated disruption of the lateral collateral ligament (LCL) complex [1]. These injuries are challenging due to inherent instability, high rates of stiffness, and risk of post-traumatic arthrosis [1,2]. Mason IV radial head fractures—defined as comminuted radial head fractures associated with elbow dislocation—are often non-reconstructable and have poor outcomes with open reduction and internal fixation (ORIF) [3].

Dodds and Fishler emphasize that terrible triad injuries require a systematic surgical protocol that addresses all three injured components to prevent chronic instability [1]. Coronoid fractures, even when small (Regan–Morrey Type I), significantly impact anterior stability and must be addressed when instability is present [4]. Radial head arthroplasty is recommended when the radial head is severely comminuted, particularly in traumatic elbow instability [5,6].

This case is reported due to the combination of: Mason IV comminuted radial head fracture, Regan–Morrey Type I coronoid fracture, Complete LCL disruption, Successful management using radial head replacement, coronoid anchor repair, and ligament repair — forming a complex terrible-triad variant.

**Patient Information:**

A 39-year-old male with no comorbidities presented with acute pain and inability to move his left elbow following a road-traffic accident (4-wheeler vs 2-wheeler). He initially received conservative management at a local hospital, but due to persistent severe pain, he presented to our tertiary care center. He denied loss of consciousness, vomiting, chest pain, dyspnea, or abdominal symptoms. (Fig 3)s

**Clinical Findings:**

General: Conscious, oriented, stable vitals (BP 130/80 mmHg; PR 74/min; $SpO_2$: 99% on RA). Multiple abrasions over face and hands

Local:

Diffuse swelling and warmth over the elbow

Marked tenderness

ROM not elicitable due to pain

No distal neurovascular deficit

Active finger movements intact

Multiple small abrasions were noted on the face and hands.

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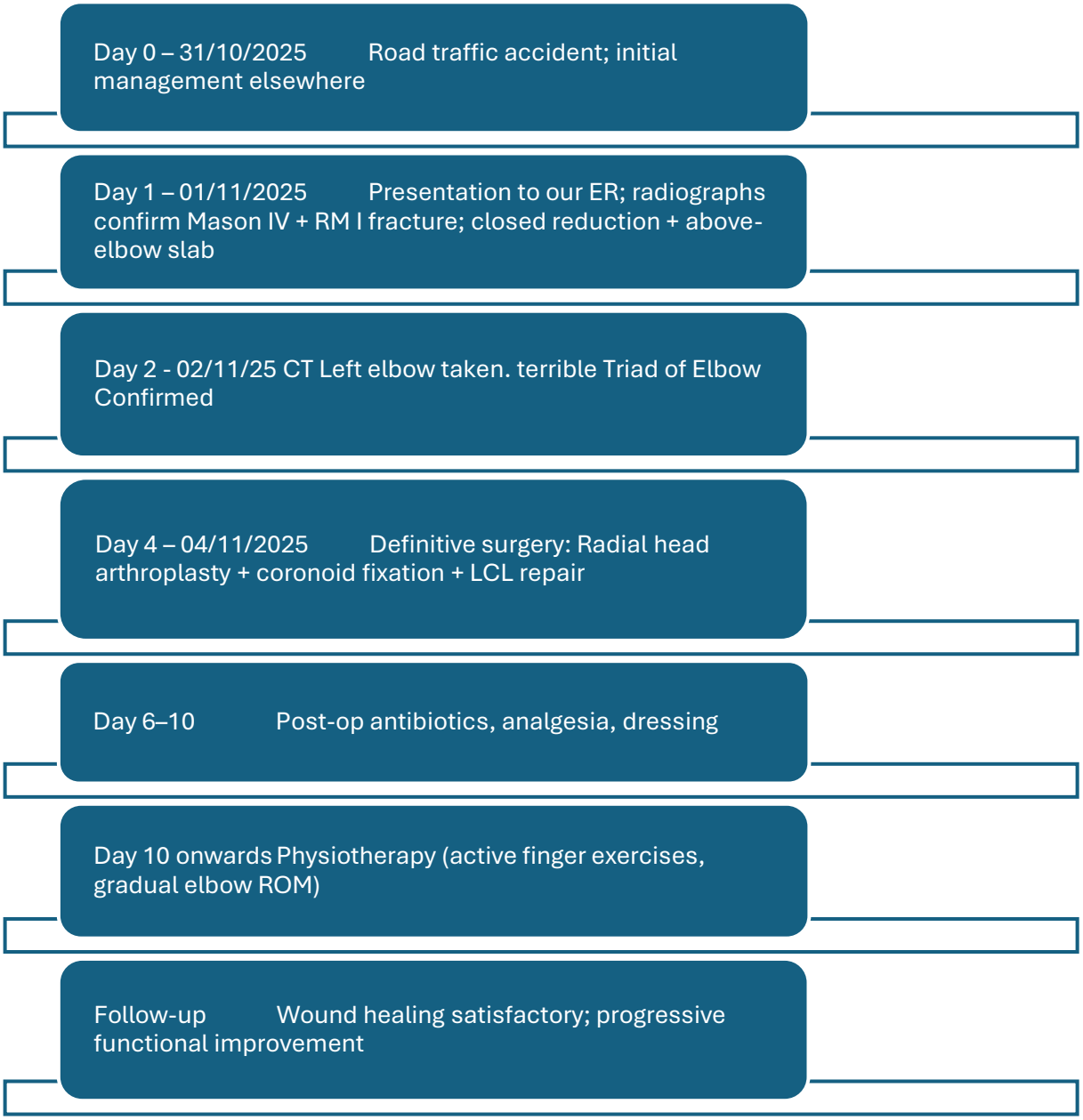
**Timeline**




**Diagnostic Assessment**

**Initial X-rays revealed:**

- Posterior elbow dislocation (Fig 1)
- Comminuted radial head fracture consistent with Mason Type IV
- Small coronoid tip fragment consistent with Regan–Morrey Type I

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These findings suggested a terrible-triad pattern of injury.

**CT Scan Findings**

- Comminuted displaced radial head fracture with persistent dislocation
- Intra-articular extension into the radiocapitellar and proximal radioulnar joints
- Displaced coronoid process fracture with ulno-trochlear subluxation
- Mild joint effusion
- Posterior and medial soft-tissue edema

These findings confirmed the terrible-triad variant, including bony and soft tissue disruption consistent with LCL injury [1,7].

**Classification:**

- Mason Classification:
    - Type IV = radial head fracture associated with elbow dislocation
- Regan–Morrey Classification:
    - Type I = coronoid tip avulsion fracture

These features indicated a terrible-triad variant with significant posterolateral rotatory instability (PLRI) due to LCL disruption.

**Diagnosis**

LEFT ELBOW POSTERIOR DISLOCATION WITH RADIAL HEAD FRACTURE (MASON CLASSIFICATION TYPE 4) WITH CORONOID PROCESS FRACTURE (REGAN-MORREY CLASSIFICATION TYPE 1)

**Differential diagnoses considered:**

Isolated radial head fracture

PLRI without coronoid involvement

Isolated coronoid avulsion

Monteggia-variant injuries

These were excluded based on imaging

**Challenges or Delays in Diagnosis:**

Initial conservative treatment at an outside hospital where only plain radiographs were used; subtle coronoid fractures and ligamentous injuries are often underappreciated on X-ray alone. Post-reduction radiographs may give a false sense of stability, masking underlying instability mechanisms. Persistent radial head instability only became clear after 3D CT, which demonstrated intra-articular extension, persistent displacement, and ulnotrochlear subluxation. Soft-tissue injuries (LCL disruption) are not directly visible on X-ray, contributing to early underestimation of injury severity.

**Therapeutic Interventions**

**Initial Procedure (01/11/2025): Closed Reduction**

Under short GA, traction–countertraction technique was used to reduce the dislocation. The limb was immobilized with an above-elbow POP slab in supination and hyperflexion. Post-reduction C-arm confirmed congruent joint alignment. (Fig 2)

**Definitive Operative Management (04/11/2025)**

**Surgical Approach:**

**Kaplan anterolateral approach** between the EDC and ECRB, protecting the posterior interosseous nerve.

**Intra-operative Findings**

- Severe comminution of radial head → non-reconstructable
- Small coronoid tip avulsion
- Attenuated / disrupted lateral collateral ligament complex

**Steps Performed**

1. Removal of comminuted radial head fragments.
2. Coronoid process repaired using anchor sutures (H5000) (Fig 9)
3. Preparation of radial neck and insertion of 21 mm metallic radial head prosthesis. (Fig 5) (Fig 6)
4. Reconstruction of the lateral collateral ligament complex with sutures. (Fig 8)

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5. Confirmation of elbow stability through flexion-extension and pronation-supination. (Fig 7)
6. Layered closure, slab immobilization, and posterior support.

**Follow-up and Outcome**

Postoperative period was stable with intact distal pulses. Postoperative xray showed desired reduction. Physiotherapy initiated early (finger mobilization, gradual ROM). Serial wound inspections showed healthy healing with no discharge or gaping.

At follow-up, the elbow demonstrated restored stability with improving flexion–extension arc and pronation–supination. No signs of postoperative infection or redislocation.

**Discussion**

Terrible-triad injuries are challenging because they involve simultaneous osseous and ligamentous disruption, producing multidirectional elbow instability [1]. Successful management requires addressing all three injured components: the radial head, the coronoid process, and the lateral collateral ligament (LCL)—a principle emphasized in modern treatment algorithms [1,3,7].

Mason IV radial head fractures are typically highly comminuted and demonstrate poor reconstructability, making open reduction and internal fixation (ORIF) unreliable when more than three fragments are present [3]. Literature consistently supports radial head arthroplasty in the following situations:

- Severe comminution
- Loss of head–neck structural integrity
- Elbow instability associated with soft-tissue injury
- Need for immediate postoperative stability in terrible-triad patterns [5,6]

Radial head replacement restores valgus stability and acts as a secondary stabilizer against posterolateral rotatory instability, particularly when the LCL complex is injured [6]. Studies have demonstrated superior functional outcomes and lower failure rates with arthroplasty compared to ORIF for Mason IV injuries [5–7].

Even small coronoid fragments, such as Regan–Morrey Type I, play a significant role in anterior and varus stability of the elbow [4]. In terrible-triad injuries, the coronoid serves as the primary anterior buttress, and failure to repair it can result in persistent posterior subluxation. Anchor-based fixation techniques have been shown to provide adequate stabilization while avoiding extensive exposure [4].

The LCL complex, particularly the lateral ulnar collateral ligament (LUCL), is the main restraint against posterolateral rotatory instability (PLRI) [1]. Dodds & Fishler stress that untreated LCL disruption leads to:

- Recurrent subluxation
- Chronic PLRI
- Painful mechanical symptoms
- Progressive degenerative changes [1]

Therefore, LCL repair is indispensable in terrible-triad management. When combined with radial head replacement, LCL repair produces superior clinical stability, allowing early functional rehabilitation [1,7].

This case represents a terrible-triad variant characterized by:

- Mason IV comminuted radial head fracture
- Regan–Morrey Type I coronoid fracture
- Complete LCL complex disruption

The constellation of CT findings—including persistent radial head dislocation, ulnotrochlear subluxation, and soft-tissue edema—further supported the diagnosis and influenced the operative plan. These features align with the radiologic instability patterns described in contemporary terrible-triad literature [1,7].

**Why This Case Is Unique**

- It involves a Mason IV comminuted radial head fracture, which is less frequently reported than Mason II/III patterns.
- Definitive management utilized a three-component reconstructive strategy:

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radial head arthroplasty + coronoid anchor repair + LCL reconstruction, which is the recommended modern protocol for terrible-triad injuries.

- Surgery was performed using the Kaplan anterolateral approach, which preserves the posterior interosseous nerve (PIN) and provides excellent access to the radial head and coronoid.
- Early stabilization permitted early active mobilization, contributing to good early outcomes—consistent with current recommendations aimed at reducing stiffness [2].

This case reinforces existing evidence that a structured, component-based surgical approach produces predictable and favorable results in complex terrible-triad variant injuries.

**Conclusion / Learning Points**

- Terrible-triad injuries require combined management of radial head, coronoid, and ligamentous structures.
- Radial head arthroplasty is preferred in non-reconstructable Mason IV fractures.
- Even small coronoid fractures must be fixed in unstable patterns.
- LCL repair is crucial to prevent chronic posterolateral instability.
- CT imaging enhances diagnostic accuracy and aids operative planning

**Patient Consent**

Written informed consent was obtained from the patient for the publication of this case report and for the use of anonymized clinical details.

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**Figures:**

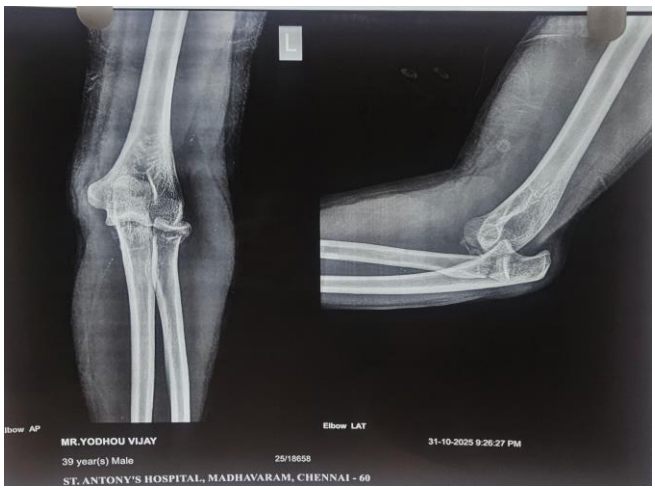


**Fig 1:** Initial Xray taken on 31/10/25 showing Posterior elbow dislocation and comminuted radial head fracture consistent with Mason Type IV

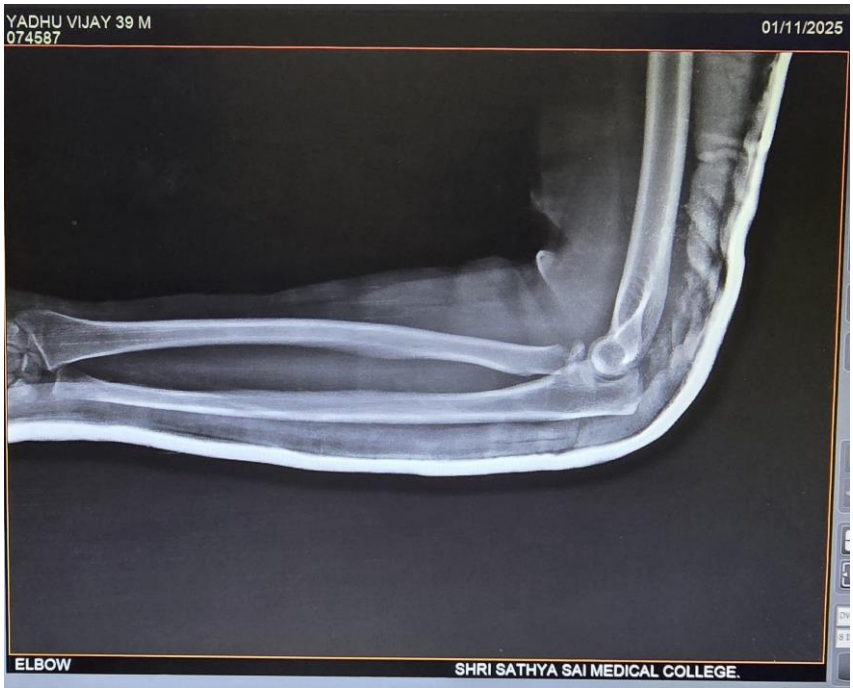


**Fig 2:** Post reduction xray taken on 1/11/25

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**Fig 3:** Clinical Photo of the patient at the time of admission

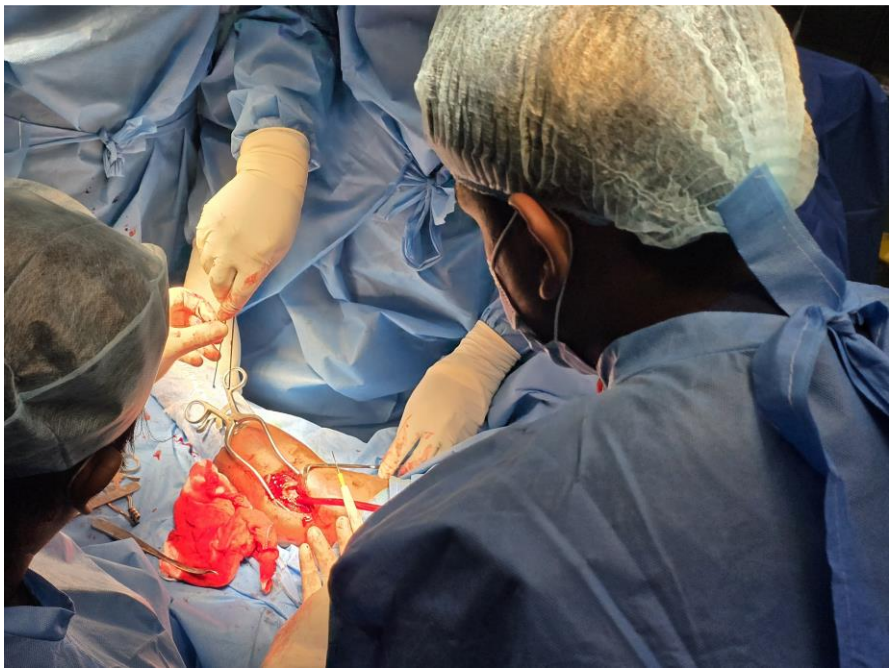

**Fig 4:** Kaplan's Approach to the Elbow Joint being used to gain access

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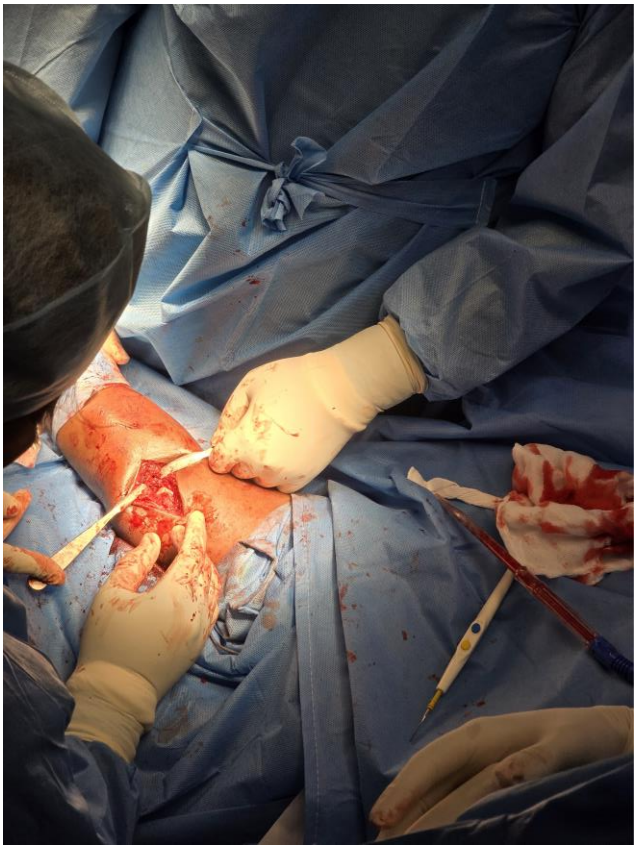

**Fig 5:** Insertion of Radial Head Prosthesis

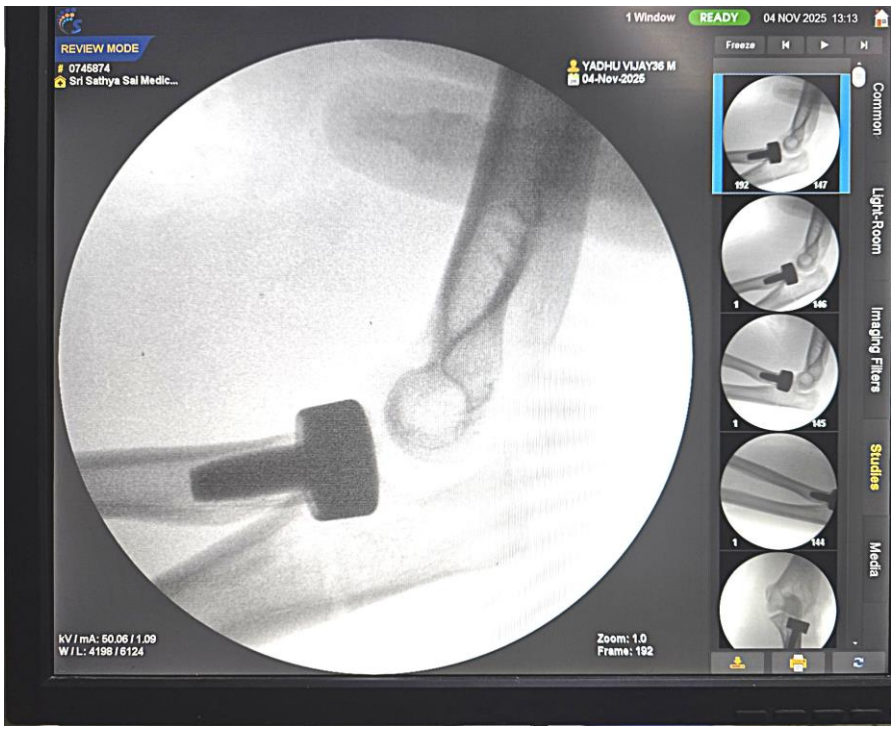


**Fig 6:** Confirmation of Placement of Radial Head under C-arm

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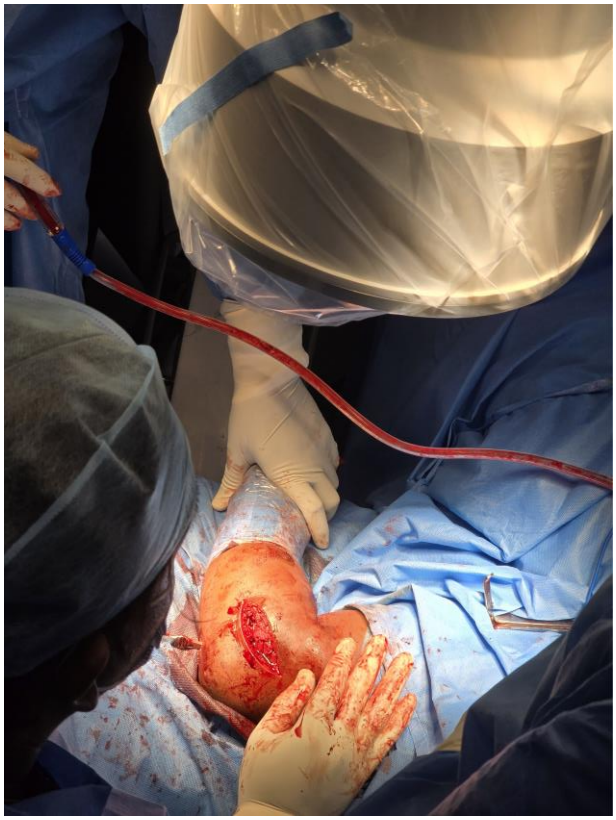

**Fig 7:** Confirmation of Range of Motion Intra op

**Fig 8:** LCL repair

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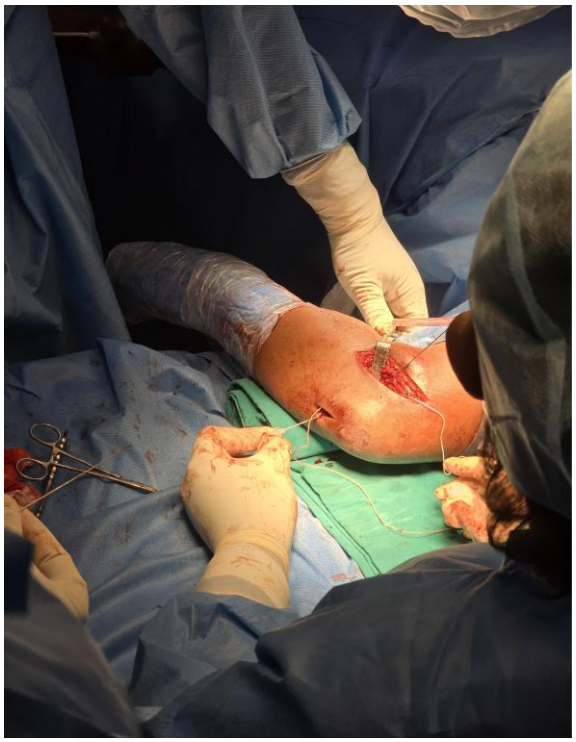

**Fig 9:** Placement of Suture Anchors

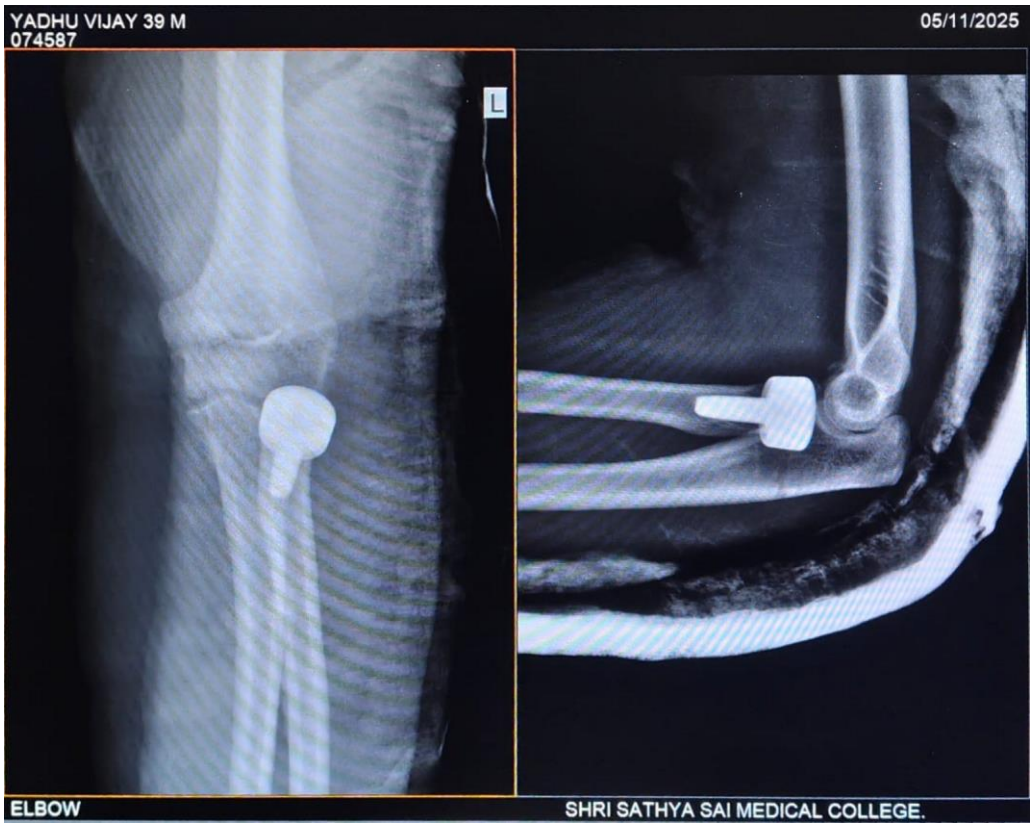


**Fig 10:** Post Operative xray