International Journal of Case Reports in Orthopaedics

E-ISSN: 2707-8353
P-ISSN: 2707-8345
Impact Factor (RJIF): 6.09
IJCRO 2025; 7(2): 342-345
www.orthocasereports.com
Received: 10-08-2025
Accepted: 15-09-2025

Dr. Rajath S Shetty
Department of Orthopaedics Grant Govt. Medical College and Sir J.J. Group of Hospitals, Byculla, Mumbai Maharashtra, India

Dr. Dharya Pimpale
Department of Orthopaedics Grant Govt. Medical College and Sir J.J. Group of Hospitals, Byculla, Mumbai, Maharashtra, India

Dr. Kunal Rahane
Department of Orthopaedics Topiwala National Medical College and Nair Hospital, Mumbai, Maharashtra, India

Dr. Aditya Mugutrao
Department of Orthopaedics Lokmanya Tilak Municipal Medical College and General Hospital Sion, Mumbai, Maharashtra, India

Dr. Tushar Bharat Ramteke
Department of Orthopaedics Lokmanya Tilak Municipal Medical College and General Hospital, Sion, Mumbai, Maharashtra, India

Dr. Syed Mohammed Farhan Irfan
Department of Orthopaedics Grant Govt. Medical College and Sir J.J. Group of Hospitals, Byculla, Mumbai, Maharashtra, India

Corresponding Author:
Dr. Rajath S Shetty
Grant Government Medical College and Sir J. J. Group of Hospitals, JJ Marg, Noor Baug, Nagpada, Mumbai Central, Mumbai, Maharashtra, India

Minimally invasive management of a Judet 4b radial neck fracture using combined K-wire leverage and métaizeau technique: A rare case report

Rajath S Shetty, Dharya Pimpale, Kunal Rahane, Aditya Mugutrao, Tushar Bharat Ramteke and Syed Mohammed Farhan Irfan

DOI: https://www.doi.org/10.22271/27078345.2025.v7.i2f.309

Abstract
Background: Radial neck fractures in children are uncommon and can be challenging to manage when severely displaced. Judet type 4B fractures, characterised by angulation greater than 80°, are especially difficult to reduce by closed methods. Open reduction increases the risks of avascular necrosis, synostosis, and stiffness. Minimally invasive strategies such as the Métaizeau technique, supported by temporary percutaneous K-wire leverage, provide an attractive alternative with the advantage of preserving vascularity.
Case Presentation: A 13-year-old male presented with a Judet 4B radial neck fracture following a fall. Closed manipulation was unsuccessful, and a minimally invasive combined technique was employed.
Methods: Through a percutaneous approach, a 2.0 mm K-wire was introduced into the radial head–neck interval to assist with levering the displaced fragment into partial alignment. Subsequently, a Titanium Elastic Nail was advanced across the fracture using the Métaizeau principle and rotated to achieve stable anatomical reduction.
Results: Radiographs at one-year follow-up demonstrated complete union with full recovery of elbow flexion–extension and forearm rotation. No complications such as avascular necrosis, synostosis, or growth disturbance were observed.
Conclusion: The combination of percutaneous K-wire leverage and the Métaizeau technique offers a reliable minimally invasive option for treating Judet 4B radial neck fractures, avoiding the morbidity of open reduction while achieving excellent functional outcomes.

Keywords: Radial Neck, Judet, Métaizeau, TENS nail, Percutaneous K wire

Introduction
Radial neck fractures in children involve injury to the proximal radius metaphysis and commonly occur following a fall on an outstretched hand with valgus stress transferred to the elbow [1]. Although relatively infrequent, these injuries require careful consideration due to their proximity to the radial head's physis and blood supply. Failure to restore anatomical alignment may result in significant long-term morbidity, including restricted motion, malunion, and growth disturbance [2, 3].
The Judet classification remains the most widely used system for defining the severity of fracture displacement and angulation. Angulation grades progress from Type I (undisplaced) to Type IV, with Type 4B indicating angulation greater than 80°, often accompanied by significant translation and rotation of the radial head [4]. Fractures falling within this category are frequently irreducible by closed manipulation, contributing to high rates of unsuccessful initial management.
Several closed reduction maneuvers have been described in the literature, including the Patterson method, Israeli (Kaufman) technique, Neher and Torch method, and elastic bandage methods [6]. Despite their simplicity and non-invasive nature, these approaches routinely fail in cases with severe displacement or mechanical obstruction.
Minimally invasive methods, particularly the Métaizeau technique (Elastic Stable Intramedullary Nailing), have become increasingly popular due to their ability to achieve controlled realignment with minimal soft-tissue disruption [7]. In high-grade fractures—especially Judet 4B—augmenting the Métaizeau technique with temporary percutaneous K-wire leverage can significantly improve reduction capability and reduce the need for open surgery [8].
Open reduction, although sometimes necessary, has been consistently associated with higher complication rates, including avascular necrosis of the radial head, radioulnar synostosis, and

decreased forearm rotation [9, 10]. Consequently, current practice favours strategies that maintain soft-tissue integrity while achieving precise reduction.

We report a case of a 13-year-old male with a Judet 4B radial neck fracture managed successfully using a combined percutaneous K-wire leverage and Métaizeau technique, resulting in excellent clinical and radiological outcomes at one year.

Case Report

A 13-year-old right-hand-dominant male presented with pain, swelling, and restricted elbow movement following a fall on an outstretched hand while playing sports. Examination revealed marked tenderness over the lateral elbow, limited flexion–extension, and severely restricted pronation–supination. Neurovascular evaluation was normal.

Standard anteroposterior and lateral elbow radiographs demonstrated a Judet 4B radial neck fracture with angulation exceeding 80° and significant displacement. Closed manipulation attempted in the emergency department under conscious sedation was unsuccessful (Fig .1).

Fig 1: Pre-Operative Elbow AP and Lateral Radiographs showing Judet IV B Radial Neck Fracture.

After assessing the degree of deformity and instability, a minimally invasive closed-assisted reduction using temporary percutaneous K-wire leverage and Métaizeau elastic nailing was planned.

Operative Technique

Under general anaesthesia, the patient was positioned supine with the affected limb placed on an arm board in neutral rotation. After sterile preparation, a percutaneous approach was chosen.

A 2.0 mm K-wire was inserted distally and directed proximally toward the axilla of the radial head–neck junction. Under fluoroscopic guidance, the K-wire was positioned into the fracture interval and carefully used as a lever to elevate and realign the radial head, achieving partial reduction.

Attention was then turned to intramedullary fixation. Following the principles of the Métaizeau technique, a Titanium Elastic Nail (TENS) was inserted retrograde through the distal radial metaphysis. The prebent nail was advanced into the proximal fragment. Once in position, the nail was rotated 180 degrees to achieve complete reduction of the radial head and secure stable internal alignment.

The K-wire, having served solely as a reduction aid, was removed intraoperatively. Final fluoroscopic evaluation confirmed restoration of the radial head–neck alignment. A sterile dressing was applied, and the limb was immobilized using an above-elbow posterior slab (Fig .2).

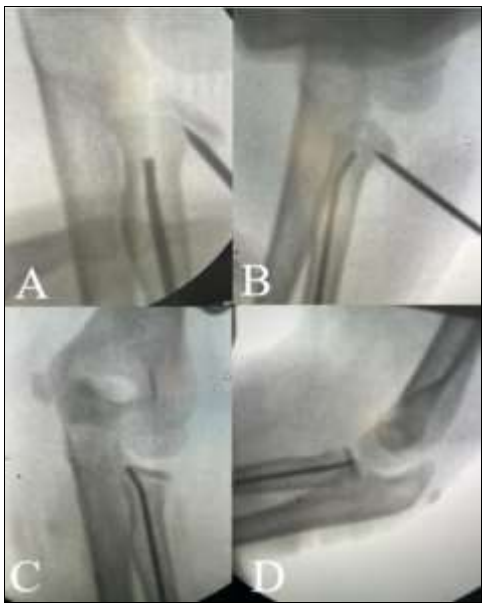

Fig 2: Intra-operative C-arm shoots showing combined percutaneous K-wire leverage and Métaizeau technique

Postoperative Management

The patient was maintained in an above-elbow slab for three weeks, with elevation and analgesia. After slab removal, a structured physiotherapy program was initiated focusing on gentle flexion–extension and rotational movements. Over successive follow-up visits, the patient demonstrated steady improvement in elbow mobility without pain or instability (Fig .3).

Fig 3: Immediate Post-Operative X- rays showing anatomical reduction of the fracture

Results

By the one-year postoperative evaluation, the patient exhibited complete radiographic union, full elbow flexion-extension, full pronation and supination, no evidence of avascular necrosis, synostosis, heterotopic ossification, or physeal arrest, and a return to full daily and recreational activities. Clinical recovery was excellent, with a restored range of motion matching the contralateral side and no residual deformity (Fig .4) (Fig .5).

Fig 4: One year Follow up X- rays showing complete fracture union and no signs of Avascular necrosis of the radial head

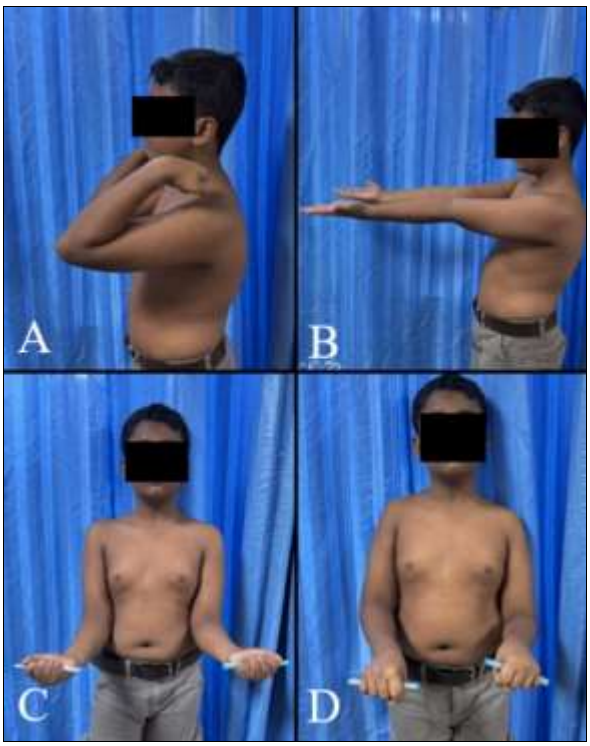

Fig 5: Clinical images at one year follow up showing complete elbow range of motion.

Discussion

High-grade radial neck fractures in children, particularly Judet 4B patterns, pose a management challenge due to their severe displacement and increased risk of circulatory compromise to the radial head. Achieving stable anatomical reduction while preserving vascularity is essential to optimise long-term outcomes.

Closed reduction techniques, although widely used, frequently fail in cases with angulation beyond 60° (6). The complexity arises from soft-tissue interposition, severe tilt of the radial head, and mechanical constraints imposed by surrounding structures.

The Métaizeau technique, which uses a prebent intramedullary nail to manipulate and stabilize the fracture internally, has gained prominence for its biological friendliness and predictable outcomes [7]. However, in markedly displaced fractures such as Judet 4B, adding a percutaneous K-wire leverage step improves reduction by providing an external mechanical advantage to lift and rotate the radial head into alignment [8].

Clinical studies consistently show superior outcomes with minimally invasive approaches compared to open reduction, which carries heightened risks of complications such as avascular necrosis of the radial head, radioulnar synostosis, elbow stiffness with limited forearm rotation, and premature physeal closure [9, 10].

The present case aligns with these findings, demonstrating that combining K-wire leverage with the Métaizeau technique provides an effective method for restoring normal anatomy and function, even in severely displaced fractures.

Conclusion

The combination of temporary percutaneous K-wire leverage and the Métaizeau technique represents an effective, minimally invasive approach for treating Judet 4B radial neck fractures in children. This method avoids the morbidity of open reduction, preserves soft-tissue integrity, and achieves excellent radiological and functional outcomes. It should be considered a preferred technique for managing severely displaced pediatric radial neck fractures.

Conflict of Interest

Not available.

Financial Support

Not available.

References

1. POSNA Study Guide. Radial neck fractures in children.
2. Zimmerman RM, *et al*. Pediatric radial head and neck fractures. J Pediatr Orthop.
3. Macken AA, *et al*. Mechanism and management of pediatric radial neck fractures. World J Orthop.
4. Kaiser M, *et al*. Judet type-IV radial neck fractures in children. Acta Orthop.
5. StatPearls. Radial neck fracture repair in children. 2023.
6. StatPearls Publishing. Closed reduction techniques: Patterson, Kaufman, Neher-Torch.
7. Métaizeau JP. Intramedullary nailing in pediatric fractures. J Pediatr Orthop.
8. D'Souza S, *et al*. Percutaneous leverage combined with ESIN for radial neck fractures. BMC Musculoskelet Disord.

9. Steele JA, *et al*. Open vs closed reduction outcomes. J Orthop Trauma.
10. Boston M, *et al*. Complications of pediatric radial head injuries. World J Orthop.

How to Cite This Article
Shetty RS, Pimpale D, Rahane K, Mugutrao A, Ramteke TB, Irfan SMF. Minimally invasive management of a judet 4b radial neck fracture using combined K-wire leverage and métaizeau technique: A rare case report. International Journal of Case Reports in Orthopaedics. 2025;7(2):342-345.