

## Management of Displaced Pediatric Radial Neck Fractures Using the Métaizeau Technique

**Dr. Abhijit More<sup>1</sup>, Dr. Swaroop Solunke<sup>2</sup>, Dr. Abhishek Nair<sup>3</sup>, Dr. Aishwary Verma<sup>4</sup>, Dr. Setu Kaneria<sup>5</sup>**

<sup>1</sup>Assistant Professor and Head of Unit, Department of Orthopaedics, Dr D.Y. Patil Medical College and Hospital, Pimpri, Pune, Maharashtra, India.

Email ID: [abhijitmore1234@gmail.com](mailto:abhijitmore1234@gmail.com)

<sup>2</sup>Associate Professor, Department of Orthopaedics, Dr D.Y. Patil Medical College and Hospital, Pimpri, Pune, Maharashtra, India.

Email ID: [dr.swaroopsolunke@gmail.com](mailto:dr.swaroopsolunke@gmail.com)

<sup>3</sup>Assistant Professor and Head of Unit, Department of Orthopaedics, Dr D.Y. Patil Medical College and Hospital, Pimpri, Pune, Maharashtra, India.

Email ID: [dr.abknair@yahoo.com](mailto:dr.abknair@yahoo.com)

<sup>4</sup>Pg Resident, Department of Orthopaedics, Dr D.Y. Patil Medical College and Hospital, Pimpri, Pune, Maharashtra, India.

Email ID: [verma.aishwary@gmail.com](mailto:verma.aishwary@gmail.com)

Pg Resident, Department of Orthopaedics, Dr D.Y. Patil Medical College and Hospital, Pimpri, Pune, Maharashtra, India.

Email ID: [setu.kaneria141@gmail.com](mailto:setu.kaneria141@gmail.com)

### ABSTRACT

**Introduction:** Radial neck fractures in children are relatively uncommon but can lead to significant functional impairment if not managed appropriately. These fractures often occur between the ages of 8 and 12 and are typically classified as Salter-Harris Type I or II injuries. While minimally displaced fractures can be treated conservatively, displaced fractures pose challenges such as malunion, limited range of motion, and avascular necrosis. The Métaizeau centromedullary technique, a minimally invasive surgical method, has gained popularity for its ability to stabilize fractures while minimizing complications. This case report highlights its effectiveness in treating displaced pediatric radial neck fractures.

**Case:** A cohort of five children (ages 8–14) with displaced radial neck fractures was treated using the Métaizeau technique. Most injuries were due to falls, with associated fractures present in 31% of cases. Closed reduction was successful in 62.5%, while a lever arm technique and open reduction were used in the remaining cases. Under general anesthesia, elastic intramedullary nails were inserted to stabilize the fracture, ensuring proper alignment while minimizing soft tissue disruption. Postoperative immobilization was maintained for two weeks, with intramedullary nail removal after 2–3 months. Clinical assessment showed that 94% of patients regained full range of motion, with radiological evaluation confirming anatomical healing in 88% of cases.

**Conclusion:** The Métaizeau technique proves to be a highly effective and minimally invasive method for treating displaced pediatric radial neck fractures. With excellent clinical and radiological outcomes, it minimizes complications while promoting early mobilization. While open reduction remains necessary in select cases, this study reinforces the superiority of closed reduction techniques where feasible. Future research with larger sample sizes and randomized controlled trials will further validate its advantages in pediatric fracture management.

**Keywords:** Métaizeau technique, Avascular necrosis, Pediatric fractures, DASH score

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## 1. INTRODUCTION

Radial neck fractures in children are relatively uncommon, accounting for 5–10% of all elbow fractures in this population. It is observed that these injuries tend to occur between the ages of 8 and 12 leading to the assumption that there is an increased likelihood in girl [1,3,5]. Most commonly, these fractures involve the proximal radial physis and are classified as Salter-Harris Type I or II Injuries [1,3]. While fractures with minimal displacement are often responsive to non-surgical treatment, those with displacement present greater challenges such as malunion, limited range of motion (ROM), and other associated components like avascular necrosis [1,4,5].

Historically, open reduction and internal fixation have been the standard approaches to fixing internally severely displaced fractures during a great displacement of limbs. This procedure is notorious for carrying the risk of undesirable outcomes, which have so far included radioulnar synostosis and soft tissue injury [1,6,7]. Kermesse and Peters described a method to further cure that limitation using K wires, which has not widely been used due to several intra-operative disadvantages such as limited rotation of the forearm while testing, and repetition of damage to the posterior interosseous nerve [1,4,6].

The Métaizeau Centro medullary technique, introduced in 1980, provides a minimally invasive option that has gained popularity over the years. This method utilizes elastic stable intramedullary nails (ESIN) for both reduction and fixation, enabling extracapsular stabilization while minimizing soft tissue damage [1,2,6]. By reducing the risk of complications, this technique promotes early mobilization and has shown encouraging clinical and radiological results in cases of displaced pediatric radial neck fractures [1,5,7]. This case report highlights its effectiveness based on the evaluation of several pediatric patients treated using the Métaizeau technique.

## 2. CASE DESCRIPTION

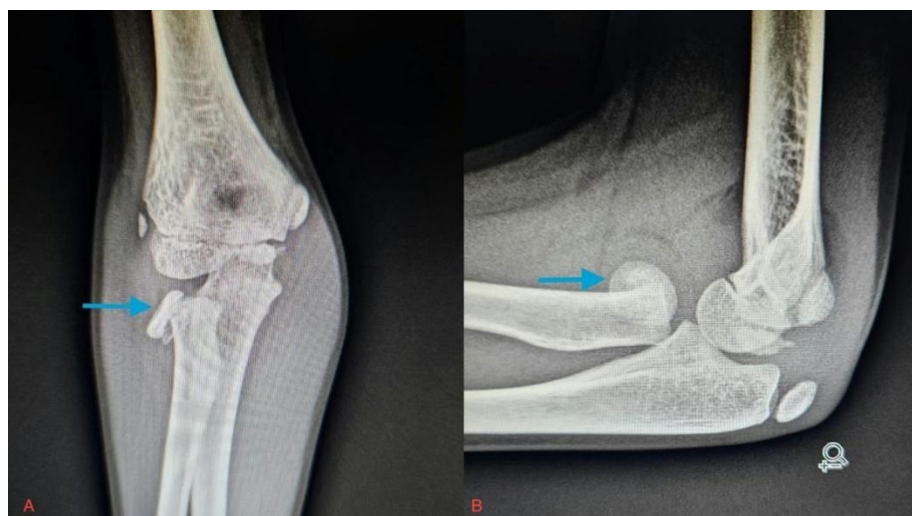
A cohort of 5 children aged 8 to 14 years with displaced radial neck fractures were treated using the Métaizeau technique. Most patients sustained injuries due to falls. Associated fractures were present in 31% of cases. Closed reduction was performed in 62.5% of the cases, while a lever arm technique was used in 25%, and open reduction in 12.5%. Clinical outcomes were evaluated using the DASH score and the Métaizeau classification, while radiological outcomes were assessed using Steele's classification.

## 3. OPERATIVE TECHNIQUE

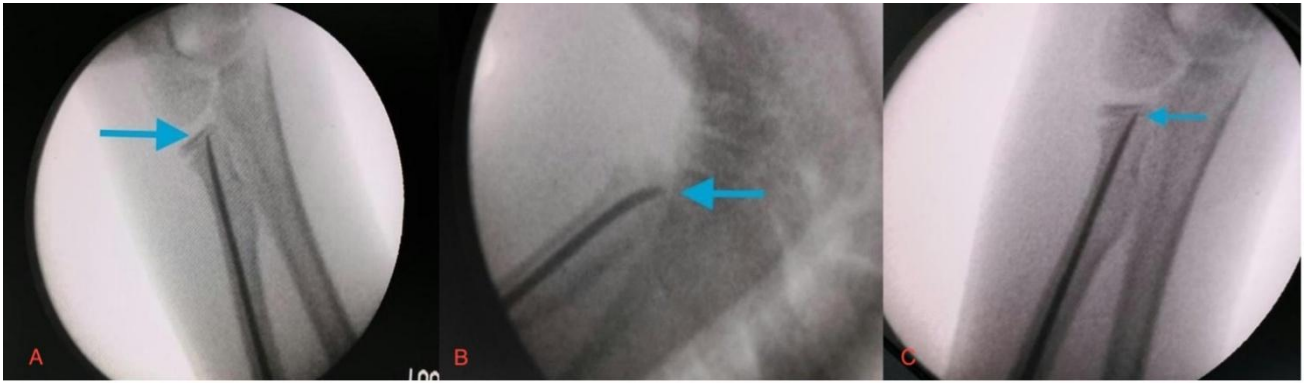
Under general anesthesia, closed reduction was attempted by applying varus pressure to the extended elbow, followed by supination-pronation maneuvers. A 2-cm incision proximal to the distal radial physis allowed the introduction of an elastic intramedullary nail, which was gently advanced to achieve reduction. In cases of unsatisfactory alignment, percutaneous K-wire leverage was employed.

## 4. POST OPERATIVE REHABILITATION

Immobilization with a long arm splint was maintained for two weeks, and the intramedullary nail was removed after 2–3 months. Active range of movement at elbow and wrist joint was started at 4 weeks after repeat xray showing formation of callous. Full range of pain free movement was achieved at 6 weeks and patient was able to perform daily routine activities at 8 weeks.



**Figure 1[A and B]: Xray of right elbow in anteroposterior and lateral views showing fracture of radial head and its displacement.**



**Figure 2[A,B AND C]: Intraoperative Xray showing fixation of radial head fracture using TENS.**



**Figure 3: Full range of flexion and extension at right elbow joint.**



**Figure 4: Full range of supination and pronation is shown at right elbow joint.**

## 5. OUTCOMES

The average DASH score was 3.06, indicating favorable subjective outcomes. Clinically, 94% of patients achieved excellent range of motion, with only one patient showing significant limitation. Radiologically, 88% demonstrated anatomical healing, with one case of malunion and one pseudoarthrosis. Open reduction correlated with less favorable results, underscoring the technique's effectiveness in minimizing complications.

## 6. DISCUSSION

The treatment of radial neck fractures in children, especially those with severe displacement, has evolved significantly. While conservative management is appropriate for minimally displaced fractures, angulated fractures greater than 30° usually require surgery to avoid the possibility of a poor outcome [1,4,8,9]. Open reduction, which gives anatomical

alignment, is risky with avascular necrosis and radioulnar synostosis. The reasons for this are largely because of the disruption of the periosteum and surrounding soft tissues [1,5,6]. The Métaizeau technique has become a gold standard in the treatment of pediatric radial neck fractures that are displaced. It has the following advantages: it is a minimally invasive technique, preserves the soft tissues, and allows for an extracapsular reduction and fixation [1,6,7]. In this study, most of the patients obtained excellent clinical and radiological outcomes with an average DASH score of 3.06, indicating minimal disability. Interestingly, 94% of the patients achieved perfect or near-perfect ROM, and 88% had anatomical healing on radiographs. The results are inline with the previous reports where high percentages of functional and radiological success have been documented with the Métaizeau technique [1,6,7]. Despite these advantages, the Métaizeau technique does have its drawbacks. The technique requires precise manipulation of the elastic intramedullary nail to achieve satisfactory alignment. In addition, while open reduction is generally avoided, it must be performed in instances of comminuted fractures, significant soft tissue interposition, and fracture dislocations [1,2,8]. In this series, an unfavorable outcome was seen in those requiring open reduction, which underlines the value of minimal surgical exposure wherever possible [1,5]. Another strength of this study is the use of a DASH score to evaluate the outcome of surgery in terms of function. Unlike earlier studies, which depend solely on the assessment by clinical and radiological means, this valid tool measures the patient's subjective experience to detail [1,9,10]. The disadvantages are that only a few participants were selected and that this is a retrospective study, leading to bias. Further randomized control studies that compare the Métaizeau technique with other surgical methods will yield more robust evidence. Overall, this case series reinforces the Métaizeau technique as a safe and effective method for managing displaced pediatric radial neck fractures. Its minimally invasive nature, combined with excellent clinical outcomes, makes it a valuable addition to the orthopedic surgeon's repertoire.

## 7. CLINICAL MESSAGE

The clinical message of this article is that the Métaizeau centromedullary technique is a minimally invasive, effective, and reliable method for treating displaced radial neck fractures in children. It provides excellent functional and radiological outcomes while minimizing complications associated with open reduction, such as avascular necrosis and stiffness.

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**CONSENT:** The patient has been explained about the publication and has given their informed consent for the case report to be published.

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**AUTHOR CONTRIBUTION:**

SS contributed to the planning of the entire patient management as well as this report long with the design. AM contributed to conception and acquisition of the data and documenting this case report. AV and SK contributed to helping the co-authors in compiling data and providing help at whatever part was needed.

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