

A Retrospective Analysis of Management of Pediatric Radial Neck Fractures By Metaizeau Technique.

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Abstract: Fractures of the radial neck in children are usually seen after the appearance of the proximal radial epiphysis at about the age of five years. Management options of radial neck fractures in children range from conservative to various surgical option. In this study we analysed retrospectively all the paediatric radial neck fractures treated by closed reduction with metaizeau technique. At an average 16 -month follow-up, all 21 patients treated with Metaizeau technique were clinically and radiographically evaluated. . All 21 patients achieved radiologic bone union by 4 weeks. Elbow ROM was comparable to the contralateral side. Use of Metaizeau technique for treating displaced radial neck fractures is now gold standard. The shorter learning curve compared to any other technique makes it easily adoptable giving excellent results.

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I. Manuscript

INTRODUCTION:

Fractures of the radial neck in children are usually seen after the appearance of the proximal radial epiphysis at about the age of five years. They are frequently caused by a fall on the outstretched hand with the forearm supinated and the elbow extended, which produces a valgus strain. [1] Management options of radial neck fractures in children range from conservative to various surgical option. Interventional options include: Manipulation, closed reduction methods using k wire, TENS nail by Metazeau technique and open reduction and fixation with k wire. Paediatric radial neck fractures with angulation less than 30 degree do need any reduction and heals well with good outcome.[2] Although open reduction allows accurate reduction, it has high chances of avascular necrosis and risk of radio-ulnar synostosis. Pseudo improvised Bohler technique of percutaneous leverage of radial neck to aid in reduction. [3] The radial head and its blood supply can be damaged by the original trauma or by surgical trauma, such as open reduction or forceful manipulations. Severe angulation and translation increases the risk of complications, mainly malunion, avascular necrosis of the head, cubitus valgus and stiffness of the joint. Although open reduction is a method of treatment often used in the past, it is used today in comminuted fractures and cases where closed reduction has failed. In fact, in the literature higher rates of complications are reported after open compared to closed reduction, in particular regarding avascular necrosis (19 vs. 5 %) [4,5]; premature epiphyseal fusion (50 vs. 5 %) [4,5], and heterotopic ossifications (25 vs. 4 %) [4,6]. In this study we analysed retrospectively all the paediatric radial neck fractures treated by closed reduction with metaizeau technique.

II. Methodology

All the displaced radial neck fractures with an angulation of more than 30° (Judet type III and IV) in children with open growth plates and treated with metaizeau technique of closed reduction were included in the study. During 2016-2018, there were a total of 21 injuries, of which 15 (71 %) type III, and 6 (29 %) type IV fractures. Thirteen (62 %) patients were boys and eight (38 %) were girls. One child had an associated compound fracture of the ipsilateral olecranon. There was no case of polytrauma in the series. All the cases have been operated by closed reduction method – Metaizeau technique. A TENS (Titanium Elastic Nailing System) nail was used for reduction as per described method.

SURGICAL TECHNIQUE:

A TENS wire of diameter 2 mm or 2.5 mm was contoured and bent at the tip at an angle of 30–45°. Under c arm guidance, a small incision was given over distal radius metaphyseal region. The soft tissue was dissected by taking care not to injure the cutaneous branch of the radial nerve. The lateral cortex was exposed and perforated to pass the curved flexible nail, which was pushed cranially until it reached the inferior aspect of the displaced epiphysis. It is very important to note the displacement of the displaced fragment. The tip of the nail directed towards the maximum tilt of the epiphysis. The nail is advanced with gentle taps across the fracture

and up to the subchondral bone. Displacement of the radial head is usually lateral or posterolateral, and therefore the nail is rotated anteriorly (Fig. 1c) and then medially (Fig. 1d). The intact periosteum prevents over-correction of the fragment. Pronation of the forearm may also help reduction. If the epiphysis is displaced anterolaterally, the nail needs to be rotated posteriorly and medially.

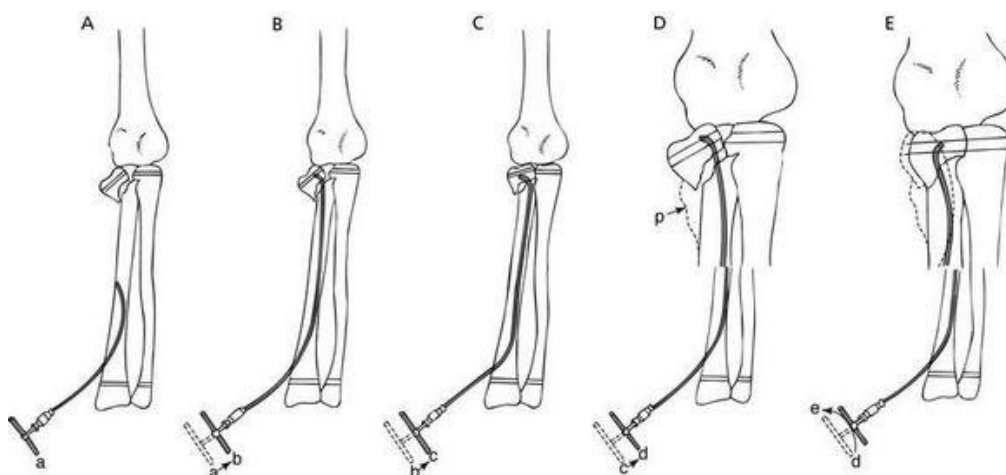


Fig 1 : Surgical Technique : Metaizeau – A) Insertion of TENS nail from distal radius metaphysis. B) Advancement of nail to maximum tilt of epiphysis in proximal radial head fragment. C) Gentle advancement in to sub chondral bone. D) Rotation of the nail basing on displacement patterns to reduce the fragment as described.

The postoperative clinical evaluation was done by analysis of passive and active range of motion of elbow (ROM) and radiological evaluation of alignment. All the included patients were evaluated at 4,8,12 weeks and at 6 months follow up and at the time of implant removal. Radiologically, the reduction was considered excellent when it healed in the anatomical position; good when the radial neck angle was less than 20°; medium when the angle was between 20° and 40°; poor with an angle of more than 40°. Arc of motion was compared to normal contralateral elbow and documented.

III. Results

At an average 16 -month follow-up, all 21 patients treated with Metaizeau technique were clinically and radiographically evaluated. Thirteen of these 21 patients sustained the fracture on the dominant right side. We operated on all patients using the modified Metaizeau technique, and none of the cases needed conversion to open reduction. However, six cases needed manipulation using thumb over radial head for the nail to entry in to the epiphysis of radial head. All 21 patients achieved radiologic bone union by 4 weeks. Elbow ROM was comparable to the contralateral side in all except 1 case, in which there was a 10° loss in the flexion-extension and pronation-supination at the final follow up. Eight of the cases in the series, complained of pain at the insertion site at the wrist that resolved spontaneously after nail removal. No other complications were noted. All patients returned to their normal day-to-day activities within 6 weeks post injury. Average time for implant removal was 3.8 months (Range – 2.5-7 months). The arc of motion of all the children was comparable to their opposite elbow without any restriction, except for in one child mentioned above.



Fig 1: Pre op X ray of radial neck fracture. B) Intra-op Reduction AP view C) Reduction in Lateral View.

IV. Discussion

The proximal radial epiphysis is mainly supplied by periosteal blood vessels running from distal to proximal; the fracture itself or dissection required for open reduction may disturb the blood supply and may lead to avascular necrosis of the radial head or physeal closure [7,8]. The ESIN technique, as proposed by Metaizeau et al. [9], consists of introducing a pin into the medullary canal of the radius and pushing it proximally until its point reaches the inferior aspect of the epiphysis, lifting it up. This permits extracapsular but intramedullary reduction and fixation combining closed reduction and minimal invasive internal fixation with preservation of the soft-tissue attachments. [10] Metaizeau method is technically easy with a simple learning curve and is highly effective with excellent functional outcomes. Complications like avascular necrosis, heterotopic ossification, posterior interosseous nerve palsy, and elbow stiffness associated with ORIF are avoided with this procedure. However, this study has a limitation. The second limitation is the lack of a control group to compare this technique with ORIF/CRIF by other methods.

V. Conclusion

Use of Metaizeau technique for treating displaced radial neck fractures is now gold standard. The shorter learning curve compared to any other technique makes it easily adoptable giving excellent results.

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