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ORIGINAL RESEARCH

Functional outcome of displaced radial neck fracture in paediatric population managed with retrograde nailing (me`taizeau technique)

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ABSTRACT

Radial neck (metaphysis) fractures in children are relatively common injuries in age group 6-11 years \. These injuries are serious with frequent sequelae when the tilt exceeds 60 degrees. Conservative treatment is often inadequate when tilt is more than 30 degree such in o`brien type 2 and 3 and judget type 3 and 4. in such cases and open reduction may produce iatrogenic complications. Displaced radial neck fractures in the paediatric population can be treated with retrograde intramedullary nailing of the radius (the Me`taizeau technique). This method allows early post-operative movement and thus has high functional outcome without iatrogenic injury as this is close reduction technique. **Methods:** This is a prospective study in which follow-up of 20 cases with radial neck fracture treated with Me`taizeau technique was done. Clinical and radiological evaluation was done at immediate next post operative ,2 weeks, 4 weeks, 6 weeks and 12 weeks months,6 months . Active range of motion of flexion and extension at elbow and forearm rotation was noted at 6 weeks along with pain score and Mayo Elbow Performance Score (MEPS). Radiological assessment was also done at 6 weeks regarding union. **Results:** 18 out of 20 cases had radiological union at 6 weeks. All 20 had radiological union at 10 weeks. Excellent result was obtained in all cases. Range of flexion-extension, supination and pronation was excellent. **Conclusions:** Metaizeau technique for radial neck fracture fixation is close procedure, simple, safe, soft tissue sparing, minimally invasive technique giving excellent functional and cosmetic results with minimal complication.

Keywords: Metaizeau Technique, Retrograde Intramedullary Nailing, Radial Neck Fracture.

INTRODUCTION

Radial neck fracture in children accounts for 5 - 8.5 % of total elbow injury. Mode of injury usually fall onto an extended and supinated forearm which leads to the radial neck fracture and leads to angulation of the radial head. Most fractures of the proximal radius occur at the neck(metaphysis) . The immature radial head is primarily cartilaginous and intra-articular radial head fractures in children and adolescents are rare. The radial head is entirely articular cartilage and the primary blood supply comes from the metaphysis. This may predispose the radial head to avascular necrosis and non-union with significant displacement. The cartilaginous head absorbs the force and transmits it to the weaker physis or metaphysis of the neck. These fractures characteristically produce an angular deformity of the head with the neck. Radial neck fractures in children are serious injuries with frequent sequelae when the tilt exceeds 60 degrees(type3). Displaced radial neck fractures in the paediatric population can be treated with retrograde intramedullary nailing of the radius (the Metaizeau technique). The direction of angulation depends on whether the forearm is in a supinated, neutral, or pronated position at the time of the fall. Vostal Showed that in neutral, the pressure is concentrated on the lateral portion of the head and neck. In supination, the pressure is concentrated anteriorly and in pronation it is concentrated. The prognosis depends on the degree of displacement, the age of the patient, associated elbow injury and the method of treatment. Less than 30 degree of angulation, which is Judet II, generally acceptable. Poor results are generally associated with more degree of angulations and displacement. Restoration of radial neck angulation and displacement is essential to restore the normal biomechanics and stability of the elbow. Most of the minimally displaced radial neck fractures are treated

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conservatively with early initiation of physical therapy. Conservative treatment might result in secondary malunion and cubitus valgus, whereas open reduction and internal fixation (ORIF) is associated with non-union, reduced range of motion (ROM), posterior interosseous nerve palsy, heterotopic bone formation and avascular necrosis of the radial head. The standard procedure accepted for isolated radial neck in paediatric age group is centro medullary pinning (Me`taizeau technique).

Injuries associated with radial neck fracture

Injuries Associated with Radial Neck Fracture Proximal radius fractures can occur concomitantly with distal humerus, ulna, radial shaft, or distal radius fractures. Fractures in combination with ulnar fractures often are part of the Monteggia fracture. Presence of associated fractures portends a poor prognosis for patients with proximal radius fractures with higher rates of persistent stiffness and pain compared to those with isolated proximal radius fractures. Proximal radius fractures can also occur during traumatic elbow dislocations. The posterior interosseous nerve (PIN) wraps around the proximal radius and occasionally can be injured in association with proximal radius fractures. More typically, however, the nerve is at risk during percutaneous manipulation or open reduction of proximal radius fractures.

Sign and symptom

Following a fracture, tenderness over the radial head or neck . The pain is increased with forearm rotation than with elbow flexion and extension. Displaced fractures frequently result in visible bruising on the lateral aspect of the elbow with soft tissue swelling. Neuro vascular examination should be done to evaluate the PIN (test for wrist, digital and thumb extension) and vasuclarity of limb. the primary complaint may be wrist pain, and pressure over the proximal radius may accentuate this referred wrist pain. The wrist pain may be secondary to radial shortening and subsequent distal radioulnar joint dysfunction.so Always do radiographs of both ends of a fractured long bone and complete examination of the entire affected extremity.

Imaging

Displaced proximal radius fractures are usually easy to identify on standard anteroposterior (AP) and lateral radiographs. Most of these involve the radial head, although a step-off can also develop as a normal variant of the metaphysis. Comparison views of the contralateral elbow are useful for evaluation of unusual ossification centers after an acute elbow injury. If the elbow cannot be extended because of pain, special views are necessary to see the AP alignment of the proximal forearm and distal humerus. A regular AP view with the elbow flexed may not show the fracture because of obliquity of the beam and overlap of proximal forearm and distal humerus bones. One view is taken with the beam perpendicular to the distal humerus, and the other with the beam perpendicular to the proximal radius. The perpendicular views show the proximal radial physis in clear profile.

Method

It was a prospective study in which 20 cases of radial neck fracture, after proper consent were treated by Metaizeau technique at Jawaharlal Nehru Medical College ajmer from 2021 - 2022. Patients were followed up at 2 weeks, 4 weeks, 6 weeks, 10 weeks , 12 weeks and 6 months. Long arm back slab was done after operation for 48 hours. After 48 hours, slab was removed, dressing changed and active range of motion (AROM) exercise was advised and patients were discharged with single oral antibiotic. Clinical assessment was done by degree of active range of motion and MEPS at 6 weeks. Radiological assessment for union was also done at 6 weeks

Surgical technique

Patient was positioned supine with arm abducted 90 degree and forearm placed on a radiolucent side-table. C-arm was positioned and pre-checked. All the patients were given general anaesthesia . Under C-arm, radial head was tried to be reduced by Patterson manoeuvre. If it failed, then blunt tip K wire was used to hinge and reduce the head (Kapandji technique). Reduction was confirmed under C-arm. 2 mm titanium elastic nails (TENS) were used for this purpose. 1 cm long incision was placed on dorsal aspect of wrist lateral to lister tubercle. With help of awl entry made for nail and ckecked under c arm. TENS was introduced inside the radial medullary canal and advanced under C-arm till it gets engaged in proximal fragment. Then tip of nail was rotated 180 degree and fracture was reduced and confirmed under fluoroscopy. The nail distal end cut and buried under skin and single suture was given at entry site. Long arm back slab was applied for 48 hours and then slab was removed, and dressing was changed, and patient was allowed for AROM exercise.

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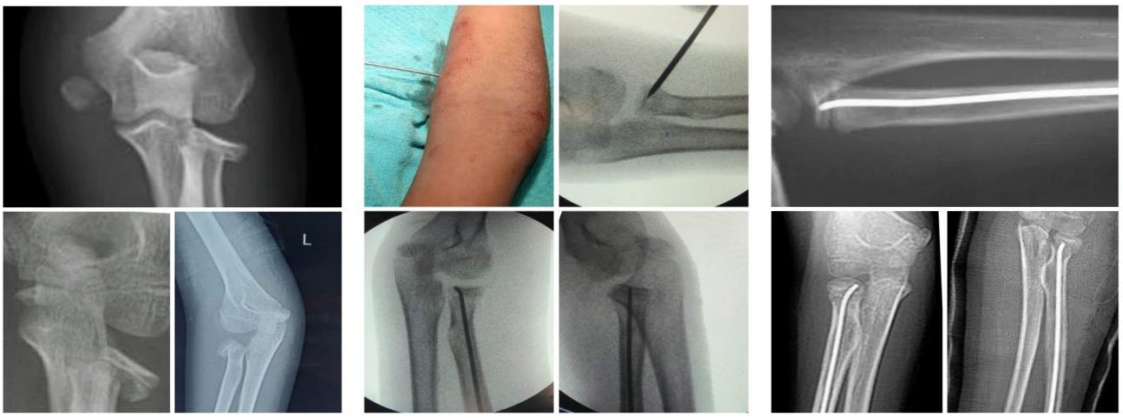

Pre op xrays **intra op images** **post op xrays**

Post -Op Protocol

- Patient was discharged with single antibiotic coverage And painkiller Pt was followed up at 2 weeks and stich removed. At 4 weeks X-ray was done to check for union. At 6 weeks clinic-radiological assessment was done. At 12 weeks removal of TENS was done. Clinical and radiological assessment also done at 6 months.

RESULTS

- A total of 20 cases were included. Average age was 9 years (range = 5 yrs. - 12 yrs.). Functional outcome data was compiled at 6 weeks

DISCUSSION

The method of closed intramedullary pinning of displaced radial neck fractures described in this article was introduced by the French in 1980.14 This group was led by Jean Paul Metaizeau. The prognosis for radial neck fractures was strongly dictated by 2 factors: severity of displacement and associated injuries to the elbow. Radial neck fracture is relatively a common paediatric fracture accounting for 5 - 9 % of all paediatric elbow fracture and 1 % of all paediatric fractures. Judet I and II and o`brien 1 (angulation < 30 degree ) can be well treated conservatively by long arm slab but Judet III and IV and o`brien type 2,3 requires intervention. Closed reduction and intramedullary pinning technique (Metaizeau technique) are considered as the treatment of choice. The ORIF is associated with a higher rate of avascular necrosis, proximal synostosis, heterotopic ossifications,infection, posterior interosseous nerve palsy and loss of range of motion (ROM). In this study, it is found that this technique is safe and effective in treating radial neck fracture in children. The fracture should be reduced within 5 to 8 days of injury. Later on, fracture reduction will not be possible because of initation of fracture healing. In our study All cases achieved radiological and clinical union by 6 weeks except 2 cases which also achieved union by 10 week. Average MEPS was 83.5 which was quite remarkable. Only one patient developed Extensor pollicis longus weakness due to by cut end of TENS nail which also recoverd after nail removal without repair of tendon . The other disadvantage of this technique was need of second surgery to remove TENS nail which we did at 10 weeks.

CONCLUSION

Results of Me`taizeau technique in children was promising. Proper selection of patient and timing of surgery is important for success. Me`taizeau technique is a minimally invasive technique with easy learning curve, very minimal tissue damage, and reduced chance of elbow stiffness and osteonecrosis of radial head and allow early range of motion.

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