CASE REPORT

Proximal radial neck fracture with complete 180-degree rotation of radial head: A case report

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Abstract

Radial neck fractures with radial head rotation are very rare and extremely difficult to manage. We present the case of an 11-year-old girl who fell on her outstretched left upper extremity and damaged her left elbow in a road traffic accident. An arthrotomy was performed under a C-Arm fluoroscope, which confirmed the radial head displacement of 180° along with the fracture. The fracture site was reduced and fixed with two Kirschner wires, cutting the wire short at its distal end for a complete closure. Open reduction and internal fixation were followed by casting for five weeks. After two years of follow-up, she had complete pain free range of motion of the affected limb. No post-operative complications have been observed till date. Open reduction and internal fixation with two K-wires is a viable option for such complex injuries. However, further evaluation of outcomes and post-operative complications are required.

Keywords: Radius fracture, Fracture dislocations, Trauma, Paediatric fractures, 180°, Rotation, Displacement, Radial Head Fracture.

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Introduction

Radial neck fractures account for 5% to 10% of all elbow injuries in paediatric population[1,2] and comprise 1% of overall paediatric fractures.[3] The most common cause of this fracture is a fall on an outstretched arm.[4] It is a compression injury that extends well into the wrist joint. The common displacement mechanism is the valgus strain in the elbow which induces lateral angulation from 10° to 90°.[2]

The treatment of displaced radial neck fracture is highly challenging and depends on the degree of displacement and nature of the injury.[5,6] The outcomes of some treatment options do have some adverse effects; for example the blood supply to the radial neck may be damaged due to severe trauma or closed reduction options.[7-9]

Here, we aim to present a case report of an 11-year-old girl who experienced a proximal radial neck fracture with 180° rotational displacement of the radial head due to falling on her elbow.

Case Report

An 11-year-old girl fell on an outstretched left upper extremity in a road traffic accident (RTA) on 3rd June 2013. She was initially taken to a local hospital for treatment, where her head wound was stitched, and back slab was applied to both her arms and was sent home. The patient came to our institution (AO Hospital, Karachi) in emergency department four days after her initial injury with complaint of persisting pain and swelling on her left elbow and right forearm with a stitched head wound.

On examination, the patient's left elbow and right forearm were moderately swollen and tender. There was no loss of sensory or motor functions in the extremities. The wound on her head had been properly stitched and her Glasgow Coma Scale (GCS) was 15/15.[10] Early investigations included radiographs (X-ray with Anterior-Posterior/Lateral view), which revealed displaced fracture of the radial neck on the left side with 180° rotation of the radial head along its longitudinal axis. She also had a non-displaced fracture of distal one-third of the right radius and ulna. The right radius and ulnar non-displaced fracture was managed by Manipulation Under Anaesthesia (MUA) followed by a scotch cast.

For the left elbow, further investigation was needed, therefore, a Computed Tomography Scan (CT scan) was

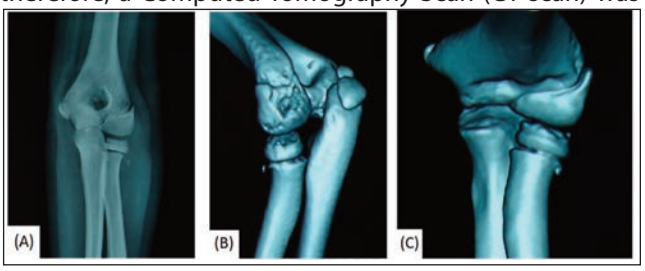

Figure-1 : Post-traumatic radiograph. (A) Ant. Post view X-ray of arm; (B) CT- scan showing lateral view of the arm; (C) CT-scan showing Ant. Post view of the arm.

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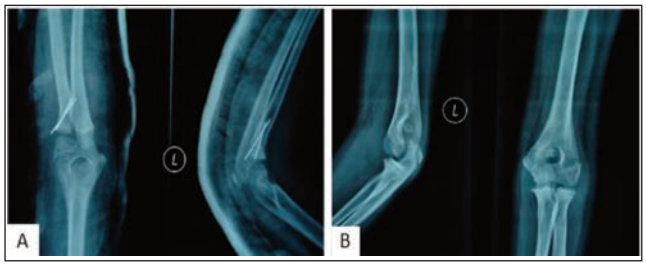

Figure-2: Pre-removal of K wires; (B) post-removal of K wires.

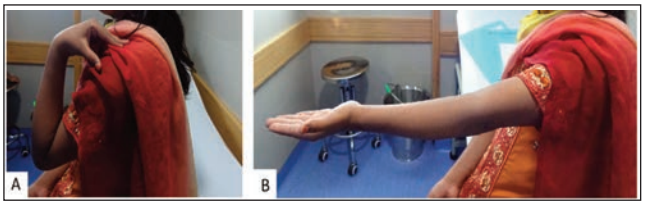

Figure-3: Range of motion of the operated elbow at 2-year post-surgery. (A) Flexed arm; (B) Extended arm.

performed to evaluate the extent and nature of the fracture and decide the next course of treatment. The CT scan confirmed the extent of the fracture and rotation of the radial head. Figure 1A shows an X-ray of the rotated radial head, whereas Figures 1B and 1C show the CT scans of the rotated radial head.

This case was managed by performing an arthrotomy under a C-Arm flouroscopy, which confirmed 180-degree displacement of the radial head along with the fracture that was evident on the radiographs previously. The fracture site was reduced and fixed with two Kirschner wire (K-wires), cutting the wire short at its distal end for a complete closure. Open Reduction and Internal Fixation (ORIF) was the preferred choice rather than closed reduction as the radial head was completely displaced and closed reduction would not have had a better functional outcome. Kocher approach was preferred for open reduction as compared to other approaches as it has a lower risk of damaging the radial nerve and has fewer cosmetic complications. This was followed by casting for five weeks as illustrated in Figure 2A. The patient was strictly advised to take oral antibiotics for at least two weeks, along with a follow-up on every 10th day. On radiographs taken at six weeks, union was evident on both fracture sites without osteonecrosis and heterotrophic ossification. The cast and both K-wires were removed after six weeks (Figure 2B). Physiotherapy was commenced after removal of the cast to achieve better functional outcomes. Physiotherapy consisted of active and active-assisted extension and flexion exercises of the elbow to regain the range of motion and to combat any stiffness caused by the injury. Active and active-assisted supination and pronation was also begun to improve the range of motion. Flexion in pronation was avoided as well as any valgus loads on the elbow to reduce any post-operative complications in range of motion. After two years of follow-up, she had complete pain-free range of motion of the affected limb comparable to the other limb, including complete flexion and extension of the arm, as shown in Figure 3A and 3B. No post-operative complications were observed at the last follow up. The institute keeps track of patient information and keeps checking the progress of the patients by consistent follow-ups and regular contact. Last follow-up was done after 10 years of surgery and the patient was satisfied with the outcomes.

The patient's parents were very co-operative and concerned and brought her for regular follow-ups. Their consent was also taken prior to the writing of the manuscript for publication. The patient's data privacy was maintained throughout the process.

Discussion

Cartilaginous radial head in children has provided a high resistance against the external forces resulting in radial neck fractures rather than the radial head. The outstretched hand strain-induced displacement often ranges from 10° to 90° but 180°-rotation is very rare.[2] The status of the joint surface is of crucial significance following 180°-rotation in such cases, for better results. To our knowledge, only seven cases of 180°-rotation of radial head have been reported following radial neck fracture.[2,6-12] In all these cases, the fracture occurred after falling on the outstretched hand where reduction attempts finally led to 180° rotations in the radial head. All these had occurred due to the iatrogenic malposition causes.[2,6-12] In contrast, this patient fell on an outstretched hand and got a fracture along with 180° displacement of the radial head without any attempts at close reduction. There are several surgical options to treat this sort of injury, such as excision of the radial head and open reduction and internal fixation using screws and plates, but as the patient was still a growing child better functional outcomes have been seen with fixation using K wires. Previous studies have reported high complication rate after operative management for radial neck fractures.[7-9] The most prevalent complications reported in the previous studies are avascular necrosis (AVN) and osteomyelitis.[7-9] In the current case, no post-operative complications were observed; it could be due to the surgeon's expertise and difference of techniques used, to respect the neurovascular anatomy prior to open reduction and fixation. Also, the shortening of K-wires, with complete closure followed by two weeks of oral antibiotics reduced the risks of infections.

A proper referral system should be in place in primary and secondary care hospitals so that patients receive proper

care by specialists in their field to catch on things missed out be junior doctors. Luckily, the patient came within four days of initial injury which is why no major difference was faced in functional and clinical outcome, but delay in treatment due to improper care and referral systems should be worked on and improved. Early diagnosis is the key to success in such cases. Therefore, timely and accurate investigations and radiographs are necessary to detect and diagnose, and refer the case to experts. We also recommend that a multi-disciplinary team involving vascular surgeons should be involved for assessment of the surgery and during the surgery to resolve any complications in the OR as well as provide a better functional outcome for the patient.

These complicated and rare injuries are still a "developing area" in the field of orthopaedics. There are only few case reports available with short follow-ups. Our case report showed promising results of ORIF at 10 years follow-up. Therefore, we recommend multi-centre, comparative studies in future for different approaches towards such injuries with long term follow-up.

Conclusion

Good clinical and functional outcomes with no post-operative complications were reported in this case. Therefore, open reduction seems to be a successful treatment for radial neck fractures along with radial head displacement. However, further prospective studies to evaluate the long-term outcomes and complications associated with these fractures are recommended.

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Author Contribution:
IAS: Concept, design, literature search, drafting and final approval.
MHA: Writing, data collection, analysis, interpretation and revision.
MAN: Writing, data collection, analysis and interpretation.
ZAK: Concept, literature review and drafting.
UB, JAS: Concept, design and final approval.