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A Case of Radial Neck Fracture with Free Radial Head Displaced Posterior to the Capitellum Treated with Good Functional Outcome

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Abstract

Intra-articular radial head fractures in children and adolescents are rare and account for approximately 1% of all fractures. A large amount of displacement and age greater than 10 years have been found to be associated with poor outcomes. Increased displacement increases the risk of postoperative complications such as osteonecrosis, nonunion, overgrowth, physeal arrest. In this study, we present a very rare case of radial neck fracture with no clinically significant elbow collateral ligament injury, radial head excluded from the Judet fracture classification, no soft tissue connection, and displaced radial head to the posterior capitellum in the form of a free fragment. We aimed to show that a free radial head fragment that retains its integrity can result in complete recovery without anatomical and functional sequelae after surgical fissure despite poor prognostic factors because of complete recovery in terms of elbow motion and function in the postoperative follow-up of the fracture.

Keywords: Pediatric; Radial head fracture; Elbow

Introduction

Most proximal radius fractures occur after falling on the open arm. The immature radial head is primarily cartilaginous, and the epiphysis ossifies at about 10 years of age. Intra-articular radial head fractures in children and adolescents are rare and constitute approximately 1% of all fractures [1,2]. The cartilage tissue on the radial head absorbs the force and transmits it to the weaker physis or metaphysis of the neck. These fractures characteristically cause an angular deformity of the head with the neck [2,3]. Increased displacement increases the risk of postoperative complications such as osteonecrosis, nonunion, overgrowth, and physeal arrest [4], and up to half of children with radial neck fractures have limited forearm rotation [5]. It is generally accepted that residual angulation greater than 30° or translation greater than 2 mm requires open reduction [6]. In a retrospective study of pediatric radial neck fractures by Zimmerman et al., the authors found that first displacement and age greater than 10 years were associated with poor outcomes [7], while another study by Gutierrez found that only first displacement was an indicator of poor outcome [8].

Proximal radial fractures may also occur with elbow dislocation. The fracture may occur during dislocation, typically with anterior displacement, or alternatively, during spontaneous reduction of the distal humerus, causing posterior displacement of the proximal radius [4]. In this study, we present a very rare case of radial neck fracture with no clinically significant ligament injury, outside the radial head Judet fracture classification, no soft tissue connection at the radial head, and a free fragment displaced to the posterior of the capitellum.

Case Report

A 10-year-old girl was admitted to the emergency department of an external center with left elbow pain after a fall from a scooter onto an open hand. The patient, who underwent long arm splinting, presented to our clinic 1 day later. The long arm plaster splint was removed, and the first examination was performed. There was excessive edema in the elbow and no open skin lesion was observed. No neurovascular lesion was observed in the examination. In the x-ray images taken in our clinic and taken in the external center, it was seen that the radial head was in a displaced position in the posterior of the capitellum and the elbow was subluxated (Figure 1). Computed Tomography (CT) images showed the free fragment posterior to the capitellum, and no additional bone pathology was observed (Figure 2). In order to reduce the risk of osteonecrosis and additional chondral damage, open reduction and fixation was decided to be performed urgently. After informing the patient's relatives about the surgical intervention to be performed and obtaining their consent, the patient was hospitalized for emergency surgery after the necessary examinations and anesthesia preparation.

Figure 1: Preoperative X-ray image shows radial head in a displaced position in the posterior of the capitellum and the elbow was subluxated.

Under general anesthesia, a tourniquet was applied, the forearm was pronated, and the soft tissue was dissected through the skin and fascia with the lateral Kocher approach until the space between the Anconeus and extensor carpi ulnaris. It was observed that the capsule maintained its integrity, the fracture hematoma drained when the capsule was opened laterally and the radial head was not in place (Figure 3). The radial head was palpated posterior to the capitellum and an attempt was made to reach the radial head distal to the capitellum, but it could not be removed. By reaching the radius head in the posterior capitellum from the medial border of the anconeus muscle, it was observed that there was no soft tissue connection, it was completely free, and it was taken out from among the soft tissues (Figure 4).

Figure 2: Computed Tomography (CT) images showes the free fragment posterior to the capitellum.

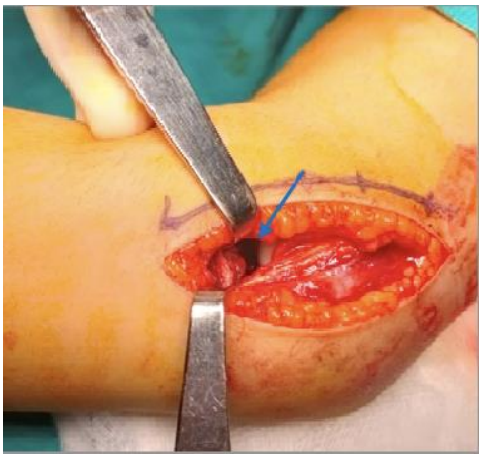

Figure 3: At the elbow, radial head isn't in place.

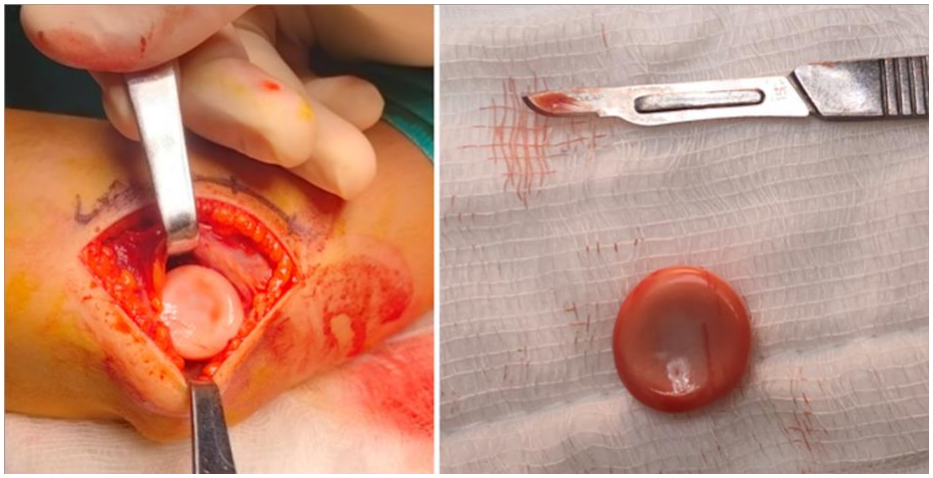

Figure 4: Free radial head is found in another place.

The area was washed, and the radial head was replaced in the anatomical position based on the metaphyseal part of the radial head salter haris type 2 fracture. In order to remove the posterior interosseous nerve, two Kirschner wires were placed from the periphery of the radial head articular cartilage to the metaphysis for fixation in the forearm pronation, over the anterograde skin, outside the incision area (Figure 5). Elbow movements were checked to evaluate joint stability and no significant instability was observed. Distal pulses were palpated and capillary filling was observed to be complete. The wound was closed in a standard way, by bending the pins outside the skin. Elbow movements: It was found to be stable in flexion, extension, pronation and supination. After dressing, a long arm splint was applied from the posterior.

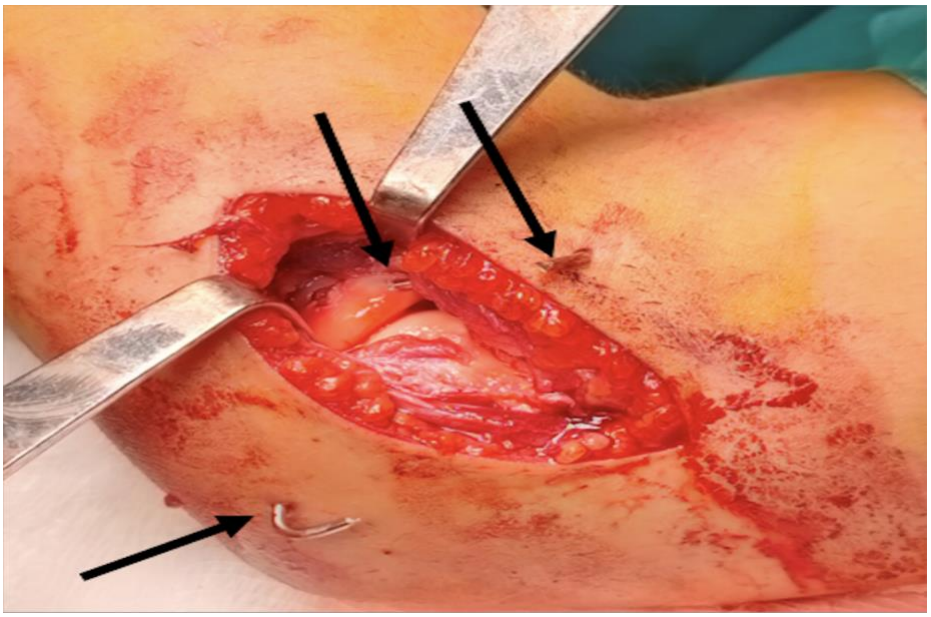

Figure 5: İmage of stabilation of radius head with percutaneus Kirschner wire.

The patient was followed in the 1st week, 3rd week, 6th week, 2nd month, 3rd month and 6th month. Radiographs at week 1 showed that the fracture was stably aligned and there were no implant complications. The splint was re-wrapped and followed up. At week 3, a periosteal reaction was observed in the proximal radius (Figure 6). At week 6, x-ray imaging showed a prominent callus at the radial neck, the pins were removed, and passive range of motion movements were started in the physical therapy unit. At the 2nd month, although flexion 30, extension 15, supination and pronation 10 degrees and supination and pronation 10 degrees were restricted, the movements were painless and stable against varus and valgus stress. Imaging at the 3-month postoperative visit showed a well-healed radial neck (Figure 7) and a functionally fully healed elbow fracture with the same range of motion as the contralateral extremity, with full and painless movements (Figure 8). This was maintained at the 6-month evaluation and no deformity was seen on physical examination.

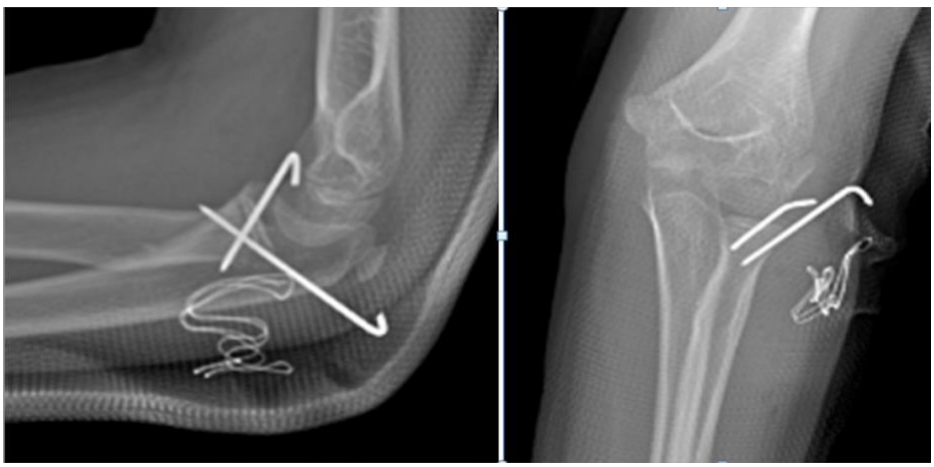

Figure 6: Postoperative X-ray image showes radius head with percutaneus Kirschner wire.

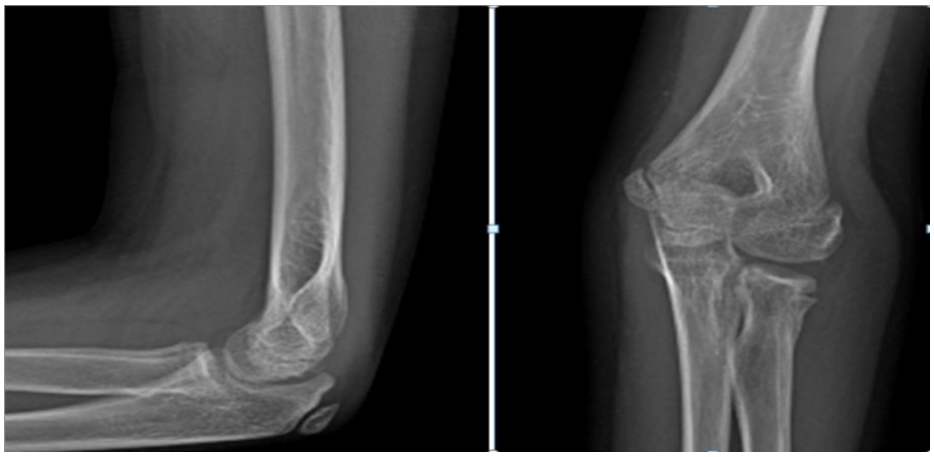

Figure 7: Imaging at the 3-month postoperative visit showed a well-healed radial neck.

Figure 8: Functionally fully healed elbow fracture with the same range of motion as the contralateral extremity, with full and painless movements.

Discussion

Radial head and neck fractures are relatively rare injuries in children, accounting for 4.5-14% of elbow injuries in children. Most fractures in this region occur as a type 2 Salter-Harris injury or a radial neck fracture. Joint fracture is a rare event [9]. Classification of radial neck injuries is based on the angulation between the radial head and neck. The Judet classification and O'Brien classification systems are most commonly used [10]. However, in this case, since the radial head was observed to be displaced posterior to the capitellum, it was a case outside the classification. The radial head was removed from the posterior capitellum intact, preserving the integrity of the articular surface.

There are several surgical options described in the literature. Generally, open surgery with percutaneous reduction with or without fixation has been recommended for large displacement fractures and angulation greater than 60° [11]. Metaizeau [12] and Tollet [13] believe that closed surgery may be indicated even for large displacement fractures. Open surgery allows anatomical reduction of the fracture, but compromises the epiphyseal vascularization, resulting in a high rate of complications (radial head necrosis) and a poor outcome rate in 40% of cases [14]. In this case, open surgery was performed considering the distal displacement of the radial head and it was completely free, no soft tissue structure holding the completely free and mobile radial head was observed in the posterior of the capitellum. Since the radial head was completely intact, we preferred fixation with 2 percutaneous K-wires.

Although concomitant elbow dislocation, epicondyle fracture, annular ligament tear and nerve injury have been reported to be associated with this injury [9], no additional injuries were recorded in our case.

The literature surrounding the wide variation in fracture pattern and specific complications associated with all types of radial neck fractures with or associated with elbow injuries is sparse. Denver B et al. reported a rare case of Jeffery type 2 lesion with documented posterior dislocation and fluoroscopic imaging highlighting the displacement mechanism of the radial neck fracture at the time of reduction attempt [15]. In this case, closed reduction of Jeffery type 2 radial neck fracture led to complete radial head inversion. In our case, only a subluxed image due to radial head displacement was observed without complete elbow dislocation, and it was detected by x-ray that the head was posterior to the capitellum without any reduction procedure. Ligament injury was not considered because elbow instability was not observed in the intraoperative examination.

Conclusion

In the postoperative follow-up of a rare, unclassified radial neck fracture that was displaced to the posterior of the capitellum without elbow dislocation and had no soft tissue connection with the radial head, complete recovery was achieved in terms of elbow motion and function. Although high rates of complications and functional loss have been reported in such severely displaced cases in the literature, we think that it will contribute to the literature due to the absence of additional elbow ligament injury, complete union, and recovery experience without sequelae.

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