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A case report of post traumatic radioulnar synostosis after isolated closed radial head fracture with radial head subluxation

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Abstract

Radioulnar synostosis is a rare pathological fusion of the two forearm bones, when seen in pediatric must differentiate between congenital Synostosis versus post traumatic synostosis, post traumatic radioulnar Synostosis is uncommon especially if it was closed fracture and treated conservatively. We describe a 5 year old girl who presented with radioulnar synostosis 1 year following radial head fracture with radial head subluxation, with full pronation and limitation in supination and compensated for supination with shoulder abduction, patient missed her appointment and showed at the age of 11 with increase limitation of pronation and supination. We suggest that clinicians should be aware of this rare potential when treating patients with radial neck fractures and associated elbow injuries. It is advisable to conduct more frequent follow-up examinations using radiography and assess the range of motion to promptly identify any signs of proximal radioulnar synostosis.

Keywords: Radioulnar, Synostosis, proximal, closed, fracture

Introduction

Synostosis also known as fusion, if two bones, at the level of forearm the fusion will be at radius and ulna. It affects the supination and pronation to the extent of affecting performing daily activities, however considered to be a rare condition with incidence rate between 0% and 9.4% [1]. Risk factors usually related to brain injury, open fracture, or extensive soft tissue injury, moreover displaced radial head fracture, fracture at the same level, monteggia fracture, and iatrogenic duo to open reduction and internal fixation [2]. Although it is rare to have proximal radioulnar synostosis after closed radial head fracture especially if it was treated conservatively with reduction and cast, it might happen in some cases as reported in this case.

Materials and Methods

This patient presented to emergency department on 11/10/2016 after a fall into her right upper limb resulted in severe pain over the right elbow with decrease range of motion, on examination patient was vitally stable, afebrile right elbow swelling with no open wounds, severe tenderness over the radial side of the proximal forearm, with limited range of motion in flexion/pronation/supination, distal neurological examination was unremarkable, and distal pulses were palpable, X-ray showed radial head displaced fracture [PIC 1], reduction and above elbow back slab was done and showed good alignment [PIC 2]. Patient was followed up in the clinic. On 06/11/2016 she presented to the clinic, cast removed and X-ray showed acceptable alignment and good callus formation [PIC 3]. She missed her follow-up and presented 5 months later on 16/04/2017 with a completely healed fracture and good remodeling with signs of proximal radioulnar synostosis in X-ray [PIC 4], with limitation in supination/pronation, which CT elbow was ordered. 1 year after the injury on 04/03/2018, follow up after CT scan confirmed radioulnar synostosis

Results

No surgical intervention was done.

Discussion

Fractures occurring in the proximal radius present considerable challenges in elbow injuries due to their tendency to lead to a variety of complications. These complications include nerve damage, osteonecrosis (bone tissue death), stiffness, and reduced range of motion [4].

Post-traumatic radioulnar synostosis is an infrequent complication observed following forearm and elbow fractures [5]. This condition involves the fusion of the radius and ulna bones at any point along the forearm, resulting in a loss of forearm rotation and functional limitations. Both non-surgical and surgical approaches can lead to the development of synostosis. Incidence rates have been reported to range from 0 to 9.4% in patients treated with open reduction and internal fixation with plating for one or both forearm bone fractures [6-9].

Posttraumatic synostosis of the proximal radioulnar joint (PRUJ) is a serious complication observed in cases of radial head and neck fractures, significantly restricting the range of motion. This condition is frequently linked to displaced radial neck injuries and/or surgical interventions [4, 11], particularly after procedures involving percutaneous fixation or open reduction and internal fixation [4]. Consequently, it is recommended, following the prevailing standard of practice [4], to manage radial neck fractures with an angulation of less than 30° and translation of less than 3-4 millimeters through closed reduction and casting, which tends to yield better outcomes.

In the vast majority of instances, closed reduction and casting offer an effective solution, leading to optimal alignment and minimizing the risk of significant complications, including posttraumatic proximal radioulnar synostosis (PPRUS) [12, 13, 14-16]. Nevertheless, even though exceptionally uncommon, isolated cases of PPRUS have been reported following nonoperative treatment of minimally displaced radial neck injuries. In our examination of the literature, we identified only one case report of PPRUS that emerged after closed reduction and immobilization for a radial neck fracture accompanied by an elbow injury.

According to the literature, an important risk factor associated with the development of posttraumatic proximal radioulnar synostosis (PPRUS) is the increased severity of the radial neck fracture, particularly in cases with >45° angulation or >3-4mm translation, especially when surgical treatment is involved [7]. This characteristic of radial neck fractures has been well-documented since the early 20th century. In 1933, Dr. John Bohrer conducted a study on twenty adults and nine children with radial head and neck fractures, all treated

nonoperatively. He observed that PPRUS occurred only when there was "marked displacement" or "severe injury with displacement or comminution of the head of the radius."

Conversely, in cases of "slight displacement" or "slight trauma," excellent outcomes were noted [17]. Other studies have largely supported the notion that minimally displaced radial neck fractures treated nonoperatively typically do not result in PPRUS [14].

However, our patient, despite having a minimally displaced nonoperatively treated injury, did present a concomitant elbow injury, which sets her case apart from the typical findings in the literature. Our hypothesis suggests that when a minimally displaced proximal radius fracture is treated nonoperatively and occurs alongside an elbow injury, the development of PPRUS may be attributed to the disruption of the periosteum caused by the transmission of energy from the wrist to the radial neck, through the proximal radioulnar joint (PRUJ), and finally reaching the ulna.

Other factors may contribute to PRUJ such as arthrosis of the elbow joint space, the formation of bone tissue in elbow ligaments (including annular and collateral ligaments), disruption of the joint capsule leading to capsular fibrosis [19], soft tissue contracture, abnormal calcification of nearby soft tissues (including myositis ossificans in the brachialis muscle), impaired fracture healing [20], and the unintentional presence of bone fragments within the interosseous membrane [20]. It is conceivable that one or more of these additional factors might have contributed to the particular situation observed in our patient's case.

Conclusion

Proximal radioulnar synostosis could be a relatively uncommon occurrence in the natural progression of minimally displaced radial neck fractures in children, particularly when there is a concomitant elbow injury. Hence, we suggest that clinicians should be aware of this rare potential when treating patients with radial neck fractures and associated elbow injuries. It is advisable to conduct more frequent follow-up examinations using radiography and assess the range of motion to promptly identify any signs of proximal radioulnar synostosis and more case reports are recommended to be published to test our hypothesis.

Conflict of Interest

Not available

Financial Support

Not available



PIC 1: at presentation to ER



PIC 2: Post reduction



PIC 3: 6 weeks post reduction



PIC 4: 5 months post reduction.



PIC 5: 1 year post reduction



PIC 6: 6 years post reduction

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