

Successful Closed Reduction of a Jeffery Type 2 Radial Head Epiphysiolytosis –A Case Report with Literature Review

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Learning Point of the Article:

Closed or percutaneous reduction of Jeffery's type 2 fracture, when feasible, is associated with excellent functional outcome, although awareness is needed to avoid the "upside-down" malreduction.

Abstract

Introduction: Radial neck fractures in children are rare injuries, accounting for approximately 5–8.5% of all pediatric elbow fractures; even rarer is the Jeffery type 2 injury, which was described by Jeffery in 1950 and occurs during the automatic reduction of a previous posterior elbow subluxation or dislocation. Only few cases and case small series have been reported on this rare injury, but there is no report on the achievement of closed reduction of the radial head. In all the reported cases, open surgery was essential to achieve adequate reduction of the fracture, except for two cases where percutaneous reduction was achieved using a pin.

Case Report: We present a 10-year-old female patient with a Jeffery type 2 fracture who was treated successfully with closed reduction. We describe a detailed closed reduction method to treat the fracture, providing a brief literature review for this rare injury. The clinical outcome of our patient was excellent without any complications.

Conclusion: Jeffery's type 2 injury is a rare, but potential devastating lesion of the elbow, especially if left undiagnosed or inadequately treated. Adequate knowledge of the mechanism and presentation of the injury is mandatory for early diagnosis. Closed or percutaneous reduction is not only difficult but also preferable due to better functional outcomes. Awareness is needed to recognize early complications ("upside-down" radial head) after the external manipulation.

Keywords: Radial neck fracture, jeffery type 2 injury, closed reduction.

Introduction

Fractures of the radial neck in children are rare, accounting for approximately 1% of all fractures and 5–8.5% of pediatric elbow fractures [1]. In 1950, Jeffery described a radial head fracture that occurred during the automatic reduction of a previous posterior elbow subluxation/ dislocation [2, 3]. To the best of our knowledge, no successful closed reduction has ever been reported in literature. Rotational instability and a high incidence of iatrogenic complications after closed manipulation of this injury [4, 5] have forced some authors to suggest immediate open reduction of the radial head [6]. In this case

report with an accompanying brief literature review, we present in detail the first successfully treated Jeffery type 2 injury by means of closed reduction with impressive clinical outcomes and more than 1 year of follow-up data.

Case Report

A 10-year-old female was admitted to our emergency department after falling on her right hand. Clinical examination revealed mild edema with significant pain and functional disability both in active elbow motions and in supination-pronation movement of the forearm. Initial plain radiographs

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Author's Photo Gallery



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Figure 1: Anteroposterior and lateral radiogram of the right elbow demonstrate the Jeffery type 2 injury.

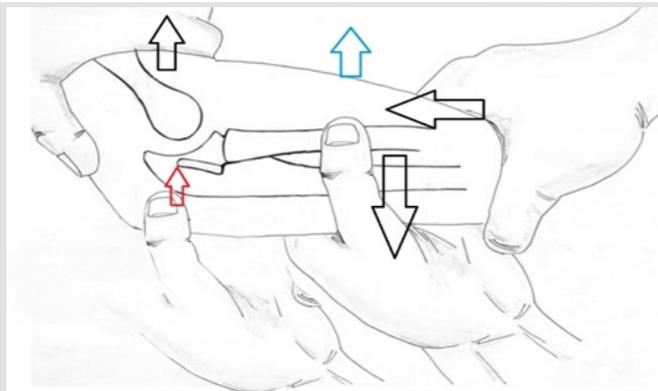


Figure 2: Maneuver image description. One surgeon pushes the arm toward, while the second surgeon pulls the forearm downward and posterior to reproduce the elbow subluxation and achieve mild distraction (black arrows) of the joint. These two surgeons apply also a mild varus deformity (blue arrow). The main surgeon performs the milking maneuver (red arrow) to achieve the reduction.

revealed a displaced radial head lying at a position of 90 degrees perpendicular to the posterior radius shaft, with capitellum interpositioning (Fig. 1). Following recognition of this rare injury, the patient was taken to the operating room for reduction of the fracture. We informed the patient’s parents at the time that an open reduction was most possibly required to address this fracture. Under general anesthesia and adequate muscle relaxation, we performed a closed reduction based on the principles of Chotel et al.[3], who, in 2006, described the performance of a percutaneous reduction technique using a pin. We attempted to reproduce the posterior subluxation of the injured elbow to overcome the capitellum interpositioning between the radial head and metaphysis, which constituted the main obstacle of the closed reduction. Thus, with the forearm fully supinated and at 70 to 90 of flexion, one of the surgeons moved the arm anteriorly while the second surgeon forced the



Figure 3: Anteroposterior and lateral radiogram of the right elbow demonstrate the successful closed reduction.

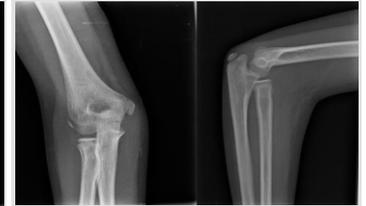


Figure 4: Anteroposterior and lateral radiogram of the right elbow demonstrate the maintenance of the reduction after 3 weeks of immobilization.



Figure 5: Clinical images of the right elbow 3-month post-traumatic demonstrate full extension and 136° flexion.



Figure 6: Clinical images of both forearms 3-month post-traumatic demonstrate full recovery of supination-pronation.

forearm posteriorly with mild distraction and varus application. The senior surgeon, using the “milking” maneuver, attempted to reduce the fracture (Fig. 2). Then, he gently reduced the posterior subluxation and a splint was applied, with the elbow at a 90 flexion angle and the forearm in a neutral position (Fig. 3). The plaster was removed 3 weeks later and, based on the excellent radiographic images, mobilization was initiated (Fig. 4). At the 3-month follow-up, our patient had regained the full range of elbow (arc: 0–136°) and forearm (arc of supination-pronation: 0–175°) motion (Figs. 5 and 6). At the 6-month follow-up, the Broberg and Morrey scoring system was excellent (100/100), while the Quick DASH symptom score revealed only 2.27% of disability. At the last follow-up 12 months later, radiographs revealed premature closure of the upper radial epiphysis with 2° valgus deformity of the elbow comparatively to the contralateral elbow (Fig. 7), with no clinical impact to the patient (Fig. 8).



Figure 7: Anteroposterior and lateral radiogram 1-year post-traumatic of both elbows demonstrate the 2° valgus deformity to the right elbow and the premature closure of the epiphysis.



Figure 8: Clinical images of both forearms demonstrate similar carrying angle of both elbows (carrying angle of the right elbow 16° and 14° of the left).

Discussion

Radial head and neck fractures are rare lesions, accounting about 5–10% of all elbow injuries in children [1]. There are three known mechanisms for radial head fractures. The main mechanism (type 1) refers to the valgus forces generated during the fall of the child with an outstretched hand, when the capitellum impinges on the head of the radius, causing radial head displacement with 10–90 degrees of angulation. A type 2 (Jeffery) lesion refers to radial head dislocation resulting during reduction of a previous posterior luxation/ subluxation of the elbow [2]. The third type was first described by Newman [7] and refers to the fractures produced during posterior dislocation by displacement of the radial head anteriorly.

The pathognomonic point to define a Jeffery radial head fracture is capitellum interpositioning between the radial head and radial shaft, whereas the radial head lying perpendicular to the posterior shaft of the proximal radius [2]. Differential diagnosis between the first two types of radial head fractures is difficult in cases of type 1 lesion with 90 posterior displacement resulting from valgus forces and pronation [8]. Notably, though, in all type 1 lesions, there is no bone interposition. Furthermore, the diagnosis of Jeffery lesions in children younger than 6 years is extremely challenging even for experts. The explanation for this is that the ossification of the radial head occurs at this age. All published cases with Jeffery lesions concern patients older than 6 years of age. To address these injuries in patients who are younger, physicians need to use more complex imaging methods such as magnetic resonance, arthrography, or ultrasonography [6]. To the best of our knowledge, the presented case is the first successful attempt of a closed reduction of this injury. In 2006, Chotel et al. [3] described two cases with percutaneous reduction using a pin with specific maneuvers [9]. Based on these maneuvers and the knowledge that this type of injury is associated with the presence of a posterior metaphyseal-epiphyseal periosteal attachment between the two radial fragments, the closed reduction of this type of fracture is enabled [6] and, in this particular case, we achieved a good reduction of the

fracture–dislocation. This specific characteristic of this injury increases the risk of complete reversal of the radial head following the external manipulation. An “upside-down” radial head has been reported in a few cases [4, 5] and its presence forced many surgeons to recommend direct open reduction [10]. To avoid this complication, biplane good quality radiographs are mandatory after reduction because fluoroscopic imaging is often inadequate [4]. Open reduction and internal fixation of this injury is associated with some degree of motion loss of the elbow in the majority of cases [2, 6], while our case and the two cases treated with the percutaneous technique were accompanied with excellent clinical results [3], making the use of closed reduction worthwhile to be considered. Complications such as radial head avascular necrosis, premature physal closure, radial head overgrowth, and radioulnar synostosis have been reported in 10% of cases, especially when correct diagnosis and treatment are delayed [11].

Conclusion

Adequate knowledge of Jeffery’s type 2 lesion mechanism and good quality radiograms of the child’s elbow accompanied with a high index of suspiciousness are needed to recognize this rare but potential disastrous injury. The excellent radiological and clinical results in all cases treated with closed or percutaneous reduction make the use of external manipulation worthwhile. Awareness is also needed regarding the possible complications associated with the performance of closed reduction and the existence of the injury itself.

Clinical Message

Jeffery’s type 2 injury is a rare, but potential devastating lesion of the elbow, especially if left undiagnosed or inadequately treated. Adequate knowledge of the mechanism and presentation of the injury is mandatory for early diagnosis. Closed or percutaneous reduction is not only difficult but also preferable due to better functional outcomes. Awareness is needed to recognize the “upside-down” complication.

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