

Galeazzi - Equivalent Pronation Type Injury with Splitting of Ulnar Epiphyseal Plate into Two Fragments – A Rare Case Report and Review of Literature

Ashish Suthar J¹, Ashish Kothari V²

What to Learn from this Article?

Diagnosis and management of a rare epiphyseal injury

Abstract

Introduction: In children and adolescents distal forearm physeal fractures are common. Usually distal forearm physeal injuries of are common injuries in children and adolescents. Epiphyseal injuries to the distal radius are common in children, but involvement of the distal ulna is rare. Fracture of the distal radius with dislocation of the DRUJ is known as a True Galeazzi fracture dislocation and an epiphyseal separation of the distal ulna occurred instead of dislocation of DRUJ or both)[10] is called Galeazzi equivalent lesions. Galeazzi fractures in children are less common than in adults. [4] These injuries are uncommon and there are few descriptions of them in the current literature.

Case Report: Here we report the case of a 13-year-old boy, student with history of RTA presented with pain and swelling of distal forearm diagnosed with closed injury of Galeazzi equivalent type. Here injury to the distal ulnar epiphyseal plate is in the form of epiphyseal separation (Salter Harris type I / Peterson type III) with splitting of epiphysis into two fragment – [ulnar styloid & radial side of ulnar epiphyseal plate] (Salter Harris type III / Peterson type IV) with fracture of metaphysis of lower end radius (Peterson type I) without neurovascular deficit. Patient was given surgical treatment in the form of closed reduction and K-wire fixation for fracture of distal radius and open reduction using extended ulnar approach and fixation with K-wire for ulnar epiphyseal fracture as closed reduction was not possible due to soft tissue interposition.

Conclusion: Galeazzi equivalent injury is rare. It may require radiographic comparison of opposite uninvolved distal forearm with wrist, CT or MR imaging to define injury accurately. It may also require open reduction for anatomical or acceptable reduction of fracture to minimize chances of growth arrest which may occur as a complication of injury. It is also necessary for frequent follow up to identify complication early especially growth arrest in asymptomatic patient.

Keywords: Galeazzi equivalent injury, distal forearm physeal fractures, Peterson type I injury

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Dr. Ashish Suthar J



Dr. Ashish Kothari V

¹Department of Orthopaedics, Baroda Medical College, Baroda, Gujarat. / ²Consultant Orthopaedic Surgeon, Shrey Orthopaedic Hospital, Baroda, Gujarat.

Address of Correspondence

Dr. Ashish J Suthar, Assistant Professor, 21, Jayshree Mahakali Soc., Near Deep Chambers, Manjalpur, Baroda, Gujarat -390011. India. drashishsuthar@yahoo.com

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Introduction

Galeazzi fractures in children are less common than in adults. [4] Distal forearm fractures occur mostly as a result of a fall onto an outstretched hand (FOOSH), the wrist may be extended or dorsiflexed (more commonly the case—the distal fragment will be displaced dorsally). Volar displacement of the distal radius is due to fall on a flexed wrist. [2] The mechanism of injury in Galeazzi fractures is axial loading and forearm is in extremes of rotation. [5] In adults, the mechanism of injury usually is an axially loading fall with hyperpronation leading to distal radial fracture with dorsal ulnar dislocation. In children, either supination (apex volar) or pronation (apex dorsal) deforming forces lead to displacement of distal ulna volarly or dorsally respectively. [3] Buckle fractures and minimally displaced fractures mostly occurs due to low energy injury on the other hand displaced fractures result from high velocity injury — fall from a height or with forward momentum — running, riding a bike, etc. The distal radial physis accounts for 75% to 80% of growth of the radius. This rapid growth may predispose the distal radius to fracture because the distal metaphysis is thin from the continuous remodeling. [2] A Peterson type I physeal injury is a transverse metaphyseal fracture with longitudinal comminution extending into the physis. It is important to identify these fractures because growth arrest has been reported after such innocuous appearing injuries. [6] Isolated ulnar physeal fractures are rare injuries. Most ulnar physeal fractures occur in association with radial metaphyseal or physeal fractures. The rare pediatric Galeazzi injury usually involves an ulnar physeal fracture rather than a soft tissue disruption of the distal radioulnar joint. Another ulnar physeal fracture is an avulsion fracture off the distal aspect of the ulnar styloid. [3] Galeazzi fractures in children are less common than in adults. [2] Letts and Rowhani classified Galeazzi fractures in children according to the position of the distal ulna—dorsal or volar. They included injuries with true ligamentous disruption of the DRUJ and “equivalent”—fractures of the distal radius with separation of the ulnar physis. [2] Walsh and McLaren classified pediatric Galeazzi injuries by the direction of displacement of the distal radial fracture. According to their classification, more common pattern of injury is dorsal displacement with supination of the distal radius in which distal ulna lies volar to the dorsally displaced distal radius. The least common pronation pattern includes volar or anterior displacement of the distal radius and



Figure 1: Preoperative AP and Lateral X-ray of the distal forearm with wrist joint showing all carpals and proximal metacarpals with distal forearm showing Peterson type I injury of distal radius with volar displacement of distal radius and dorsal displacement of ulna with epiphyseal separation of distal ulna and splitting of epiphyseal plate into two fragments—one ulnar styloid and other half of ulnar epiphysis situated on radial side of ulnar epiphyseal plate.

distal ulna lied dorsal. [4] [3] Letts and Rowhani noted a poor prognosis for the equivalents than for the classic Galeazzi lesions. The worse prognosis may be related to the high complication rate associated with distal ulnar physeal separation. The goal of treatment is to prevent migration of the distal radius and stabilize the

distal radioulnar joint. Letts and Rowhani have suggested that all Galeazzi fractures and equivalents be managed with the forearm in supination. If the DRUJ remains unstable after reduction and stabilization of the radius, consideration should be given to pinning the DRUJ in position with transverse K-wire from the ulna to the radius. Open reduction may also be required for Galeazzi-equivalent lesions due to interposition of soft tissue. [2] Growth arrest is a complication of physeal injury. There are reports of arrest after metaphyseal fractures after Peterson type I fractures of the physis. [7] Growth arrest may occur in either the radius or the ulna. Despite the frequency of distal radial physeal fractures, growth arrest is relatively infrequent. [8] This may be a due to high velocity of growth from the distal radial physis as well as these injuries result from a relatively low-energy impact. [2] Conversely, ulnar physeal separation is an unusual injury and associated with a high incidence of growth arrest. [8] [9]. It is recommended to follow-up at 4- to 6- month intervals for at least a year. A precise radiographic analysis of the epiphyseal separation of the distal ulna and its anatomical reduction are necessity to obtain a good result in the treatment of paediatric Galeazzi-equivalent



Figure 2: Pre-operative comparative radiographs of the same patient ----- radiographs of the opposite uninjured distal forearm with wrist were taken for comparison and to define and analyze injury accurately.



Figure 3: Per operative picture (above) and IITV guided image (below) of the same patient in which fracture of ulna was dealt open reduction was done as closed reduction was not possible. Fracture of distal radius was managed by closed reduction and K-wire fixation.

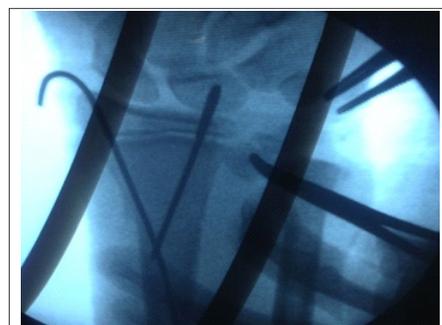


Figure 4: Per operative picture and IITV guided image of the same patient.



Figure 5: Post operative X-ray of the same patient reduction achieved, maintained and fixed with K wire. Distal Radio- Ulnar Joint was stabilized with K-wire.



Figure 6: K-wires removed at 3 weeks. X rays taken at 3 weeks.



Figure 7: Post operative X-rays at follow up and wrist ROM.

fracture.[2].

Case Report

Our patient was 13 year old male student, who presented with history of RTA and FOOSH. On clinical examination, patient had pain and difficulty moving Rt. / Lt.Wrist. Patient was not having any significant past history. Radiographs of injured distal forearm with wrist were obtained, on finding difficulty in analyzing the injury precisely radiograph of opposite distal forearm with wrist was taken for comparison. Patient was given short general anaesthesia (SGA) and surgical treatment in the form of closed reduction and K-wire fixation for fracture of distal radius. Ulnar epiphyseal fracture required open reduction using extended ulnar approach. Reduction was achieved in pronation, maintained and fixed with K-wire as closed reduction was not possible due to soft tissue interposition. DRUJ was also fixed using K-wire

passed from ulna to radius. Patient was given immobilization in the form of AE slab. Reduction was confirmed post operatively. K-wires were removed at 3 weeks. No complication was encountered and patient has regain wrist ROM shown below with the pictures and post-operative follow up X-rays. with X-rays.



Discussion

Buckle fractures and minimally displaced fractures of the distal forearm occur due to lower energy injury and displaced fractures result from high velocity trauma— falls from a height or with forward momentum (running, riding a bike, etc.) [1] [2] The distal radial physis accounts for 75% to 80% of growth of the radius. This rapid growth may predispose the distal radius to fracture because the distal metaphysis is thin from the continuous remodeling.[2]Galeazzi equivalent injuries are rare. Masayuki Kamano et al. also reported two cases of Galeazzi equivalent. [4]The ulnar physeal fracture can be irreducible in a Galeazzi equivalent injury due to soft tissue interposition — periosteum [13] , extensor tendons [12] , or joint capsule [11] which can be deal with extended ulnar

approach or Bowers approach (provides advantage of more direct visualization and extraction of interposed soft tissues in irreducible cases.) [3]It is important to identify and analyze these fractures precisely because growth arrest has been reported after such injuries. [6] Letts and Rowhani noted a poor prognosis for the equivalents than for the classic Galeazzi lesions. [2] The worse prognosis may be related to the high complication rate associated with distal ulnar physeal separation.[1][2] The goal of treatment is to prevent migration of the distal radius and stabilize the DRUJ. Letts and Rowhani et al suggested that all Galeazzi fractures and equivalents managed with the forearm in supination [7] although supination may be required for dorsally displaced fracture and pronation for volarly displaced fractures. It is advisable to explain to the parents of patients with physeal injuries about the possibility of growth arrest, the advantage of early identification and consequently the necessity of follow-up. It is recommend follow-up at 4- to 6- month intervals for at least a year. A precise radiographic analysis of the epiphyseal separation of the distal ulna and its anatomical reduction were keys to obtaining a good result in the treatment of paediatric Galeazzi-equivalent fracture. [10]

Conclusion

It is important to analyze and define these fractures accurately because growth arrest has been reported after such injuries.[2]Sometimes it may require radiograph of the opposite uninvolved extremity to identify the injury accurately if it is not feasible to do imaging studies like CT or MR imaging. Open reduction may also be required for Galeazzi-equivalent lesions with entrapped soft tissue like extensor tendon, joint capsule or periosteum. However, open reduction must be done with care to avoid further injuries to physis.Hence these fractures require special attention and proper care.

Clinical Message

Though rare, Galeazzi equivalent pronation type injuries do occur. They should be diagnosed and treated on emergency basis. One may require open reduction for anatomical or acceptable reduction. Parents and patients should be made aware of possibility of growth arrest.

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