Acta Orthop Scand 2002; 73 (2): 234–237

Traumatic bowing and Galeazzi fracture-dislocation—a report of 2 children

Peter Vorlat and Hugo De Boeck

Department of Pediatric Orthopedics, University Hospital–V.U.B. Brussels, Laarbeeklaan 101, BE-1090 Brussels, Belgium. E-mail: p.vorlat@worldonline.be
Submitted 01-05-17. Accepted 01-08-21

Case 1

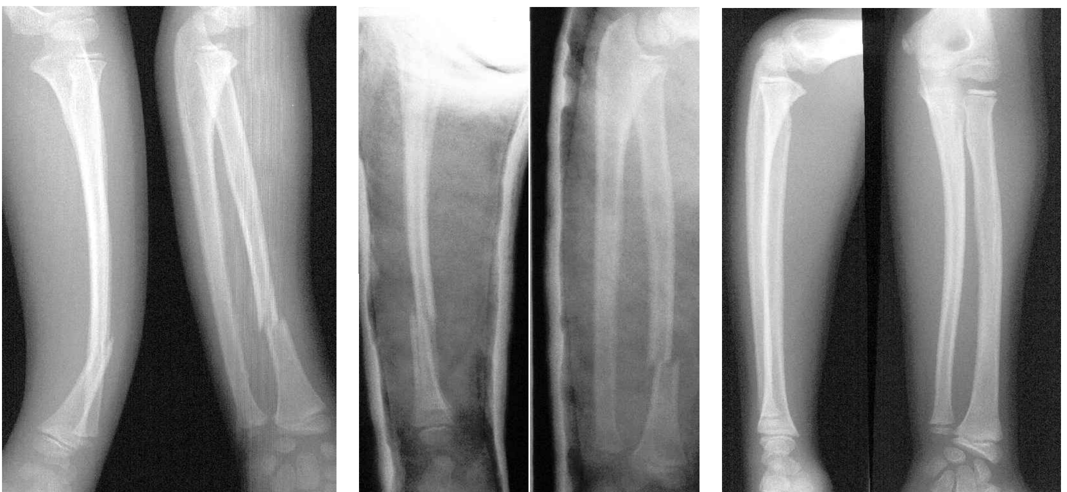
A 9-year-old boy was seen in the emergency department after he fell on his outstretched left hand during school gymnastics. He complained about pain in the forearm and wrist. On physical examination there was some volar angulation of the forearm and tenderness on palpation. The range of motion of the elbow and wrist could not be evaluated because of pain.

The radiographs showed a fracture of the radial diaphysis with 35° of volar angulation, plastic deformation of the ulnar diaphysis with 13° of angulation in the same plane and a volar dislocation of the radius at the distal radioulnar junction. Closed manipulation under general anesthesia reduced the fracture of the radius and the dislocation of the distal radioulnar joint. To avoid breaking the bone, a persistent volar bow of the ulna of 9° was accepted. A long arm cast was applied for 4 weeks which was replaced by a short cast for 2 weeks. 8 weeks after the trauma, the boy had no pain and normal function.

He was reexamined 2 years after the initial trauma. He has no complaints and participates in competitive gymnastics. On clinical examination, supination of the forearm is limited to 60° vs. 90° on the other side. Pronation of the forearms, and range of motion of the elbows are normal. Radiographs show healing of the fracture of the radius, good remodeling of the ulna and a normal distal radioulnar joint.

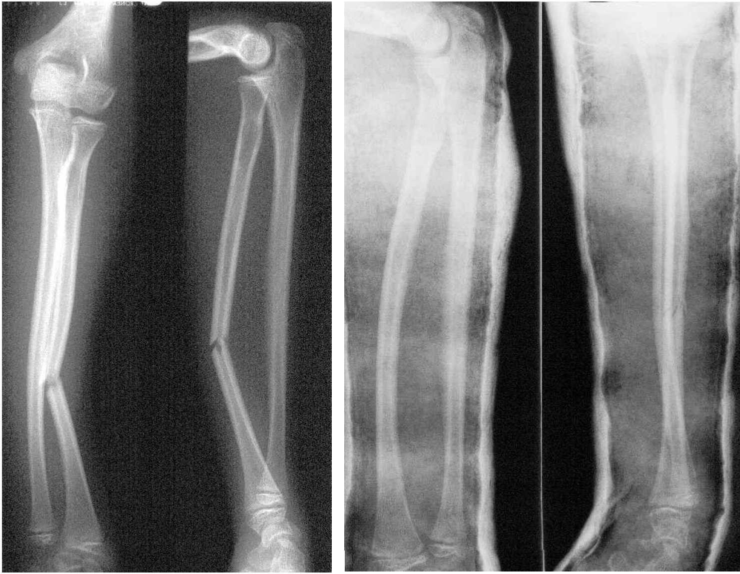
Case 2

A 12-year-old girl was seen in our emergency department after she fell backward over a ball, on her outstretched pronated left hand. She complained about pain. Swelling and prominent bowing of the forearm were present. On the radiographs, the attending physician found a diaphyseal fracture of the radius in 18° of valgus, and reduced it under local anesthesia. The plastic deformation of the ulnar diaphysis with 10° of valgus defor-

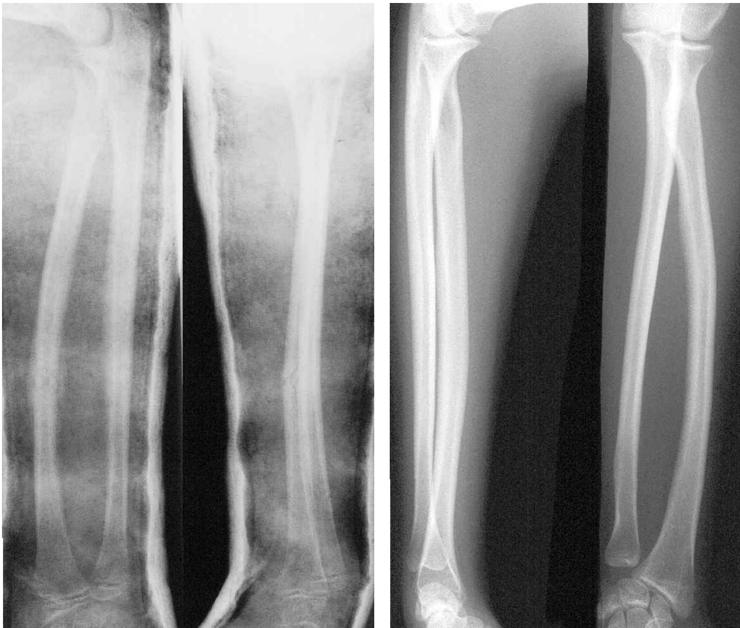


Case 1. On admission. After reduction. At follow-up.

Copyright © Taylor & Francis *2002. ISSN 0001–6470. Printed in Sweden – all rights reserved.*



On admission. After reduction.



4 weeks after reduction. At follow-up.

Case 2.

mity was not diagnosed. Since the wrist was not palpated nor its range of motion evaluated and since the initial radiographs showed no clear sign of distal radioulnar instability, it's dislocation was missed as well. However, after 4 weeks with a long arm cast, the volar dislocation of the radius at the distal radioulnar joint was noted on the control radiographs. It was not reduced. Further treatment consisted of 4 weeks with a short cast followed by exercises. This resulted in a normal range of motion of the wrist and elbow.

The girl was evaluated 9 years after her initial trauma. She had normal function and participated in all activities. Only when exerting forced pro- and supination did she have an uncomfortable feeling at the wrist. Her range of motion of the wrist and elbow were normal. The distal ulnar epiphysis was more prominent. Radiographs showed good healing of the radius and nearly complete remodeling of the ulna. There was, however, an incongruity of the distal radioulnar joint due to an overgrowth of the radius (compared to the other side) with a varus inclination of the articular surface of the radius.

Discussion

The Galeazzi injury, a fracture of the shaft of the radius and an associated dislocation of the distal radioulnar joint, is rare (Ogden 1982, Wilkins and O'Brien 1996). Plastic deformation of bones consists of multiple microfractures that deform the diaphysis without a visible fracture (Borden 1974, 1975, Chamay 1969). We found no cases of this combination of the two lesions in the literature.

Galeazzi injuries are caused by a combination of hyperpronation and axial loading (Albert and Engber 1990, Letts and Rowhani 1993, Wilkins

and O'Brien 1996). Forearm-bowing fractures in children are usually caused by axial loading (Chamay 1969, Borden 1974, 1975, Naga and Broadrick 1977, Demos 1980, Komara et al. 1986, Povacz 1989). Both mechanisms seem to be involved in our 2 patients.

Galeazzi and bowing fractures are frequently overlooked (Walsh et al. 1969, Crowe and Swischuk 1977, Naga and Broadrick 1977, Köteles and Szigetváry 1982, Kienitz and Mandell 1985, Nimityongskul et al. 1991, Andersen and Hvolris 1999). Although Letts and Rowhani (1993) and Shonnard and DeCoster (1994) emphasized palpation of the wrist and examination of forearm rotation, examination of the range of motion in our cases was considered too painful. Nevertheless, the distal radioulnar joint and the elbow should always be examined.

According to Walsh et al. (1987), Galeazzi lesions are missed due to difficulties in taking true lateral radiographs of the wrist, at admission. In our second case, these did not show a distal radioulnar dislocation. A high index of suspicion seems imperative.

The indications for reducing bowing fractures depend mainly on the patients' age (Borden 1974, 1975, Naga and Broadrick 1977, Rydholm and Nilsson 1979, Demos 1980, Schild et al. 1983, Sanders and Heckman 1984, Kienitz and Mandell 1985, Komara et al. 1986, Scheuer and Pot 1986, Attia and Glasstetter 1989, Nimityongskul et al. 1991, van den Wildenberg and Greve 1993, Reisch 1994). In children of less than 4–6 years, reduction of angulations of more than 20° is advised. In children up to 10 years old, there is less agreement since the capacity to remodel and the functional loss due to persistent deformity are disputed. In older children, reduction is advised for deformities exceeding 10–15°. It is particularly important to recommend reduction in cases of bowing that prevent an associated fracture or dislocation from being reduced, regardless of the patient's age. This may have been the case in our second patient.

As in our first case, reduction of a bowing fracture is difficult (Borden 1974, 1975, Sanders and Heckman 1984, Scheuer and Pot 1986, Attia and Glasstetter 1989, Povacz 1989, Nimityongskul et al. 1991, van den Wildenberg and Greve 1993, Reisch 1994). According to Borden (1974, 1975), the force needed for reduction is 100–150% of the patient's body weight, applied for several minutes. The method of Sanders and Heckman (1984) achieves 85% correction. They place the apex of the curve at a fulcrum and apply a firm pressure for several minutes at right angles to the deformity.

The complications of Galeazzi lesions in children include malunion of the radius, injury to the ulnar nerve, radioulnar subluxation due to malunion of the radius and union of the radius with loss of the normal bow (Wilkins and O'Brien 1996). We found no case of this last complication in the literature. It results from an overgrowth of the radius with subsequent distal radioulnar incongruity. In our second patient, this complication led to sporadic pain during rotation. In 9 of 40 radius fractures in children, de Pablos et al. (1994) observed overgrowth of the radius. According to these authors, an associated ulna fracture was the most important factor related to radial overgrowth. They attribute this to loss of the close relationship between both forearm bones through the interosseous membrane and the proximal and distal radioulnar junctions. If this is true, this complication is probably commoner than the absence of reported cases suggests, since these structures are damaged in Galeazzi lesions.

Albert M J, Engber W D. Dorsal dislocation of the radioulnar joint secondary to plastic deformation of the ulna. J Orthop Trauma 1990; 4 (4): 466-9.

Andersen K H, Hvolris J J. Bøjningsfraktur af ulna og samtidig distal radioulnar luksation. Ugeskr Laeger 1999; 161 (5): 605-6.

Attia M W, Glasstetter D S. Plastic bowing type fracture of the forearm in two children. Ped Emerg Care 1989; 13 (6): 392-3.

Borden S. Traumatic bowing of the forearm in children. J Bone Joint Surg (Am) 1974; 56 (3): 611-6.

Borden S. Roentgen recognition of acute plastic bowing of the forearm in children Am J Roentgenol Radium Ther Nucl Med 1975; 125 (3): 524-30.

Chamay A. Mechanical and morphological aspects of experimental overload and fatigue in bone. J Biomechanics 1969; 3 (3): 263-70.

Crowe J E, Swischuk L E. Acute bowing fractures of the forearm in children: a frequently missed injury. AJR Am J Roentgenol 1977; 128 (6): 981-4.

Demos T C. Radiologic case study: Traumatic (plastic) bowing of the ulna. Orthopedics 1980; 3 (11): 1108-21.

De Pablos J, Franzreb M, Barrios C. Longitudinal growth pattern of the radius after forearm fractures conservatively treated in children. J Pediatr Orthop 1994; 14 (4): 492-5.

Kienitz R, Mandell R. Traumatic bowing of the forearm in children: Report of a case. J Am Osteopath Assoc 1985; 85 (9): 565-8.

Komara J S, Kottamasu L, Kottamasu S R. Acute plastic bowing fractures in children. Ann Emerg Med 1986; 15 (5): 585-8.

Köteles G, Szigetváry I. Acute plastic bowing fractures of the extremities in childhood. Radiol Diagn 1982; 23 (3): 313-6.

Letts M, Rowhani N. Galeazzi-equivalent injuries of the wrist in children. J Pediatr Orthop 1993; 13 (5): 561-6.

Naga A H, Broadrick G L. Traumatic bowing of the radius and ulna in children. N C Med J 1977; 38 (8): 452-6.

Nimityongskul P, Anderson L D, Sri P. Plastic deformation of the forearm: a review and case report. J Trauma 1991; 31 (12): 1678-85.

Ogden J A. Galeazzi's fracture-dislocation. In: Skeletal Injury in the Child (ed. Ogden J A). Lea & Febiger. Philadelphia PA 1982; 349-53.

Povacz F. Zur Behandlung der "plastischen Deformation" langer Röhrenknochen. Z Unfallschir Vers med Berufskr 1989; 82 (4): 266-8.

Reisch R B. Traumatic plastic bowing deformity of the radius and ulna in a skeletally mature adult. J Orthop Trauma 1994; 8 (3): 258-62.

Rydholm U, Nilsson J E. Traumatic bowing of the forearm: a case report. Clin Orthop 1979; 139: 121-4.

Sanders W E, Heckman J D. Traumatic plastic deformation of the radius and ulna. Clin Orthop 1984; (188): 58-67.

Scheuer M, Pot J H. Acute traumatic bowing fracture of the forearm. Neth J Surg 1986; 38 (5): 158-9.

Schild H, Mueller H A, Klotter H J, Kuhn F P. Die traumatische Knochenverbiegung - eine besondere Skelettverletzung. Röntgen Bl 1983; 36 (8): 241-3.

Shonnard P Y, DeCoster T A. Combined Monteggia and Galeazzi fractures in a child's forearm, a case report. Orthop Rev 1994; 23 (9): 755-9.

van den Wildenberg F A J M, Greve J W. Intramedullary stabilization of a bowing fracture of the forearm with Ender's nails: a case report. J Trauma 1993; 35 (5): 808-9.

Walsh H P J, McLaren C A N, Owen R. Galeazzi fractures in children. . J Bone Joint Surg (Br) 1987; 69 (5): 730-3.

Wilkins K E, O'Brien E. Galeazzi fractures in children. In: Fractures in Children (Eds. Rockwood CA Jr, Wilkins K E, Beaty J H), J B Lippincott, Philadelphia PA 1996; 3: 507-15.