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Anterior Olecranon Fracture-Dislocations of the Elbow in Children

A Report of Four Cases

By Thierry G. Guitton, MSc, Robert G.H. Albers, MD, PhD, and David Ring, MD, PhD

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A subset of olecranon fractures with loss of normal articular apposition (subluxation or dislocation) is recognized in adults as anterior and posterior olecranon fracture-dislocations¹⁻⁶, but such injuries in skeletally immature patients have been rarely described⁷⁻⁹. The anterior olecranon fracture-dislocation may resemble an anterior Monteggia lesion in that there is anterior dislocation of the radial head with respect to the capitellum; however, the forearm (the radioulnar relationship) remains intact and the injury is primarily to the ulnohumeral joint by means of disruption of the trochlear notch (Figs. 1-A and 1-B). The coronoid is fractured in approximately half of the patients, the radial head is rarely injured, and the collateral ligaments are generally spared¹⁰. Olecranon fractures are relatively uncommon in skeletally immature patients¹¹⁻¹³, and we were able to identify the cases of only three skeletally immature patients with an apparent anterior olecranon fracture-dislocation reported in the literature⁷⁻⁹.

We identified four skeletally immature patients with an anterior olecranon fracture-dislocation from a fracture registry. This report describes the injury characteristics, treatment methods, and results of these four patients.

Case Reports

Materials and Methods

Between 1974 and 2002, all fractures treated at our institution were entered into a database organized according to the AO Comprehensive Classification of Fractures¹⁴. A search of this database identified four skeletally immature patients who had treatment of a so-called anterior, or transolecranon, fracture-dislocation of the elbow^{1-6,10}. The database contained fourteen skeletally immature patients with a fracture of the olecranon over this time period, so that anterior olecranon fracture-dislocations represented nearly one-third of all olecranon fractures in skeletally immature individuals in the database.

The patients were treated by a general orthopaedic surgeon or a general trauma surgeon experienced in AO principles and techniques of internal fixation¹⁴. Using a protocol approved by our ethics committee, we reviewed the medical records of these four patients.

The clinical outcome was graded with use of a scale described by Roberts¹⁵. The result was rated as excellent if the patient had no symptoms and no limitation of movement, as good if there were only mild symptoms and $\leq 10^\circ$ of loss of movement, and as fair if there were moderate symptoms and 10° to 30° of loss of movement. The result was considered poor if there were severe symptoms and loss of movement of $>30^\circ$.

Results

Injury Characteristics

On the basis of radiographs made immediately after the injury and the intraoperative findings, the anterior olecranon fracture-dislocations were classified, according to the Comprehensive Classification of Fractures¹⁴, as 22-B1.3 in three patients and as 22-B1.1 in one patient.

Patient Characteristics

For all four patients, the medical record had the results of an evaluation performed at an average of seventeen months (range, twelve to twenty-four months) after the injury. All four patients were male, with an average age of eleven years (range, eight to thirteen years) at the time of the injury. Two patients had injured the right arm, and two patients had injured the left arm. Limb dominance was not recorded. Three patients had sustained the injury in a motor vehicle collision, and one patient was injured in a bicycle accident. None of the patients had other injuries of the ipsilateral upper extremity. One patient had an associated fracture of the tibia and fibula.

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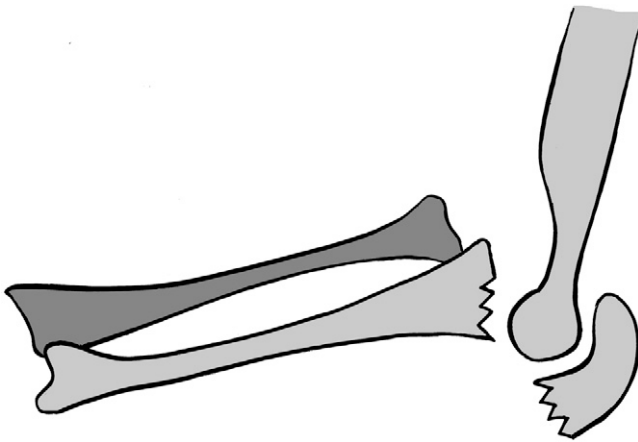


Fig. 1-A

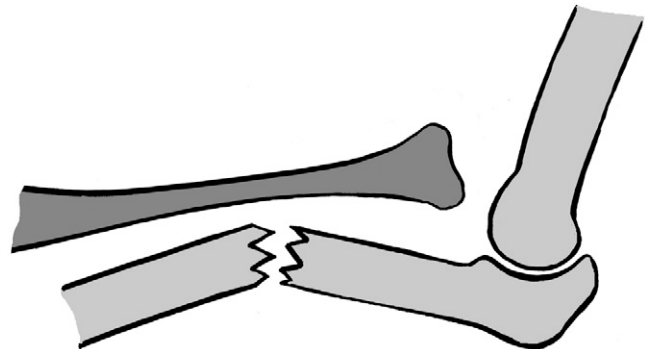


Fig. 1-B

Figs. 1-A and 1-B Drawings differentiating between anterior olecranon fracture-dislocation and anterior Monteggia injuries. **Fig. 1-A** In the anterior olecranon fracture-dislocation, the proximal radioulnar joint remains aligned and intact, but there is an anterior dislocation of the radiocapitellar joint along with the rest of the forearm. **Fig. 1-B** In the anterior Monteggia fracture, there is a fracture of the ulna with anterior dislocation of the radial head.

Two surgeons participated in the care of these patients, and no standard protocols were used. All patients had operative treatment on the day of the injury. Open reduction and plate-

and-screw fixation was performed with use of a four-hole, 3.5-mm, one-third tubular dynamic compression plate and screws in two patients (one with an ancillary Kirschner wire);



Fig. 2-A

Figs. 2-A, 2-B, and 2-C Radiographs of a twelve-year-old boy who injured the right upper extremity in a motor vehicle collision and sustained a 22-B1.3 fracture according to the Comprehensive Classification of Fractures. **Fig. 2-A** Somewhat oblique anteroposterior and lateral radiographs, made immediately after the injury, show an oblique fracture of the olecranon and anterior dislocation of the forearm (the coronoid and the radial head).

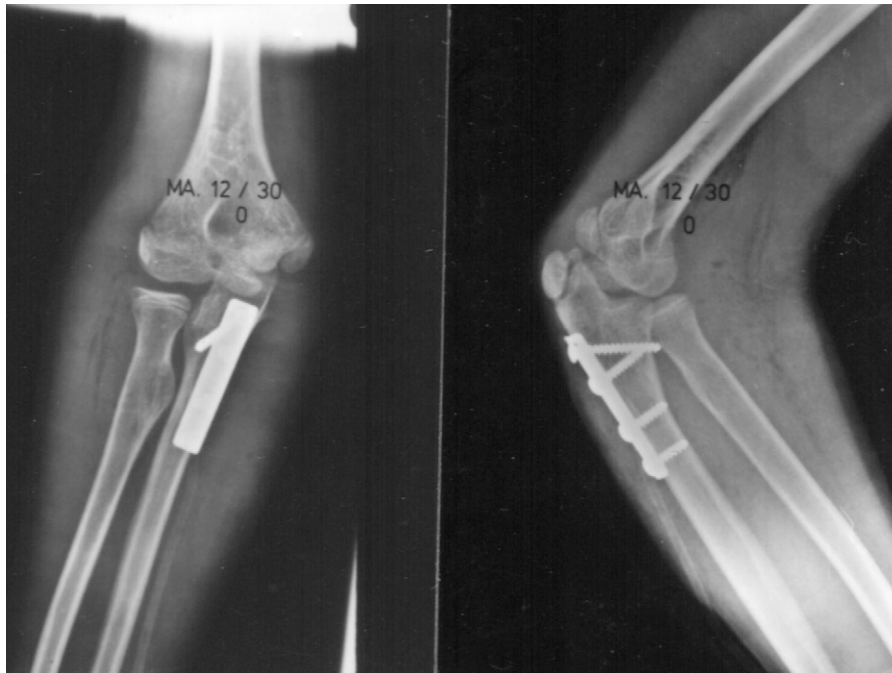


Fig. 2-B

Treatment was open reduction and internal fixation with a four-hole, 3.5-mm, one-third tubular dynamic compression plate.

a six-hole, 3.5-mm, one-third tubular dynamic compression plate in one patient; and a screw and a figure-of-eight tension-band wire in one patient (Figs. 2-A, 2-B, and 2-C).

After surgery, the elbow in one patient was splinted in 90° of flexion for four weeks. For three patients, detailed postoperative management was not documented.



Fig. 2-C

At the time of the final follow-up, twelve months after the injury, the implants had been removed. The patient had an excellent functional outcome, according to the system of Roberts, with full flexion and extension of the elbow and full forearm rotation.

Complications and Additional Surgeries

The patient treated with a screw and tension-band wire had repeat surgery three weeks after the injury to treat articular incongruity. A 3.5-mm, one-third tubular dynamic compression plate was applied at the time of the revision surgery. The implants were routinely removed in three patients at an average of nine months (range, seven to thirteen months) after surgery.

Final Result

At an average of seventeen months (range, twelve to twenty-four months) after the injury, all four patients had regained full flexion and extension of the elbow and full forearm rotation. According to the classification system of Roberts, all four patients had an excellent result.

Discussion

While simple fractures of the olecranon in children are uncommon, anterior olecranon fracture-dislocations represented a substantial proportion (four) of the fourteen pediatric olecranon fractures in our fracture registry over a twenty-eight-year period. It is possible that anterior olecranon fracture-dislocations are underreported because they are misidentified as anterior Monteggia-type fracture-dislocations of the forearm. While there is anterior dislocation of the radiocapitellar joint in an anterior olecranon fracture-dislocation, the proximal radioulnar joint remains aligned and intact. In other words, this is primarily an ulnohumeral fracture-dislocation rather than a radioulnar fracture-dislocation. Fracture of the coronoid occurs in half of the adult patients with an anterior olecranon fracture-dislocation¹⁰, but it has not been observed in children with this injury pattern.

Tension-band wiring of the olecranon is thought to be inadequate fixation of an anterior olecranon fracture-dislocation in an adult, and, on the basis of the need for revision surgery in the only patient treated with tension-band wiring in our series, the same may be true in children¹⁰. We speculate that the added instability of the associated soft-tissue injury makes tension-band wiring insufficient, and plate-and-screw fixation seems preferable. This approach seems analogous to the treatment of pediatric Monteggia injuries, in which it has been noted that unstable injuries may displace with simpler casting or pinning techniques¹⁶. ■

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