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# Capitellar fracture with bony avulsion of the lateral collateral ligament in a child: Case report



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## ABSTRACT

**INTRODUCTION:** Isolated capitellar fracture is a rare injury accounting for 1% of all elbow fractures Bryan and Morrey (1985) and Poynton et al. (1998). In children, a fall on an outstretched hand, before the fusion of the epiphysis, usually leads to lateral condyle physeal fractures. Very few cases of capitellar fractures in the paediatric population have been reported.

**PRESENTATION OF CASE:** Our patient, a 9-year-old girl presented with a capitellar fracture and lateral collateral ligament (LCL) avulsion of her left elbow. A type IV capitellar fracture, indicated by the *double arc* sign on the radiogram, was confirmed with 3-dimensional computed tomography. The patient underwent open reduction through a lateral approach and fixation with 2 Herbert's screws. The lateral collateral ligament (LCL) avulsion was repaired with 2 suture anchors. Early mobilization and rehabilitation were started soon after the surgery. Follow-up radiography showed union of the fracture with no signs of osteonecrosis.

**DISCUSSION:** Capitellum fracture in children is easily overlooked due to its rarity. And hereby, meticulous history, clinical examination and proper radiological views with high index of suspicion is crucial in order to diagnose these injuries. Our patient had type IV capitellar fracture with lateral collateral ligament avulsion. Principles of management of these intra articular fractures include accurate reduction, stable fixation and early mobilization. We used an extensile lateral approach to expose, reduce and fix the fracture. LCL avulsion was fixed with 2 suture anchors.

**CONCLUSION:** Capitellum fractures are rare injuries in children. Careful evaluation and proper stable fixation are the cornerstones of good functional results.

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## 1. Introduction

Isolated capitellar fracture is a rare injury accounting for 1% of all elbow fractures [1,13]. In children, a fall on an outstretched hand, before the fusion of the epiphysis, usually leads to lateral condyle physeal fractures. Very few cases of capitellar fractures in the paediatric population have been reported.

In this report, we present a case of type IV capitellar fracture with bony avulsion of the lateral collateral ligament (LCL) in a 9-year-old left hand dominant and average body mass index Arabic girl.

## 2. Presentation of case

The patient presented to our emergency department with an acute history (3 h) of a fall from a hover board on outstretched

hands. She complained of pain and mild swelling of her left elbow. The child was previously healthy and her past medical history was unremarkable. On examination, tenderness over the lateral aspect of the left elbow was noted. Flexion and extension of the elbow were restricted due to pain. Supination and pronation were painless and unrestricted. There was no neurovascular compromise and no evidence of compartment syndrome.

Radiography revealed a displaced fracture of the capitellum, which was more clearly visualized in the lateral view. A *double arc* sign was well appreciated on the lateral radiogram. Unfused Physis of children of this age and the complex distal humerus anatomy poses diagnostic challenges. Computed tomography (CT) of the elbow was performed for better visualization of the fracture and for preoperative planning. Fig. 1.

The fracture was classified as type IV based on imaging findings and according to Bryan-Morgan classification [1] (Fig. 3). An open reduction and internal fixation of the fracture was planned, and consent was received from the parents. The intended procedure was discussed in detail with the parents.

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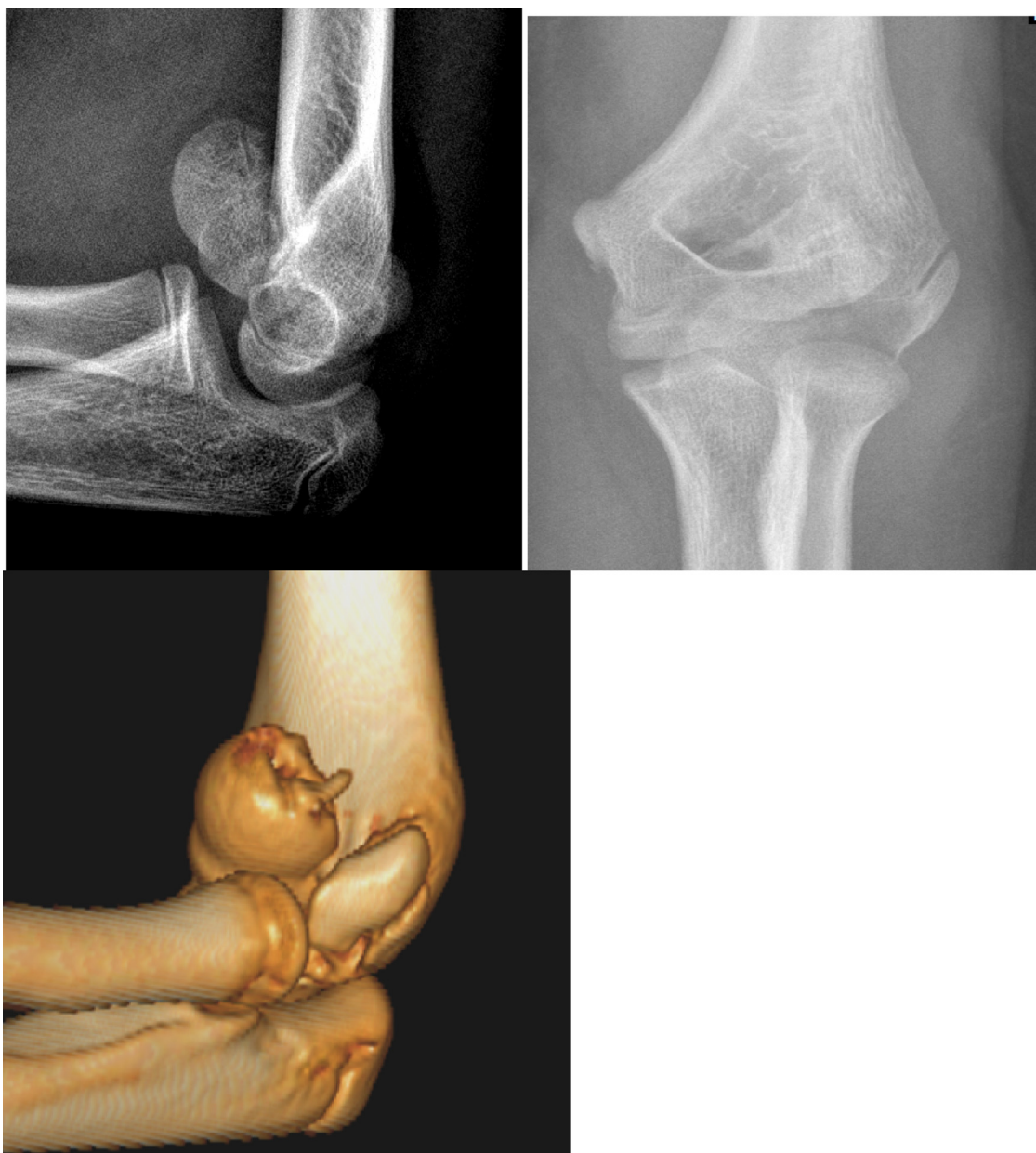


Fig. 1. Plane xray and CT scan reconstruction view of the child's elbow showing the capitellar injury.

The complications were explained to the parents including the chances of avascular necrosis, growth disturbance and deformity in future.

Senior consultant operated on the patient. Using a tourniquet, the lateral approach which utilizes the interval between triceps and common extensor origin proximally and extensor carpi ulnaris and extensor carpi radialis longus distally was used.

A shear fracture of the capitellum extending to the trochlea was noted. There was a comminution at the inferior surface of the articular cartilage. The LCL was avulsed from the lateral epicondyle with a chip of bone.

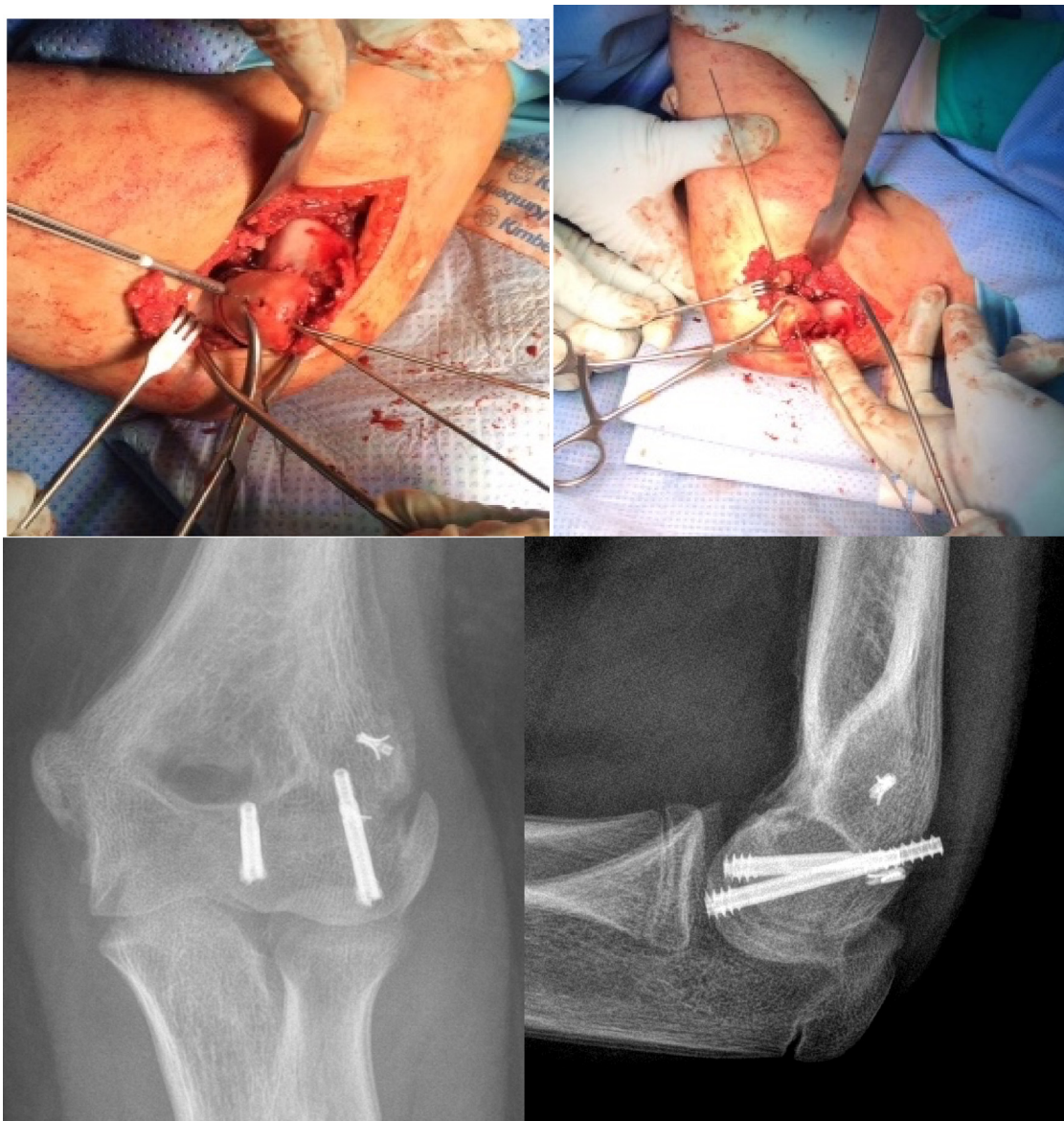
Fracture fragments were reduced without loss of the tiny soft tissue attachments. Reduction was assessed by checking the fracture line reaching medially to the lateral trochlea and reducing the articular surface. Based on the anatomical reduction of the visible cortex and palpation, we assumed far cortical reduction. The comminuted inferior articular surface was also reduced. Temporary fixation with K-wires followed by definitive headless Herbert

screws, traversing antero-posteriorly, was performed. The LCL with the avulsed piece was anchored to the anatomical site with 2 suture anchors. An above-elbow slab was placed for 1 week postoperatively and then a gradual assisted active exercise program was started. The patient regained full elbow range of motion and radiological union of the fracture on her follow-ups at 1, 3, 6, 12 weeks and 6 months Fig. 2.

### 3. Discussion

Fractures of the capitellum are rare injuries and account for less than 1% of all elbow fractures [1]. Most reports demonstrated female predominance [2]. They are thought to be associated with cubitus valgus, cubitus recurvatum or osteoporosis [3,4].

capitellar fracture is rare among paediatrics. Marion and Faysse reported only 1 capitellar fracture in a series of 2000 elbow fractures in children [5]. Dr Letts' series of seven patients had an average patient age of 14.7 years (range 11–17) [12].



**Fig 2.** Clinical picture of intra-operative finding and postoperative radiograph.

Usually, children become vulnerable to shear forces after the ossification and fusion of the capitellar metaphysis, which usually occurs after 12–13 years of age.

The capitellum ossifies at the age of 1 year, while the lateral part of the trochlea ossifies at the age of 7 years. The lateral distal humeral epiphysis is the last portion of the distal humeral epiphysis to ossify. It may be identified radiologically at an early age of 8–9 years. The capitellum and trochlea can fuse as early as 9–10 years of age; however, this usually occurs at the age of 12 years. This combined ossification centre fuses with the lateral epicondyle almost at the same time to form the main body of distal humeral epiphysis. This epiphysis attaches to the metaphysis of the humerus at 12–13 years of age [5,9] Fig. 3.

Our case was a Bryan and Morgan type IV [1] capitellar fracture with bony avulsion of the LCL from the lateral epicondyle. To the best of our knowledge, no such case has been previously reported. The avulsion of the lateral epicondyle was an associated finding. We also noted a comminution at the articular surface in our case.

Type IV fractures were described by Mckee et al. [6] in his series of six patients (average age, 38 years; range, 10–63 years).

The mechanism of injury in capitellar fractures is the axial loading of the distal humerus by the radius upon a fall on an outstretched hand. This results in a shearing force across the capitellum, and the capitellum fragment displaces proximally and rotates [5].

Owing to the growing physis and complex distal humeral anatomy, capitellar fractures in children may be difficult to identify and can be easily missed in the emergency room. A comparison of the opposite side and true lateral view are very helpful in detecting these rare fractures. The *double arc sign*, as described by Mckee et al. [6], is characteristic to type IV capitellar fractures. The double arc represents the subchondral bone of the displaced capitellum and the lateral trochlea. In our patient, the contralateral elbow was not examined radiologically. However, the authors believe that imaging of the intact elbow would help elaborating the bony anatomy in paediatric cases and prevent oversight of these rare injuries.

When capitellar fracture is strongly suspected but cannot be confirmed radiographically, an arthrogram may be helpful, particularly in paediatric cases. Yates and Sullivan [7] reported their experience with the use of arthrography for the evaluation of elbow



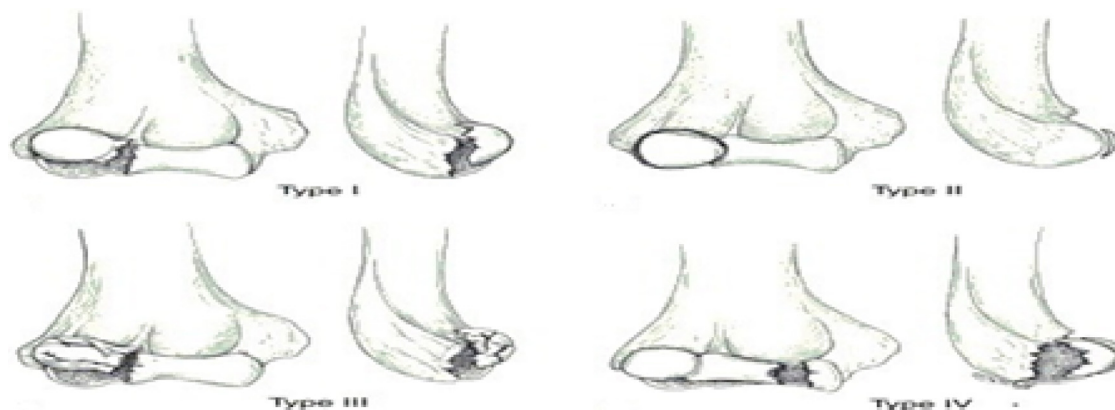


Fig. 3. Bryan and Morgan classification.

injuries in 6- to 8-year old patients; they noted that the initial diagnosis was incorrect in 7 of 36 patients. A CT scan with 3-dimensional reconstruction can help clearly delineate the extent of the fracture and classify it. In our case, we could identify the lateral epicondyle avulsion preoperatively on a CT scan.

As capitellar fractures are intra-articular fractures, accurate reduction should be achieved. Non-operative treatment is ideal in cases of non-displaced, stable fractures. Lack of anatomical reduction can adversely affect not only the arc of flexion and extension of the elbow but also the intrinsic stability of this joint, which is provided by the trochlea-olecranon articulation [8].

A lateral extensile approach is preferred in these injuries [2]. It helps in viewing the medial most extension of the fracture and is also appropriate for accurate reduction and fixation. In young children with open physes, care must be taken to leave the posterolateral soft-tissue sleeve of the elbow intact during the surgical approach to preserve the vascular supply to the lateral column of the distal humerus. Surgeons should recognize that the inferior aspect of the capitellum is often comminuted and should not be used as a reference for final reduction.

Multiple methods of fixation have been described, and the choice depends on the type of fracture and fracture fragment sizes. Countersunk headless screw fixation perpendicular to the fracture line, either anteroposterior or posteroanterior, yields good compression at the fracture site in type I and type IV fractures. In type II and IV fractures, if the fragments are small and cannot be fixed with any fixation method, excision can be performed. In certain cases, an additional lateral column plate may be necessary to stabilize the fracture [9].

Postoperatively, the elbow is mobilized early. Incidence of avascular necrosis in the reported cases is very low [6,10].

#### 4. Conclusion

Capitellar fractures in children need prompt diagnosis; detailed preoperative and intraoperative evaluation of the fracture and rigid internal fixation followed by early mobilization can provide excellent outcomes.

#### Conflicts of interest

All of the Authors declare that they have no conflict of interest either personally or with any of their relatives.

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#### Ethical approval

This article has been reviewed and approved by Medical Research centre (MRC) in QATAR. Reference number: 16098/16.

#### Consent

Informed consent was taken from the patient father in order to publish this case report.

#### Author contribution

Dr Mazhar Fuad: is the corresponding author he shared in study design, data collection and analysis and writing the paper, reviewing literature.

Dr. Aissam Elmhiregh: he shared in data analysis, writing the paper, getting approval.

Dr. Ardeshir Motazedian: Study design and data analysis.

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#### Registration of research studies

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#### Guarantor

Dr. Mazhar Fuad, Orthopedic specialist, Alwakra Hospital [drfuad14@gmail.com](mailto:drfuad14@gmail.com).

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