Paediatric Capitellar Fracture

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Abstract

Capitellar fracture in the paediatric population is extremely rare. There have been only a handful of case reports or case series in the literature. For this reason, it is likely to be missed or misdiagnosed. An untreated capitellar fracture poses a risk of severe compromise of the elbow function and range of movement. We present a rare case of type I capitellar fracture in an 11-year-old girl. She underwent open reduction and percutaneous Kirschner wiring and she subsequently recovered with excellent outcome. A high index of suspicion is needed to diagnose a capitellar fracture. The lateral view of a plain radiograph must be carefully screened and sometimes an oblique view may be helpful in making the diagnosis.

Keywords: capitellum; fracture; open reduction

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Introduction

Fracture of the humeral capitellum is rare, accounting to only 1% of all elbow fractures and 6% of distal humeral fractures. In the paediatric age group, these fractures are even more unusual with limited published literatures. This is mainly due to the nature of the cartilaginous composition of the capitellum, rendering it more resistant to stress. A force resulting from a fall is more likely to cause a supracondylar or a lateral condylar fracture. Due to its rarity, a paediatric capitellar fracture is often misdiagnosed or missed. If the fracture is undiagnosed and untreated, it may lead to limited range of movement of the elbow. It is important to have a high index of suspicion to diagnose and treat a paediatric capitellar fracture early to avoid severe compromise on the elbow function.

Case Report

An 11-year-old, right hand dominant girl presented to us with pain at the left elbow after sustaining a fall on her outstretched left hand while riding a bicycle. Clinically, her left elbow was swollen and tender. There was no open wound.

The range of movement of the left elbow was limited due to pain. Plain radiographs of the left elbow (antero-posterior and lateral views) revealed a closed capitellar fracture Bryan-Morrey type I (Hahn-Steinthal fracture)(Figure A).

![Figure A: The initial plain radiograph of the patient. There is no abnormality detected on the anteroposterior view. The lateral view of the left elbow reveals a type I capitellar fracture](image1)

An open reduction was performed via a posterolateral approach(Figure B). The fracture was identified, reduced and stabilized with three percutaneous Kirschner wires(Figure B).

![Figure B: The intra-operative fragment identification and subsequent plain radiographs after open reduction and percutaneous Kirschner wiring.](image2)

Post-operatively, the elbow was protected with a backslap for 2 weeks, after which active range of movement exercises was commenced. The Kirschner wires were removed 6 weeks post-operative. The fracture subsequently healed with excellent outcome (Mayo elbow score 95)(Figure C).

![Figure C: The well united capitellar fracture on the plain radiograph and the patient demonstrates a good range of motion of the affected elbow.](image3)

Discussion

The mechanism of injury of capitellar fracture is usually attributed to fall on an out-stretched hand. The axial loading of the distal humerus by the radius results in a shearing force across the capitellum, causing it to displace proximally and rotate. Clinically, the main presenting complaint will be pain at the affected elbow, predominantly at the lateral aspect. In a child of age less than 12 with unfused epiphysis, the capitellar fracture can often be mistaken as a growth plate. Plain radiograph in an antero-posterior (AP) view can be perfectly normal in some cases. Most of the time, the diagnosis can be made via a plain radiograph lateral view. Nevertheless, Pradhan et al highlighted the importance of an oblique plain radiograph in a near-missed capitellar fracture. In some centres, computed tomographic imaging is performed to illustrate the fracture configuration which can aid the definitive fracture fixation.
Capitellar fractures can be classified based on Bryan and Morrey classification. Type I fracture (Hahn-Steinhal fracture) is the most common type, accounting up to 68% of all types. It is characterized by coronal shear fracture through the capitellum, resulting in a separation of the entire eminence of the capitellum anteriorly and superiorly. Type II fracture (Kocher-Lorenz fracture) is characterized by involvement of the articular cartilage of the capitellum with adjacent subchondral bone. A type III fracture (Broberg-Morrey) is a comminuted fracture of the capitellum. The fourth type, described by McKee et al, is a shear fracture involving the capitellum with medial extension into most of the trochlea.

Due to its rarity, the treatment modality in treating capitellar fracture varies. A capitellar fracture can be treated conservatively, closed reduction and immobilization or open reduction and fixation. It is important to obtain an anatomic reduction of bone fragments and supplement it with proper stabilization to avoid compromise in elbow function and late-onset arthritis. If an implant is used, the head of the implant should not be prominent due to the intra-articular nature of the fracture. Kirschner wires, partially threaded cancellous screws, headless double-threaded compression screws and 3.5 mm lag screws have been used with successful outcomes in adult patients. Headless (Herbert) screw is currently the fixation implant of choice for capitellar fracture. Herbert screw can be fully embedded into the bone, preventing it from affecting the articular surface, hence it can be left in-situ after union of the fracture.

On top of that, the cannulation of Herbert screw ensures precise placement of the screw through the cannulated guide wire, which is normally inserted for temporary fracture fixation. Besides that, a titanium Herbert screw has a superior strength and Young’s modulus which is closer to the cancellous bone, rendering it a better implant than a stainless steel implant. Due to the above-mentioned reasons, in paediatric population, the author uses headless screws to treat most of the paediatric capitellar fracture.

Despite all the advantages of a headless screw, in our patient, we use three 1.6 mm Kirschner wires to stabilize the fracture fragments as the patient cannot afford the cost of the headless screw. Onay et al reported mid-term and long-term outcomes of 13 patients treated for capitellar fractures, in which two patients who were treated with Kirschner wires achieved excellent and fair outcomes. Non-anatomic reduction of the fracture was the cause of the fair result. Pradhan et al also reported good outcome in a patient with capitellar fracture treated with Kirschner wires. In order to compensate for the more inferior biomechanical strength of the Kirschner wire, an above-elbow backslab is applied for two weeks after the surgery. We deem that all implants should be removed whenever once fractures have united, as the risk of infection increases with time. Kirschner wires can be easily removed in the clinic setting without any difficulty. In this case, we use a postero-lateral approach similar to the one reported by Murthy et al as it provides excellent visualization of the fracture fragments. Our patient subsequently recovers with excellent outcome.

**Conclusion**

High index of suspicion is needed to diagnose a capitellar fracture in a paediatric patient. Despite the clear advantages of headless screws, Kirschner wiring can be the alternative implant for surgical fixation of type I (Hahn-Steinhal) capitellar fracture.

**References**


