

The Posterior Elbow Approach in Our Pediatric Orthopaedic Trauma Practice

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EDITORIAL

This editorial aims to review the literature on the posterior elbow approaches, report the indications and surgical steps of our midline laterally curved paratricipital posterior elbow approach, and evaluate its value in our common pediatric orthopaedic trauma practice.

A variety of posterior elbow approaches are available for trauma and reconstructive surgery in children and adults. The extensile posterior skin incision, also named universal incision, is the most commonly used due to its efficacy in reaching the medial, lateral, and anterior joint parts [1,2]. When open surgical reduction is required, the posterior approach can be used in almost all pediatric distal extraarticular or intraarticular humeral fractures [3].

Among the various posterior approaches to the elbow, the triceps sparing or 'triceps on' approaches leave the triceps intact, offering less morbidity to the extensor mechanism. In children, they usually include the triceps tendon splitting and paratricipital approaches. Posterior midline incisions, which are laterally or medially curved, are superior to straight ones regarding ulnar nerve protection, healing rates, and lateral and medial brachial cutaneous nerve laceration [4-7].

The posterior transolecranon approach is the best surgical approach for comminuted distal humeral fractures in adults [8]. However, in skeletally immature patients, the triceps paratricipital, splitting, reflecting, elevating, sliding, or inverted 'V' shaped tongue approaches give adequate exposure to the distal articular humeral surface [9] except complex T-condylar fractures associated with significant intraarticular comminution [10] and old displaced lateral condylar fractures [11].

Van Gorder, in 1940, advocated the Campbell approach; it involves a longitudinal splitting of the triceps while maintaining its attachment to the olecranon. The triceps tongue approach is a modification indicated in cases with triceps contracture necessitating a lengthening technique [12]. Alonso-Llames described a bilaterotricipital approach, without severing the triceps, through a posterior midline incision, which is valuable in the treatment of supracondylar and intercondylar distal humeral fractures without intraarticular comminution in children [13].

The triceps splitting and paratricipital approaches follow the 'triceps on' tactic, preserving the olecranon-triceps unit intact [14].

However, the triceps splitting approach may denervate a muscle portion, while the bilaterotricipital approach uses bloodless planes, leading to improved elbow range of motion and fewer postoperative contractures [15].

Schildhauer described an alternative extensor mechanism-sparing paratricipital exposure to the distal humerus, mobilizing the triceps and the anconeus muscle off the posterior humerus and the intermuscular septae [4].

We used the midline laterally curved posterior incision in displaced distal humeral intraarticular fractures involving the lateral (Fig. 1), medial (Fig. 2), or both condyles in either the shape of a 'T' or a 'Y' (Fig. 3). The radiographs in all our patients showed simple complete articular fracture with simple or multifragmentary metaphyseal involvement. We treated no cases with comminuted or multifragmentary intraarticular fractures.



Figure 1. An 11-year-old boy with a fracture of the humeral lateral condyle before and after open reduction and internal fixation with double cross-pinning.



Figure 2. A 13-year-old boy with a fracture of the humeral medial condyle before and after open reduction and internal fixation with a smooth Kirschner and two screws.

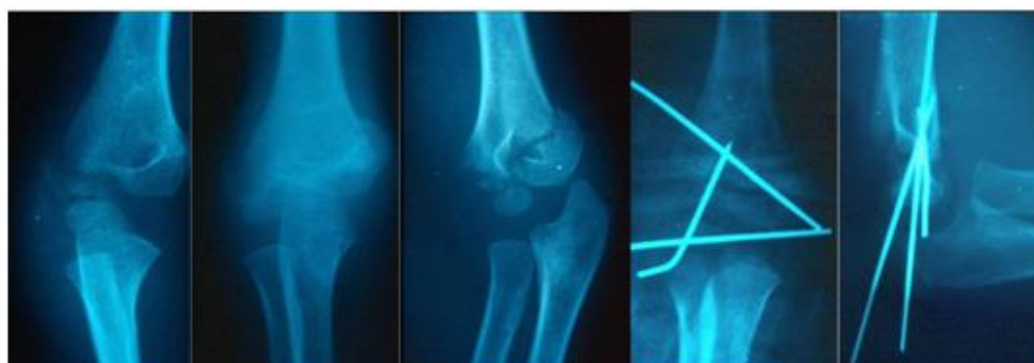


Figure 3. A 4-year-old girl with an intercondylar humeral fracture before and after open reduction and internal fixation with the triangular technique using three smooth Kirschner wires.

The patient is placed on the operating table under general anesthesia in the supine position with the injured arm across the chest. We do not use a pneumatic non-sterile or sterile tourniquet to facilitate distal triceps handling, avoid further traumatic insult to soft tissues, secure sterile surgical draping, prevent contamination, and not limit the available operating field. We perform a midline posterior incision laterally curved around the olecranon and continuing for approximately 2 cm distal to the olecranon tip. The underlying fascia is split and elevated with the dermis and subcutaneous tissue. The ulnar nerve is identified posterior to the medial epicondyle, carefully released from the cubital

tunnel, and gently retracted posteriorly. We place one or two latex loops around the ulnar nerve to constantly indicate its position.

Dissection is then continued on the medial and lateral triceps borders, separating the muscle from the posterior surface of the intermuscular septae. We do not detach the triceps or the anconeus muscle from the olecranon. We use blunt Hohmann retractors and place a loop around the triceps muscle belly to facilitate retraction on both sides (Fig. 4). The periosteum and the joint capsule are divided in the midline to expose the entire posterior distal humerus and wash out the fracture hematoma.

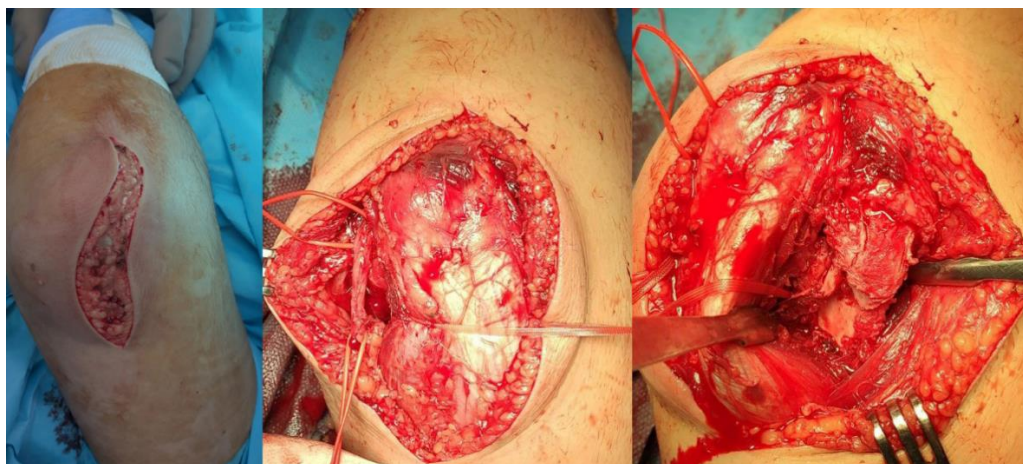


Figure 4. *Our triceps-sparing paratricipital posterior elbow approach.*

Fracture reduction follows with manipulation of the fragments. The reduction can be evaluated by direct visualization of the posterior distal humeral surface and through fingertip palpation of the anteroinferior humeral surface, in elbow extension and varying degrees of flexion. Once anatomic reduction is satisfactory, fixation follows with smooth Kirschner wires or screws in older children and adolescents. Radiographic images in the anteroposterior and lateral planes are then taken in the operating room to secure anatomic reduction and proper hardware placement. The pin ends are left outside the skin to allow hardware removal simultaneously with the long arm plaster removal at five weeks postoperatively. We did not transpose the ulnar nerve in any of our patients. The operating time was similar to an extension-type supracondylar fracture of the distal humerus treated with the lateral approach.

We did not use arthrography and magnetic resonance imaging to prove the integrity of the distal humeral articular surface. We examined all our patients 2 to 3 years after surgery. The clinical and radiographic results were excellent based on the adequacy of the initial reduction,

the radiological union of the fracture, any secondary loss of reduction or fixation failure, other complications, and the functional and cosmetic results.

Refusal of surgical treatment has been due to religious or cultural issues during the previous decades. Unfortunately, nowadays, the treating surgeon may still occasionally face this problem. Subsequently, we treated conservatively with overhead traction a girl with the consensus that she required surgical intervention, but her parents refused to accept it (Fig. 5a, b).

Gaining surgical experience and improving the surgical technique is mandatory for a pediatric orthopaedic surgeon commonly involved in elbow trauma. However, it may be prudent to consider that he should be ready anytime to offer conservative treatment to a patient under exceptional circumstances. In our practice, the midline laterally curved paratricipital posterior elbow approach proved extremely valuable in the surgical treatment of displaced lateral, medial, or intercondylar fractures of the distal humerus without comminution or multi fragmentation of the articular surface.

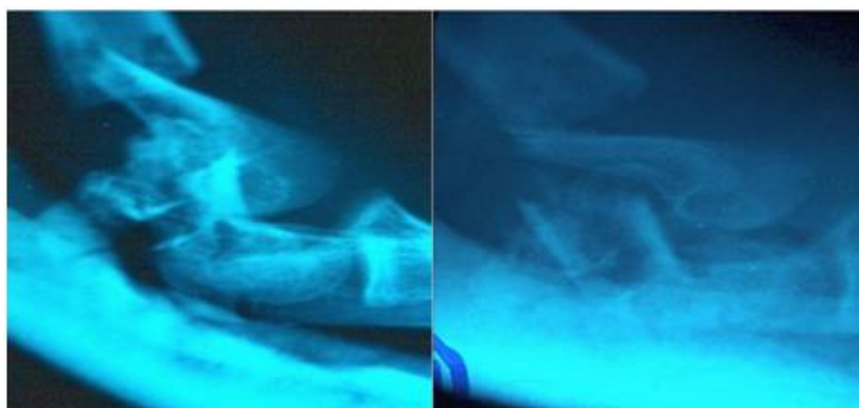


Figure 5a. *An 11-year-old girl with a T-condylar humeral fracture with a complete simple articular fracture and multifragmentation of the lateral metaphysis*



Figure 5b. Conservative treatment with overhead traction for five weeks. The posterior free osteocartilaginous fragments are outside the olecranon fossa and do not block elbow extension. The supracondylar columns have reconstituted with callus formation and bone remodeling.

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