

# **Radial Percutaneous Pinning of Type III Supracondylar Humeral Fractures in Children, Risks and Complications**

**Thesis**

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## **Abstract**

This study included 20 children who had type III, extension type supra condylar humeral fractures and treated by lateral cross-wire fixation technique. According to Flynn's criteria, the results were 16 patients (80%) had excellent results, 3 patients (15%) had good results, and only one child (5%) had a fair result. Type III extension fractures are treated by closed reduction and percutaneous pinning. Open reduction is usually required when closed reduction cannot be achieved. Medial pin introduction is more difficult in the presence of small distal fragment and marked elbow swelling.

### **Keyword:**

K-wire- F.D.S- Percutaneous- Supracondylar

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## Abbreviations

Abbreviations	Words
<b>AP</b>	Antero-posterior.
<b>F.D.S.</b>	Fall down Stair.
<b>F.F.H.</b>	Fall from Height.
<b>F.T.G.</b>	Fall to Ground.
<b>Fr.</b>	Fractures.
<b>K-wire</b>	Kirschner wire.
<b>No.</b>	Number.

## **Aim of the Thesis**

The aim of this thesis is to study the results of treatment of type III supracondylar humeral fractures in children by closed reduction and radial or lateral percutaneous cross pinning. Fixation will be achieved with crossed K-wires inserted from the lateral condyle and lateral humerus towards the medial humerus and the medial epicondyle respectively. Also the risk factors, complications incidence, and preventive measures will be illuminated and the results will be compared to those of data-related literature.

# **Introduction**

## **INTRODUCTION**

Supracondylar humeral fractures in children are the most common injuries about the elbow joint and account for up to 70% of elbow fractures in children.<sup>(1)</sup> They occur most frequently at age between 5 and 10 years<sup>(2)</sup> and result from a fall on an outstretched hand in up to 90% of patients. The non-dominant upper extremity is the most commonly affected.<sup>(3)</sup>

Children under three years of age usually sustain supracondylar humeral fractures after a fall from a height of less than one meter (e.g. fall from a bed or couch). Most fractures in older children result from higher falls from playground equipment (e.g. swings) or other high energy mechanism.<sup>(4)</sup>

These fractures carry the highest risk for long standing complications because of the young age of the children, the marked displacement, and the risks of neurovascular compromise from the injury or iatrogenic from the treatment. So, these fractures require accurate diagnosis, urgent and correct treatment, and avoidance of complications with proper care.<sup>(1)(5)(6)(7)(8)</sup>

Many factors add to the mechanisms of injury involved in supracondylar humeral fractures as the thickened anterior capsule, remodeling of the metaphysis with thinned

cortices and metaphyseal flaring, normal ligaments of childhood, and also presence of ligamentous laxity.<sup>(6)(9)</sup>

Gartland classified supracondylar humeral fractures in children into three types: Type I undisplaced fracture, type II displaced fracture with intact posterior cortex, and type III displaced fracture with no cortical contact.<sup>(10)</sup>

This classification was modified by Wilkins to allow for rotational deformity: Type I undisplaced fracture, type IIA angulated fracture with intact posterior cortex and no rotation, type IIB angulated fracture with intact posterior cortex and rotational deformity, and type III displaced fracture with no cortical contact.<sup>(11)</sup>

These fractures are divided into extension and flexion types depending on the mechanism of injury and the direction of displacement of the distal fragment of the humerus. Extension-type injuries occur in > 95% of cases, while flexion-type injuries occur in < 5%.<sup>(12)(13)(14)(15)(16)</sup>

Both extension and flexion types, particularly the extension injuries, are associated with complications such as neurovascular injuries in 5-30% of cases, compartment syndrome, and malunion that result in functionally and cosmetically lesser outcomes.<sup>(3)(14)(17) (18)(19)(20)(21)(22)(23)</sup>

History of elbow pain and inability to use the upper extremity of a child after a fall onto an outstretched hand should suspect an elbow or forearm fracture.<sup>(24)(25)</sup>

A thorough physical examination of the extremity is essential in any significant elbow joint injury. The initial

assessment should rule out any associated trauma particularly distal forearm fractures. The integrity of the neurovascular structures should be determined.<sup>(25)</sup>

Initial x-rays should always be obtained before elbow manipulation. Comparison views sometimes may be required to evaluate centers of ossification.<sup>(25)</sup>

Treatment of types I and IIA are mainly in an above elbow cast.<sup>(26)(27)(28)</sup> While type IIB and type III have many options such as closed reduction and above elbow cast or back slab, skin traction, olecranon traction, open reduction and internal fixation, or closed reduction and percutaneous pinning. However, all of these methods have many complications.<sup>(11)(29)(30)(31)(32)(33)(34)(35)(36)(37)(38)</sup>

Closed reduction and percutaneous pinning are considered the optimal method of treatment.<sup>(26)(27)(28)</sup> Open reduction is indicated for irreducible fractures, neurovascular compromise, and open injuries.<sup>(13)(39)</sup>

The best methods of pin fixation have a continuous debate in the literature. They include lateral parallel, lateral divergent, or crossed Kirschner wires.<sup>(36)(40)(41) (42)</sup> Current textbooks and studies describe the crossed-pin procedure as the ideal treatment, except when the medial epicondyle or the ulnar nerve cannot be palpated. However, several studies report that percutaneous lateral cross pinning, performed correctly, is effective in maintaining reduction and stability.<sup>(6)(36)(43)(44)(45)(46)</sup>

The frequency of ulnar nerve injuries in many series