A Systematic Review of Medial and Lateral Entry Pinning versus Lateral Entry Pinning for Supracondylar Fractures of the Humerus in Children

SYSTEMATIC REVIEW
Submitted for Partial Fulfillment Of the Master Degree in Orthopedic Surgery

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2017

سورة البقرة الآية: ٣٢

I wish to express my deep appreciation and gratitude to **Prof. Dr. Ayman Hussain Gooda,** *Assistant Professor of Orthopedic Surgery, Faculty of Medicine, Ain Shams University and* **Dr. Abdel Rady Mohamoud Abdel Rady,** *Lecturer of Orthopedic Surgery, Faculty of Medicine, Ain Shams University for their academic supervision, guidance, constant encouragement and valuable advice which were essential for the completion of this study.*

I cannot forget ***my great wife, my daughter, my father, my mother and my big family*** *who supported me and facilitate difficulties. I cannot finish this work without them.*

Ahmed Ibrahim Aref

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ABSTRACT AND KEY WORDS

ABSTRACT: The supracondylar fracture of the distal humerus is the most common pediatric fracture in the elbow. This systematic review summarizes the existing data about the effect of medial and lateral (medial/lateral) entry pins versus only lateral entry pin fixation on the risk of iatrogenic nerve injury and deformity or loss of reduction.

A literature search identified clinical trials and observational studies presenting the probability of nerve injury and/or deformity or loss of reduction associated with closed reduction and either medial/lateral entry or lateral entry pinning of supracondylar fractures in pediatric patients. Data from 2054 children were identified from 35 studies; 2 randomized trials, 6 cohort studies, and 25 case series. For operative fixation with medial/lateral entry pins, the probability of ulnar nerve injury is 5.04 times higher than with lateral entry pins. When all documented operative nerve injuries are included, the probability of iatrogenic nerve injury is 1.84 times higher with medial/lateral entry pins than with isolated lateral pins. Medial/lateral pin entry provides a more stable configuration, and the probability of deformity or loss of reduction is 0.58 times lower than with isolated lateral pin entry. When the prospective studies alone were analyzed, there were no significant difference in the probability of iatrogenic nerve injury or deformity and

displacement, although the confidence intervals were wide. This systematic review indicates that medial/lateral entry pinning, of pediatric supracondylar fractures, remains the most stable configuration and that care needs to be taken regardless of technique to avoid iatrogenic nerve injury and loss of reduction.

Key words: elbow fracture, supracondylar fracture, and systematic review.

Supra condylar fracture in children

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.[1] They occur most frequently at age between 5 and 10 years[2] 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.[3]

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.[4]

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. [1][5][6][7][8]

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.[6][9]

Gartland classified supracondylar humeral fractures in children into three types: Type I un-displaced fracture, type II displaced fracture with intact posterior cortex, and type III displaced fracture with no cortical contact.[10,11,12]

This classification was modified by Wilkins to allow for rotational deformity: Type I un-displaced 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.[11,12]

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%.[2,12]

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.[10]

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.[2,5]

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.[13]

Initial x-rays should always be obtained before elbow manipulation. Comparison views sometimes may be required to evaluate centers of ossification.[15]

Treatment of types I and IIA are mainly in an above elbow cast.[12]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.[11,13]

Closed reduction and percutaneous pinning are considered the optimal method of treatment. [9] Open