

Type III Supracondylar Fractures of the Humerus in Children – Straight-Arm Treatment

J Gandhi, G Horne

Citation

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Abstract

Introduction: Gartland type III supracondylar fractures are a common injury in children. We present a method of manipulative reduction, immobilisation and fixation using a Plaster of Paris with the elbow in full extension (straight-arm). **Method:** Retrospective study looking at all patients with Gartland type III supracondylar fractures in Wellington Public Hospital during the period of February 1999 until March 2007, under the care of the senior author. The seven patients had been treated in the straight-arm technique with the outcomes reviewed in this study. **Result:** All parents were satisfied with the results. Using the Flynn criteria⁶, six patients achieved excellent results and one good when looking at the carrying angle. When looking at the range of motion four patients had good results, one fair and two poor. **Conclusion:** Straight-arm treatment of Gartland type III supracondylar fractures appears to be a non-invasive and safe alternative to K-wire fixation.

INTRODUCTION

Supracondylar fracture of the humerus occurs at the metaphyseal bone, proximal to the elbow joint, and does not involve the growth plate.¹ The extension type of supracondylar fracture of the humerus is the most common, occurring in 95% of cases.²

The most frequently used methods of treatment are closed reduction and application of a cast, traction (skeletal or skin), closed reduction and percutaneous Kirschner-wire (K-wire) fixation, and open reduction with internal fixation.³ Management of the displaced fracture is fraught with problems, including Volkmann's ischaemic contracture, cubitus varus deformity, and difficulty obtaining and maintaining reduction.^{3,4}

Supracondylar fractures of the humerus are usually classified according to the system described by Gartland.⁵ Type I fractures are not displaced. Type II fractures are partially displaced, but some contact remains between the proximal and the distal fragment. Type III fractures are completely displaced.

A method of manipulative reduction, immobilisation and fixation using a Plaster of Paris with the elbow in full extension for type III supracondylar fractures of the humerus in children is presented here. A study by Chen et al.²

presented a similar method of reduction and immobilisation with promising results.

METHOD

A retrospective study was carried out. The population consisted of all patients who had Gartland type III supracondylar fractures who attended Wellington Public Hospital during the period of February 1999 until March 2007 under the care of the senior author. A hospital patient database was used to access potential patients. The search criteria were as follows; no date criteria, limited to those cases in which the senior author was directly involved in the case, limited to those cases in which the patient was 16 years of age or under at time of surgery. The search led to a list of 98 patients. The notes of these patients were obtained through the hospital medical records and read through to determine if the patient had a Gartland type III fracture. There were seven patients with this type of fracture.

The mean age of patients at the time of fracture was six years and two months. The range was between 4 years 3 months and 8 years 5 months. All patients who presented with a Gartland type III fracture during the study period were treated with the straight arm technique.

Once the diagnosis of Gartland type III fracture was made with clinical and radiological data, the patient was taken to

the operating theatre (OT). A well moulded above elbow Plaster of Paris cast was applied with the elbow in full extension. The carrying angle was matched with the opposite unaffected elbow. An anterior-posterior (AP) radiograph was taken in the OT to ensure that Bauman's angle was less than 80 degrees. The patient was discharged once comfortable and seen again in one week's time. At this time an AP radiograph was ordered to check Bauman's angle. No lateral radiograph was done as this did not contribute to the management.

The date of assessment for this study ranged from 7 months after the date of the injury to 5 years.

The grading of results was assessed using the criteria by Flynn et al.₆ (Table 1). This is used to compare the motion and carrying angle of the affected and unaffected elbow. Pirone et al.₃ mentioned in their study that this is the most rigorous grading method in the literature and is recommended to facilitate comparative studies. The function is graded in 5 degree intervals of loss of the total arc of flexion and extension, and the cosmetic appearance of the elbow is graded in 5 degree intervals of change in the carrying angle. A poor grade was adopted if there was any varus angulation. The lower of the two grades is adopted as the over-all grade.

The neurovascular status of the injured limb was determined including the radial, ulna and median nerves, and radial artery. Parents of each child were asked if they were satisfied with the result.

Figure 1

Table 1: Criteria for Grading Results

Results	Rating	Cosmetic Factor: Loss of Carrying Angle (Degrees)	Functional Factor: Loss of Motion (Degrees)
Satisfactory	Excellent	0-5	0-5
	Good	6-10	6-10
	Fair	11-15	11-15
Unsatisfactory	Poor	>15	>15

RESULTS

Figure 2

Table 2: Results

Results	Rating	Cosmetic Factor: Loss of Carrying Angle	Functional Factor: Loss of Motion
Satisfactory	Excellent	6	4
	Good	1	0
	Fair	0	1
Unsatisfactory	Poor	0	2

Using the lower of the two grades as the over-all grade (functional factor) Table 2 indicates 71% of patients had a satisfactory outcome and 29% of patients had an unsatisfactory outcome. The patients with poor outcomes had a loss of flexion/extension of 22 and 23 degrees with the reduction in extension being 3 degrees. The cosmetic assessment revealed all patients had an excellent or good result.

All injured limbs had completely intact neurological function and vascular status. All patients/parents were pleased with results.

Figures 1 and 2 are radiographic images of the same patient before and after the straight-arm technique.

Figure 3

Figure 1: Fracture



Figure 4

Figure 2: Healed



DISCUSSION

The most common method of treatment of Gartland type III fractures is closed reduction with K-wire fixation. This method necessitates two operations, the second to remove the K-wires. Pirone et al.³ presented 96 cases with 75 excellent results, 15 good, one fair and five poor results.

Khurram et al.⁶ treated 48 patients with closed or open reduction and crossed K-wires. 30 obtained excellent results, nine good, four fair and none had a poor result.

Chen et al.² used the straight arm method to treat Gartland type III fractures and obtained promising results but did not use the Flynn criteria⁶ to evaluate the results. 49 patients were treated with this method with only one patient having a reduced carrying angle (less than 5 degrees).

We present a small series treated with the straight-arm method. Using the Flynn criteria⁶, this method appears to produce a slightly inferior result compared to using closed reduction and K-wiring. However given the intra-observer

error in measuring range of movement, and the weight placed on range of movement by the Flynn assessment method, the results are likely not significantly different. The advantages of the straight-arm method include the absence of fixation devices and the need for further surgery to remove them being eliminated. Pirone et al.³ noted superficial wire-tract infections had developed in some cases. The K-wire fixation method resulted in an 18% vascular complication rate and neural complications in 13%.⁶

No complications were recorded with the straight-arm method of treatment.

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Author Information

Jamish Gandhi, MBChB

General Surgical Registrar, Hutt Hospital

Geoffrey Horne, PhD, MBChB

Professor Orthopaedic Surgeon, Wellington Hospital