

TYPE III SUPRACONDYLAR FRACTURES OF THE HUMERUS IN CHILDREN – STRAIGHT-ARM TREATMENT

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ABSTRACT

Objective: Gartland type III supracondylar fractures are a common injury in children. We present a method of manipulative reduction, immobilization and fixation using Plaster of Paris with the elbow in full extension (straight-arm). **Method:** Retrospective study analyzing all patients with Gartland type III supracondylar fractures at the Wellington Public Hospital during the period from February 1999 to March 2007. The seven patients had been treated with the straight-arm technique, and the clinical outcomes are reviewed in this study. **Result:**

All the parents were satisfied with the results. Using the Flynn criteria, six patients achieved excellent results and one good, in relation to the carrying angle. With regard to 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.

Keywords: Humeral fractures. Child. Elbow. Fracture fixation, Internal.

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INTRODUCTION

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

The most frequent treatment methods are closed reduction and plaster cast application, traction (skeletal or cutaneous), closed reduction and percutaneous fixation with Kirschner wires (K wire), and open reduction with internal fixation.³ The treatment of the fracture with displacement is replete with problems, including Volkmann's ischemic contracture, cubitus varus deformity and difficulty in achieving and maintaining the reduction.^{3,4}

Supracondylar fractures of the humerus are, in general, classified according to the system described by Gartland.⁵ Type I fractures do not have displacement. Type II fractures have partial displacement, but a certain degree of contact is maintained between the proximal and distal fragments. Type III fractures have complete displacement.

This study presents a method of manipulative reduction, immobilization and fixation using plaster of Paris with the elbow in full extension for type III supracondylar fractures of the humerus in children. A study by Chen *et al.*² presented a similar method of reduction and immobilization, with promising results.

METHOD

A retrospective study was conducted. The population consisted of all the patients that had Gartland type III supracondylar fractures treated at Wellington Public Hospital during the period from February 1999 to March 2007, by the main author. The hospital's database was employed for access to the possible patients. The search criteria were the following: without date criteria, limited to the cases in which the main author was directly involved, limited to the cases in which the patient was 16 years of age or under at the time of surgery. The search led to a list of 98 patients. The information on these patients was obtained in the medical records of hospital and was read to determine whether the patient had a Gartland type III fracture. There were seven patients with this kind of fracture.

The mean age of the patients at the time of the fracture was six years and two months. The age bracket ranged from 4 years and 3 months to 8 years and 5 months. All the patients that exhibited type III Gartland fracture during the study period were treated with the straight-arm technique.

When the diagnosis of type III Gartland fracture was made with clinical and radiological data, the patient was taken to the operating room (OR). A well-molded plaster cast reaching above the elbow was applied with the elbow in full extension. The alignment angle was compatible with the intact opposite elbow. An anterior-

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posterior (AP) radiograph was taken in the OR to guarantee that the Bauman's angle was below 80 degrees. The patient was discharged as soon as he or she felt comfortable and came back for a new appointment in one week. On this occasion an AP radiograph was requested to verify the Bauman's angle. No lateral radiograph was taken as this exposure did not contribute to the treatment.

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

The scaling of results was evaluated by the criteria of Flynn *et al.*⁶ (Table 1). It is used to compare the movement and the angle of alignment of the affected elbow and of the intact elbow. Pirone *et al.*³ mentioned in their study that this is the most stringent scaling method in literature, and is recommended to facilitate comparative studies. Function is classified at intervals of 5 degrees of loss of the total flexion and extension arch, and the appearance of the elbow is classified at intervals of 5 degrees of change of the angle of alignment. A low degree is adopted if there is varus angulation. The lower of the two degrees is adopted as the most comprehensive degree.

Table 1 – Criteria for the scaling results.^{3,6}

Results	Scaling	Esthetic factor: Loss of the angle of alignment (degrees)	Functional factor: Loss of movement (degrees)
Satisfactory	Excellent	0-5	0-5
	Good	6-10	6-10
	Moderate	11-15	11-15
Unsatisfactory	Poor	> 15	> 15

The neurovascular state of the injured limb was determined including the radial, ulnar and median nerves and the radial artery. The parents of each child were asked whether they were satisfied with the result.

RESULTS

Using the lower of two degrees as the most comprehensive (functional factor), Table 2 indicates that 71% of the patients had a satisfactory outcome and 29% had an unsatisfactory outcome. The patients with poor outcomes had loss of flexion and extension of 22 and 23 degrees, whereas the reduction of the extension was 3 degrees. The esthetic evaluation revealed that all the patients had excellent or good results.

Table 2 – Results.

Results	Scaling	Esthetic factor: Loss of the angle of alignment	Functional factor: Loss of movement
Satisfactory	Excellent	6	4
	Good	1	0
	Moderate	0	1
Unsatisfactory	Poor	0	2

All the injured limbs had totally intact neurological function and vascular state. All the patients and parents were pleased with the results.

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

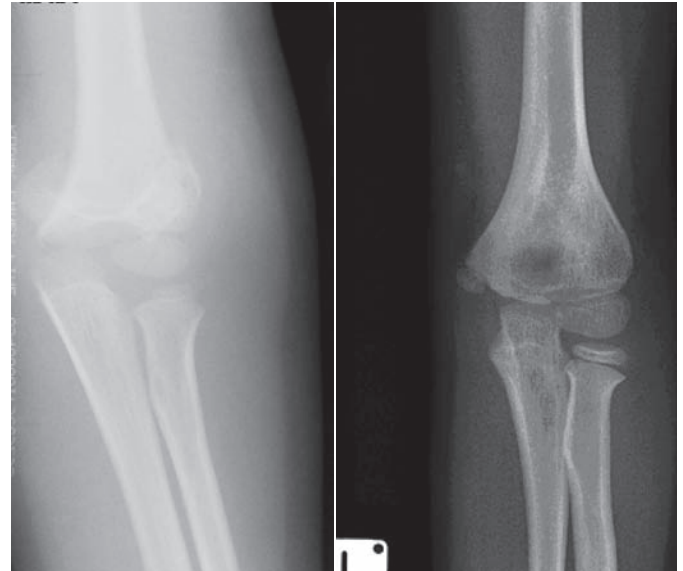


Figure 1 – Fracture

Figure 2 – Consolidated

DISCUSSION

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

Barlas and Baga⁷ treated 48 patients with closed or open reduction and crossed K wires. Thirty patients obtained excellent results, nine good, four moderated, and none poor.

Chen *et al.*² used the straight-arm method to treat type III Gartland fractures and achieved promising results, but did not employ the criteria of Flynn⁶ to evaluate the results. Forty-nine patients were treated with this method, whereas only one of them had reduction of the angle of alignment (below 5 degrees).

We presented a small series of patient treated with the straight-arm method. Using the criteria of Flynn *et al.*⁶, this method appears to produce a slightly inferior result in comparison with the one that uses closed reduction and fixation with K wire. However, considering the intra-observer error in the measurement of range of movement, and the weight given to the range of movement in the evaluation by Flynn, the results probably have no significant difference. The advantages of the straight-arm method are the absence of fixation devices and of the need for further surgery to remove them. Pirone *et al.*³ verified that superficial infections developed due to use of the wire in a number of cases. The fixation method with K wire resulted in a rate of 18% of vascular complications and of 13% of neural complications.⁶

No complication was recorded with the straight-arm treatment method.

REFERENCES

1. Skinner HB. editor. Current diagnosis and treatment orthopedics, 4th ed. New York: McGraw-Hill Medical; 2006.
2. Chen RS, Liu CB, Lin XS, Feng XM, Zhu JM, Ye FQ. Supracondylar extension fracture of the humerus in children. Manipulative reduction, immobilisation and fixation using a U-shaped plaster slab with the elbow in full extension. J Bone Joint Surg Br. 2001;83:883-7.
3. Pirone AM, Graham HK, Krajbich JI. Management of displaced extension-type supracondylar fractures of the humerus in children. J Bone Joint Surg Am. 1998;70:641-50.
4. Palmar EE, Niemann KMW, Vesely D, Armstrong JH. Supracondylar fracture of the humerus in children. J Bone Joint Surg Am. 1978;60:653-6.
5. Gartland JJ. Management of supracondylar fractures of the humerus in children. Surg Gynecol Obstet. 1959;109:145-54.
6. Flynn JC, Matthews JG, Benoit RL. Blind pinning of displaced supracondylar fractures of the humerus in children. Sixteen years' experience with long-term follow-up. J Bone Joint Surg Am. 1974;56:263-72.
7. Barlas K, Baga T. Medial approach for fixation of displaced supracondylar fractures of the humerus in children. Acta Orthop Belg. 2005; 71:149-53.