

Blount Method in the Management of Supracondylar Fractures of the Humerus in Children

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Abstract

Supracondylar fractures of the humerus are the most common traumatic elbow injury in children. Several techniques are described in their support. Blount's method is one of the widely used orthopedic means. The objective of our study was to evaluate the results of supracondylar fractures of the humerus treated by this method in our department. This was a descriptive, longitudinal study with the prospective collection over a period of 12 months from May 2018 to April 2019. It focused on children aged 0 to 15 years treated in the Orthopedic Traumatology Department of the CHU of Kati for a supracondylar fracture of the humerus in extension. A minimum follow-up period of 6 months was necessary for inclusion. 12 patients were collected. The sociodemographic, anatomopathologic, therapeutic and evolutionary aspects were studied. The results were evaluated according to Flynn's criteria. The male sex was predominant with a ratio of 2. The average age was 5.5 years. The average admission time was 12.5 hours. Domestic accidents were the main etiology (66.66%) and Type II fracture was the most frequent with 58.33%. The duration of immobilization was 42 days for 11 patients. Complications were 1 case of secondary displacement and 1 case of 12° flexion deficit. The average Baumann angle was 72°. The result was satisfactory for all our patients. Supracondylar fractures of the humerus are common in children, especially boys. The method of Blount when it is well carried out by respecting the indications gives good results.

Keywords

Supracondylar Humerus Fracture, Children, Blount Method

1. Introduction

Supracondylar fractures of the humerus are frequent lesions in pediatric traumatology. They represent 50% to 75% of all elbow fractures [1] [2]. Their etiology remains dominated by domestic and sports accidents. Two large groups are distinguished according to the mechanism: extension fractures (95%) which reveal an indirect mechanism and flexion fractures (5%) occurring following a direct mechanism [3]. Their management still remains a challenge due to complications dominated by compartment syndrome and late sequelae specially stiffness and malunions. Since the first report by Lagrange and Rigault [4] to the French Society of Orthopedic and Traumatological Surgery (SOFOT) in 1962, Blount's method has occupied an important place in the treatment of supracondylar fractures of the humerus in children.

The aim of this study was to evaluate the results of supracondylar fractures of the humerus treated by this method in our department.

2. Methodology

This was a descriptive, longitudinal study with a prospective collection that took place over a period of 12 months from May 2018 to April 2019. Our study sample was made up of all patients aged 0 to 15 with extensional SFH treated according to the Blount method [4] in the Orthopedic Traumatology Department of the Kati University Hospital. A minimum period of 6 months was necessary for inclusion. We identified 71 cases of elbow fractures in all ages including 39 cases of SFH in children. 12 cases met our criteria and were included in the study. **The 27 other patients were treated by pinning or by the Blount method, with a follow-up of less than 6 months.**

The fractures were classified according to the classification of Lagrange and Rigault [5]. The realization of the treatment method was carried out in two stages: reduction and contention. In case of swelling of the elbow, it was deferred after a period of elevation of the limb.

Reduction: This is performed under general anesthesia, in the supine position using a Brilliance's amplifier. Reduction begins with traction in the longitudinal axis of the limb to disengage the fracture site. The correction of the displacement in the frontal plane is carried out by lateral pressure on the distal fragment. The forearm is carried in supination or pronation depending on the direction of displacement of the epiphyseal fragment. The posterior tilt is corrected by direct pressure on the olecranon while bringing the elbow in flexion (**Figure 1**).

Contention: This is ensured by a padded tubular jersey forming a collar and an armband which are connected to maintain the elbow in flexion of 120° (**Figure 2**).

An information interview with the parents of all children on clinical monitoring and compliance with the device was carried out. The radiographic checks were carried out on D1, D7, D14 and D21, and then the device was brought back from 120° to 90° flexion for 2 to 3 weeks. The reduction judgment criteria were



Figure 1. Type III supracondylar fracture reduced by Blount method.



Figure 2. Contention by Blount method.

based on the appreciation of the Baumann angle ($72^\circ \pm 5^\circ$), the anteversion of the paddle (humero-condylar angle: $30^\circ - 40^\circ$) and the rotation of the distal fragment. The assessment of the results at the last follow-up was made according to the Flynn criteria (**Table 1**) [6].

3. Results

The male sex was predominant with 66.66% of cases. The average age was 5.5 years with extremes of 3 years and 9 years. 91.66% of patients were admitted within the first 24 hours after the trauma. The average delay was 12.5 hours with extremes of 1 and 24 hours. The suspension of the limb was necessary in three patients for the melting of the swelling. The fracture concerned the non-dominant limb with 8 cases. Domestic accidents were the main etiology of fractures with 8 cases or 66.66%. Type II fracture was the most common with 7 or 58.33%. The reduction technique was performed by a resident in the last year of training (5th year) in 50% (6 cases) and by a surgeon in 50% (6 cases). Brillance's amplifier was used in 75% of patients (9 cases). The duration of immobilization was 42 days for 11 patients. Complications were 1 case of secondary displacement and 1 case of 12° elbow flexion deficit with respect to the contralateral side. The Baumann angle was normal in almost all of our patients with 11 cases or 91.67%. The average angle was 72° ($62^\circ - 75^\circ$). The result was satisfactory in all our patients with 83.33% excellent, 8.33% good and 8.33% fair (**Figure 3**).

Table 1. Flynn's criteria.

Result	Rating	Cosmetic factor: carrying angle (°)	Functional factor motion loss (°)
Satisfactory	<i>Excellent</i>	0 - 5	0 - 5
	Good	5 - 10	5 - 10
	Fair	10 - 15	10 - 15
Unsatisfactory	Poor	>15	>15

Source: Flynn, J.C., *et al.* (J Bone Joint Surg Am, 56(2): 263-272, 1974) [6].



Figure 3. Radiographic and functional image of the left elbow three years after the fracture in a 9-year-old patient.

4. Discussion

Elbow injuries are a frequent reason for consultation in pediatric traumatology. Supracondylar fractures are by far the most common anatomical entity with up to 50% - 75% [1] [2]. They occur preferentially in boys [7]. The average age in the literature varies between 5 and 7 years [2] [8] [9]. In our series, the average age was 5.5 years. According to Metaizeau and Dimeglio [10], the occurrence of the fracture at this age is explained by two anatomical characteristics of the child's elbow, namely ligament laxity responsible for hyperextension and the fragility of the supracondylar region between 5 - 10 years in relation to the importance of remodeling under the effect of growth. The main etiology of fractures was domestic accidents with 66%. This etiological predominance is variable from one series to another. It remains dominated by sports accidents [7] [11] and domestic accidents [12] [13]. We noted an average consultation time of 12.5 hours. Kinkpé [14] in Senegal reported a longer average delay of 30 hours (1 - 240 hours). This delay was on the other hand 6 hours at Badina [15] in France. The long delay in the African series is generally linked to the influence of traditional medicine. In the event of trauma, the parents of the children tend to consult the bonesetters first. The manipulations of the latter contribute to the accentuation of the inflammatory phenomenon at the level of the elbow and thus making the realization of the Blount method difficult or even impossible in an emergency. These practices increase the time required to perform the Blount method. In the Kinkpé [14], Devnani [16] and Gupta [17] series, the time to treatment had no

influence on the anatomical result. In the initial description of the technique by Blount in 1954 [4], the stability of the fracture is ensured in flexion by the presence of the posterior periosteum, the effect of which is supplemented by the triceps. The author does not recommend it in case of neurovascular deficit or significant displacement associated with severe swelling. Since the description of the technique, it has been widely reported in the literature as a means of treatment in Types I, II and III fractures [8] [9] [10] [11] [15]. However, despite the presumed involvement of the posterior periosteum in Type IV fractures, many authors have extended the technique to this type [11] [14] [18] [19] which is usually treated surgically. For Kinkpé [14], involvement of the posterior periosteum is rather exceptional in Type IV fractures, insofar as all these patients remained stable after reduction. The main complications of the Blount method are ischemia secondary to flexion of an inflamed elbow and secondary displacement of the fracture site by melting of the swelling or insufficiency of the device. The awareness and collaboration of the child's family are essential to the success of the method. We did not note any vascular complications. Whenever the swelling of the elbow appeared significant, an elevation of the limb was performed with jersey in combination with a non-steroidal anti-inflammatory suppository and the application of ice. This attitude was reported by Kinkpé [14]. We noted a case of secondary displacement by disassembly of the device by the radiographer during the realization of the control radiography on D1 post-reduction. A recovery was carried out immediately and the evolution was favorable. The duration of immobilization according to our protocol was six weeks (42 days). It was effective in 11 (91.6%) patients. The only Type I case was an exception with 5 weeks, 3 of which were in the flexion position. The duration of immobilization is widely variable according to the authors. Pham [8] in France reports an average duration of the flexion retainer of 26.6 days (16 - 49 days); 28% of these patients had additional immobilization with an average of 16.6 days (7 - 35 days). Muccioli [20] in his study on Supracondylar fractures of the humerus Gartland 3 found an average duration of immobilization of 4.3 weeks (3 - 8 weeks). Thomas [9] was immobilized for 4 weeks. Chagou [11] reported an immobilization period of 30 days. At the last follow-up, the Baumann angle was normal in almost all of our patients with 11 cases or 91.67%. A mean angle of 72° was found (62° - 75°). This value corroborates the data from the literature with a variable mean of 68° to 78° [9] [11] [14] [20]. According to Flynn's criteria, our results were satisfactory in all our patients with 83.33% (n = 10) excellent, 8.33% (n = 1) good and 8.33% (n = 1) passable. Despite the small size of our sample, this result, like those in the literature [10] [13] [18] [19], shows the reliability of the Blount method in the management of supracondylar fractures in the extension of the humeral paddle in children.

5. Conclusion

Supracondylar fractures of the humerus are the most common and serious elbow

fractures in children. They predominate in boys aged between 3 and 9 years. It is a therapeutic emergency before the constitution of a significant swelling which will delay the definitive treatment. The Blount method gives satisfactory results, it still requires a learning curve. The information and collaboration of the parents of the children are essential for the success of this method.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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