

Gartland Extension Type 2 Supracondylar Fractures Of The Humerus In Children: Conservative Or Surgical Management?

Dr. Vulasala Srinivasalu (M.S. ORTHO)¹, Dr. Thonangi Yeshwanth, M.S. ORTHO, FISS², Dr. S. Sasi Bhushana Rao, M.S. ORTHO, Mch ortho³, Dr. Marrapu Venkata Vinay (M.S. ORTHO)⁴

¹(Junior resident, Department of Orthopaedics, Maharajah's institute of medical sciences, Nellimarla, Vizianagaram, Andhra Pradesh-535217.),

²(Assistant Professor of Orthopaedics, Department of Orthopaedics, Maharajah's institute of medical sciences, Nellimarla, Vizianagaram, Andhra Pradesh-535217.),

³(HOD & Professor, Department of orthopaedics, Maharajah's institute of medical sciences, Nellimarla, Vizianagaram, Andhra Pradesh-535217, India.),

⁴(Junior resident, Department of Orthopaedics, Maharajah's institute of medical sciences, Nellimarla, Vizianagaram, Andhra Pradesh-535217.)

ABSTRACT:

Background: Controversy exists to date in the treatment of Gartland extension type-2 supracondylar fractures of the humerus. Our study aims to compare the outcomes of conservative and operative treatment for Gartland type 2 fractures in children.

Materials and Methods: This prospective study included 30 patients with Gartland extension type 2 supracondylar humerus fractures. 15 patients were treated conservatively and 15 were treated operatively. The functional outcome was assessed using Flynn's criteria and the radiological outcome was assessed by measuring Baumann's angle.

Results: According to Flynn's criteria 10 (66.6%) patients had excellent results in both the conservative versus operative group at the final visit & the p-value is 0.91. The mean Baumann's angle in the conservative group was 79.93° and in the operative group was 79.20° & the p-value is 0.80. There was statistically no significant difference in the functional and radiological outcomes between the two groups.

Conclusion: Gartland Type-2 supracondylar humerus fractures can be successfully treated with conservative management without significant complications if the reduction is achieved and maintained at less than 90° of elbow flexion.

Keywords: Elbow fractures in children, supracondylar fracture of the humerus, Gartland classification, Baumann's angle, pediatric elbow fracture treatment.

Date of Submission: 05-03-2023

Date of Acceptance: 17-03-2023

I. INTRODUCTION:

Supra-condylar fractures of the humerus (SCFH) are the most common elbow fractures in children accounting for about 50-60%.¹ Anatomically, these fractures are classified as flexion and extension types. Typically, these fractures are extension-type with an incidence of about 96-98%.²

Gartland classified extension type fractures into 3 types - type 1 (un-displaced), type 2 (displaced with intact posterior cortex), and type 3 (complete displacement with a breach in the posterior cortex).³

Treatment of type 1 & type 3 fractures is widely accepted as conservative and surgical management respectively. There is no consensus in the literature regarding the management of type -2 SCFH. France et al stated that inadequate reduction or loss of reduction after conservative management may lead to deformities of the elbow⁴, but Hadlow et al showed that pinning every type 2 supracondylar fracture resulted in unwanted surgery in as many as 77% of the cases.⁵

Our study aims at comparing conservative versus operative management of type-2 SCFH in terms of functional and radiological outcomes.

II. MATERIALS AND METHODS :

Ours is a prospective comparative study done from January 2021 to June 2022. All the children under 15 years of age who were admitted to our institute with SCFH were evaluated both clinically and radiologically.

Inclusion criteria:

- Age group 1-11 years,
- Gartland type 2 SCFH,
- closed fractures
- No neurological deficit.

Exclusion criteria:

- Gartland type-1 and type-3 fractures,
- Age:<1 year or >15 years,
- Fractures associated with neurological deficit or head injury and
- Polytrauma patients.

Methodology

30 children were included in the study based on inclusion criteria. After evaluation, all the children were shifted to the operation theatre, sedation was given by the anesthetist & reduction maneuvers were performed under sedation. The reduction was considered stable if the anterior humeral line (AHL) intersects the capitellum on lateral radiographs and Baumann’s angle within 10° of opposite side on AP view & unstable if the AHL is anterior to capitellum, change in Baumann’s angle >10° or more than 90° of elbow flexion required to maintain the reduction. If fracture reduction was stable after reduction maneuvers, they are treated conservatively with the above elbow posterior pop-slab. If fracture reduction was unstable, they were treated surgically either by closed or open reduction and percutaneous pinning technique in the same sitting. In all patient’s slab was removed at 3 weeks and physiotherapy was initiated. In the operative group, the k-wires are removed at 4 weeks. Patients were reviewed at regular intervals; elbow ROM and radiographs were assessed. Outcomes at the end of the 6-month postoperative period were compared between the two groups. Loss of carrying angle and elbow ROM was evaluated using Flynn’s criteria and the radiological outcome was evaluated by using a change in Baumann’s angle and compared between the two groups. Student’s t-test & chi-square test was used to evaluate the differences between the groups, using p<0.05 as the cut-off for statistically significant differences.

III. RESULTS:

30 patients were included in the study. 15 of the patients were treated conservatively and 15 were treated operatively. The mean age in the conservative group was 6.06 years and in the operative group was 8.33 years. 16 out of 30 patients were boys and 14 were girls. 2 patients in the conservative and 1 patient in the operative group developed cubitus varus deformity. 1 patient in the operative group developed superficial pin tract infections which is treated successfully with oral antibiotics. Hospital stay was significantly lower in the conservative group than in the operative group.

The mean Baumann’s angle in the conservative group is 79.93 and in the operative group is 79.20. No statistically significant difference exists between the two groups (p=0.80) concerning the radiological outcome.

Flynn’s criteria were reported as excellent in 10 (66.6%), good in 2(13.3%), fair in 1(6.6%), and poor in 2(13.3%) in the conservative group. Whereas in the operative group, the results were excellent in 10 (66.6%), good in 3(20%), fair in 1(6.6%), and poor in 1 (6.6%) patient. No significant statistical difference exists between the two groups (p=0.91) concerning functional differences.

	Conservative group	Operative group	P value
Mean	79.93	79.20	0.8006
SD	8.08	7.66	

TABLE 1: BAUMANN’S ANGLE AT THE FINAL VISIT

	Conservative group		Operative group	
	3 months	6 months	3 months	6 months
Excellent (0-5°)	8(53.3%)	10(66.6%)	10(66.6%)	10(66.6%)
Good (6-10°)	4(26.6%)	2(13.3%)	3(20%)	3(20%)
Fair (11-15°)	1(6.6%)	1(6.6%)	1(6.6%)	1(6.6%)
Poor (>15°)	2(13.3%)	2(13.3%)	1(6.6%)	1(6.6%)

TABLE 2: FLYNN’S CRITERIA AT 3RD MONTH AND 6TH MONTH FOLLOW-UP

Illustrations (figures):

FIGURE 1: CONSERVATIVE GROUP:



1.(a-b)-Pre-reduction radiographs,(c-d) -post-reduction radiographs ,(e-f) radiographs at final visit



The clinical picture at the final visit

FIGURE 2: OPERATIVE GROUP



2.(a-b)-Pre-reduction radiographs,(c-d)-post-operative radiographs,(e-f) radiographs after k-wire removal.



The clinical picture at the final visit

IV. DISCUSSION:

Treatment of Gartland type 2 SCFH in children remains controversial and confusing.⁶ These fractures can be treated by either conservative or surgical treatment. The fear of loss of reduction and poor cosmetic results associated with conservative management is compelling orthopedic surgeons to go for surgery in these fractures.⁷⁻¹⁰ However, complications like pin migration, irritation, infection, and risk of neurovascular damage associated with surgical management cause the surgeon to reconsider the conservative management of these fractures.⁵

Although Wilkin's modification to Gartland's classification may be helpful in decision-making¹¹, great difficulty exists in identifying the rotation of fragments in radiographs. The interobserver reliability of Wilkin's modification is variable, thus decision-making becomes arguable. With this uncertainty, the question arises if we are overtreating these fractures surgically where they can be managed conservatively, or undertreating them when we have to operate. So, our study aims at segregating those who need surgery from those who do not. In

our study, we decided whether to treat conservatively or surgically based on the stability of the fracture after the reduction maneuver and the degree of elbow flexion required to maintain the reduction.

No significant statistical difference was present between the two groups in terms of functional and radiological outcomes.

Previous studies used a range of motion and dash questionnaire to assess the functional outcome. But in our study, we used Flynn's criteria to evaluate the functional outcome and change in Baumann's angle to evaluate the radiological outcome. we encompassed more factors in evaluating the outcome of SCFH. Though there is evidence in literature based on Flynn's criteria it was from retrospective studies but ours is prospective. The conservative group has its obvious advantages like short duration of hospital stay, outpatient care, low-cost, no second procedure for implant removal, and lower apprehension for parents. So, it is essential to consider conservativemanagement but not at the risk of developing deformities in case of loss of reduction.

V. CONCLUSION:

Gartland type 2 supracondylar fractures of the humerus can be treated conservatively if the reduction is achieved & maintained at less than 90 degrees of elbow flexion. This will avoid the unnecessary exposure of the child to the stress of anesthesia and surgery. It is imperative to reserve surgical management for those requiring more than 90 degrees of elbow flexion for maintaining the reduction of the fracture.

Limitations of the study: The sample size in our study was relatively small owing to a very low prevalence. Clinical studies show supracondylar humerus fractures comprise less than 5% of all fractures in children and that the majority are treated conservatively.¹² There is a need for clinical studies with bigger sample sizes to achieve the statistical significance applicable to the population at large.

REFERENCES:

- [1]. Houshian S, Mehdi B, Larsen MS. The epidemiology of elbow fracture in children: analysis of 355 fractures, with special reference to supracondylar humerus fractures. *J Orthop Sci* 2001;6(4):312-5.
- [2]. Brubacher JW, Dodds SD. Pediatric supracondylar fractures of the distal humerus. *Curr Rev Musculoskelet Med.* 2008;1(3-4):190-196.
- [3]. Gartland JJ: Management of supracondylar fractures of the humerus in children. *Surg Gynecol Obstet.* 1959, 109:145-154.
- [4]. France J, Strong M. Deformity, and function in supracondylar fractures of the humerus in children variously treated by closed reduction and splinting, traction, and percutaneous pinning. *J Pediatr Orthop* 1992; 4: 494-498.
- [5]. Hadlow AT, Devane P, Nicol RO. A selective treatment approach to supracondylar fracture of the humerus in children. *J Pediatr Orthop.* 1996; 16:104-106.
- [6]. Camus T, MacLellan B, Cook PC, et al. Extension type II pediatric supracondylar humerus fractures: a radiographic outcomes study of closed reduction and cast immobilization. *J Pediatr Orthop.* 2011;31(4):366-371.
- [7]. Pirone AM, Graham HK, Kresbach JI. Management of displaced extension-type supracondylar fractures of the humerus in children. *J Bone Joint Surg Am.* 1988;70:641-650.
- [8]. Mazda K, Boggione C, Fitoussi F, et al. Systematic pinning of displaced extension-type supracondylar fractures: a randomized controlled trial. *J Pediatr Orthop B.* 2001; 10:131-137.
- [9]. Parikh SN, Wall EJ, Foad S, Wiersema B, Nolte B: Displaced type II extension supracondylar humerus fractures: Do they all need pinning? *J Pediatr Orthop* 2004;24(4):380-384.
- [10]. Ariyawatkul T, Eamsobhana P, Kaewpornasawan K. The necessity of fixation in Gartland type 2 supracondylar fracture of the distal humerus in children (modified Gartland type 2A and 2B). *J Pediatr Orthop B.* 2016 Mar;25(2):159-164.
- [11]. Leung S, Paryavi E, Herman MJ, et al. Does the modified Gartland classification clarify decision-making? *J Pediatr Orthop.* 2018 Jan;38(1):22-26.
- [12]. Peter M. Waters, David L. Skaggs, John M. Flynn. *Rockwood and Wilkins' Fractures in children.* 9th ed. Philadelphia : Wolters Kluwer, 2020. Chapter 12, evaluation of injured pediatric elbow: p.727-753.

Dr. Vulasala Srinivasalu, et. al. "Gartland Extension Type 2 Supracondylar Fractures Of The Humerus In Children: Conservative Or Surgical Management?." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(3), 2023, pp. 47-51.