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Original Article

Comparison of Treatment Modalities for Management of Pain in Pediatric Gartland Type I Extension Type Supracondylar Humerus Fractures Using Above Elbow Backslab (Splint Immobilization) Versus Collar and Cuff

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ABSTRACT

Objective: To compare the effectiveness of the above elbow backslab versus collar and cuff sling to treat Gartland Type I supracondylar fracture in terms of better pain control.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Orthopedic Surgery, Federal Government Polyclinic Hospital, Islamabad, Pakistan, from Jan 2020 to Jan 2021.

Methodology: The study enrolled a total of 60 pediatric patients who suffered from extension type Gartland Type I supracondylar fracture, with 30 patients allocated to one of two groups. In Group A, the fracture was managed by using above elbow backslab and in Group B, the collar and cuff sling was utilized. Post-treatment pain evaluation at the fracture site was done using the Visual Analogue Scale (VAS).

Results: The mean age of the patients was 7.35±1.94 years, comprising of 37(61.7%) males and 23(38.3%) females. Significant pain (VAS ≥4) was present in 4(13.3%) patients from Group A and 15(50%) patients from Group B, which was noted to be statistically significant (*p*-value=0.02).

Conclusion: Management of Supracondylar fracture Gartland Type I with above elbow backslab was associated with less incidence and decreased severity of pain as compared to management by collar and cuff.

Keywords: Above elbow backslab, Collar and cuff, Gartland Type I, Pain, Supracondylar fracture.

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INTRODUCTION

Supracondylar fractures (SCF) are the most prevalent type of fractures observed in pediatric populations aged 4-10 years,[1] accounting for 15% to 18% of all the fractures seen in the pediatric population.[2] In Pakistan, 31.7% of all the upper limb fractures in the pediatric population are supracondylar fractures with deficiency of vitamin D, especially in preschool children, being one of the main predisposing factors.[3] Recent studies have revealed no statistically significant variation in the gender-wise distribution of SCF contradicting previous knowledge regarding its increased incidence in male children.[4] Presently, SCF is broadly divided into extension type or flexion type with extension type being the most prevalent variety (98% of all SCFs) associated with the posteromedial or posterolateral displacement of the distal fracture segment,[5] as a consequence of falling on an outstretched hand with elbow extended.[6] The flexion type is much rarer and constitutes only 2-3% of all SCFs encountered.[7] SCFs are associated with a variety of complications, and if timely diagnosis and effective management are delayed, these may result in irreversible catastrophic events, leading to permanent loss of limb function or amputation. Pediatric SCFs are classified in order to standardize a management plan as per the severity of the displaced fracture segment,[8,9] with Gartland Type I (GT-I) as a non-displaced fracture that is primarily managed conservatively by immobilization of the fracture segments, Gartland Type II as a displaced fracture with intact posterior hinge, while Gartland Type III labelled a completely displaced fracture.[10] Despite significant advancements, choosing a better and preferred approach for immobilization of GT-I fracture in terms of better pain relief still remains a topic of controversy among surgeons. Therefore, the aim of this study was to compare pain and discomfort in our local pediatric

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population, treated with above elbow back slab and collar and cuff sling for GT-I fractures.

METHODOLOGY

This study took place at the Department of Orthopedic Surgery, Federal Government Polyclinic Hospital, Islamabad, Pakistan, from January 2020 to January 2021, after obtaining approval granted by the Ethical Review Committee via letter serial no # No.F.1-1/2015/ERB/SZABMU/. For calculating sample size, World Health Organization (WHO) sample size calculator was used, using following parameters: 95% power of the test, 5% level of significance, pain with collar and cuff 80% and pain with the above elbow backslab 5%.[11,12] Based on these, the total sample size of 60 patients, with 30 patients in each group was calculated. Patients were selected through non-probability consecutive sampling after getting informed written consent and divided into two equal groups by using the paper lottery method prior to the treatment.

Inclusion Criteria: Patients belonging to either gender, with age ranging from 4-12 years, presenting in the Accident and Emergency Department with extension type GT-I SCF.

Exclusion Criteria: Patients with neurovascular complications, additional injuries, or fractures on the same or other limb, intellectual disability, or verbal or hearing impairment were excluded along with those children whose parents or guardians did not give consent on their behalf.

All patients underwent initial rapid assessment and were then referred to the Trauma Orthopedic team. ATLS protocol was adhered to during management where the mechanism of injury was inquired, and adequate intravenous analgesia was administered as per guidelines, neurovascular examination of the injured limb was done, and possible associated complications were all ruled out. After providing initial pain relief plain, x-ray films (2 views) of the injured as well as the opposite elbow were obtained for relative comparison and x-ray images of a joint above and below the injured joint were also obtained to diagnose any additional injury of the same limb. After confirming the diagnosis of GT-I SCF, counseling of accompanying parents or guardians was done regarding the management plan and possible outcome. Group A patients were managed using the above elbow backslab made of Plaster of Paris (4-inch width, 8-12 layers thickness, length adjusted according to patient arm length) while Group B patients were treated using a collar and cuff sling. An oral analgesic (syrup ibuprofen) was prescribed to all patients for symptomatic pain relief. The first follow-up visit was planned after 7 days in the Orthopedic Outpatient Department (OPD). X-ray film was obtained to re-evaluate the fracture, and a detailed examination of the affected limb was performed and patients or guardians were inquired about the daily severity of pain at the fracture site as per VAS.[13] For our study, we defined significant pain as pain severity of ≥4. Patients or guardians were also queried about occurrence of sleep interruption because of pain for ≥ 2 nights, visit to the hospital emergency department for intravenous analgesics, day of return to normal routine activities and overall satisfaction with the treatment. Statistical Package for Social Sciences (SPSS) version 23.0 was used for statistical data analysis. Quantitative variables (age, return to routine activities) were analyzed using Mean±SD frequency and percentages of categorical variables (gender, mechanism of injury, sleep interruption, visit to AandE for intravenous analgesics, parent's/guardian's satisfaction, significant pain) were calculated while Chi-Square test was used to compare categorical variables, and the Independent Samples t-test was used for quantitative variables. A *p*-value of ≤0.05 was considered as significant.

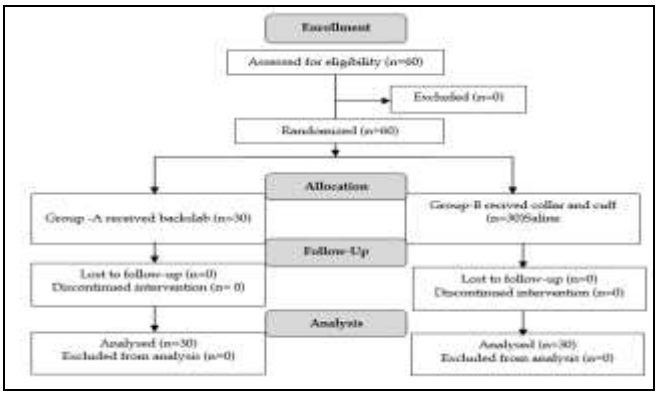

Figure: Patient Flow Diagram (n=60)

RESULTS

The study included pediatric patients(n=60), with 30 patients in Group A (Backslab) and 30 patients in Group B (Collar and cuff). Mean age of the participants was 7.35±1.94 years, including 37(61.7%) males and 23(38.3%) females. The comparison of baseline characters between the two groups is shown below in Table-I.

Table-I: Comparison of Baseline Characters Between Study Groups, (n =60)

Characteristics	Group A (Back Slab) (n=30)		Group B (Collar and Cuff) (n=30)	*p*-value (≤ 0.05)
Gender	Male	20(66.6%)	17(56.6%)	0.42
	Female	10(33.3%)	13(43.3%)	
Mean age (Mean±SD)	7.2±1.8		7.5±2.0	0.55

**SD: Standard Deviation*

While comparing outcomes between groups, it was observed that 6(20%) patients in Group A had sleep interruption as compared to 14(46.6%) patients in Group B. Group A had 4(13.3%) patients who had to visit the hospital's emergency for pain relief as compared to 12(40%) patients in Group B. Return to routine activities was achieved in Group A at 2.3±0.60 days and in Group B at 3.6±0.58 days. This comparison is outlined in Table-II.

Table-II: Comparison of Outcome Between the Study Groups, (n=60)

Outcomes	Group A (Backslab) (n=30)	Group B (Collar and Cuff) (n = 30)	*p*-value (≤ 0.05)
Sleep Interruption	6(20.0%)	14(46.6%)	0.02
Visit to Emergency for intravenous analgesics	4(13.3%)	12(40.0%)	0.20
Return to routine activities (Mean±SD), days	2.3±0.60	3.9±0.58	<0.001

**SD: Standard Deviation*

Significant pain (VAS ≥4) was present in 4(13.3%) patients in Group A and in 15(50%) patients in Group B (*p*-value=0.02). Satisfaction of parents/guardians was achieved in 26(86.6%) patients in Group A and 19(63.3%) patients in Group B, as shown in Table-III.

Table-III: Comparison of Post-Treatment Pain and Satisfaction Between Study Groups, (n = 60)

Parameters	Group A (Back Slab) (n=30)	Group B (Collar and Cuff) (n=30)	*p*-value (≤ 0.05)
Post-Treatment Pain (VAS ≥4)	4(13.3%)	15(50%)	0.002
Parent's/Guardian's Satisfaction	26(86.6%)	19(63.3%)	0.03

**VAS: Visual Analogue Scale*

DISCUSSION

In this study, we compared these two commonly used methods in terms of better pain relief and comfort. Our study results revealed above elbow back slab was associated with better pain relief and comfort and early return to normal daily activities, similar to multiple studies conducted on the same subject.

Supracondylar fractures (SCFs) are highly prevalent fractures in children where the fracture involves a distal segment of the humerus and constitutes approximately 60% of all elbow fractures with a peak incidence of SCFs observed among children aged 5-7 years.[14] Surgeons must be aware of the various complications associated with SCFs, and these must be ruled out with thorough clinical examination. A research study evaluated various complications associated with SCF and concluded that cubitus varus and neurological complications were the most commonly encountered ones,[15] while another study observed that 16.81% of the patients with displaced SCF suffered from neurovascular injuries, with median nerve being most commonly injured and increased complications were associated with more severely displaced fractures.[16] A system to classify Extension Type SCF to standardize its management plan depending on the severity and extent of the displacement was proposed in 1959, and in 1984, Gartland Type II was further subdivided into Type IIA and IIB based on rotational stability status,[17] with rare variety, Type IV, having multidirectional instability, added to into the original Gartland classification system.[18] There is a general consensus for the conservative management of GT-I fracture by immobilizing, usually for 3-4 weeks, using either the above elbow backslab or the collar and cuff sling. In our hospital, there are no standard protocols yet developed regarding which method to be preferred for immobilizing GT-I fractures. Another study also concluded in favor of the above elbow backslab to treat GT-I fractures due to shorter pain duration and early return to normal routine activities,[19] while another researcher also found similar results, concluding that above elbow back slab is associated with decreased pain and better comfort as compared to collar and cuff sling,[12] however, one author declared this comparison controversial as some centers prefer collar and cuff as the primary choice to manage GT-I fractures while others are in favor of using above elbow back slab.[20] The current study's findings lend credence to the idea that the above elbow back slab should be the preferred method for immobilizing GT-I SCF due to better comfort and pain relief.

CONCLUSION

Supracondylar fracture of Gartland Type-I extension type in the pediatric population can be managed

conservatively using the above-elbow backslab as a treatment of choice for better pain relief and comfort.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

YU & SJI: Data acquisition, data analysis, critical review, approval of the final version to be published.

AN & WU: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

NJ: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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