

Clinical and Perioperative Correlates of Poor Flynn Outcome After Triceps-Sparing Open Reduction of Gartland Type III Pediatric Supracondylar Humeral Fractures

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ABSTRACT

Introduction: Most children with displaced supracondylar humeral fractures achieve satisfactory functional recovery after operative treatment, although a small proportion develop Poor outcomes. Information regarding clinical and perioperative characteristics associated with Poor Flynn outcome after triceps-sparing open reduction remains limited. **Aim:** To identify clinical and perioperative correlates of Poor Flynn outcome after triceps-sparing open reduction of Gartland type III pediatric supracondylar humeral fractures. **Methods & Materials:** This prospective concurrent observational study was conducted at the National Institute of Traumatology and Orthopaedic Rehabilitation, Dhaka, Bangladesh, from July 2020 to June 2022. Forty-four children aged 5–10 years with closed Gartland type III supracondylar humeral fractures and failed closed reduction underwent triceps-sparing posterior open reduction with crossed Kirschner-wire fixation and were followed for up to 24 weeks. Final outcome was assessed using Flynn's criteria. For analysis, Poor outcome was defined as a Flynn grade of Poor, corresponding to $>15^\circ$ loss of carrying angle and/or elbow motion, while Excellent, Good, and Fair grades, representing losses of $0-15^\circ$, were grouped as non-Poor. Clinical and perioperative characteristics were compared between Poor and non-Poor groups using the Mann-Whitney U test, Fisher's exact test, and Fisher-Freeman-Halton exact test, as appropriate. Multivariable regression was not performed because only four Poor outcomes occurred. **Results:** Poor Flynn outcome occurred in 4/44 (9.1%) children. The median injury-to-operation interval was significantly longer in the Poor group than in the non-Poor group, 7.0 versus 5.0 days, $p=0.005$. Poor

outcome occurred in 4/11 (36.4%) children operated on day 7 compared with 0/33 (0.0%) operated on days 4–6, $p=0.002$. All 4 children with postoperative triceps power of Medical Research Council grade 4/5 had Poor outcomes, compared with none of the 40 children with grade 5/5 power, $p<0.001$. No significant associations were observed for age, sex, injury mechanism, affected side, healing time, or recorded complications. **Conclusion:** Longer injury-to-operation interval and reduced postoperative triceps power were the principal correlates of Poor Flynn outcome in this cohort. These findings are exploratory and should be confirmed in larger studies.

Keywords: Flynn Outcome; Supracondylar Humeral Fracture; Triceps-Sparing Open Reduction; Operative Timing; Pediatric Fracture

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INTRODUCTION

Among pediatric elbow injuries, supracondylar humeral fractures represent a major source of traumatic morbidity and occur predominantly during early childhood. In the review by Duffy et al., supracondylar fractures were described as accounting for approximately 15% of all pediatric fractures, with extension-type injuries comprising approximately 97–99% of cases^[1]. In another review by Vaquero-Picado et al., these injuries were reported to constitute approximately 55–80% of pediatric elbow fractures, with the highest frequency occurring between 5 and 8 years of age^[2]. Within South Asian populations, delayed presentation and displaced fracture patterns have also been documented. In the rural Indian series reported by Anjum et al., more than one-third of children presented

one week after injury, while Gartland type III fractures represented a substantial proportion of cases^[3]. Similarly, in the Nepalese operative series reported by Rokaya et al., Gartland type III fractures predominated, the mean injury-to-surgery interval was 5.2 days, and open reduction was required in 27.5% of surgically managed children^[4]. For displaced Gartland type III fractures, closed reduction with percutaneous pinning is generally preferred, while open reduction is required when satisfactory closed reduction cannot be achieved or when particular clinical circumstances necessitate direct exposure. In the review by Vaquero-Picado et al., failed closed reduction was recognized as an indication for open treatment^[2]. When open reduction is necessary, preservation of the extensor mechanism may be relevant to

postoperative recovery. In the series reported by Kokly et al., 98 children with Gartland type III fractures underwent triceps-sparing posterior open reduction after unsuccessful closed reduction, with union achieved in all patients and limited mean extension loss^[5]. Favorable outcomes following delayed triceps-sparing open treatment have also been reported. In the prospective study by Abdelraheem, satisfactory Flynn outcome was observed in 27 of 28 children presenting at least five days after injury and treated through a posterior triceps-sparing approach^[6]. Despite generally satisfactory results following operative treatment, a minority of children develop residual functional or cosmetic impairment. Flynn's criteria provide a combined assessment based on loss of elbow motion and loss of carrying

angle, and remain widely used for outcome classification following pediatric supracondylar fracture treatment. In a large operative cohort reported by Hahn et al., satisfactory modified Flynn outcomes were observed in 98.6% of 364 children, indicating that unfavorable outcomes were uncommon [7]. Among Gartland type III fractures treated by open reduction, variation according to surgical exposure has not consistently been demonstrated. In the multicenter study by Yavuz et al., functional and cosmetic Flynn outcomes did not differ significantly among four open surgical approaches [8]. Uncertainty remains regarding whether clinical or perioperative characteristics identify children more likely to experience an unfavorable outcome. In the study by Abbott et al., operative timing was not significantly associated with complications or conversion to open reduction among 297 Gartland type III fractures, although older age and male sex were associated with a higher complication frequency [9]. Regarding timing specifically, no significant differences in open reduction, neurologic injury, vascular injury, infection, or compartment syndrome were demonstrated between early and delayed treatment in the systematic review and meta-analysis by Ismayl et al [10]. However, the definitions of delay in those studies generally ranged from only 6 to 24 hours. Likewise, in the study by Han et al., no significant difference in Flynn outcome was observed between children treated within 12 hours and those treated later [11]. These findings may have limited applicability to settings where presentation or operative treatment is delayed by several days. Within delayed-presentation cohorts, favorable outcomes have still been documented. In the study by Waikhom et al., a mean treatment delay of 7.5 days was reported among Gartland type III fractures undergoing open reduction, and all 40 children completing

follow-up had satisfactory Flynn outcomes [12]. Similarly, no Poor Flynn outcomes were reported in the series by Das et al., although both Gartland type II and III fractures were included [13]. Consequently, delayed treatment alone does not appear to uniformly determine clinical outcome, and other patient, injury, and postoperative characteristics may contribute to the small proportion of Poor results. Therefore, the present study was undertaken to explore the clinical and perioperative correlates of Poor Flynn outcome among children with Gartland type III supracondylar humeral fractures treated by triceps-sparing open reduction.

METHODS & MATERIALS

This analytical study was conducted as a secondary analysis of a prospective observational study carried out in the Department of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh, over a two-year period from July 2020 to June 2022. Children aged 5–10 years with closed Gartland type III supracondylar humeral fractures, failed closed reduction, and injury duration within 7 days were included, while open fractures, associated vascular injury, and multiple fractures were excluded. Of 48 initially enrolled patients, 4 were lost to follow-up, leaving 44 children for analysis. All patients underwent triceps-sparing posterior open reduction with crossed Kirschner-wire fixation and were followed postoperatively for up to 24 weeks. Final functional and cosmetic outcome was assessed according to Flynn's criteria. For the present analysis, Poor outcome was operationally defined as a final Flynn grade of Poor, corresponding to loss of carrying angle and/or elbow motion greater than 15°; non-Poor outcome comprised Excellent, Good, and Fair Flynn grades, corresponding to losses of 0–15°.

Accordingly, 4 patients were classified as Poor and 40 as non-Poor. Clinical and perioperative variables evaluated included age, sex, cause of injury, affected side, injury-to-operation interval, healing time, postoperative triceps muscle power, and recorded complications. Continuous variables were summarized using median and interquartile range, while categorical variables were expressed as frequency and percentage. Comparisons between Poor and non-Poor groups were performed using the Mann-Whitney U test for continuous variables, Fisher's exact test for 2×2 categorical comparisons, and the Fisher-Freeman-Halton exact test for categorical variables with more than two levels. Additional exploratory comparisons of the proportion of Poor outcomes across selected clinical and perioperative categories were performed using Fisher's exact test. Because only four Poor outcomes occurred, multivariable regression was not performed. A two-sided p value <0.05 was considered statistically significant. The original study received approval from the Institutional Review Board of NITOR, and written informed consent was obtained from the guardians of all participants.

RESULTS

Children with Poor outcomes tended to be younger, with a median age of 6.0 years compared with 7.0 years among those with non-Poor outcomes, although the difference was not significant, $p=0.147$. Three of four Poor outcomes occurred among children aged 5–6 years. Falls from bed accounted for 2 (50.0%) of the four Poor outcomes compared with 4 (10.0%) of the 40 non-Poor outcomes, but the overall distribution of injury mechanisms was not significantly different, $p=0.127$. No significant differences were identified according to sex or affected side (Table I).

Table I

Baseline and injury characteristics according to Poor Flynn outcome, $n=44$.

Characteristic	Non-Poor, n=40	Poor, n=4	p value
Age group, years			
5–6	11 (27.5)	3 (75.0)	0.210‡
7–8	17 (42.5)	1 (25.0)	
9–10	12 (30.0)	0 (0.0)	
Median (IQR)	7.0 (6.0–9.0)	6.0 (5.75–6.50)	0.147†
Sex			
Male	31 (77.5)	2 (50.0)	0.256§
Female	9 (22.5)	2 (50.0)	
Cause of injury			
Fall from tree	23 (57.5)	1 (25.0)	0.127‡
Sports injury	9 (22.5)	1 (25.0)	
Fall from bed	4 (10.0)	2 (50.0)	
Accidental fall	4 (10.0)	0 (0.0)	
Affected side			
Left	29 (72.5)	3 (75.0)	1.000§
Right	11 (27.5)	1 (25.0)	

Data are presented as n (%) unless otherwise specified. IQR, interquartile range. †Mann-Whitney U test. ‡Fisher-Freeman-Halton exact test. §Fisher's exact test.

The injury-to-operation interval differed significantly between outcome groups. All four children with Poor Flynn outcome underwent surgery on day 7, whereas no Poor outcome occurred among the 33 children operated on days 4–6. The median

injury-to-operation interval was 7.0 days in the Poor group compared with 5.0 days in the non-Poor group, $p=0.005$; the overall day-specific distribution also differed significantly, $p=0.004$. Reduced postoperative triceps power was present in

all four Poor cases and in none of the non-Poor cases, $p<0.001$. Healing time and recorded complications did not differ significantly between groups (*Table II*).

Table II
Perioperative and postoperative clinical characteristics according to Poor Flynn outcome, $n=44$.

Characteristic	Non-Poor, n=40	Poor, n=4	p value
Injury-to-operation interval, days, median (IQR)	5.0 (5.0–6.0)	7.0 (7.0–7.0)	0.005†
Operation according to day after injury			
Day 4	7 (17.5)	0 (0.0)	0.004‡
Day 5	16 (40.0)	0 (0.0)	
Day 6	10 (25.0)	0 (0.0)	
Day 7	7 (17.5)	4 (100.0)	
Healing time			
4 weeks	21 (52.5)	1 (25.0)	0.607§
6 weeks	19 (47.5)	3 (75.0)	
Triceps muscle power			
MRC 5/5	40 (100.0)	0 (0.0)	<0.001§
MRC 4/5	0 (0.0)	4 (100.0)	
Any recorded complication			
No	35 (87.5)	3 (75.0)	0.456§
Yes	5 (12.5)	1 (25.0)	

MRC, Medical Research Council. †Mann-Whitney U test. ‡Fisher-Freeman-Halton exact test. §Fisher's exact test.

Poor Flynn outcome was observed in 4/11 (36.4%) children operated on day 7 after injury, compared with 0/33 (0.0%) operated on days 4–6, $p=0.002$. Poor outcome was also present in all 4/4 (100.0%) children with postoperative triceps power of MRC

4/5, compared with 0/40 (0.0%) with MRC 5/5, $p<0.001$. Higher proportions of Poor outcome were observed among children aged ≤ 6 years, females, and those injured by falling from bed, but these differences were not statistically significant. Healing time

and recorded complications were also not significantly associated with Poor Flynn outcome (*Table III*).

Table III
Poor Flynn outcome according to selected clinical and perioperative characteristics, $n = 44$.

Characteristic	Category	Poor Flynn outcome, n/N (%)	p value
Age group	≤ 6 years	3/14 (21.4)	0.088
	>6 years	1/30 (3.3)	
Sex	Female	2/11 (18.2)	0.256
	Male	2/33 (6.1)	
Cause of injury	Fall from bed	2/6 (33.3)	0.083
	Other mechanisms	2/38 (5.3)	
Timing of operation	Day 7 after injury	4/11 (36.4)	0.002
	Days 4–6 after injury	0/33 (0.0)	
Healing time	6 weeks	3/22 (13.6)	0.607
	4 weeks	1/22 (4.5)	
Recorded complication	Present	1/6 (16.7)	0.456
	Absent	3/38 (7.9)	
Postoperative triceps power	MRC 4/5	4/4 (100.0)	<0.001
	MRC 5/5	0/40 (0.0)	

Values indicate the number of children with Poor Flynn outcome divided by the total number of children within each category. Exact p values were obtained using Fisher's exact test. MRC, Medical Research Council.

DISCUSSION

In the present study, Poor Flynn outcome was observed in 4 of 44 children, 9.1%, following triceps-sparing open reduction of Gartland type III supracondylar humeral fractures. The principal perioperative finding was a significantly longer injury-to-operation interval among children with Poor outcome, with a median of 7.0 days compared with 5.0 days among those with non-Poor outcomes, $p=0.005$. All four Poor outcomes occurred among the 11 children operated on day 7, representing 36.4% of that subgroup, whereas no Poor outcome occurred among the 33 children operated on

days 4–6, $p=0.002$. A second prominent finding was the concurrent association between postoperative triceps weakness and Poor outcome, as all four children with MRC 4/5 triceps power had Poor Flynn outcomes, compared with none of the 40 children with MRC 5/5 power, $p<0.001$. The association observed with treatment timing should be interpreted in relation to the substantially different timing intervals evaluated in most previous studies. In the systematic review and meta-analysis by Ismayl et al., 14 studies involving 1,263 children with Gartland type III fractures were reviewed, and no significant difference

was demonstrated between early and delayed treatment for conversion to open reduction, compartment syndrome, iatrogenic nerve injury, vascular injury, or infection [10]. However, the definitions separating early and delayed treatment ranged from approximately 6 to 24 hours, and the certainty of evidence was low or very low. Similarly, in the study by Han et al., no significant difference in Flynn outcome was observed between children treated within 12 hours and those treated later; among open-reduction cases, Excellent or Good outcomes were reported in 87.5% and 91.7%, respectively [11]. These

findings therefore address relatively short delays and are not directly comparable with the 4–7-day treatment interval evaluated in the present study. More comparable evidence has been reported from children presenting several days after injury. In the study by Waikhom et al., the mean delay in presentation was 7.5 days among children with Gartland type III fractures treated by delayed open reduction^[12]. At three months, 6 of 40 children, 15.0%, had unsatisfactory Flynn results because of motion loss exceeding 15°, although satisfactory outcomes were subsequently observed in all 40 follow-up completers after continued recovery. This finding suggests that delayed presentation may be accompanied by early functional limitation without necessarily resulting in persistent Poor outcome. In contrast, in the prospective study by Abdelraheem, children presenting at least five days after injury, with a mean delay of 13.57±7.4 days, underwent posterior triceps-sparing open reduction, and satisfactory Flynn outcome was recorded in 27 of 28 children, 96.4%^[6]. Favorable outcomes were also reported in the study by Das et al., where no Poor Flynn outcomes occurred despite a delayed-presentation subgroup exceeding seven days, although Gartland type II and III fractures were combined and an anterior approach was used^[13]. These observations differ from the concentration of Poor outcomes on day 7 in the present cohort and indicate that delay alone does not uniformly determine outcome. Several unmeasured factors may have contributed to the present timing association. Greater soft-tissue swelling, fracture complexity, difficulty of reduction, or other clinical characteristics may have influenced both the timing of surgery and subsequent outcome. In the study by Abbott et al., operative timing was not associated with complications or conversion to open reduction among 297 closed Gartland type III fractures, while age, sex, and pin configuration showed associations with complication occurrence^[9]. However, Flynn outcome was not the endpoint in that analysis. Consequently, the day-7 finding in the present study is better regarded as an exploratory perioperative correlate rather than evidence that surgery on the seventh day independently causes Poor outcome. Postoperative triceps power demonstrated the strongest statistical association with Poor Flynn outcome. Reduced power of MRC 4/5 was present in all four Poor cases and in none of the non-Poor cases. Because triceps strength was assessed after treatment, this variable cannot be interpreted as a preoperative risk factor or predictor. Rather, reduced triceps power appears to have accompanied the unfavorable functional state. In the triceps-sparing series by Kokly et al., preservation of the extensor mechanism was followed by union in all treated fractures and limited

mean extension loss, supporting preservation of triceps function as an operative objective^[5]. However, postoperative MRC strength was not formally correlated with Flynn outcome in that study. Accordingly, direct external confirmation of the present MRC 4/5 association remains unavailable. No statistically significant associations were observed for age, sex, injury mechanism, affected side, healing time, or recorded complications. Although Poor outcome was more frequent among children aged ≤6 years, 21.4% versus 3.3%, $p=0.088$, the direction was not supported consistently by other evidence. In the study by Syed et al. (2026), older age was independently associated with delayed return of functional elbow motion, while in the long-term study by Tuomilehto et al., children older than 10 years had lower subjective functional scores^[14]. These outcomes were not identical to Poor Flynn grade, but they do not support younger age as an established adverse prognostic factor. Similarly, sex was not associated with overall subjective outcome in the study by Tuomilehto et al., despite more frequent perceived motion asymmetry among girls^[14]. Recorded complications also showed no significant association with Poor outcome in the present study, $p=0.456$. A similar separation between complications and final functional status was observed in the study by Hahn et al., where 50 complications occurred among 49 patients, yet 45 of those patients still had satisfactory outcome and only 5 of the entire 364-patient cohort had Poor modified Flynn results^[7]. Together, these findings indicate that postoperative complications do not necessarily translate directly into Poor Flynn outcome. Overall, the present findings suggest that prolonged injury-to-operation interval and reduced postoperative triceps strength were the principal correlates of Poor outcome within this small cohort, while demographic characteristics, healing time, and recorded complications showed no statistically significant relationship. The timing association remains exploratory and should be interpreted in the context of the small number of Poor events and the generally favorable outcomes reported even after delayed treatment in other series.

LIMITATIONS

The small single-center sample and the occurrence of only four Poor Flynn outcomes limited statistical power and precluded reliable multivariable analysis. As several potentially relevant indicators of fracture severity and soft-tissue condition were not available in the dataset, residual confounding may have influenced the observed associations, particularly that involving operative timing.

CONCLUSION

Poor Flynn outcome was uncommon after triceps-sparing open reduction of Gartland type III pediatric supracondylar humeral fractures. A longer injury-to-operation interval, particularly surgery on day 7, was significantly associated with Poor outcome, while reduced postoperative triceps power showed a strong concurrent association with Poor Flynn status. Age, sex, injury mechanism, affected side, healing time, and recorded complications were not significantly associated with outcome. Given the limited number of Poor cases, these findings should be regarded as exploratory and require confirmation in larger cohorts.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

REFERENCES

1. Duffy S, Flannery O, Gelfer Y, Monsell F. Overview of the contemporary management of supracondylar humeral fractures in children. *Eur J Orthop Surg Traumatol*. 2021 Jul 1;31(5):871–81. doi:10.1007/s00590-021-02932-2
2. Vaquero-Picado A, González-Morán G, Moraleda L. Management of supracondylar fractures of the humerus in children. *EFORT Open Rev*. 2018 Oct 1;3(10):526–40. doi:10.1302/2058-5241.3.170049 PubMed PMID: 30662761; PubMed Central PMCID: PMC6335593.
3. Anjum R, Sharma V, Jindal R, Singh TP, Rathee N. Epidemiologic pattern of paediatric supracondylar fractures of humerus in a teaching hospital of rural India: A prospective study of 263 cases. *Chinese Journal of Traumatology*. 2017 Jun;20(03):158–60. doi:10.1016/j.cjtee.2016.10.007
4. Rokaya PK, Karki DB, Rawal M, Limbu D, Menyangbo S, Devkota H. Pattern of Pediatric Supracondylar Fracture Operated at A Rural Teaching Hospital of Nepal: A Descriptive Cross-sectional Study. *JNMA J Nepal Med Assoc*. 2020 Mar;58(223):153–7. doi:10.31729/jnma.4869 PubMed PMID: 32347820; PubMed Central PMCID: PMC7580320.
5. Kokly S, Castagna A, Aarabi M. Triceps-sparing Posterior Approach for Supracondylar Humeral Fracture in Children. *Arch Bone Jt Surg*. 2019 Sep;7(5):416–21. PubMed PMID: 31742217; PubMed Central PMCID: PMC6802550.
6. Abdelraheem MA. Open Reduction and Fixation of Late-Presenting Pediatric Supracondylar Humeral Fractures: A Prospective Study. *Orthopedic Research and Reviews*. 2024 Dec 31;16:221–31. doi:10.2147/ORR.S474219 PubMed PMID: 39324027.

7. Hahn SG, Schuller A, Pichler L, Hohensteiner A, Sator T, Bamer O, et al. Complications and Outcomes of Surgically Treated Pediatric Supracondylar Humerus Fractures. *Children*. 2024 Jul;11(7):791. doi:10.3390/children11070791
8. Yavuz İA, Özdemir G, Akgül T, Yılmaz B, Çiçekli Ö, Yazar EA. Comparison of 4 surgical approaches in pediatric Gartland type 3 supracondylar humerus fractures treated by open reduction and pinning: A multicenter study. *Acta Orthop Traumatol Turc*. 2023 Mar 1;57(2):50–4. doi:10.5152/j.aott.2023.22049 PubMed PMID: 37159027; PubMed Central PMCID: PMC12462846.
9. Abbott MD, Buchler L, Loder RT, Caltoun CB. Gartland type III supracondylar humerus fractures: Outcome and complications as related to operative timing and pin configuration. *Journal of Children's Orthopaedics*. 2014 Dec 1;8(6):473–7. doi:10.1007/s11832-014-0624-x
10. Ismayl G, Kim WJ, Iqbal M, Sajid S. Early Versus Delayed Treatment for Gartland Type III Supracondylar Humeral Fractures in Children: A Systematic Review and Meta-analysis. *JOIO*. 2022 Nov 1;56(11):1871–81. doi:10.1007/s43465-022-00734-0
11. Han Q lin, Wang Y hua, Liu F. Comparison of complications and results of early versus delayed surgery for Gartland type III supracondylar humeral fractures in pediatric patients. *Orthopaedic Surgery*. 2011;3(4):242–6. doi:10.1111/j.1757-7861.2011.00153.x
12. Waikhom S, Mukherjee S, Ibomcha I, Digendra A, Sohkhlet HR. Delayed Open Reduction and K-Wire Fixation of Widely Displaced Supracondylar Fractures of Humerus in Children using Medial Approach. *J Clin Diagn Res*. 2016 Aug;10(8):RC06-RC10. doi:10.7860/JCDR/2016/20753.8349 PubMed PMID: 27656516; PubMed Central PMCID: PMC5028575.
13. Das R, Borthakur B, Agarwala V, Ghosh S. Evaluation of anterior approach in failed closed reduction and delayed presentation of supracondylar humerus fractures in children. *Journal of Orthopaedics*. 2022 Mar 1;30:51–8. doi:10.1016/j.jor.2022.02.006
14. Tuomilehto N, Sommarhem A, Nietosvaara AY. 9 years' follow-up of 168 pin-fixed supracondylar humerus fractures in children. *Acta Orthopaedica*. 2018 May 4;89(3):351–6. doi:10.1080/17453674.2018.1438765 PubMed PMID: 29451050.