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How long does treated supracondylar humerus fracture in children take to recover elbow range?

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ABSTRACT

Background: Our goal was to address requirement of physiotherapy after treatment of supracondylar humerus fractures in children and evaluate result of casting on elbow without injury using control group of distal forearm fractures.
Methods: 57 cases of supracondylar fractures were included in this retrospective study and compared with group of 54 children with distal forearm fractures treated with long arm casting for 28 days. Passive elbow ROM was checked with goniometer on day of cast removal, 2 weeks later, and then every month until the elbow ROM returned to 95% ROM (ROM-95) of uninjured side. No physiotherapy was given.
Results: Average time in cast for supracondylar fracture group was 31.8 days and distal forearm fracture group was 32.4 days. The elbow total flexion angle reached a plateau of 139 degrees at 1month after cast removal whereas forearm group required less than 2 weeks. Total rotation ROM required half the time to reach 139 degrees in forearm group. From the paired t test it took more time for pronation to recover than supination in supracondylar fractures. In supracondylar group there was positive correlation between casting period and recovery period of ROM-95 elbow extension (p=0.021) and days of casting (p=0.021) and ROM-95 flexion recovery period. There was no statistically significant impact between casting and recovery period in other directions and recovery of ROM-95 & F-ROM and the subclassification and type of treatment of individual fractures.
Conclusions: Lessons learned: thorough assessment of elbow function post cast removal, lack of need of physiotherapy in management protocol and elbow stiffness is related to initial injury and associated treatment not merely immobilisation.

Keywords: Physiotherapy, Supracondylar fracture, Forearm fracture, ROM recovery

INTRODUCTION

Fractures about the elbow account for 5% to 10% of all fractures in children.[1,2] The most common type of elbow fracture in children and adolescents are supracondylar fractures of the humerus.[3] Mercer Rang stated that the goal of treatment of supracondylar humeral fractures is to "avoid catastrophes" (vascular compromise, compartment syndrome) and "minimize embarrassments" (cubitus varus, iatrogenic nerve palsies).[4]

Opinions as regards to the requirement of physiotherapy following management of supracondylar humerus fracture differ. Even though many authors note that there are no indications for physical therapy after supracondylar fracture treatment, certain orthopedic surgeons still prescribe physical therapy to these patients.[5]

The propensity to become stiff after injury is unusual in children.[6] There is paucity of data regarding the time

required for revival of elbow range of motion (ROM) and associated factors. Most frequent query post management of elbow fracture is regarding return to normalcy of elbow function. In quest for an answer to that concern, a study was orchestrated to note the elbow ROM after the treatment of supracondylar humerus fractures. The goal of this study was to address the requirement if at all of physiotherapy after the treatment of supracondylar condylar fractures of humerus in children, and to evaluate the result of casting on elbow without an elbow injury using the control group of distal forearm fractures.

METHODS

From 2015 to 2018, 57 cases of supracondylar humerus fractures in children reporting to the Department of Orthopedics at Seth GS Medical College & KEM Hospital, Mumbai were included in this retrospective study. For comparison another group of 54 children with distal forearm fractures treated with long arm casting for about 28 days was used. A senior orthopaedic surgeon treated all the patients. Each subgroup of supracondylar fractures comprised of 19 cases. All Gartland type 1 and eleven type 2 supracondylar fractures were treated with an above elbow cast. The remaining Gartland type 2 and all type 3 fractures were treated with closed reduction, internal fixation with K wires and above elbow cast. The advocated casting period was 4 weeks. No patient included in the study required open reduction. The position of immobilization of the elbow was 90 degrees flexion and neutral rotation of forearm. Passive elbow ROM including flexion, extension, forearm supination, and pronation was checked with the help of a goniometer on the day of cast removal, 2 weeks after cast removal, and then every month until the elbow ROM returned to 95% ROM (ROM-95) of the uninjured side. A trained orthopaedician recorded all the measurements. After cast removal encouragement was given to all the patients to perform painless active ROM exercise. Passive or resisted ROM exercise wasn't given to any patient. No form of physiotherapy was given to the patient.

The functional ROM (F-ROM) which means the minimum ROM required for activity of daily living has been defined as 30-130 degrees of flexion, and 50 degrees of forearm supination and pronation.[7] The duration required to restore F-ROM and ROM-95 in each case was recorded. Statistical analysis was done with the help of Graphpad Prism 8 software.

RESULTS

There were 32 males and 25 females out of 57 children in the supracondylar humerus fracture group whereas the distal forearm fracture group comprised of 30 females and 24 female children. There were 19 patients each of Gartland type 1, 2 and 3 in supracondylar group.

The average time spent in cast for the supracondylar fracture group was 31.8 days and distal forearm fracture group was 32.4 days.

On analysis with the help of Graphpad software we could not determine any statistical difference in casting time between the two fracture groups. No major complications like cast complications could be noted.

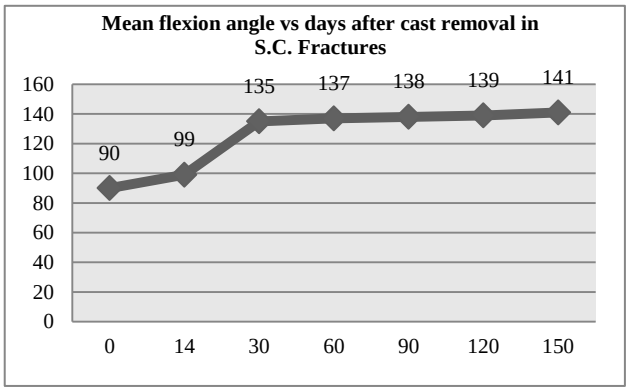

Figure 1: Mean flexion range in supracondylar fractures.

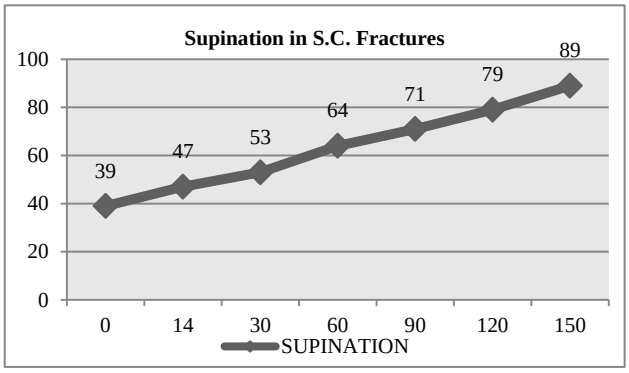

Figure 2: Mean range of supination in supracondylar fractures.

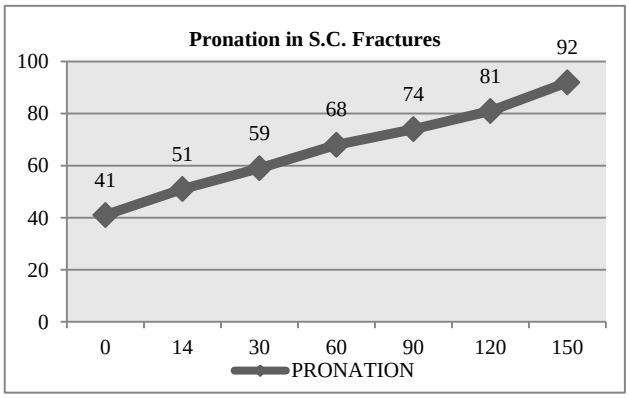

Figure 3: Mean range of pronation in supracondylar fractures.

On analysing the trend line of Figure 1 (supracondylar fractures), it becomes evident that the elbow total flexion angle reached a plateau of 139 degrees at 1month after cast removal, whereas forearm total rotation ROM required half the time to reach 139 degrees.

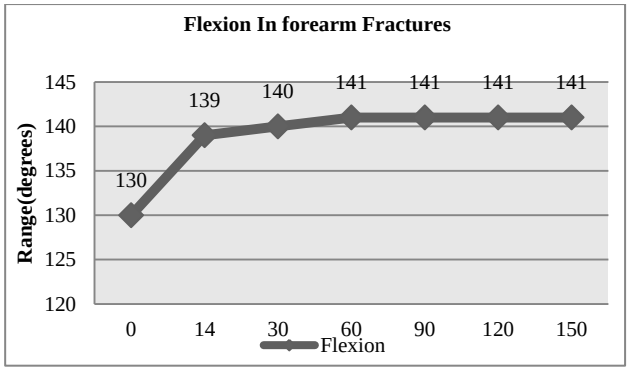

Figure 4: Mean flexion angle after cast removal.

The supination range was easier to recover than the pronation in supra- condylar fractures (Figure 2 and 3). In the group of patients with distal forearm fracture group that is the elbow immobilization without elbow injury, the total elbow flexion–extension angle recovered quicker and required less than 2 weeks to reach 139 degrees (Figure 4).

On thorough scrutiny of statistical data, the following facts came to light. Supracondylar group required longer period for restoration of flexion and extension motion as compared with distal forearm fractures. From the paired t-test it took more time for pronation to recover than supination in supracondylar fractures.

There was positive correlation between number of days of casting and the number of days required for recovery of ROM-95 elbow extension in patients with supracondylar (p=0.021) fractures. Positive correlation was also noted between days of casting (p=0.021) and ROM-95 flexion recovery days in supracondylar fractures.

Table 1: Average days needed for recovery of functional range of motion in forearm and supracondylar fractures.

Days needed to achieve functional range	Flexion	Angle	Extention	Angle	Supination		Pronation	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Functional range target (degrees)	130		30		50		50	
Distal forearm (days to achieve)	13.8	0.7	0	-	2.1	1.2	2.8	1.1
Supracondylar fractures (days to achieve)	28.2	13.7	9.1	7.4	2	0.8	3.4	1.6

Otherwise, there was no correlation between days of casting and no of days required for recovery in other directions. There was no statistically significant impact on the recovery of ROM-95 and F-ROM and the sub classification and type of treatment of individual fractures. We would here like to state that a likely drawback could be the limited no of cases in each subgroup.

DISCUSSION

Supracondylar humerus fractures are second most common childhood fractures. Closed reduction with percutaneous K-wire fixation is treatment of choice for most of these fractures. Literature suggesting the dynamics of reinstating the ROM in the treated elbow are scarce, conflicting and inconclusive.

The most common cause of decreased elbow ROM is Trauma.[8] Also it has been observed that there occurs a functional loss if prolonged immobilization is carried out during the bone healing stage. Literature review regarding recovery of ROM after the elbow fractures focuses mainly on the etiology and treatment of stiffness.[9] Literature review reveals that in adults the functional outcome is affected by severity of elbow trauma.[10,11] Studies by Morrey and King and Faber implied that long-lasting immobilization and the severity of injury is linked with posttraumatic elbow stiffness.[10,11] But according to our study there was no difference in recovery of ROM as regards to the types and severity of fracture in children.

Reduced range of motion (ROM) is a well-known complication of supracondylar humerus fractures. In majority of the cases, this restricted ROM is most evident post cast removal.

It was reported by King and Faber that after trauma to the elbow the remaining extension loss is more frequent than flexion loss.[11] Contrastingly in our study, at final follow-up ROM-95 was reacquired by all cases.

The existing literature review on the time to restoration of full ROM following removal of immobilisation in supracondylar humerus fractures yields conflicting evidence. On one hand few studies report expedient recovery of elbow motion after closed reduction and percutaneous fixation with K-wires. Shrader specified that it is infrequent to find a child who hasnt gained full ROM 6 to 8 weeks after immobilization.[12] While on the other hand many studies revealed that restoration of maximum elbow motion after these fractures took about a year with substantial individual variation.[13,14]

The elbow stiffness arising after treatment is transient and doesn't appear to be a consequence of mere elbow immobilization because the children who were in the group of distal forearm fractures (given elbow immobilization without an elbow fracture) had enhanced early elbow flexion–extension (Figures 1 and 2) and the recovery of ROM occurred sooner than the other group which included children with elbow fracture (Figure 5). It seems that the transient post treatment elbow stiffness is a

collective outcome of intial injury, associated treatment, and immobilization. It was found by us that the time of recovery of ROM was positively correlated with immobilization time, signifying that in order to assist functional revival after elbow injury the length of immobilization should be condensed as much as possible.

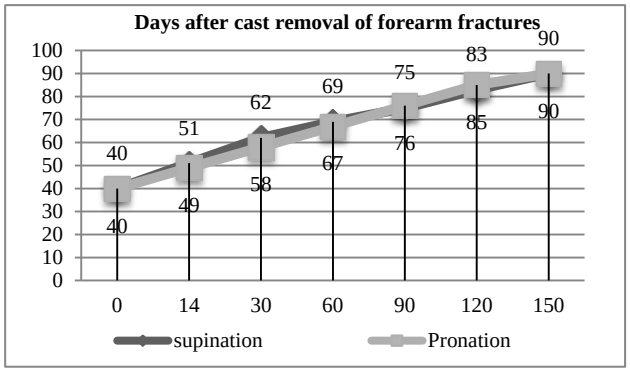

Figure 5: Mean range of supination and pronation in forearm fractures.

The data on the effects of physiotherapy on recovery of ROM is conflicting.[15] Few orthopedicians for cases of supracondylar humerus fractures still recommend physiotherapy after cast removal.[16] On the contrary, many authors stress that physiotherapy is inessential post supracondylar humerus fractures management. One school of thought advocates the physiotherapy in specific cases with severe elbow stiffness and lack of recovery of ROM after prolonged time period.[17,18] According to McIntyre timely mobilization at 3 weeks more often than not would minimize elbow stiffness (as stated in Letts' textbook).[19] Keppler et al and other published data have wide acceptance regarding the fact that postoperative physiotherapy is unnecessary in children with supracondylar humerus fractures.[20] In our study based on the observation that cases regained their ROM-95 without physiotherapy, we can conclude that postoperative physiotherapy may not be needed in children with uncomplicated elbow fractures.

In our study, in both groups the recovery of forearm supination was faster than pronation. The piece of evidence that the supinators are stronger than pronators amply accounts for the finding. [20]

The orthopaedicians and physiotherapists should be suggested to wait before initiating intensive physiotherapy since it takes time to recover a full ROM. In this recovery period proper counselling of the anxious parents should be undertaken.

Additionally, this study leads to the next obvious question as to how long would it take to recover ROM and what should be the indications of intervention in the form of physiotherapy or surgery? This should form the basis of future studies.

CONCLUSION

Lessons learned from this study include thorough post-operative assessment of elbow function post cast removal in the management of supracondylar humerus fractures, the lack of need of physiotherapy in management protocol since restoration of 95% of ROM took place without any physiotherapy and the fact that the ROM in the control group of distal forearm fractures recovered significantly faster than supracondylar fractures means that mere elbow immobilisation does not lead to stiffness and it is also probably related to the initial injury and associated treatment.

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REFERENCES

1. Iqbal QM. Long bone fractures among children in Malaysia. Int Surg. 1974;59:410.
2. Landin LA. Fracture patterns in children. Analysis of 8,682 fractures with special reference to incidence, etiology and secular changes in a Swedish urban population, 1950–1979. Acta Orthop Scand Suppl. 1983;202:1.
3. Reed MH. Fractures and dislocations of the extremities in children. J Trauma. 1977;17:351.
4. Rang M, Barkin M, Hendrick EB. Elbow. In Rang M, editor: Children's fractures, Philadelphia: 1983, Lippincott; 1983: 152.
5. Lee S, Park MS, Chung CY. Consensus and Different Perspectives on Treatment of Supracondylar Fractures of the Humerus in Children. Clin Orthop Surg. 2012;4:91-7.
6. Herring JA. Upper extremity injuries. In: Herring JA, ed. Tachdjian's Pediatric Othopaedics. Philadelphia, PA: WB. Saunders Co; 2002: 2115–2250.
7. Vardakas DG, Varitimidis SE, Goebel F. Evaluating and treating the stiff elbow. Hand Clin. 2002;18:77–85.
8. Bruno RJ, Lee ML, Strauch RJ. Posttraumatic elbow stiffness: evaluation and management. J Am Acad Orthop Surg. 2002;10:106–16.
9. Jupiter JB, O'Driscoll SW, Cohen MS. The assessment and management of the stiff elbow. Instr Course Lect. 2003;52:93–111.
10. Morrey BF. The posttraumatic stiff elbow. Clin Orthop Relat Res. 2005;431:26–35.
11. King GJ, Faber KJ. Posttraumatic elbow stiffness. Orthop Clin North Am. 2000;31:129–43.
12. Shrader MW. Pediatric supracondylar fractures and pediatric physeal elbow fractures. Orthop Clin North Am. 2008;39:163-71.
13. Dameron TB Jr. Transverse fractures of distal humerus in children. Instr Course Lect. 1981;30:224-35.

14. Flynn JC, Matthews JG, Benoit RL. Blind pinning of displaced supracondylar fractures of the humerus in children: sixteen years' experience with long-term followup. J Bone Joint Surg Am. 1974;56:263-72.
15. Stans AA, Maritz NG, O'Driscoll SW. Operative treatment of elbow contracture in patients twenty-one years of age or younger. J Bone Joint Surg Am. 2002;84:382–7.
16. Worlock P, Stower M. Fracture patterns in Nottingham children, J Pediatr Orthop. 1986;6:656.
17. Topping RE, Blanco JS, Davis TJ. Clinical evaluation of crossed pin versus lateral pin fixation in displaced supracondylar humerus fractures. J Pediatr Orthop. 1995;15(4):435-9.
18. Cohen MS, Hastings H. Post-traumatic contracture of the elbow. Operative release using a lateral collateral ligament sparing approach. J Bone Joint Surg Br. 1998;80:805–12.
19. McIntyre W. Supracondylar fractures of the humerus. In: Letts MR, ed. Management of Pediatric Fractures. New York City, NY: Churchill Livingstone; 1994: 194.
20. Keppler P, Salem K, Schwarting B. The effectiveness of physiotherapy after operative treatment of supracondylar humeral fractures in children. J Pediatr Orthop. 2005;25:314–6.

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