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The Comparison of the Results between Single Casting and Splint in the Treatment of displaced Distal Radius Fracture in Pediatrics

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Abstract

Background: Distal radius fracture is one of the most prevalent fractures, which there is disagreement about its treatment and it is one of the most controversial issues of pediatric fractures.

Methods: In this clinical trial, 152 children with distal radius fractures were randomly treated by the cast or splint based on the random number table. Therapeutic outputs of these patients were evaluated six weeks after treatment.

Results: The results of our study show that the mean Mayo Wrist Score in the group under treatment by cast was 92.9 and in the group under treatment by splint were 90.8. Therefore, there was not a considerable difference in the physical function of the patients, statistically. According to Face Pain scale – revised and its achieved score, the two groups did not have a considerable difference from the viewpoint of wrist pain. In addition, statistically, no difference was found in the range of motion of the wrist between two groups. Therefore, the therapeutic output of the fracture without displacement or with minimal displacement of the distal radius by splint is as effective as casting.

Conclusions: Considering the results of treatment by splint or cast and in addition the cost of the treatment and the complications of each, splints can be used instead of short arm cast in the fractures without displacement or with minimal displacement of the distal radius in children.

Keywords: Pediatric; Distal radius fracture; Non operative treatment; Splint; Cast

Introduction

Forearm fractures are the most prevalent fractures of long bones in pediatrics and account for about 40% of the fractures [1], among distal radius fractures, metaphyseal fractures are more prevalent than other fractures and distal radius fracture is somehow the most prevalent wrist fractures in children [2] and is a prevalent cause of visiting to the emergency ward [3]. The most prevalent cause for distal radius fracture is falling with stretched hands and the rate of displacement depends on the height and the speed of falling [4]. The fracture signs include pain and tenderness of the fracture site [5]. Diagnosis is by using clinical signs and also profile graphy of the wrist [6]. The treatment is divided into two groups of operative and non-operative treatment but there is not a unique order for choosing the kind of therapy according to the classification [7]. Non-operative treatment includes reduction and immobilization, which is one of the most prevalent and controversial disagreements are about immobilization [8]. About complete fractures and two cortex fractures, reduction and the casting could be done considering the acceptable issues, but it needs more careful follow up [9]. Fractures with the displacement less than five mm and angulation less than 15 degrees can be well cured without reduction according to some standard references [10]. Different methods are mentioned in different references for immobilization. These methods are hard cast, soft cast and splint [11]. Considering the complications of treatment by the cast especially swelling, pain or even compartment syndrome and also its effect on the range of motion and decrease wrist range of motion and other complications followed by cast like pruritus and dermal stimulation, heavy weight of the cast, and not bearing it by the patient, splints can be used as its alternative. Recently, it is reported in many studies that immobilization is tolerated well by splint [12]. In addition, it can be used as a proper therapeutic choice. In addition, in many studies immobilization with a splint is reported as the more prevalent therapy. Although this method of treatment has important complications, which loosen the splint is among its prevalent complications [13] there are primary evidences in some studies that treatment by splint can be a proper alternative for the treatment by cast [14]. We

surveyed and compared the treatment of these fractures by splint and cast in order to choose a more proper, therapeutic method with less complication and less cost from this study and comparing other studies.

Materials and Methods

In this study, which is conducted by clinical trial methods, a statistical society of 152 persons was considered which were surveyed into two groups of 76 persons after studying the texts and other similar studies and according to the statistical counsel. In this study, all the patients, which were 1500 persons referring to the orthopedic emergency of educational therapeutic centers of Ahvaz Jundishapur University of Medical Sciences were visited and treated for six months among them children of 5- 12 years old which were 500 persons with the isolated fracture of distal radius without displacement or with minimal displacement enrolled the study. In addition, from this number, some people were excluded from the study based on the exclusion criteria of this study. These criteria were:

i. Patients with injury to the physes

ii. Patients with open fractures

iii. Patients with nervous- vascular injury

iv. Patients with injuries more than five days

v. Patient with the fracture of both radius and ulna bones

vi. Patients with congenital anomalies

vii. Patients with Buckle fracture

viii. Patients with risk factor for pathologic fractures

ix. Patients with intra articular fractures

x. Patients with fractures with the displacement of more than five mm or the angulation more than 15 degrees

xi. Patients younger than five years old or older than 12 years old

xii. Patients with the injury to other parts of the body, in addition, some patients were excluded from the study because of having complications induced by fractures or not referring for follow- up. However, at last, 152 patients who had the criteria of the study and had complete follow- up were surveyed. Patients were examined by the time of their entrance to the emergency and radiography in two vertical views including anteroposterior and lateral view were asked. Then they were under treatment by cast or splint completely randomly and after taking the consonant from parents. The patients were weekly visited and examined for three weeks, in the fourth week if clinical and union radiography was seen the cast or splint would be removed. In addition, it was suggested to use a wrist brace and not to do hard works for two more weeks. Then in the sixth week, the patients were visited and completely examined. The primary output of the patients was evaluated by surveying their physical function and using the Mayo Wrist Score. This questionnaire includes four parts or multiple choices which each part has 25 scores and the total score is 100. The score 90-100 is considered perfect. Scores 80- 90, 60- 80, less than 60 are good, desirable, and poor function, respectively. The wrist pain was evaluated by Face Pain Scale-revised which is a schematic design scored zero to 10 based on the face change of the patients. The more the score, the more will be the severity of the pain. Which its score was between zero to 10. Scores zero, one to four, and more than four were considered, painless, mild pain, and disabling pain, respectively. We evaluated the range of motions by measuring the rates of flexion, extension, ulnar deviation, radial deviation using goniometer based on the degree. During this visit, special forms that were prepared previously and contained patients' information like personal characteristics, history, and type of fracture, the results of examinations, complications, and score of the questionnaire were filled. Then using these forms, the patients' information was extracted and was analyzed and evaluated by using SPSS software version 17. In each case, P-value less than 0.05 was considered significant. In this study, short forearm cast was used for the group under treatment by the cast, the patients were suggested to hold their hands up for two days, and if swelling or any signs of compartment syndrome were seen, they had to refer to the emergency ward. In the group under treatment by the splint, sugar tong splint was used and they were suggested to hold up their limb and not to open the splint. Assistants put on all the casts or splints. Patients' follow up and filling the related forms were done by corresponding assistant and under direct observation of the related attending. If any complications occurred during the study, that patient would be excluded from the study and would be under treatment. As we expected, at last 152patients were surveyed into two groups of 76 persons.

Results

Out of 152 studied persons, 114 persons were boys and 38 persons were girls which in the group under splint therapy, 16 persons were girls and 60persons were boys and in the groups under cast therapy, 22 persons were girls and 54 persons were boys. The secondary output of the patients was conducted by surveying angulation of the fracture site, residual pain in the wrist, range of the motion of the wrist, re-fractures, and the rate of union. Re-fractures and non-union were also surveyed according to clinical examinations and radiographic evidences.

Physical function

As it was mentioned, the most important criteria surveyed in this study were evaluated by Mayo Wrist Score questionnaire. This questionnaire was filled in the sixth week for each patient and its score was entered in the patients' information record form. In the group under treatment by the cast, the mean score

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of this questionnaire was 92.2 with the standard deviation of 10.10, which the least score of this group was 55. However in the group under splint therapy, the mean score was 90.8 with the standard deviation of 8.5, which the least score of this group, was 60.In the group under cast therapy, there was one case of score less than 60 that is considered as weak function and in the group under splint treatment no patient was categorized in this part. In the group under treatment by cast 5, 8, 62 persons achieved the scores between 60- 80, 80- 90, and 90- 100, respectively. In the group under treatment by splint only one person achieved the score 60- 80 and 19 and 56 persons got the scores 80- 90, and 90- 100, respectively. After analyzing the data and doing Mann-Whitney test there was not a significant statistical difference from the viewpoint of physical function in two groups based on the P- value= 1.5 which was more than 0.05 (Table1) (Figure 1).

Table 1: The results of evaluating the physical function by questionnaire.

Score<60	60-80	80-90	90-100	Mean	Standard Deviation	
Treatment by cast	1(1.3%)	5(6.5%)	8(10.5%)	62(81.5%)	92.2	10.10
Treatment by splint	(0%)	1(1.3%)	19(25%)	56(73.6%)	90.8	8.5

Figure 1A: AP & LAT view of wrist before splinting.

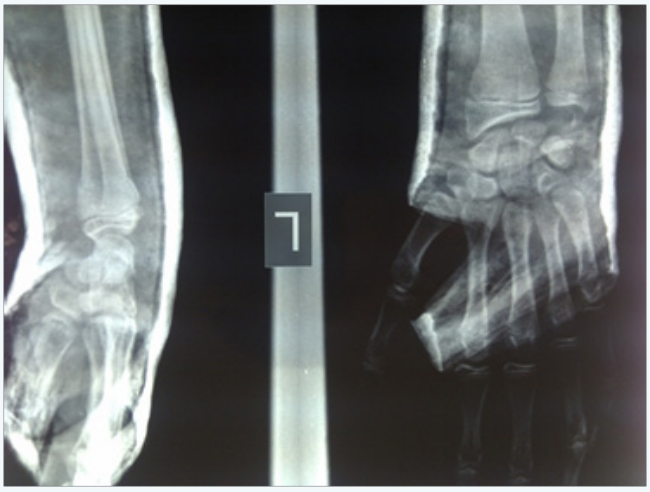

Figure 1B: AP & LAT view of wrist 4 week after splinting.

Figure 1: A profile graphy of an 11-year-old boy with distal radius fracture before splinting and four weeks after splinting.

Wrist pain

We evaluated pain according to Face Pain Scale- revised. In this survey the patients under treatment by cast had five cases of score more than four which was calculated as disabling pain, but in the group under splint therapy, six persons had the score more than four. The maximum score in this survey was seven for the patients under treatment by the cast. Considering the P-value>0.05, the patients in two groups did not show a significant statistical difference from the viewpoint of pain.

Range of Motions

After statistical survey and analysis of the data, there was not a significant statistical difference, either based on the P-value>0.05.Comparing the two groups, the P- values for flexion, extension, radial deviation, and ulnar deviation were 0.0309, 0.0690, 0.575, and 0.79, respectively (Table 2) (Figure 2).

i: The evaluation of the mean of the motion's range in the two therapy groups.

		Flexion	Extension	Ulnar Deviation	Radial Deviation
Cast	Mean	68.52	64.86	36.5	19.1
	SD	4.41	8.97	3.99	2.27
Splint	Mean	68.54	66.26	36.2	19.3
	SD	2.54	6.18	4.43	2.02
Normal		70 degrees	70 degrees	40 degrees	20 degrees

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Figure 2A: AP&LAT view of wrist before casting.

Figure 2B: AP & LAT view of wrist 4 week after casting.

Figure 2: A profile graphy of a 10-year-old boy with distal radius fracture before splinting and four weeks after casting.

Angulation

In this survey, we considered the residual angulation of less than 10 degrees as normal. In the group under treatment by the cast, only one case, who was an eight- year-old boy having 16 degrees angulations in the sagittal plan, had angulations after finishing the treatment. And considering the acceptable angulations according to the patients' age, the non- operative therapy was considered after explaining to his family. In addition, in the group under treatment by splint, two cases of angulations were seen after treatment. One of them was a six-year old boy with the angulations of 17 degrees in the sagittal plan and the other was a nine-year-old boy with the angulations of 13 degrees in the sagittal plan. In these two cases, considering the acceptability of the angles according to their age, they had non- operative therapy after explaining the patients' family and consulting with them.

Other complications

No case of fracture was seen during surveying the patients. In addition, all the patients had radiographic and clinical evidences showing that non-union did not exist. At the end of the sixth week, two cases of the patients under treatment by cast had movement restriction which they underwent physiotherapy. Four cases of the patients under treatment by cast had swelling that three of them were cured by holding up the hands and one of them was cured by opening one side of the cast.

Discussion

In this study, the patients were between the ages five to 12 years old which confirms with the study conducted by Boutis et al. [15] in Canada in the year 2010. But in another study about this issue, It was conducted on the pediatrics between five to 15 years old in Canada in the year 2002 [16]. But because the growth plate of the distal radius is closed in the age of 12 years old, we preferred to consider the age to 12 years old. The number of patients was similar to the previous studies. Nevertheless, the two previous studies had used Activity Scale for Kids for physical function. In the present study, the physical function was evaluated by Mayo Wrist Score, which the results were the same as other studies, although there was a difference in the questionnaire. There was not any statistical difference from the viewpoint of physical function in the treatment of distal radius fractures with minimal displacement by splint or cast. In this study, the range of motion was surveyed besides physical function. There was not much difference in the treatment by the cast or splint from this viewpoint that this issue confirms the two previous studies conducted in this field. The rate of residual pain was surveyed by Face Pain Scale- revised, which also confirmed the previous studies. However in this study the pain rate was surveyed in the sixth week but in the statistical study of Boutis et al. [15] in the year 2010 it was surveyed in the first, fourth and sixth weeks but the achieved results were completely similar. In this study, no case of re-Fracture or non-union was seen in the two therapy groups. In addition, there was not a considerable difference between the two therapies from the viewpoints of other complications like angulations, movements' restriction and joint stiffness. However, complications like swelling, pruritus or the discomfort of the patients were seen more in the group under treatment by the cast and some therapeutic costs were more in casting. However, over all, there was not a difference between the treatment by the cast and splint from the viewpoints of function and union.

Conclusion

As it was mentioned in Boutis et al. [15] study, it can be said that treatment by splint in not lower than treatment by the cast from the viewpoints of union, remission, and even the function of the wrist and even in some cases using splint is better than cast in the treatment of fractures without displacement or with minimal displacement. From this study and similar mentioned

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studies and the achieved results, it can be concluded that however the results of treatment by cast and splint are the same from the viewpoints of union and physical function and the results do not have significant difference, considering that splint is easier and cheaper, and its acceptability by patients and their parents is more and next cares of splint are easier and besides it does not have complications such as edema, pain and compartment syndrome and rehabilitation of movements is better, so splint can well be used in distal radius fractures without displacement or with minimal displacement. Yet now more researches and a survey of more complete and wide parameters are needed to definitely substitute splint for the cast.

References

1. Landin LA (1983) 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 sc and suppl 202: 1-109.
2. Thomas EM, Tuson KW, Browre PS (1975) Fractures of the radius and ulna in children. Injury 7(2): 120-124.
3. Bachman D, Santora S (2000) Orthopedic trauma. In: Fleisher G, et al. (Eds.), Textbook of pediatric emergency medicine. Lippincott Williams & Wilkins, Philadelphia (PA), USA, pp. 1455-1457.
4. Skillern PG (1915) Complete fracture of the lower third of the radius in child hood, with greenstick fracture of the ulna. Ann surg 61(2): 209-225.
5. Waters PM, Kolttis GJ, schwend R (1994) Acute median neuropathy following physeal fractures of the distal radius. J Pediatr Orthop 14(2): 173-177.
6. Mino DE, Palmer AK, Levinsohn EM (1985) Radiography and computerized tomography in the diagnosis of incongruity of the distal radio-ulnar joint. A prospective study. J Bone joint surg Am 67(2): 247-252.
7. Jupiter JB, Fernandez DL (1997) Comparative classification for fractures of the distal end of the radius. J Hand Surg Am 22(4): 563-571.
8. Van der Linden W, Ericson R (1981) Colles' fracture. How should its displacement be measured and how should it be immobilized? J Bone joint surg Am 63(8): 1285-1288.
9. Wildmann R, waters PM, Reeves S (1995) Complications of closed treatment of distal radius fractures in children. Presented at the posna annual meeting, Miami, China.
10. Al-Ansari K, Howard A, Seeto B, Yoo S, Zaki S, et al. (2007) Minimally angulated pediatric wrist fractures: is immobilization without manipulation enough? CJEM 9(1): 9-15.
11. Davidson JS, Brown DJ, Barnes SN, Bruce CE (2001) Simple treatment for torus fracture of the distal radius. J Bone Joint Surg Br 83(8): 1173-1175.
12. Symons S, Rowsell M, Bhowal B, Dias JJ (2001) Hospital versus home management of children with buckle fractures of the distal radius. A prospective, randomized trial. J Bone Joint Surg Br 83(4): 556-560.
13. Solan MC, Rees R, Daly K (2002) Current management of torus fractures of the distal radius. Injury 33(6): 503-505.
14. Oakley E, Ooi KS, Barnett PL (2008) A randomized controlled trial of 2 methods of immobilizing torus fractures of the distal forearm. Pediatr Emerg Care 24(2): 65-70.
15. Boutis K, Willan A, Babyn P, Goeree R, Howard A (2010) Cast versus splint in children with minimally angulated fractures of the distal radius: a randomized controlled trial. CMAJ 182(14): 1507-1512.
16. Plint AC, Perry JJ, Correll R, Gaboury I, Lawton L (2006) A randomized controlled trial of removable splinting versus casting for wrist buckle fractures in children. Pediatrics 117(3): 691-697.

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