



# EFFECTS OF PHYSICAL THERAPY IN THE TREATMENT OF THE POSTTRAUMATIC ELBOW CONTRACTURES IN THE CHILDREN

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## ABSTRACT

Pediatric post-traumatic elbow contracture can occur as result of the various injuries of area of the elbow joint. The aim of the study was to investigate the effect of the physical therapy and rehabilitation on the range of the motion of the elbow joint in the post-traumatic elbow contractures in the childhood. We analyzed in this research 54 children (average age  $9.4 \pm 3.15$  years) that were treated because of posttraumatic elbow contractures. Kinesitherapy, occupational therapy and other procedures physical therapy are used in the management. Range of the motion of the elbow was measured at the beginning and the end of the therapy for every child. Functional outcome was presented in degree from 1 to 3 (Flynn). Satisfied result of the therapy at the discharge was in the 94, 45% of the children and 74, 07 % of the children had excellent result. The difference in the grade at the beginning and the end of the therapy is statistically significant ( $t = 13.72, p < 0.001$ ). Significant improvement of the range of the motion in the elbow joint in the children with post-traumatic elbow contracture is attained by physical therapy.

KEY WORDS: elbow, contracture, children, physical therapy

## INTRODUCTION

Elbow contracture in childhood can occur as result of the various injuring in elbow joint area. Elbow mobility for children is of major importance for Activity of Daily Living (ADL). It has reported that the most frequent fractures in the children are on the upper extremities and that incidence of fractures in the elbow area is from 7% to 9% (1, 2). Also it has noted that fractures of the elbow area are more frequent in the children than in the adults and bones maturity and immature in childhood have influence on that (3). Traumatism in the elbow area and genesis of the contractures can leave various degrees of limitation mobility and functional limitations after the treatment finished. All these may have long-term consequences on the child's delicate health. That's why treatment of the elbow contractures after injury in childhood is important task. The success of the therapy and reestablishing of the mobility in elbow joint after injury depend on different factors. They have included the type of injury, damage of the soft tissue, bones and other structures that become during of injuring, conservative or operative treatment. The choice of the way of management, correct and lasting of immobilization, kinesitherapy (and other procedures of physical therapy) are important factors that

influence on outcome of the therapy and reestablishing of elbow joint mobility. It is reported about different fractures in the elbow area, about success of conservative and operative treatment of various fractures (1, 4, 5), success of surgical therapy of elbow contractures (3). But little information is available regarding the effects of physical therapy and rehabilitation on the mobility of the elbow joint in the treatment of elbow posttraumatic contractures in the pediatric population. The aim of our investigation was to establish therapy effects of the procedures of the physical therapy and rehabilitation on the range of motion of elbow and outcome of treatment in posttraumatic elbow contractures in childhood.

## MATERIALS AND METHODS

In our investigation we analyzed 54 children average aged  $9,4 \pm 3,15$  years (range from 3 to 16 years) who has admitted to a hospital for rehabilitation because of posttraumatic elbow contractures after conservative or surgical treatment of injury in the elbow area (Table 1). On the receipt in hospital every child had limitation of range of motion of elbow of different degree. Amplitude of motion in elbow joint we measured by goniometry and expressed in degree for every child at the beginning and the end of the therapy on discharge from hospital. All patients were included in program of physical therapy and rehabilitation (depend of clinical findings), that included dosage kynesotherapy, procedures of occupational therapy and physical therapy according to need (electrotherapy, cold therapy, thermotherapy, hydrotherapy). Therapeutically program has adapted during of the therapy in relation to degree of advancing in the therapy. The average duration of the therapy was 41, 02 days. The degree of mobility of elbow at the admission and at the discharge estimated on the Flynn using a rating on a scale from 1 to 3 for every patient (6). These criteria are completely usable on the children's age and do not opposite with classifications of the other authors

(7). The degree 3 estimated complete range of motion in elbow joint, degree 2 limitation of complete mobility in elbow from 5 to 10 degrees, degree 1 limitation of amplitude of motion of 10 to 15 degrees. A poor therapeutically result with loss of the elbow mobility for more than 15 degrees we estimated with grade 0. The injury severity was determined with ISS. ISS was derived from the AIS to assess the combined effect of multiple injuries and to determine degree of severity of injuries (8). In order to determine severity of injuries we used Abbreviated Injury Scale (AIS) and Injury Severity Score (ISS). AIS quantify the extent of anatomic insult to body regions, using a rating on a scale from 1 to 5 (8). For establishing significance of differences in degrees of mobility at beginning and at the end of the used therapeutically program (physical therapy and rehabilitation), we were used Student-t test. Statistical significance we determined on the range  $p < 0,05$ . Pearson's coefficient of correlation we were used for establishing correlation between injury severity (ISS) and outcome and result of physical therapy and rehabilitation of pediatric elbow contractures.

## RESULTS

Results of the therapy of the pediatric posttraumatic elbow contractures at the discharge from hospital (period of the therapy was average 41,02 days) we classified as satisfied and unsatisfied results. Satisfied result has marked limitation of range of motion in the elbow injured (flexion-extension) for less than  $15^\circ$  and when child was without of subjective discomfort. Unsatisfied result of the therapy indicated decreasing of the range of motion in the elbow injured for more than  $15^\circ$  at discharge. On the Table 2 we can see that normal range of motion in the elbow after physical therapy has attained 40 children or 74, 07% of the treated patients. From the Table 3 it has noticed that the most number of children their 30 or 55,5% at the beginning of the physical therapy had limitation of the motion of elbow

Characteristics	No	%
Age (years)	Average age	$9,4 \pm 3,15$
Sex	Boys	37
	Girls	17
Total		54
Average length of hospital stay (days)		41,02
Cause of injury	Fall	48
	Traffic accident	2
	Explosion	1
	Projectiles	2
	Other means	1
	TOTAL	54

TABLE 1. Characteristics of the study population (n=54)

RESULT	GRADATION	FUNCTIONAL FACTOR (loss of motion in degree)	GRADE	NUMBER OF CHILDREN	%
Satisfactory	Excellent	0-5 degree	3	40	74,07
	Good	5 to 10 degree	2	9	16,66
	Satisfactory	10 to 15 degree	1	2	3,72
Unsatisfied	Bad	>15 degree	0	3	5,55
TOTAL				54	100

TABLE 2. Outcome of the physical therapy of pediatric elbow contractures (n=54).

GRADE	AT BEGINNING		AT THE END OF THERAPY	
	Number of children	(%)	Number of children	(%)
3	0	0	40	74,1
2	7	13	9	16,7
1	17	31,5	2	3,6
0	30	55,5	3	5,6
TOTAL	54	100	54	100

TABLE 3. Estimate of movement of elbow at the beginning and at the end of therapy by physical therapy and rehabilitation (n=54).

AT BEGINNING OF THERAPY		AT THE END OF THERAPY	
Average grade of motion (x <sub>1</sub> )	SD <sub>1</sub>	Average grade of motion (x <sub>2</sub> )	SD <sub>2</sub>
0,581818	SD <sub>1</sub> =0,712	2,592593	SD <sub>2</sub> =0,813
t= 13,72, p<0,001			

TABLE 4. Average grade of motion at beginning and at the end of physical therapy

PARAMETER	Children without elbow contractures	Children with elbow contractures	DIFFERENCE
Average age (years)	9,15	10,43	p=0,09687
Average length of hospital stay (days)	32,62	68,86	p=0,000225
Injury severity score (ISS)	9,25	11,71	p=0,0077
Functional outcome (Flynn)	3	1,43	
Correlation ISS and functional outcome (Pearson's coefficient) :			r = -0,27733

TABLE 5. Children without and with elbow contractures at discharge (n=54)

for more than 15°, but after therapy only 3 patients or 5,6% had limitation of the range of motion of the elbow higher than 15°. In 14 of the patients, posttraumatic elbow contractures remained after physical therapy and rehabilitation. Among remained contractures it was the common limitation of mobility between 5 and 10 of degree and only 5, 6% of total treated patients had restriction of the motion higher than 15°. After finished physical therapy, average range of motion of injured elbow was statistically significantly increased (t= 13, 72, p<0,001) as seen in Table 4. Length of therapy was statistically significant higher in the children with unsatisfied result of the therapy (p=0, 000225). Degree of severity of injuries (ISS) after that contractures occur although was statistically significant higher in children with unsatisfied result of therapy (p=0, 00774369), as seen in Table 5, has not statistically significant correlated with functional outcome (Pearson's coefficient r= -0, 27733).

## DISCUSSION

Elbow injuries are common in children and most fractures around the elbow joint occur (3). Posttraumatic elbow contractures that are recognized as sequel of trauma of the elbow in pediatric patients occur as a different degree of limitation of motion in the elbow joint. These contractures may result from a combination of injury-related, diagnostic-related and therapy-related factors and may present an important therapeutics problem. When plans orthopedics-surgical treatment was finished and after that limitation of motion in the elbow joint occurred, physical therapy and rehabilitation has had the important role in the attaining of the functional improvement and turning out of mobility of the elbow. Kinesitherapeutical program, activities and technique of the occupational therapy, combined with other physical procedures, may have favorable affect on the outcome of the therapy of the pediatric posttraumatic elbow

contractures. Especially are important therapeutically procedures that as means of therapy use motion (kinesitherapy, hidrokinesitherapy and occupational therapy), but different forms of physical therapy which facilitate to perform of the motions, also. Our investigation shows that 75% of children with posttraumatic elbow contractures were boys and that in 88,9% of cases, cause of the injuring that result with elbow contracture was fall, what is in according to reports of the other authors (5, 9). Injuring of tissue of elbow area has not caused only by injury it may occur secondary as consequence of surgical intervention, manipulation of fractured fragments and by excessive use of physiotherapy (10). That's why success of the therapy and making of motion in joint elbow after trauma depends on different factors, including choice of applied procedures of physical therapy, as response of body on the applied therapy. In our investigation we did not find significant difference in regard to aging of children with completely healing of the posttraumatic contractures of elbow and who had loss of motion after physical therapy. Statistically significant was longer time of treatment of children with presented elbow contractures after therapy. Long of time on the

therapy was 2,1 times higher in the children with loss of elbow motion at discharge. Degree of severity of injury (ISS) was significantly different in the children with complete range of motion in regard to children with presented elbow contractures at discharge Average ISS was significantly higher in the children with presented contractures at discharge, but functional outcome was not in statistically significant correlation with severity of injury (Table 4). Results have showed that degree of severity of injury in the elbow area has not been only factor which is acting on therapeutically result. It has reported good results of conservative treatment of fractures in the children's elbow area (11). In our investigation 30 children with posttraumatic elbow contractures or 55,5% had limitation of the motion higher than 15 degree at the beginning of the physical therapy. 74,1% of children with posttraumatic elbow contractures had excellent result and complete movement at the end of the therapy. The most number of children with some degree of elbow contracture had good result and only 5,5% of children at discharge had poor result of the therapy (Table 5). Motion of the joint elbow was significant improved after applied procedures of physical therapy (Table 5).

## CONCLUSION

Results of our investigation have shown that use the kinesitherapy, occupational therapy and other procedures physical therapy, may attain significant therapeutically result in regard to motion in joint elbow of the children with posttraumatic contractures. Results of therapy of pediatric posttraumatic elbow contractures with physical procedures are satisfied at discharge in 94, 45% of cases or excellent in 74,1% of children. In the children who's at discharge had higher limitation of motion of elbow, average degree of severity of injury was higher although in generally injury severity (ISS) was not significant correlated with injury severity. Use of complex procedures of physical therapy is successful mean of management of pediatric posttraumatic elbow contractures.

## REFERENCES

- (1) Vocke A.K., von Laer L.R. Prognosis of proximal radius fractures in the growth period. *Unfallchirurg.* 1998; 101(4): 287-295
- (2) Parsch D., Loesel S., Lehner B., Carstens C. Post-traumatic loss of function and malunion of the elbow. *Orthopade* 2001; 30(9): 602-609
- (3) Stans A.A., Maritz N.G., O'Driscoll S.W., Morrey B.F. Operative Treatment of Elbow Contracture in Patients Twenty-one Years of Age or Younger. *J. Bone Joint Surg. Am.* 2002; 84 (3): 382-387
- (4) Norton C., Nixon J., Sibert J.R. Playground injuries to children. *Arch. Dis. Child.* 2004 89(2): 103-108
- (5) Norton C., Rolfe K., Morris S., Evans R., James R., Jones M.D., Cory C., Dunstan F., Sibert J.R. Head injury and limb fracture in modern playgrounds. *Arch. Dis. Child.* 2004; 89(2): 152-153
- (6) Flynn J.C., Mathews J.G., Benoit R.L. Blind pinning of displaced supracondylar fractures of the humerus in children. Sixteen year's experience with long-term follow-up. *J. Bone & Joint Surg.* 1974; 56A: 263-272
- (7) Ippolito E., Caterini R. and Scola E. Supracondylar fractures of the humerus in children. *J Bone & Joint Surg.* 1986; 68A: 333-344
- (8) Baker S.P., O'Neil B., Haddon W., Long W.B. The Injury Severity Score: A method for describing patients with multiple injuries and evaluating emergency care. *J. Trauma*, 1974; 14 (3): 187-196
- (9) Marjanović Z., Nikolić P., Đorđević M.N., Miličević R. Estimation of the value of skeletal extension applied in the treatment of dislocated supracondylar fractures of the humerus in children. *Acta Orthop. Iugosl.* 1999; 30:125-131
- (10) Stans, A. A., Maritz, G.J., O'Driscoll, S.W., Morrey, B.F. Operative treatment of elbow contracture in patients twenty-one years of age or younger. [www.vjortho.com](http://www.vjortho.com) [ 10th of December 2005.]
- (11) Munst P., Kuner E.H., Beckmann M. Conservative treatment of pediatric elbow fractures. *Orthopade* 1988; 17(3):287-296

LIST OF ABBREVIATIONS: ADL Activity of Daily Living; AIS Abbreviated Injury Scale; ISS Injury Severity Score