Physical and Medical Treatment of Elbow Injuries in Children

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Abstract

Elbow fractures are the most frequent childhood injuries. Non-dislocated fractures are treated with plaster, while dislocated fractures with orthopedic repositioning and the percutaneous fixation using Kirschner's wire. At the beginning of rehabilitation, contractures are present irrespective of whether conservative or operative methods were used for treating the injured elbow. Drugs used to treat pain after fractures are generally NSAIDs.

To determine the angle of elbow mobility, as well as the muscular strength of the injured extremity in children who are treated operatively and conservatively and to determine the impact of complications following surgery during rehabilitation.

Children with elbow injuries aged 0-15 years were analyzed retrospectively at the University Clinical Center of Kosovo. The disease was confirmed by physical examination, neurological examination, and radiography.

Out of 59 cases treated using operative method, 33 achieved a remarkable rehabilitation success rate of 3.79. Patients who did not have complications during orthopedic treatment have achieved better treatment success (excellent 92 cases) in the shortest duration of rehabilitation, averaging 69 days. Those who had no complications after orthopedic treatment had achieved better rehabilitation success, 74.80% excellent compared to those who had complications following the treatment, as a result none of them being excellent. NSAIDs were applied to 125 cases (89.3%). Antibiotics were least applied, at 12 or 8.6% of cases.

Operative or conservative treatment was not relevant to the duration and the success of rehabilitation. In the duration and success of rehabilitation complications following surgery showed high influence.The most commonly used drugs for the rehabilitation of children with elbow injuries were NSAIDs.

Clinical article (J Int Dent Med Res 2018; 11(1): pp. 352-356)

Keywords: Children, supracondylar fractures, drugs, rehabilitation.

Received date: 28 September 2017 **Accept date:** 08 November 2017

Introduction

Stability of the elbow is of crucial importance. It, as any other joint is secured with an appropriate combination of bones, ligament integrity and dynamic control performed by muscle tone.1 It's peculiarity is the activity of the growth nuclei, whose damage, caused by injuries either from trauma or during orthopedic treatment, can reduce or prolong the growth, in children, resulting in nodal deformities in the form of varus or valgus deformities.2 Elbow fractures are the most frequent childhood injuries (about 10% of all fractures). The most frequent is supracondylar fracture of humerus (more than 50% of all fractures).3,4 Elbow luxations in children are rare. Drugs used to treat pain after fractures are generally NSAIDs, analgesics, and anxiolytics. In addition, administer proper antibiotics and tetanus prophylaxis for open fractures.[4]

Non-dislocated fractures are treated with plaster cast of about 1700 extensions over a two-week period and then carrying on with plaster in semiflexion for 7 days more. In dislocated fractures the most used method is the orthopedic repositioning and the percutaneous fixation using

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Kirschner's wire fragments, with post-operative imobilization by plaster in flexion.

Open repositioning and osteosynthesis are made to those fractures which, by manipulative technique, have not reached the satisfactory position of the fragments.[5] Wrong adhesion, avascular necrosis, ulnar nerve paralysis, epiphysis plaque injuries, cubitus valgus are some of the possible complications after orthopedic fracture reproduction.[6]

At the beginning of rehabilitation, contractures are present irrespective of whether conservative or operative methods were used for treating the injured elbow.[7] Starting timely rehabilitation in treating knee injuries can reduce the contractility and pain, which cause inability.

Aim of the study

1. To determine the angle of elbow mobility, as well as the muscular strength of the injured extremity in children who are treated operatively and conservatively.
2. To determine the impact of complications during rehabilitation, following surgery.

Materials and methods

The parameters for the patients, treated for elbow injuries in the Clinic of Physical Medicine with Rehabilitation in Prishtina, were analyzed. The study analyzed diagnosed cases of elbow injuries (ICD, Rev.10, code for elbow injuries) exclusively, the injuries due to trauma.

The study included children with elbow injuries aged 0-15 years.

At admission, a functional status examination was performed, which identified the following parameters:

1. Measurement of range of motion in elbow joint and R \ C.
2. Manual testing of the examination of muscular force of the hand and forearm.
3. Measurements of the upper extremities perimeter.

For the assessment of the rehabilitation scale, we performed the outpatient check-ups, initially, two weeks later, and then every month. During each control, anamnesis was taken and objective clinical examination was carried out taking into account the overall number of procedures. For the assessment of the success of rehabilitation, three comparative groups were formed based on Hoyer's complete classification.

The collection of epidemiological data, clinical-laboratory and radiological manifestations for all the injured was carried out using a a questionnaire set up for the purpose, with sufficient number of data.

Ethical clearance

The study had been approved by The Ethic Committee of the Faculty of Medicine, University of Prishtina.

Statistical analysis

The data collected was processed with the In- STAT statistical package. Differences between categorical variables were tested with the chi-square test (x^2). Furthermore, statistical research data was tested twice for reliability and presented through tables. The difference was significant if $P<0.05$.

Results

Table 1 shows the success of rehabilitation of children with elbow injuries according to the orthopedic treatment. Out of the 140 cases, 81 were treated conservatively, while 59 operatively. Of the 81 cases treated with the conservative method 59 were remarkably rehabilitated, with a success rate of 2.25. Out of 59 cases treated using operative method, 33 achieved a remarkable rehabilitation success rate of 3.79.

Treatment	Parameters	Success			Total
		Poor	Good	Excellent	
Conservative	Sum of frequency	13	9	59	81
	Coefficient of success-the average	64.23	18.89	2.25	14.05
Operative	Sum of frequency	14	12	33	59
	Coefficient of success-the average	43.21	18.33	3.79	16.10
Total	Sum of frequency	27	21	92	140
	Coefficient of success-the average	53.33	18.57	2.80	14.91

Table 1. The rehabilitation of patients with elbow injuries according to orthopedic treatment. p>0,05.

From the obtained results we conclude that there is no significant difference (p> 0.05) between the method of orthopedic treatment and the success of the rehabilitation, thus the way of orthopedic treatment does not affect the success of rehabilitation.

In order to achieve a successful and rapid rehabilitation, it is important to avoid any complications following treatment. Based on this we have analyzed the influence of complications following the treatment on average duration of rehabilitation and the success of the treatment.

The total number of injured patients, n = 140, was divided into two cohorts: those who had complications following orthopedic treatment and those who did not have. We have come to conclusion that patients who did not have complications during orthopedic treatment have achieved better treatment success (excellent 92 cases) in the shortest duration of rehabilitation, averaging 69 days (Tab.2).

Success	Duration's parameter	Complications after orthopedic treatment		
		No	Yes	Grand Total
Poor	N	14	13	27
	Rehabilitation's duration	133.35	106.53	120.44
Good	N	17	4	21
	Rehabilitation's duration	88.23	91.5	88.85
Excellent	N	92		92
	Rehabilitation's duration	56.04		56.04
Total sum of frequency Total Average of duration	N	123	17	140
	Rehabilitation's duration	69.29	103	73.38

Table 2. Duration of rehabilitation according to complications following the treatment.

Table 3 shows the total number of cases divided into two cohorts, those who did not have any complications after orthopedic treatment and those who did have complications.

Complication after orthopedic treatment		Success			Total	
		Poor	Good	Excellent	N	%
infection		1	1		2	1.43
+ OP		3			3	2.14
c.varus		1	2		3	2.14
c. valgus			1		1	0.71
male sa		4			4	2.86
myo.oss		2			2	1.43
Volkmann ischemic contracture		2			2	1.43
Yes	N	13	4		17	12.14
	%	76.47	23.53		100.00	-
No	N	14	17	92	123	87.86
	%	11.38	13.82	74.80	100.00	-
Total	N	27	21	92	140	100.00
	%	19.29	15.00	65.71	100.00	-

Table 3. Success of rehabilitation of patients presenting complications following the treatment.

From this analysis we concluded that those who had no complications after orthopedic treatment had achieved better rehabilitation success, 74.80% excellent compared to those who had complications following the treatment, as a result none of them being excellent.

Table 4 shows medical treatments applied to all injuries depending on the type of injury. Of the total number of cases, 140 (100%) NSAIDs were applied to 125 cases (89.3%). Antibiotics were least applied, at 12 or 8.6% of cases.

Medical Treatment	Type of injury						Total	
	Fractures		Fissure		Luxation			
	N	%	N	%	N	%	N	%
N	132	100.0	4	100.0	4	100.0	140	100.0
NSAIDs	119	90.2	3	75.0	3	75.0	125	89.3
analgesics	55	41.7	1	25.0	3	75.0	59	42.1
anxiolytics	19	14.4	-	-	-	-	19	13.6
antibiotics	12	9.1	-	-	-	-	12	8.6

Table 4. Results of rehabilitation following medical treatment according to the type of injury.

Discussion

The study is presented in terms of factor analysis that most affect the duration and success of rehabilitation of children with elbow injuries, respectively the factors that slow down or disrupt an adequate, successful and complete rehabilitation.

Elbow injuries often leave serious consequences on the node function and therefore delicate recovery is needed.[8,9] In children, the total number of fractures 65% -75% occur at the upper extremity.[10] Elbow fractures in the pediatric population are very common since children when falling down lay their hands in front of them to protect themselves from the impact.[4,11-14]

Analyzing the obtained data regarding the orthopedic treatment, 81 patients with elbow injuries were treated conservatively, while 59 others operatively. Our data as well as the data taken from the studies of different authors [3,14-16] prove that for the treatment of supracondylar fracture conservative methods are mostly used. This by no means is a preffered method because various methods of treatment of supracondylar fractures of humerus have been researched and none of them is appropriate for all cases.

In order to achieve good results, accurate diagnosis and decision on whether to use conservative or operational method are needed. A study [16] conducted on 28 children, of 1-12 years old, with dislocated supracondylar fracture, concluded that closed repositioning should be carried out first and if this fails then open repository to follow. The conclusion was reached by forming two groups; group A (closed repositioning treatment) and group B (open repositioning) with 14 children each, and having the same overall statistical characteristics (p> 0.05): age, sex, dislocation, nerve injury. According to Flynn's criteria group A had excellent success in 100% of cases, while group B was excellent in 93% of cases and weak in 7% of them.

Complications following orthopedic (conservative or operative) treatment correlate with the most disadvantageous prognosis in treating the injured elbow.[17-19] This is evidenced by the data from our paper, where out of 17 cases with complications following orthopedic treatment, none achieved great success. Complications following treatment we've encountered on these patients: 3 (25%) had cubitus varus, 1 (8,3%) cubitus valgus, 4 (33,3%) malae sanata, 2 (16.7%) myositis ossificans and also 2 (16.7%) Volkmann ischemic contracture. The data from the literature [17-20] also talk about the frequency of complications in treating elbow injuries.

A study conducted in 196 children with supracondylar fractures of humerus [19] concluded: in the series of treated patients there were no permanent nerve lesions. A patient has developed Volkmann's ischemic contracture; transient nerve injury, in the form of neuropraxia were evidenced in two patients undergoing surgical exploration, nerve neurosis and then physical therapy for a period of three months which resulted in complete recovery. Deformities such as varus and valgus have been diagnosed in three patients and then corrective osteotomies have been performed. Myositis ossificans has been identified in a patient, while wound infection at the entry of Krichners wires has not been observed in any of the injured. Anatomic repositioning with minimal joints and soft tissues trauma [15] is required to achieve an excellent result.

Our study used NSAIDs to children aged 3 to 15 years, whose pain was evaluated with age-appropriate, validated pain scales. A study by Drendel et al. [21] also concluded that Ibuprofen is preferable to acetaminophen with codeine for outpatient treatment of children with uncomplicated arm fractures.

Conclusions

Basing on the elaborated material and the analysis of the obtained results we have come to the conclusion:

The method of orthopedic, operative or conservative treatment was not relevant to the duration and the success of rehabilitation, since we did not gain significant statistical significance. In the duration and success of rehabilitation complications following surgery showed high influence.

The most commonly used drugs for the rehabilitation of children with elbow injuries were NSAIDs.

Acknowledgements

Authors would like to thank all the children who participated in this study.

Declaration of Interest

The author(s) declare that they have no conflict of interest.

References

1. Marquis CP, Cheung G, Dwyer JSM, Emery DFG. Supracondylar fractures of the humerus. Current Orthopaedics. 2008;22(1):62-69.
2. Tamai J, Lou J, Nagda S, Ganley T, Flynn J. Pediatric elbow fractures: Pearls and Pitfalls. Children hospital of Philadelphia, Division Orthopaedic Surgery, Philadelphia. 2002;15:44-51.
3. Murtezani A, Pustina A, Bytyçi C, Hundozi H. Rehabilitation of children after elbow injuries. Niger J Med. 2007;16(2):138-42.
4. Omid R, Choi PD, Skaggs DL. Supracondylar humeral fractures in children. J Bone Joint Surg Am. 2008;90(5):11tab
5. 21–32.
6. Campbell WC. Operative Orthopedics, 12th edition: The CV. Mosby Co, St.Louis-Toronto-London. 2012.
7. Stans AA, Maritz NGJ, O'Driscoll ShW, and Morrey BF. Operative treatment of elbow contracture in patients twenty-one years of age or younger. Mayo Clinic and Mayo foundation, Rochester. The journal of bone and joint syrgery. 2002;84:1-3.
8. Abzug JM, Herman MJ. Management of supracondylar humerus fractures in children: current concepts. J Am Acad Orthop Surg. 2012;20(2):69–77.
9. Knight KL, Draper DO. Therapeutic modalities: the art and the science. 2nd ed. Baltimore, MD: Lippincott, Williams & Wilkins. 2013; 283-302.
10. Lee ML, Rosenwasser MP. Chronic elbow instability. New York Orthopaedic Hospital, Columbia University College of Physicians and Surgeons, New York, USA. 2002.
11. Jandric S, Talic G, Spasojevic G. Outcome of the pediatric post-traumatic contracture of the elbow. Med Arh. 2008;62(3):149-52.
12. Howard A, Mulpuri K, Abel MF, Braun S, et al. The treatment of pediatric supracondylar humerus fractures. J Am Acad Orthop Surg. 2012;20(5):320–27.
13. Garg S, Weller A, Larson AN, Fletcher ND, et al. Clinical Characteristics of Severe Supracondylar Humerus Fractures in Children. Journal of Pediatric Orthopaedics. 2014;34(1):34–39.
14. Valencia M, Moraleda L, Díez-Sebastián J. Long-term functional results of neurological complications of pediatric humeral supracondylar fractures. J Pediatr Orthop. 2015;35(6):606-10.
15. Aksakal M, Ermutlu C, Sarısözen B, Akesen B. Approach to supracondylar humerus fractures with neurovascular compromise in children. Acta Orthop Traumatol Turc. 2013;47(4):244-49.
16. Ersan O, Gonen E, Arik A, Dasar U, Ates Y. Treatment of supracondylar fractures of the humerus in children through an anterior approach is a safe and effective method. Int Orthop. 2009;33(5):1371–75.

17. Kaewpornasawan K. Comparison between closed reduction and open reduction with pinning in children with closed totally displaced supracondylar humeral fractures. Journal of Pediatric Ortopaedics. 2001;10(2):131-7.
18. Kim TH, Lee DH, JinHan K, SunChoi W, HoCho J. Early range of motion exercise in pediatric patients with olecranon fractures treated with tension band suture with double loops and double knots. Journal of Shoulder and Elbow Surgery. 2017;26(7):227-231.
19. Acar E, Memik R. Surgical Treatment Results in Pediatric Supracondylar Humerus Fractures. Eurasian J Emerg Med. 2017.
20. Abramović D and Milanović D. Closed reduction and percutaneous pinning of displaced supracondylar fractures in children. University Children's Hospital Belgrade. Acta Orthopaedica Jugoslavica. 1997;28:75-9.
21. Panthi S, Khatri K, Kharel K, Vaishya R, Agarwal AK, Vijay V. Radiological and Functional Outcome of Medial Epicondyle Fracture Treated Surgically in Children and Adolescents: A Retrospective Study. Cureus. 2017;9(1):953.
22. Drendel AL, Gorelick MH, Weisman SJ, Lyon R, Brousseau DC, Kim MK. A Randomized Clinical Trial of Ibuprofen versus Acetaminophen with Codeine for Acute Pediatric Arm Fracture Pain. Annals of Emergency Medicine. 2009;54(4):553-560.