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MODERN VIEW OF REHABILITATION OF CHILDREN WITH POST-TRAUMATIC CONTRACTURE OF THE ELBOW JOINT

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ANNOTATION

Purpose of the study. *Evaluation of the effectiveness of the clinical and biomechanical approach to functional recovery in children with post-traumatic contracture of the elbow joint.* ***Material and methods.*** *The study included 78 children divided into experimental (n = 36) and control (n = 42) groups, who evaluated passive and active amplitude of motion (ROM), functional assessment on the MEPS scale, achievement of individual goals on the GAS scale, recovery rate and stability of effects.* ***Research results.*** *The main group using the clinical-biomechanical method demonstrated significantly higher functional results: the growth of passive ROM and MEPS exceeded the control group; GAS T-score was higher. In addition, recovery was achieved faster, and the effect lasted for 6 months.* ***Conclusions.*** *The obtained data showed high efficiency of the clinical-biomechanical approach, its effectiveness, rapid achievement of functional results and stability of the effect in the long term. The presented results confirm the expediency of including this method in the standards of pediatric rehabilitation.*

KEYWORDS. *Post-Traumatic Elbow Joint Contracture, Children's Rehabilitation, Clinical and Biomechanical Approach, Mayo Elbow Performance Score (MEPS), Goal Attainment Scaling (GAS), recovery speed, effect stability*

TOPICALITY

Post-traumatic contracture of the elbow joint in children is a persistent restriction of mobility in the joint due to trauma, as well as after operations and prolonged immobilization [1,2]. The frequency of such contractures in Uzbekistan is 67% of the total number of outdated processes [1]. This condition leads to serious limitations of mobility, difficulties in performing daily activities and a decrease in the quality of life of young patients [2]. The analysis of literature data showed a wide range of diagnostic and therapeutic methods of solving this problem, but there is not enough work on their rehabilitation. Therefore, today the study of the clinical and biomechanical approach to the management of such patients is relevant, which will allow to individualize rehabilitation, adapting it to a specific child, and increase the effectiveness of the intervention, thereby reducing the risk of overload or insufficient stimulation of tissues [3,7].

Thus, the integration of clinical and biomechanical principles in the rehabilitation of children with post-traumatic contracture of the elbow joint is an innovative and promising way. It is able to significantly increase the effectiveness of treatment, provide a more accurate and safe dosage of therapy and adapt the intervention to the individual needs of the patient. In conditions where traditional methods are already showing good results, the introduction of biomechanical assessment can bring rehabilitation to a qualitatively new level.

PURPOSE OF THE STUDY

To evaluate the effectiveness of the clinical-biomechanical approach in functional recovery in children with post-traumatic contracture of the elbow joint.

RESEARCH MATERIALS AND METHODS

The study included 78 children aged 6-16 years with clinically confirmed post-traumatic contracture of the elbow joint, who applied for rehabilitation. All participants were divided depending on the activities carried out into the main (n = 36), which received an individualized rehabilitation program, including individual traction, taking into account the patient's biomechanical parameters and dosed load (physical therapy, exercises, mechanotherapy) and control groups (n = 42), who received standard therapy.

The program lasted 4-6 weeks daily, a control evaluation was carried out immediately after completion, followed by 3 and 6 months later to assess the durability of the effects.

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Two techniques were used to assess the effectiveness of rehabilitation - the Mayo Elbow Performance Score (MEPS) scale - a multi-dimensional scale designed to assess the function of the elbow joint. The function in everyday life (ADL) was evaluated by performing five basic actions, such as combing, personal hygiene, eating, putting on clothes and shoes. Goal Attainment Scaling (GAS) is an individualized method of evaluating the achieved results, focused on the specific goals of the patient.
All obtained results were subjected to statistical processing.

RESEARCH RESULTS

At the first stage, a subgroup analysis of changes in passive ROM was carried out depending on age and gender (Fig. 1.)

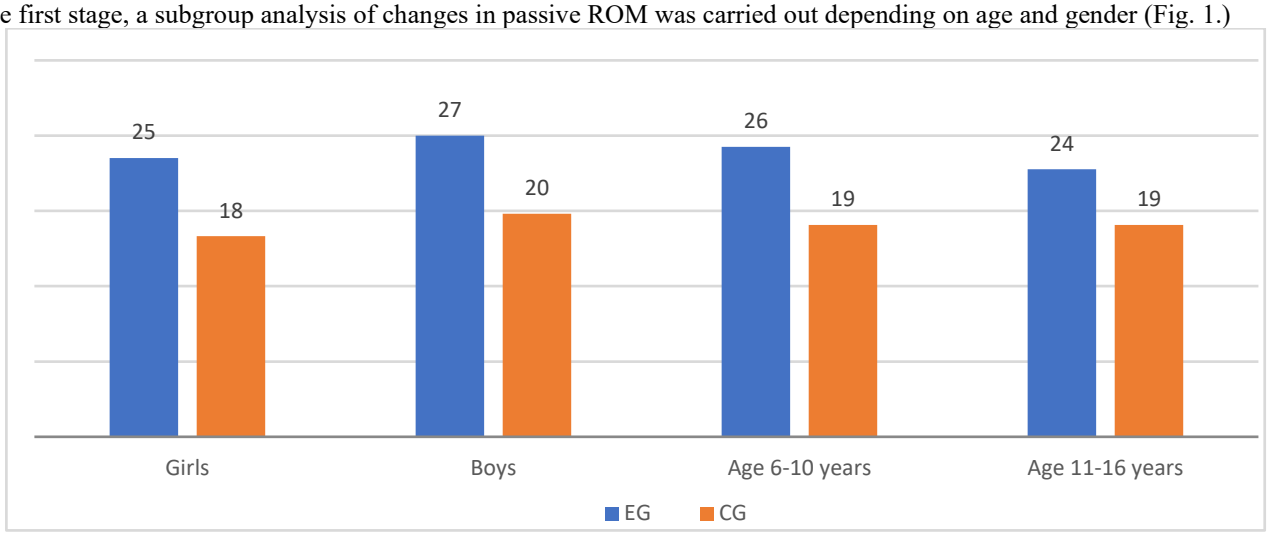


Fig. 1. Subgroup analysis of changes in passive ROM by age and gender

The data obtained showed that in the main group receiving clinical and biomechanical therapy, the ΔROM value was higher in all the subgroups considered. So, girls have an increase of 25° against 18° in the control group, boys have an increase of 27° against 20°. By age 6–10 years: increase 26° against 19°, 11–16 years: increase 24° against 19°. This indicates a consistent predominant effect of the clinical and biomechanical approach, regardless of the gender and age of patients.

Next, the change in the amplitude of movements in the elbow joint was studied (Tab.1). Before the start of treatment, the amplitude of movements was statistically similar between groups ($p = 0.76$ for passive, $p = 0.68$ for active amplitude), which confirms the comparability of groups at the initial level. After the course in the main group (with a clinical-biomechanical approach), the ROM value is much higher: Passive amplitude - 110° vs 100° ($p < 0.01$), active amplitude - 95° vs 88° ($p < 0.05$).

Table 1

Change in the amplitude of motion (ROM) of the elbow joint in both groups

Indicator	EG (n = 36)	CG (n = 42)	(p-value)
Passive amplitude (average ± SD)			
- Before the beginning	85° ± 15°	84° ± 14°	p = 0,76
- After the course	110° ± 12°	100° ± 13°	p < 0,01
Active amplitude (average ± SD)			
- Before the beginning	70° ± 14°	69° ± 13°	p = 0,68
- After the course	95° ± 11°	88° ± 12°	p < 0,05

The clinical-biomechanical approach in the rehabilitation of children with post-traumatic contracture of the elbow joint demonstrated a statistically significant advantage in increasing both passive and active amplitude of movements compared to standard therapy. A significant improvement in the main group indicates the high efficiency of the innovative method - individual tractions, load dosing and taking into account biomechanical parameters.

A comparative analysis of functional indicators in the studied groups was also carried out (Table 2). Thus, before rehabilitation, MEPS values were comparable in two groups: 65 ± 10 points in the main and 64 ± 9 points in the control. After completing the rehabilitation course on the MEPS scale, the indicator increased to 90 ± 7 in the main group and 82 ± 8 in the control group, GAS (T-score) reached 55 ± 10 in the main group, compared to 48 ± 11 in the control group.

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MEPS results after the course in the main group (90 ± 7) belong to the category of "excellent", while in the control group - "good" (82 ± 8), which indicates a more pronounced functional improvement with a clinical-biomechanical approach. GAS shows a higher average T-score in the main group (55) against the control group (48), indicating a more successful achievement of individually set goals.

Table 2
Functional indicators in groups (MEPS and GAS)

Indicator	Main group (n=36)	Control group (n=42)
Mayo Elbow Performance Score (MEPS)		
– Before the start (average ± SD)	65 ± 10	64 ± 9
– After the course (average ± SD)	90 ± 7	82 ± 8
Goal achievement indicator (GAS, average T-score)		
- After the course	55 ± 10	48. 11

The results of Table 2 show that the clinical and biomechanical rehabilitation program provides a significant clinically significant advantage in the functional restoration of the elbow joint (according to MEPS) and more effective achievement of individual rehabilitation goals (according to GAS) than traditional therapy.

Faster dynamics of recovery in 2 weeks, 55% of children in the main group reached the target amplitude, while in the control group - only 43%. By the 4th week, this figure increased to 89% in OG and 71% in CG, indicating a more pronounced and accelerated recovery with the application of a clinical-biomechanical approach. The average duration of rehabilitation in OG is 5.0 ± 0.5 weeks, while in the control group it is 5.5 ± 0.7 weeks, which indicates the possibility of achieving the result faster with an innovative technique.

Thus, when using it, children recover faster and with a shorter course duration, which has greater practical value and effectiveness compared to standard therapy.

DISCUSSION

The results of this study confirm the effectiveness of the clinical and biomechanical approach in the rehabilitation of children with post-traumatic contracture of the elbow joint. Compared to standard therapy, the innovative method provided rapid recovery of motion amplitude (ROM) - after 4 weeks, 89% of participants in the main group reached the target ROM, compared to 71% in the control group. Sustainable improvements in the long term - after 6 months, the ROM was 105° in the main group and 95° in the control group; MEPS (functional scale) indicators were also higher (85 vs 78 points). Functional superiority - MEPS increased to 90 points ("excellent") in the main group against 82 ("good") in the control group; GAS T-score was 55 compared to 48. Clinical effect: MEPS growth (+25 points) in the main group significantly exceeded the threshold of MCID (12.2) and SCB (17.3), which emphasizes the practical significance of the results.

Our data are consistent with the positive effects of physical methods in the treatment of elbow contractures in children. A retrospective study by Jandrić et al. showed that in 94% of cases the therapy led to a satisfactory one and in 74% - to an excellent result on the Flynn scale ($p < 0.001$). It is important to note that surgical interventions (for example, open contractures) can give an increase in ROM by 48°, but they are accompanied by risks and are applicable with pronounced restrictions. In contrast, our approach offers a less invasive and safe alternative with a sustainable result. Taking into account the biomechanical parameters of each child - tension in tissues, degree of contracture, mobility - it is possible to adapt the dosage of loads and traction, which provides a faster and more stable effect. Economic and resource efficiency. A shorter course time and a lower need for surgery reduce the burden on the health care system and facilitate the implementation of programs in clinics.

CONCLUSION

The clinical-biomechanical approach has proven to be an effective, clinically significant and stable method of rehabilitation in children with post-traumatic contracture of the elbow joint. It allows not only to accelerate recovery and increase functional indicators, but also to ensure that improvements are maintained in the long term without surgery. The introduction of this method into rehabilitation practice requires further research, but it already looks like a promising tool for improving the child's quality of life.

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