

THE EFFICIENCY OF KINETIC AND HYDROKINETIC RECOVERY PROGRAMS AMONG PATIENTS WITH TRAUMATIC SHOULDER PATHOLOGIES

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Abstract: *The research objectives were to highlight the importance and the role of hydrotherapy and physical therapy exercises on patients with traumatic shoulder pathologies. The research was conducted on twenty subjects, aged between 34 and 71. The initial and final evaluation included active and passive spectrum of movement assessment, muscle strength assessment, visual analogy scale, Shoulder Pain and Disability Index (SPADI). The research showed that both groups managed to regain their active range of motion during a three-week rehabilitation program. The conclusions of our research demonstrate the effectiveness of both physiotherapy and hydrotherapy exercise.*

Key words: *kinetic and hydrokinetic recovery, shoulder pathologies, medical and kinetic programs, rehabilitation.*

1. Introduction

Physical therapy addresses ailments or traumas which restrict an individual's ability to relocate and conduct utilitarian exercises in their everyday lives [17].

Physical therapy employs a person's

biography and physical evaluation to approach at a diagnostic and determine supervision plan and, when require, incorporates the outcomes of lab and imaging experiments, such as radiographs and CT results, or NMR [2].

Physical treatment has several

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specialties, encompassing neurological, orthopedic, musculoskeletal, and cardiopulmonary, endocrinology, geriatrics, paediatrics, sports medicine, gynecology. Neurological rehabilitation appears especially promptly developing discipline [3].

The shoulder is complex in structure and function because it appears may be the most accessible areas of the body due to the glenohumeral joint. The shoulder joint contains the shoulder girdle, connecting the uppermost limb to the axile skeleton through the sternoclavicular joint. The wide range of shoulder movements is detrimental to the low equilibrium of the joint and is prone to dislocation and injury [12].

In the composition of the shoulder joint, we have the scapula, clavicle, and humerus, which articulate and form the glenohumeral and acromioclavicular joint (AC) [11].

The joint capsule also has the role of closing the joint space and limiting movements, giving stability to the joint [11], [13].

The shoulder is very complicated in structure and function because the glenohumeral joint is one of the foremost unrestricted areas of movement in the human body [33].

Anatomically speaking, it is composed of the clavicle and scapula, which articulates with the humerus in its proximal area. Four joints are present at the shoulder: [33]

- Sternoclavicular joint (SC);
- Acromioclavicular joint (AC);
- Scapulothoracic joint;
- Glenohumeral joint. [33]

Shoulder Biomechanics

Shoulder joint is the particularly general-purpose zone of the physique due to the

integrated motion of the glenohumeral and scapulothoracic joints. Simultaneously, the calculated movement of the clavicle, scapula, and humerus is essential in favour of complete lifting and ordinary functioning of the upper periphery. [8]

The movements performed at the shoulder joint are [4]: adduction, abduction, flexion, external rotation, extension, internal rotation.

Traumatic shoulder pathologies

Traumatic shoulder pathologies are subacromial impingement syndrome, humeral head fracture, glenohumeral dislocation, rotary head injuries. [20]

Rotator cuff injuries

Rotator cuff tendons are often subjected to solid stresses because they work in stabilizing the glenohumeral joint.

Complete lesions frequently implicate this amount of tendon retraction. The convalescent's phase, the essential activity of the shoulder, the dimension of the abscess, the chronicity, and the amount of retraction of the tendon are essential elements that must be taken into account when deciding the most appropriate way to manage each patient [30].

The supraspinatus ligament is the foremost regularly harmed the cuff rotator muscle, preceded with the subscapularis, infraspinatus, and small round. The small round muscle tendon goes unfrequently engaged in injuries of the rotator cuff. Rupture of the subscapular tendon might go correlated through some dislocation of the bicep's tendon in the biceps notch, relocating medially in the subscapular region. Acknowledgment of intraarticular tendon ruptures goes done through the unavailability of the bicep's tendon in the biceps groove that remains empty [7].

Glenohumeral dislocation

The glenohumeral joint is the foremost common separated joints of the physique, bookkeeping with 45% of disengagements. Front separation interprets in favor of 96% of incidents and is frequently the outcome of a power implemented to the shoulder joint although the arm is in external rotation and in abduction. Dorsal displacement is the latter highly prevalent orientation of displacement, perceiving with 2% until 4% incidents [31].

Humeral head fracture

Humeral head fractures fall into a bimodal dissemination depending on age and vitality proportion. Some bimodal patterning goes widespread and might be differentiated between supreme power (e.g., auto mechanism collision in teenaged convalescents) and soft power (e.g., the condition of the elderly patient after falling from the same level) [9], [1].

Humeral head fractures occur most frequently within convalescents above 65 seasons of age. During the circumstance of osteopenia or osteoporosis, a soft-vitality decline that leads to a humeral head fracture goes, through the description, a weakness breakage. Thereby, convalescents suffering from some lesions (rather minus a managerial diagnostic by DEXA survey) might be evaluated immediately into the osteoporotic range. More underage convalescents frequently have some lesions as a result of high-energy trauma [24], [28], [29].

Conservative treatment

Immobilization in a slingshot bandage, followed by a slight innovative transformation, goes suggested in marginally resettled operative and anatomical throat ruptures [30].

Reformist physical treatment and reconstruction programs feature initially, soft exercise with the shoulder swinging 11 thru 15 days after the trauma, as determined through the convalescent's manifestations [1].

Overall, conservative management alone has illustrated an accomplishment incidence of roughly 82% to 87% in analyzing all kinds of humeral head ruptures [1].

Surgical treatment

Surgical treatment corresponds of a lot of alternatives, incorporating narrow decrease and transdermal predilection, expansive decrease and interior predilection, hemiarthroplasty, and total shoulder arthroplasty. [1], [28] locked decrease and percutaneous predilection indicated in surgical neck fractures with minimal metaphyseal crushing and intact medial limestone [1], [28].

Kinetic recovery and hydrokinetic recovery

Kinetic recovery deals by means of human activity and motion and optimizing physical ability. It also identifies and maximizes the trait of existence and the potential for movement in advertising, protection, therapy/intervention, competence, and reconstruction [32]. Considering changes in health, use physical methods to encourage, preserve, and reestablish physical, psychological, and societal wellness [32].

Hydrokinetic recovery aims at treating the disease or its effects on health using different properties of water for purposes [19]. Water offers various advantages, with fantastic liquidity, density, supreme thermal capability, and supreme thermal conductivity. In extension, the concentration of unadulterated H₂O is

analogous to the median viscosity of water in the human body, but it will be slightly different due to distinguish portions or temp transformations [10], [16]. The consequences of hydrotherapy on health typically seem as warmed, technological, and chemical consequences, either unattended or when different consequences. Thermal consequences are experienced by warmth (36–41 °C), corpse temp (32–35 °C), or ice-cold (9–11 °C). Heat treatment is usually illustrated by dilation effects and assistance of bloodstream outflow, although icy treatment is normally detailed by vasoconstriction and discomfort decrease consequences. [14]

2. Materials and Methods

2.1. Objectives of the research

This study's overall goal appears to illustrate the effectiveness of kinetic and hydrokinetic recovery programs designed and followed over the specified period among patients with trauma to the shoulder joint.

2.2. Hypothesis of the research

Advancing the procedures produced in the shoulder joint, the patients who benefited for three weeks from the kinetic and hydrokinetic recovery programs developed by us had a significant recovery of joint mobility and a significant decrease in the degree painful.

2.3. Design of the research

We utilized the following research methodologies in this work: case study method, observation method, visual approach, and statistical-mathematical method.

This research included 20 subjects with trauma to the shoulder joint, divided equally into two groups.

Each group of subjects followed a similar recovery program; the only difference was the place where it took place; more precisely, the recovery of the first group took place in the physiotherapy room and the recovery of the second group in the pool.

Equipment used: physiotherapy room; the basin; elastic bands; fixed ladder weights; sticks; sandbags; milestones; wand.

The transdisciplinary crew was prepared from medic, assistant, the squad of professionals from the Kinetic Medical Recovery Center and the Târgu Mureş County Emergency Clinical Hospital: physiotherapist, orthopedist, and psychologist.

The management of the Kinetic Medical Recovery Center and the Târgu Mureş County Emergency Clinical Hospital agreed with the development of our research.

2.4. Place and period of the research

The research was conducted over three weeks, between November 2020 and March 2021.

Place of research: Kinetic Medical Recovery Center and Târgu Mureş County Emergency Clinical Hospital.

2.5. Subjects of the research

Group of subjects; exclusion/inclusion guidelines: The research encompassed a total of 20 subjects with trauma to the shoulder joint. The expert approved all patients in the research to engage in kinetic and hydrokinetic rehabilitation regimens.

The subjects were split into the following groups: The experiment faction corresponded of ten convalescents, whereas

the control faction corresponded of ten convalescents. A kinetic recovery program was established for patients in the first group, and the other group had a hydrokinetic recovery program implemented.

The study included 20 patients, 13 males, 7 women, and elderly, among 34 to 71 years. The integration standard represents the presence of trauma at the shoulder joint.

2.6. Applied recovery programs

- **KINETIC RECOVERY PROGRAM:**

We applied for this program, for three weeks, with the objectives of:

- In the first week:

- Fighting pain; Reducing inflammation; Protection of the spotted tissue and sustaining the flexibility of the proximate and outer joints.

- In the second week:

- Improving joint mobility; Improving muscle tone, and Improving the muscular strength of the entire affected limb.

- In the third week:

- Improving proprioception; Improving neuromuscular control and maintaining the strength level.

- **HYDROKINETIC RECOVERY PROGRAM**

We applied for this program, for three weeks, with the same objectives as above.

3. Results of the Research

This research included 20 subjects with trauma to the shoulder joint.

All subjects followed a well-designed recovery program. The first batch, the control one, followed a kinetic recovery program and the second batch, the experimental one, followed a hydrokinetic recovery program for three weeks.

Following the hydrokinetic recovery program, the experimental group regained its achievable degrees of movement from the relative shoulder joint to the same extent as the control group that followed the kinetic recovery program.

Statistical interpretation

Statistical assessment features expository stats (median, mean, and deviation standard) as well as inferential statistics. Shapiro-Wilk investigation attends used in order to assess the dissemination of the measurements set under consideration. The t-student test for unpaired data was used to compare means. For unpaired data, the Mann-Whitney investigation stand utilized to correlate the medians. The GraphPad Prism software was used for statistical analysis.

Analysis from the point of view of gender and age

Table 1

	The experiment group - EG	The control group - CG
Female gender	5 (50%)	3 (30%)
Male gender	5 (50%)	7 (70%)
	10	10
Minimum	34,00	34,00
Median	41,00	40,00
Maximum	65,00	71,00
Mean	43,50	45,50
Std. Deviation	9,265	12,70
Mann Whitney test	P value 0,9999	

Mann Whitney test, $p > 0.05$, there is no statistically significant difference between the median age values in the two groups.

Analysis of initial (IF) and final flexion (FF)

Table 2

	IF		FF	
	EG	CG	EG	CG
Mean	62,50	54,50	98,50	96,00
Std. Deviation	13,99	14,42	18,86	16,47
Unpaired t test	0,2242		0,7558	

T-Student test, $p > 0.05$, there was no statistically considerable variation among the means of the initial and final flexion relevance in the 2 factions.

Analysis of initial (IE) and final extension (FE)

Table 3

	IE		FE	
	EG	CG	EG	CG
Mean	36,00	37,50	57,50	56,00
Std. Deviation	8,756	8,250	7,906	8,756
Unpaired t test	0,6980		0,6924	

T-Student test, $p > 0.05$, there was no statistically significant difference between the initial and final extension mean values in the two groups.

Table 4

Analysis of initial (IA) and final abduction (FA)

	IA		FA	
	EG	CG	EG	CG
Mean	55,50	55,00	87,00	85,50
Std. Deviation	8,960	8,819	17,35	17,23
Unpaired t test	0,9013		0,8484	

T-Student test, $p > 0.05$, there was no statistically significant difference between the initial and final abduction mean values in the two groups.

Analysis of initial (IIR) and final internal rotation (FIR)

Table 5

	IIR		FIR	
	EG	CG	EG	CG
Mean	15,00	14,50	28,00	29,00
Std. Deviation	4,082	4,378	4,830	6,146
Mann Whitney test	0,8100		0,6663	

Mann Whitney test, $p > 0.05$, there was no statistically significant difference between the mean values of the initial and final internal rotation in the two groups.

Analysis of initial (IEA) and final external rotation (FER)

Table 6

	IEA		FER	
	EG	CG	EG	CG
Mean	16,50	15,00	26,50	26,00
Std. Deviation	5,798	4,082	5,798	6,583
Mann Whitney test	0,0355		Unpaired t test 0,0490	

Mann Whitney test and unpaired t-test, $p > 0.05$, there was a statistically significant difference between the mean values of the initial and final external rotation at the two groups.

Analysis of initial and final SPADI

Table 7

	SPADI initial		SPADI final	
	EG	CG	EG	CG
Mean	78,40	77,10	38,70	39,80
Std. Deviation	8,044	10,56	6,273	6,391
Unpaired t test	0,7603		0,7022	

T-Student test, $p > 0.05$, there was no statistically significant difference between the initial and final SPADI mean values in the two groups.

4. Discussions

Following the injuries caused at the shoulder joint, it is indicated to follow kinetic and hydrokinetic recovery programs within a specific institution and under permanent observation for a faster and more efficient recovery.

In an article [5], Brady B. et al. analyzed the effectiveness of hydrokinetic programs in rehabilitating shoulder traumatology. Following the results obtained, they demonstrated that hydrokinetic programs positively affect the movements that can be achieved in the shoulder joint when regaining range of motion and reducing the degree of pain.

In another article [27], Thein J.M. and Brody LT. analyzed the importance of hydrokinetic rehabilitation of the traumatic shoulder. Following the study, the authors confirmed that any elements of the rehabilitation project, containing submissive stretching, subversive workout, and cardiovascular preparation, might be much more effective in the

pelvis. The heat and buoyancy of the water increase the stretch, although the exuberance permits the initiation of the subversive workout at a soft degree. The viscosity of the water provides resistance throughout the movement in any plane.

Also, Kuhn J. E. demonstrated [15] the effectiveness of kinetic recovery programs for shoulder trauma. The main results that were analyzed to determine these were pain and ROM. A significant percentage of shoulder trauma subjects who were treated conservatively showed improvement in each of the outcomes. Among the treated subjects, it was reported: the pain was reduced by up to 86%, and the ROM improved by 83%.

Clausen M. B. et al. demonstrated [6] the effectiveness of kinetic recovery programs among patients with shoulder trauma by significantly improving outcomes compared to the incipient condition, so the ROM fence increased and the level of pain decreased. This could be supported by improving the patient's

degree of movement and pain after the current care period.

Some research papers proved that body mass index could influence the apparition of deficiencies, and aquatic activities like swimming can reduce or can ameliorate those deficiencies [24]. The importance of practicing sports activities [21–23], [25] and leisure sports activities [18] in enjoying a healthful material and psychological living was highlighted in some experimental papers. Kinetic recovery after different lesions were highlighted in many research papers [26], proving that physiotherapeutic programs can help in recovery after traumatism.

5. Conclusions

Following our study, Efficiency of kinetic and hydrokinetic recovery programs among patients with traumatic shoulder pathologies, the hypothesis of our study was confirmed, namely the importance of kinetic and hydrokinetic recovery programs in the process of regaining normal mobility of the scapulohumeral belt.

The kinetic and hydrokinetic recovery protocols used in traumatology of the scapulohumeral joint are based on therapeutic physical exercises effectively regaining joint mobility and increasing muscle strength.

Our final evaluation also highlighted a significant decrease in pain among all subjects, giving them a much higher degree of freedom in performing possible shoulder joint movements.

We suggest that in the future, kinetic and hydrokinetic recovery protocols among patients with trauma to the shoulder joint be initiated in time for earlier, earlier, and less painful complete recovery.

We also propose the continuation of kinetic and hydrokinetic recovery programs after the three weeks of recovery to strengthen the recovery process.

We recommend combining the two recovery methods, kinesiotherapy, and hydro-kinesiotherapy, for a more efficient and fast recovery.

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