The Annals of the "Ştefan cel Mare" University of Suceava.
Physical Education and Sport Section. The Science and Art of Movement
eISSN 2601 - 341X, ISSN 1844-9131

THE CONTRIBUTION OF PHYSICAL THERAPY IN THE RECOVERY OF THE POST-TRAUMATIC SEQUELS OF THE HAND AND ITS INFLUENCE REGARDING THE RESUME OF DAILY ACTIVITY

Breha Alexandru Mihai
Ștefan cel Mare" University of Suceava
Faculty of Medicine and Biological Sciences
alexbreha@usm.ro

Keywords: physiotherapy, post-traumatic sequelae, hand recovery

Abstract

The traumas occurring at the level of the fist joint make the functions of the hand to be greatly diminished, thus we encounter a low coefficient of the patients' quality of life. The hand cannot be replaced in the daily needs of the human being, thus overloading occurs. [1].

This study, followed the selection of the most effective physical therapy techniques in addition to the electrotherapeutic program, to relieve pain, increase joint mobility, increase muscle strength and reintegrate patients into social/professional activity as quickly as possible.

Electrotherapy, physical therapy and massage were applied to the 39 patients, the objectives of the therapeutic plan being adapted according to the patient's daily lifestyle. Following this study, we demonstrated that by selecting effective physiotherapy techniques we obtained long-term results, we reduced the risk of recurrence of traumatic conditions at the level of the fist joint, with patients registering improvements in the functional index of the hand.

Introduction

Tudor Sbenghe says, in his work from 1987, that the hand is able to shape itself on an object, to grasp objects and form pliers, by adapting itself through prehension, thus the fingers can flex analytically or globally, and the pollex placed in opposition compared to the other fingers makes this adaptation characteristic of the human being itself. Although we are in the century of automation and robotization of human processes, we consider that the work performed by a human being can not be completely replaced and thus we take part in a professional overload, when any damage to the functionality of the upper limb constitutes a deficiency in the performance of any day-to-day activity, practicing sports and performing daily personal hygiene. [2].

The hand is made up of 27 bones arranged in 3 groups: the carpus, the metacarpus and the bones of the fingers. The joints make the hand the most complex segment in the body, which is acted upon by a muscular system well

represented on the cerebral cortex. Their ensemble is not only a base for prehension and discriminative sensitivity, but represents "the organ of human personality, of expressiveness, of the most elaborated professionalism". [3], [4].

Traumas occurring at the level of the fist joint drastically reduce the functions of the hand, leading to a much lower quality of life than is considered normal. In order for the recuperative treatment to reach maximum efficiency, it must be applied early, aiming not only at the recovery of muscle strength, joint mobility and pain relief, but also at the functional re-education of the affected limb. [5], [6].

The hypothesis of this study is the selection of the most effective physical therapy exercises, which, in addition to the physiotherapeutic program, will contribute to pain relief, increase joint mobility and muscle strength, early reintegration into social/professional activities and increase the quality of life of patients with fist joint trauma being the main objective.

Material-method

In the present study, 39 representative subjects were chosen based on clinical and paraclinical manifestations, of which 20 were female and 19 were male. The patients come from different social/professional backgrounds and are between 20 and 55 years of age.

Table 1. Distribution of patients by gender. Distribution of patients by age group.

DISTRIBUTION OF PATIENTS BY SEX		DISTRIBUTION OF PATIENTS BY AGE CATEGORIES		
FEMALE	20	20 – 31 ANI	32 – 43 ANI	44 – 55 ANI
MALE	19	9	19	11
TOTAL NUMBER OF PATIENTS		39		

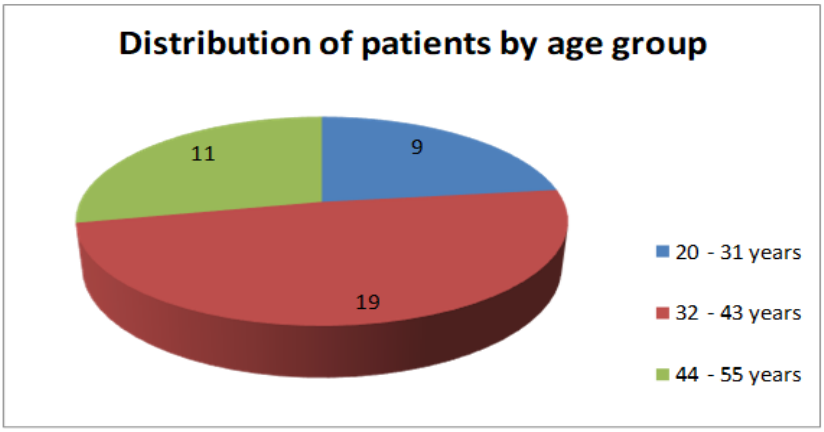


Chart 1. Distribution of patients by age category

The study was conducted over a period of 9 weeks, within the "Ștefan cel Mare" Univesity of Suceava. Initial and final tests were applied to be compared, and based on the initial tests, a physical therapy recovery program was developed and the progress achieved throughout the duration of the study was tracked, all data being quantified.

Table 2. Distribution of patients by socio-professional environment

DISTRIBUTION OF PATIENTS BY SOCIAL/PROFESSIONAL ENVIRONMENTS	
WAITERS	2
MECHANICS	2
CONSTRUCTION WORKERS	6
STUDENTS	7
COMMERCIAL WORKERS	11
AGRICULTURAL WORKERS	11

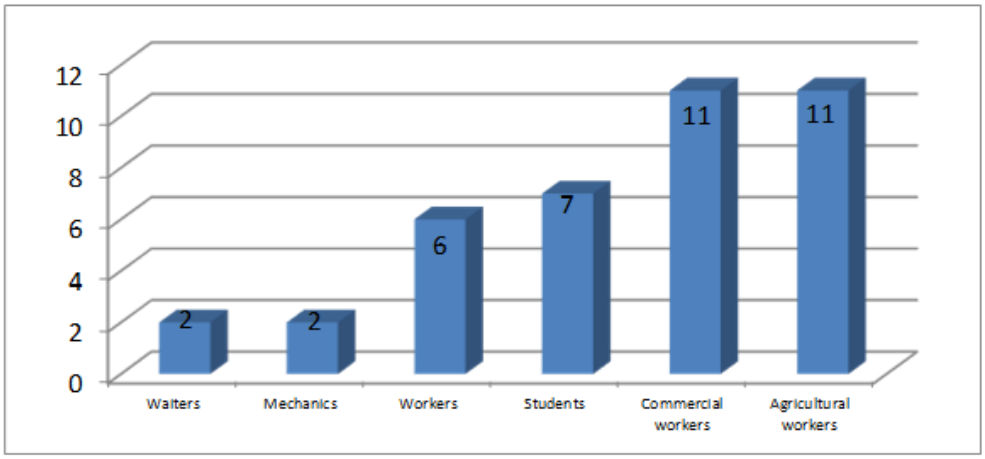


Chart 2. Distribution of patients by socio-professional environment

For the assessment of patients performed following the clinical diagnosis of the specialist doctor, the following were used: the VAS scale for pain assessment, the goniometric method for assessing joint amplitude for movements of flexion, extension, ulnar inclination and radial inclination of the fist, the manual method for assessing muscle strength and a questionnaire for assessing the functional index at the level of the hand where 0 represents the full functional capacity of the hand and 3 represents the total incapacity of the hand. Values 1 and 2 represent the possibility of using the hand with medium difficulty and high difficulty, respectively.

Table 3. Questionnaire for assessing the functional index of the hand

Questions;	Possible without difficulty 0	Possible with medium difficulty 1	Possible with great difficulty 2	Impossible 3
1.Possible without difficulty				
2. Can you use a knife?				
3. Are you able to close your fist completely?				
4. Can you lift a full bottle with your arm?				
5. Can you open and close a drawer?				
6. Can you tie a knot?				
7. Can you type for a while without interruption?				
8. Can you unlock a door?				
9. Can you zip and unzip a zipper?				
10. Can you turn the page of a book?				

The patients included in the study suffered various traumas at the level of the wrist, but the targeted cases were dislocations and sprains.

The criteria based on which patients were excluded from the batch are contraindications of electrotherapy (neoplasia, diseases in acute phase, inflammatory diseases in acute stage, osteosynthesis materials) and fist joint pains other than traumatic conditions.

At the initial evaluations, increased values in the VAS scale were recorded, on average 6 - 7 VAS, which indicates an important pain limitation of the functional capacity of the hand, the articular amplitude for the movements of flexion, extension and ulnar (33°) and radial inclination (21°) very limited, we consider the limitation for flexion (72°) and extension (61°) painful because the movements could be continued passively, and according to the patients' reports, the pain was losing its intensity. Actively measured joint amplitudes were presented. The muscle strength for the flexion movement registered the value F4 and for the extension movement F3, and for the index of the functional capacity of the hand registering at the initial evaluations the value 1, i.e. the average limitation of the functional capacity of the hand. (Chart 3).

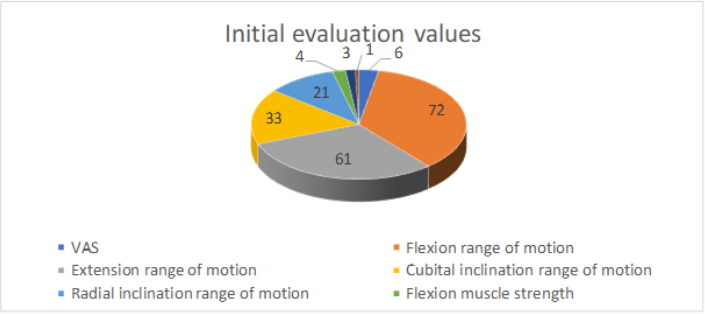


Chart 3. Values resulting from the initial evaluations

The patients were recommended rest, antalgic and muscle relaxant medication prescribed by a specialist and low-frequency current treatment, specifically Trabert - with an analgesic and hyperemetic effect- as well as transcutaneous electrical nerve stimulation (TENS), a non-traumatic method of combating painful conditions; through medium-frequency currents, the process through interference currents has as main therapeutic effects: excitomotor effect on striated muscles, decontracting effect, vascular trophic effect, analgesic effect by reducing painful excitability. In addition to this treatment, the patients were included in an early physiotherapy program, with the aim of regaining joint amplitude, muscle strength and to favor social/professional reintegration. The recovery program lasted 45 days and was the same for each patient, who had to carry out an exercise plan at home as well. In the electrotherapeutic program, the intensity of the procedures varied according to the possibilities, physiological limits and sensitivity of each patient. [7], [8].

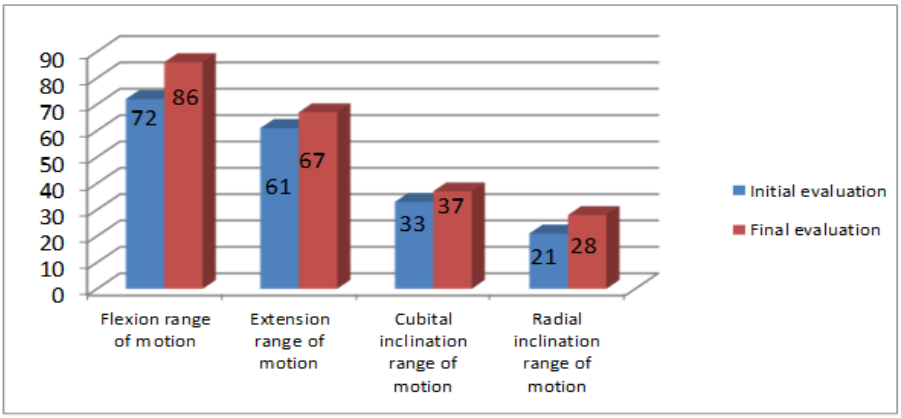
Physiotherapy I intervened through akinetic techniques of antalgic posture and static kinetic techniques, muscle relaxation and isometric contractions. Among the dynamic kinetic techniques, I chose voluntary active movement initially without resistance, applying it progressively. Among the neuro proprioceptive facilitation techniques, we applied rhythmic initiation and rhythmic stabilization to promote mobility, and to promote muscle strength and increase muscle tone, we used therapeutic physical exercise. [9], [10].

Masotherapeutically, I intervened to relieve pain, diminish muscle contractions, improve joint amplitude, muscle tone, decrease joint pressure, reduce edema and reduce joint swelling. Only part of the main massage procedures were used, namely: smoothing- to improve superficial blood and lymphatic circulation, kneading- to stimulate tissue biological activity and increase muscle elasticity, frictions- to reduce pain sensitivity and improve hypertonus where applicable and vibrations- with beneficial effects on tendo-muscular and periarticular insertions. [11].

Results

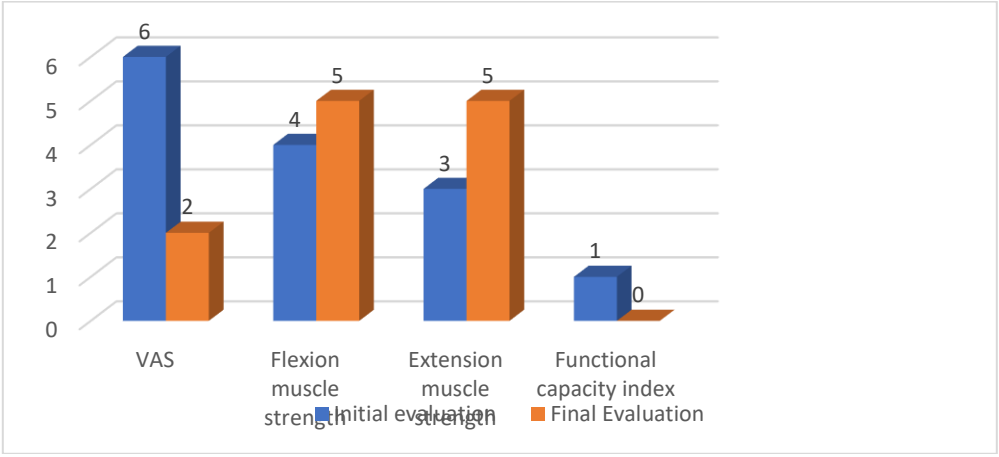
The established objectives were adapted to the patient's daily lifestyle, aiming to improve the quality of life and decrease functional residuals, combat pain and inflammation to regain the ability to carry out daily activities, increase mobility, strength, and increase muscle trophicity, thus the primary goal being reintegration the patient's social/professional activity as early as possible.

Graph 4, represents the average of the values obtained at the initial assessment of joint range of motion for the fist and a considerable improvement is observed, which indicates the importance of physical therapy in regaining joint mobility.



Graph 4. Joint amplitude values

Graph 5, highlights the improved values following the recovery program of the much reduced pain parameter at the final assessment, the improvement of muscle strength for both flexion and extension movement and most importantly the regaining of the functional capacity of the hand.



Graph 5. VAS values, muscle strength and indices of functional capacity

Graph 6, signifies the values recorded by calculating the standard error using the student test, the processed data being the averages and standard deviations for each measured parameter.
Values lower than 0.05 were obtained, which demonstrates the low index for the possibility of recording errors, in the study carried out for the parameters joint amplitude, flexion, extension, ulnar and radial inclinations and muscle strength, as well as the pain parameters and functional capacity index, although there were improvements, values greater than 0.05 were obtained.

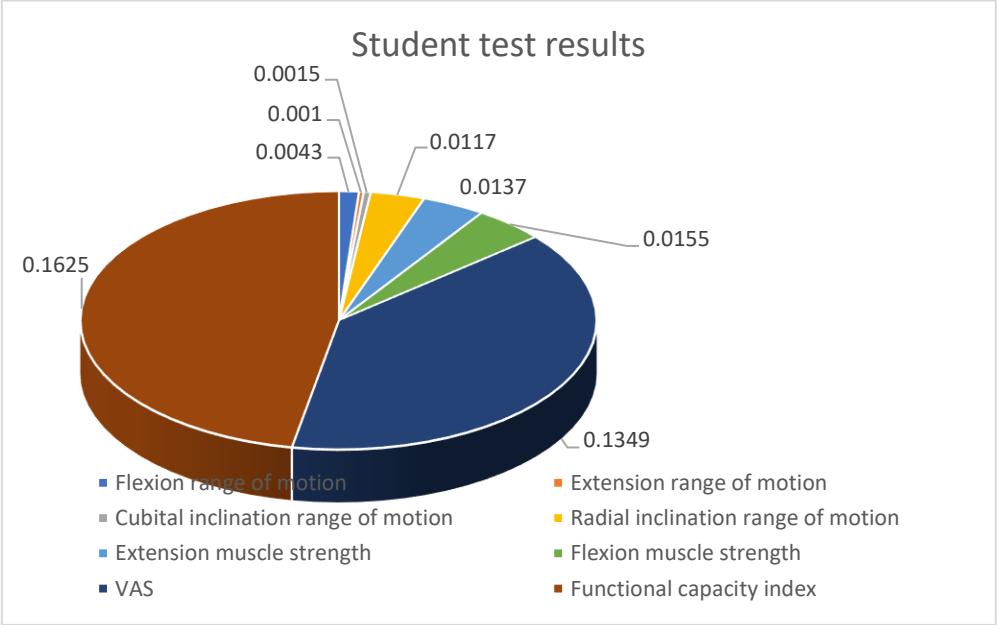


Chart 6. Student test results

Discussions

At the final evaluations, significantly low values were found for the pain parameter, which registered a VAS value of 2, for joint amplitude, increased values were recorded for all evaluated movements, flexion 86°, extension 67°, ulnar and radial inclination 37°, respectively 28°. Muscle strength improved considerably, which demonstrates the effectiveness of therapeutic physical exercise, recording the F5 value for both flexion and extension, in the index, the functional capacity of the hand recorded the value 0 which meant that the patients regained their segment functionality 100%.

Following the applied therapeutic program, the patients were evaluated, and to interpret the obtained results we used the graphic method as a method of exposition and explanation. The graphs were made following the comparison and the highlighting of the statistical significance by means, standard deviation and the t-student test. The compared values are those obtained at the initial and final evaluations, thus the average of each parameter recorded at the initial and final evaluations was compared.

Conclusions

According to the results obtained and represented graphically, it can be seen that both the joint balance for the movements of flexion, extension and radial and ulnar inclinations of the fist, as well as the muscle balance for the movements of

flexion and extension have improved substantially, which proves that the efficient selection of physical therapy techniques is the key element in regaining the functional capacity of the fist.

This study highlights the fact that the role of physical therapy and elements of electrotherapy applied to patients with post-traumatic sequelae at the level of the fist joint for their reintegration into social/professional activity is a very important and beneficial one.

The therapeutic program led to the improvement of the quality of life by decreasing the functional insufficiency , it also demonstrated efficiency in combating pain, a factor that causes an important limitation of the functional capacity.

At the end of the study, the patients registered substantial improvements in the evaluated parameters and we conclude that the elements of physical therapy used together with those of electrotherapy reduce the risk of recurrence of traumatic conditions, at the level of the fist joint.

We find, after the study, that a good collaboration with the patient and the ability of the therapist to motivate and encourage the beneficiaries of therapy, play an important role in the success of treatment, along with vast theoretical knowledge and impeccable practice.

References

[1]. Rusu L., Roșulescu E. (2007). Kinetoterapia în recuperarea afecțiunilor ortopedico-traumatice. Craiova: Ed. Universitaria, p. 32.
[2]. Sbenghe T. (1987). Kinetologie profilactică, terapeutică și de recuperare. București: Ed. Medicală, p. 44.
[3]. Sbenghe T. (1981). Recuperarea medicală a sechelelor posttraumatice ale membrelor. București: Ed. Medicală, p. 221.
[4]. Papilian V. (2006). Anatomia omului, aparatul locomotor, ediție revizuită integral de Prof. univ. dr. Albu Ion, ediția a II-a. București: Ed. ALL, pp. 117-123.
[5]. Botez P. (2008). Ortopedie. Iași: Casa de Editură Venus, pp. 43-53.
[6]. Manole V. (2009). Kinetoterapia afecțiunilor din activitatea sportivă de performanță. Iași: Ed. PIM, p.67.
[7]. Rădulescu A., Burtan M. (2005). Electroterapie, ediția a II-a. București: Ed. Medicală, p. 241.
[8]. Arnold C.M., Dal Bello-Haas V.P., Farthing J.P., Crockett K.L., Haver C.R., Jhonston G., Basran J. (2016). Falls and Wrist Fracture: Relationship to women's functional status after age 50, Med Rehab Journal.
[9]. Antonescu D. M. (2010). Patologia aparatului locomotor, vol. II. București: Ed. Medicală, p. 33.

[10]. Bruder A.M., Shields N., Dodd K.J., Hau R., Taylor N.F. (2016). A progressive exercise and structured advice program does not improve activity more than structured advice alone following a distal radial fracture: a multi-centre, randomised trial, Med Rehab. Journal.
[11]. Handoll H.H., Elliott J. (2015) Rehabilitation for distal radial fractures in adults, Med Rehab. Journal.