

PHYSICAL THERAPY INTERVENTION IN BIMALLEOLAR FRACTURES

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Abstract: *This paper has observed the re-education process of motor functions after fracture. At the end of the research, the author thinks that the physical therapy intervention has contributed to the improvement of the subjects' independent performances. For a good functionality, movement coordination and re-establishing the balance, the physical therapy program is indispensable.*

Key words: *physical therapy, ankle, fracture, functionality.*

1. Introduction

Ankle injuries are the most frequent of all of the musculoskeletal system traumas, the sprains being ranked number one, and the fractures, number two. Their high number is explained by the fact that multiple motions are performed in that area, caused by the foot's mobility needs, exposed to various traumatic factors that act under different conditions [7].

Ankle traumas are the most encountered injuries of the lower limb. Out of the patients with ankle injury, only about 15% have symptoms that are specific to fractures. The highest incidence is encountered in older females, smokers or people with high Body Mass Index. Of the total ankle fractures, the unimalleolar fractures represent 68%, the bimalleolar fractures 25%, the trimalleolar fractures

5%, and the compound fractures 2% [5].

After the lower radius fractures and the lower femur fractures, the ankle and foot fractures are the third most frequent fractures. The ankle and foot fractures have also a social impact beside their medical impact, rendering the patient incapable of work between 4 and 12 months or even more, according to the type of fracture or the subsequent sequelae.

The physical therapy approach of the traumatic and post-traumatic disorders of the leg encounters certain difficulties due to the multitude of possible problems. The characteristic of the functional rehabilitation of the ankle and foot is the very high disproportion between the agonistic and antagonistic muscle strength (the plantar flexors and the dorsal flexors).

Medical rehabilitation plays an

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important role in the treatment of a patient with ankle fracture, being mandatory after the removal of the cast. Through its means, such as electrotherapy, occupational therapy, and especially physical therapy, which have a favourable impact on the functional prognosis of the ankle and foot fractures, medical rehabilitation fills a void and aims to treat the patient until her functional capacity reaches the values recorded previous to the injury when possible, and when not possible, to develop compensatory functions that would allow the patient to live a normal social and professional life [3, 5].

2. Objectives

This research observed the re-education process of the motor functions after fracture, and highlighted the physical therapy intervention for the bimalleolar fractures.

In order to verify the hypothesis stating that through an early and continuous application of physical therapy programs, one can improve the joint mobility, rebuild muscle strength and autonomy, a series of objectives and tasks were established: the study of the professional literature and accumulation of new information in order to establish how much this theme was researched; the selection of the group of subjects; the choice of the conditions and location of the research; establishing the research hypothesis, as well as the way in which they will be verified; the identification and selection of the most effective tests to establish the functional diagnosis; the creation of certain physical therapy intervention programs according to the cases; the development and implementation of the applicative

intervention; the presentation and interpretation of the results after the application of the intervention program; the verification of the hypothesis and highlight the importance of the methods in the conclusions.

3. Materials and Methods

The research was conducted at the Teaching and Rehabilitation Base of the Physical Therapy and Occupational Therapy Department of the "Vasile Alecsandri" University of Bacău, between March and July 2018, the group comprising 2 female patients, aged 58 and 62 respectively.

The *research methods* were: the study of the professional literature, the inquiry method, the observation method, the measurement and assessment method, the statistical-mathematical method, and the graphical representation method [1].

The scientific research aims to be objective in all its stages, measuring different parameters of the subjects. The measurement is the attribution of values to various parameters based on certain rules, so that one would get the most complete information possible about the subjects. Constantly applied, it represented also a concrete method of quantifying the progress and a reference point, based on which the programs were modified, increasingly more complex means and methods being added.

The experiment had two tests (initial and final) and took into consideration the radiological aspect, the pain, the circulatory disorders, the joint mobility, the muscle strength.

The visual examination considered aspects such as skin colour, granulation and texture, its aspect giving indications

on its trophicity; pathological aspects: haemorrhagic tendency (purpura, eruptions), warts, mycoses, papules, vesicles, blisters, eczema, infections, scars, stretch marks, bedsores, fluid losses, acne, oedemas, etc.

The palpatory examination assessed the following: the temperature - high skin temperature can be an inflammatory sign, while low temperature, especially at the extremities, shows vascularization problems; the humidity - moist skin, dry skin, or fat skin imposed certain massage techniques; the thickness - a comparative study can reveal either a decrease in thickness (atrophy) or an increase (hypertrophy) due to corneous tissue or adipose tissue; the texture and elasticity - normally, the skin is supple but firm and resistant to palpation, and after deformation it can go back to its original shape; the sensitivity - the sensitivity to pinching in particular was tested, being able to spot either a superficial hyperesthesia, or a deeper pain, linked to structural alterations [3], [5].

Out of the specific functional ankle tests, the anterior drawer was used: the subject lies on her back; the examiner stabilizes her tibia and peroneus with one hand; with the other hand, the examiner grabs her foot and maintains it in a slight plantar flexion, pulling it upward. The test is positive if the movement degree of the foot is higher than on the healthy side, showing laxity in the anterior talofibular ligament (ATF), which can be caused by an injury [2]; the Kleiger test: the subject sits at the edge of the table, the examiner stabilizes her knee and twists the leg sideways. If there is pain in the leg and the examiner feels an abnormal movement of the talus in relation to the medial malleolus, the test is positive, indicating a

rupture in the deltoid ligament [2]; the balance one-leg test: the subject stands on one leg, arms crossed on her chest, the examiner records how much time she can hold her balance (30-150 sec.) [2].

The physical therapy intervention comprised 5 stages, as follows: the first stage, represented by the period of immobilization after the trauma or the surgery, its objectives being the preservation of that segment's function, dulling the pain, general and local relaxation, and fighting the local atrophy. The predominant element at this stage is pain. If this stage is neglected (especially the objectives of calming the pain and local relaxing), there could be gradual muscle retractions and articular blockage, leading to gradual articular stiffness.

The second stage or the period after immobilization mainly aimed to increase the joint mobility, but also to dull the pain when necessary, fight acute inflammation, mechanical re-harmonization of the joint, and partially rebuild the range of motion.

The third stage is a transition to the fourth stage, aiming to recover the articular mobility and to decrease the joint stiffness.

The fourth stage aims to increase the muscle strength and endurance, increase the stability, completely rebuild the articular mobility, recover the movements and readapt and train for effort. In this stage, it is very important to prepare the area for physical therapy with massage, heat, pain management electrotherapy.

The last stage aims to regain the functionality and it will persist on rebuilding the mobility and muscle strength. Moreover, this stage aims to rebuild the stability, dexterity and controlled movement [3], [5].

The therapeutic-rehabilitating massage is

strictly medical in application, dealing with the prevention of certain disorders in the functionality of the body (prophylactic massage), the treatment - in parallel with other therapies - of certain disorders (therapeutic massage), and the rehabilitation of post-traumatic injuries by removing the sequelae (rehabilitating massage) [4].

4. Results and Discussions

The research has proven the effectiveness of physical therapy in the functional rehabilitation after a trauma; the following figures illustrate the results recorded during the initial, intermediary and final tests for the articular mobility, muscle strength, and functionality.

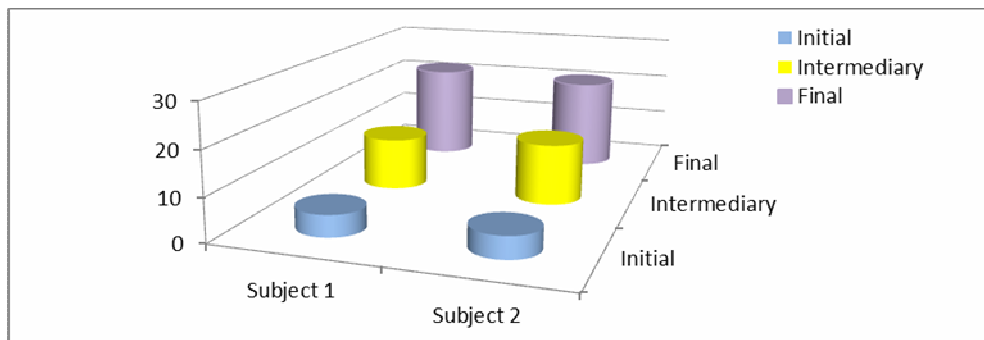


Fig. 1. *The results for the dorsal flexion of the ankle joint*

Figure 1 highlights the values for the dorsal flexion of the ankle joint recorded by the subjects during the initial, intermediary and final tests.

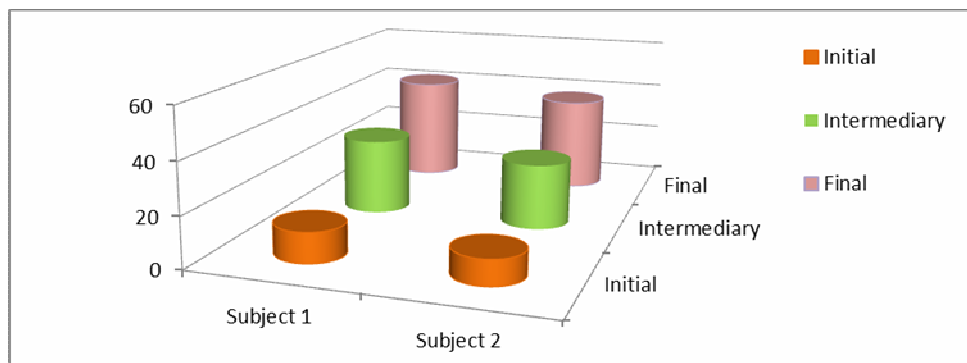


Fig. 2. *The results for the plantar flexion of the ankle joint*

Figure 2 highlights the values for the plantar flexion of the ankle joint recorded by the subjects during the initial, intermediary and final tests.

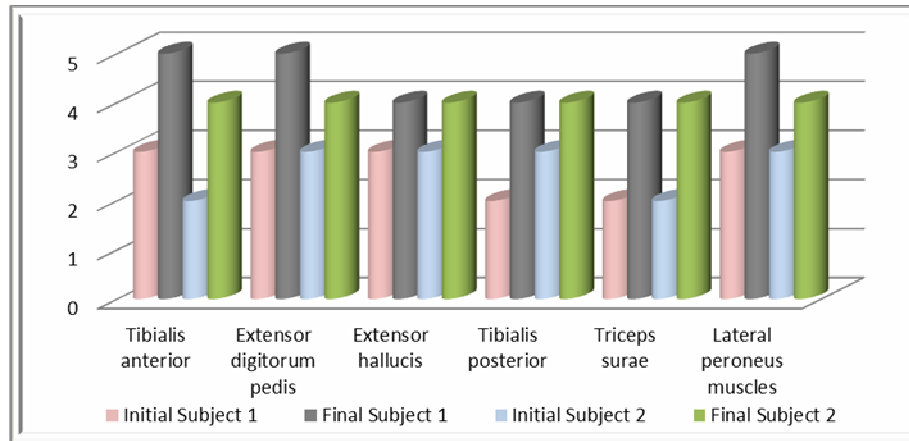


Fig. 3. The results for the ankle muscles strength

Figure 3 presents the values for the 1 and 2 during the initial and final tests. strength in the ankle muscles of the subjects

Applied tests

Table 1

Subject	Diagnosis	INITIAL TESTING			FINAL TESTING		
		Anterior drawer	Kleiger test	Supported balance test	Anterior drawer	Kleiger test	Supported balance test using one leg
Subject 1	Post bimalleolar fracture	+	+	0 sec.	-	-	140 sec.
Subject 2		+	+	0 sec.	-	+	105 sec.

Figures 1-3 show the ascendant progress of the patients, in regard to their articular mobility, muscle strength, and functionality.

Figures 1 and 2 show a progress of the range of motion for the dorsal and plantar flexion, as follows: subject 1 recorded initially for the plantar flexion 12°, and finally 42°; for the dorsal flexion, initially 5°, and finally 22°, with a difference of 17°. Subject 2 recorded initially for the plantar flexion 10°, and finally 38°; for the dorsal flexion, initially 5°, and finally 21°, with a difference of 16°.

Figure 3 shows the progress of muscle strength, which was positive for all of the ankle muscles.

The functional tests have revealed also an improvement of the functional capacity in comparison to the initial tests. One can observe the differences between the initial and final tests in table 1: the anterior drawer test recording approximately the same degree of motion in relation to the healthy foot, the Kleiger test recorded a disappearance of pain, and the one-legged balance test recorded an increased time - results that reveal the

patients' progress following the rehabilitation programs.

At the end, the treatment recorded good results, the conclusion being that the physical therapy treatment had positive results on the functionality of the subjects.

5. Conclusions

After analysing the values recorded by the subjects, several conclusions can be drawn: the support and rehabilitation of the periarticular system can be done through physical therapy, this being the best physiological and functional treatment for the motor element of movement; a complete assessment contributes to a more certain functional diagnosis, after which the most effective techniques and methods are chosen for a faster post-immobilization rehabilitation; the assessment tests have proven their effectiveness, and informing the patients in regard to the assessment methods ensured their active and aware participation; for a good functionality, movement coordination and re-education of balance, a physical therapy program is indispensable.

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