

**PHYSIOTHERAPEUTICAL REHABILITATION OF THE
PATIENTS THAT SUFFERED A FRACTURE OF THE 5TH
METATARSAL BONE (JONES FRACTURE)**

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Abstract

A Jones fracture represents transverse break at the base of the fifth metatarsal bone, 1.5 to 3 cm distal to the proximal tuberosity at the metadiaphyseal junction. It usually happens when the toes are in flexion and the foot is bent inwards (inversion), like while dancing, playing tennis or basketball. This results in pain, swelling on the outside of the foot and at the base of the little toe, difficulty walking and bruising.

As any injury to the foot and ankle determine pathologies in the knee, hip and vertebral column, treating any ankle or foot dysfunction in a timely manner becomes crucial for conserving and improving the quality of life, also preventing future afflictions.

This study focuses on 35 subjects that, during an 8-week period, underwent a series of physiotherapy, electrotherapy and massage techniques, so that they would regain their full ankle and foot functionality and reduce the risks of future relapse. At the end of the 8-week period, the patients regained their muscular strength and range of motion, got rid of the pain, the functional status of their ankles and feet getting back to normal. The risk of relapse dropped as well, and the results the patients achieved are to be kept in the same manner for a long time, as for the daily physical exercises.

Introduction

The foot and the ankle are an anatomic-functional complex that sustain the body weight and make locomotion possible. The foot has a both static and dynamic role, being the terminal mechanism of human motion, allowing us to walk, run, dance, fight or swim. The foot's skeleton consists of 26 bones, that are divided in three groups: the tarsal bones, the metatarsal bones and the phalanges. Apart from these main bones, there are several sesamoid bones that help improve function and are often found as variants of the accessory bones.

The 5th metatarsal bone is a long bone extending along the outside of the foot, that connects to the small toe. The base of the 5th metatarsal bone articulates with the cuboid, while the head area of the bone articulates with the fifth proximal phalanx, the first bone in the fifth toe. The bones, along with the soft tissue including muscles, tendons and ligaments, offer the foot its specific ability and stability.

Metatarsal fractures can occur from direct trauma to the foot or as a consequence to stress. Direct trauma is common in industrial workers who have heavy objects fall on their feet. Stress fractures of the metatarsal bone may occur from activities such as long distance running, ballet, gymnastics and high-impact aerobic activities. The symptoms may include pain on the outside of the mid foot, tenderness to pressure of when walking on the outside of the mid foot, bruising and difficulty in bearing weight or walking on the foot.

Material-method

This study was carried for 8 weeks, in the “Stefan cel Mare” University of Suceava's Swimming and Physiotherapy Complex. The participants of the study have been selected on the clinical and laboratory indicators, as well as based on the anamnesis. There have been several tests that they were included in. Initially, they have been tested so that we could elaborate a personalized physiotherapy program. At the end of the study, the patients were again tested, so that the results would be compared to the initial tests. To monitor the patients' progress, we also run a series of tests once a week since the beginning of the study to its end.

We selected a number of 35 patients, aged 23 to 45. From the total of 35, 18 are females and the rest of 17 are males. The subjects

were either casual joggers, athletes or practiced dancing, activities that bring a significant level of stress to the metatarsal area of the foot. All the patients chose a conservative way of rehabilitation, meaning that neither of them chose undergoing surgery. Patients that couldn't undergo electrotherapy sessions because of health risks have been excluded from the study.

Table 1. Age and sex distribution of the patients

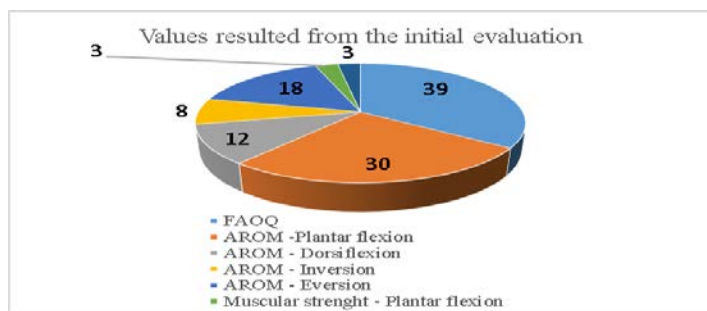
DISTRIBUTION OF PATIENTS BY SEX		DISTRIBUTION OF PATIENTS BY AGE		
FEMALES	18	23 - 30 ANI	31 – 38 ANI	39 – 45 ANI
MALES	17	17	10	8
TOTAL		35		

Once the patients got the diagnosis from the M.D., they were asked to complete the *Foot and Ankle Outcomes Questionnaire* [1], in order to establish the level of their foot functionality. The *Foot and Ankle Outcomes Questionnaire* consists of 25 questions which evaluate the pain and functional status of the patients' feet. There are 5 subscales: pain, function, stiffness and swelling, giving way and shoe comfort. Scores range from 0 to 100, with a lower score indicating worse foot health. The patients' range of motion for dorsiflexion, plantar flexion, inversion and eversion was established using the goniometric method. In order to establish the muscular strength for plantar flexion and dorsiflexion, we used the manual muscle testing technique. The active range of motion (AROM) test results in the initial testing can be found in the table below:

Table 2. Average values of the AROM – initial testing

	AVERAGE VALUE RECORDED
PLANTAR FLEXION	30
DORSIFLEXION	12
INVERSION	8
EVERSION	18

The AROM test results are severely limited by the pain and stiffness in the ankle, given the fact that each move could be continued in a passive manner. Speaking of strength, the value recorded for dorsiflexion and plantar flexion was F3, result that indicates the ability to move the ankle without a resistance being applied to the patients' feet. The functional self-assessment tool that we used (*The Foot and Ankle Outcomes Questionnaire*) recorded an average value of 39 points, value that indicates severe ankle and foot dysfunction.



Graphic 1. Values resulted from the initial evaluation

The rehabilitation program was carried out over a 40-day period of time and it contained the same procedures for all of the patients. The program had little variations with each patient, depending on the physiological limits and sensibility of each one of them. The physical exercises carried out inside the complex were completed by a series of exercises that were practiced by each patient at home. The scope of the physiotherapy program was regaining the muscular strength, the range of motion and the complete functionality of the ankle and the foot.

At the beginning of the study, patients were advised to rest and apply ice on the affected area and keep the leg elevated above the hearth as much as possible to control swelling and inflammation. They were prescribed antalgic and muscle relaxant medication by their M.D. Patients were advised be walking with crutches, so that they wouldn't overload the metatarsal area until the most swelling has resolved.

In the second week of rehabilitation, patients begun training their gait, first by using their crutches, then by slowly loading the affected foot.

Patients also received transcutaneous electrical nerve stimulation treatment (TENS), its primary scope being relieving pain, and also ultrasound therapy which helps reducing pain, improving blood flow and relaxing the muscle area.

During the massage sessions, we used the effleurage technique, with an important role in improving the blood and lymphatic flow, petrissage – for improving tissue activity and muscle elasticity, friction – for increasing pain tolerance and reducing hypertonia – and vibrations, that aimed the periarticular elements.

We used the static kinetic techniques, namely isometric contraction and relaxation, but also antalgic postures, that would help the patients relax, forget about the pain for a while and also prepare for the training program. One of the dynamic techniques that we used was active motion, to be more exact – the concentric and eccentric contractions. At the beginning of the 8 weeks, we chose not to load the articulation, so the movements were completed with no resistance. We made loading the articulation a gradual process, so that by the end of the rehabilitation program, the patient would fully support their body weight and have the strength that they used to have. The therapeutic physical exercises helped patients improve their strength and general tonus. For improving the active range of motion, we chose using proprioceptive neuromuscular facilitation techniques, namely rhythmic initiation and the hold-relax technique.

Results and discussions

At the end of the 8 weeks, the participants of the study were asked to complete the *Foot and Ankle Outcomes Questionnaire* once again. The results showed an important increase of the functional parameter, as well as complete pain relieve. The average value that resulted from the questionnaire was 97 points, meaning that the ex-pathologic foot has regained full functionality. Moreover, the active range of motion increased considerably, as per the below table:

Table 3. AROM – final values

	AVERAGE VALUE RECORDED
PLANTAR FLEXION	48
DORSIFLEXION	20

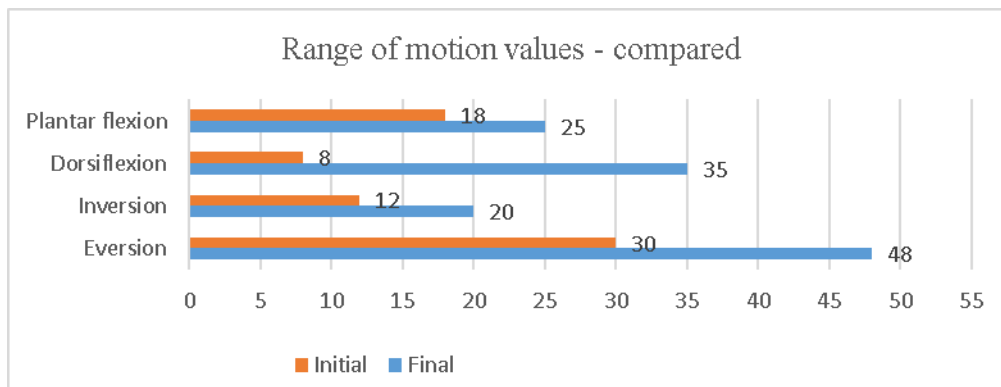
INVERSION	35
EVERSION	25

The muscular strength has visibly increased over the course of the 8-week program, becoming F5 (maximum strength) for both plantar flexion and dorsiflexion. This excellent result proves that the rehabilitation program has been executed a maximum efficiency.

The rehabilitation program has been adapted to each patient’s daily lifestyle, its primary scope being improving the quality of life by increasing the functional ability of the patients, decreasing the swelling and stiffness, improving the range of motion and the muscular strength of the feet. The ultimate scope of the rehabilitation program was re-introducing the patients into their normal, daily life and social activities.

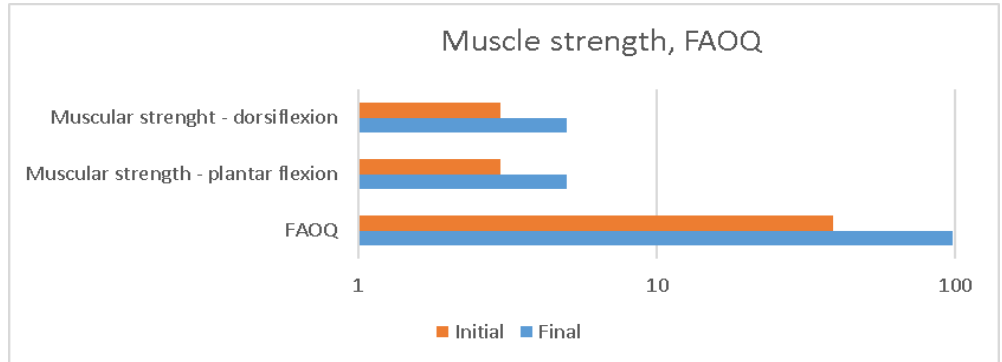
All the data gathered by testing the patients have been represented and interpreted using the graphical method, by comparing each of the measured parameters, such as the range of motion, muscular strength and functional status. The graphics were made by comparing and highlighting the statistical significance using the following functions: average, standard deviation and the Student’s t-test.

The bellow graphic represents the initial and final values of the ankle range of motion testing. The graphic clearly shows how the range of motion increased by the end of the study, meaning that the rehabilitation program was efficient in regaining the normal range of motion of the ankle and foot.



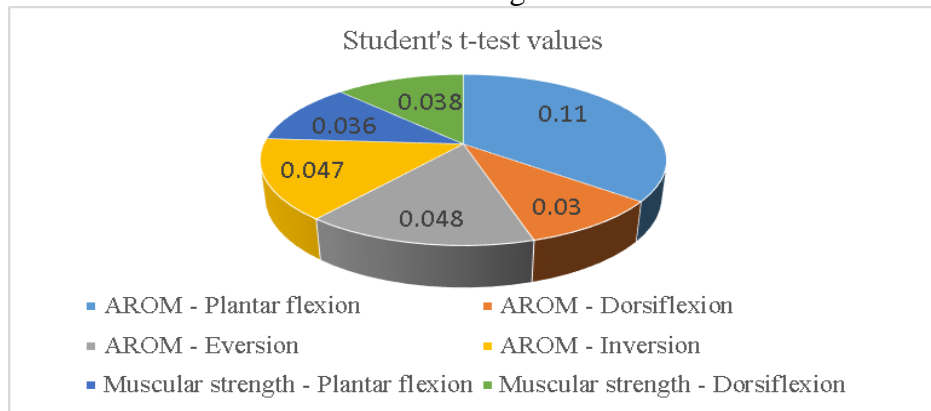
Graphic 2. Range of motion values – compared

The graphic #3 shows the increased values for muscular strength, which went from F3 to F5, for both dorsiflexion and plantar flexion. Moreover, the graphic displays improvements of the results obtained in the final questionnaire, results that show a massive pain relieve and also regaining the full functionality of the ankle and foot.



Graphic 3. Muscle strength, FAOQ

The fourth graphic displays the values that we obtained by calculating the standard error by using the Student’s t-test, the data included representing the average values and the standard deviation for the measured parameters. The values obtained are less than 0.05, showing that there’s little to no possibility of errors in measuring the range of motion and the muscular strength.



Graphic 4. Student’s t-test values

Grap

Conclusions

According to the above-mentioned graphics, we can conclude that, by the end of the study, there were significant improvements in matter of articular mobility for dorsiflexion, plantar flexion, inversion and eversion, as well as for the muscular strength for plantar and dorsiflexion. Therefore, we can conclude that regaining the functionality of the ankle can be achieved by an efficient choice of the physio-therapeutical rehabilitation techniques.

Moreover, the risk of relapse in metatarsal fractures is low, as the patients have been trained about how to prevent the disease. We can complete by saying that choosing the appropriate techniques and exercises for a rehabilitation program drop the risk of relapse in fractures of the 5th metatarsal bone.

This study highlights the major importance of the rehabilitation program in regaining the full functionality of the foot for the patients that had fractured their 5th metatarsal bone. The rehabilitation program shows the efficiency of physiotherapy in relieving the pain and regaining the functional ability of the foot and ankle, parameters that led to improving the quality of the patients' lives.

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Recuperarea fizioterapeutică a pacienților care au suferit o fractură la nivelul celui de-al 5-lea metatars (fractura Jones)

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Cuvinte cheie: metatars, recuperare, fractura Jones, durere, status funcțional

Abstract:

Fractura Jones reprezintă o ruptură transversă la baza celui de-al cincilea metatars, la 1.5 – 3 cm distal față de tuberozitatea proximala la nivelul joncțiunii meta-diafizară. De obicei apare atunci când degetele sunt în flexie și piciorul în inversie, ca în timpul dansului, tenisului sau basketball-ului. Consecința acestei mișcări este reprezentată de durere, inflamarea părții laterale a piciorului și a bazei degetului mic, dificultate în mers și echimoza.

Deoarece orice leziune la nivelul piciorului și al gleznei determina afecțiuni ale genunchiului, șoldului și ale coloanei vertebrale, tratarea disfuncțiilor piciorului și ale gleznei într-un timp cât mai scurt devine un aspect crucial în conservarea și îmbunătățirea calității vieții, prevenind și viitoare disfuncții.

Studiul de față se axează pe 35 de subiecți care, timp de 8 săptămâni, au fost supuși unei serii de tehnici kinetoterapeutice, electroterapeutice și masoterapeutice, astfel încât să își recâștige capacitatea funcțională a piciorului și gleznei și să reducă riscul de recidivă. La sfârșitul celor 8 săptămâni, pacienții și-au recâștigat forța musculară și amplitudinea de mișcare, au scăpat de durere, statusul funcțional al gleznei și piciorului revenind la normal. Riscul de recidivă a scăzut de asemenea, iar rezultatele obținute vor fi păstrate pentru mult timp, datorită exercițiului fizic zilnic.

