

CHARLES UNIVERSITY IN PRAGUE
FACULTY OF PHYSICAL EDUCATION AND SPORT
DEPARTMENT OF PHYSIOTHERAPY

**CASE STUDY: PHYSIOTHERAPY TREATMENT OF A PATIENT
WITH A TOTAL ANKLE SPRAIN**

BACHELOR DEGREE OF PHYSIOTHERAPY

BACHELOR THESIS

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ABSTRACT

Title: Case Study: Physiotherapy treatment of a patient with a total lateral ankle sprain

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Clinic of Work placement: C.L.P.A (Centrum léčby pohybového aparátu)

AIM OF THESIS

The aim of this bachelor thesis is on understanding how the ankle joint is made and of course what is its function. Then, mentioning what are the most common injuries referring the ankle joint. by analyzing the case of this patient with a six therapy session rehabilitation plan, we will be focusing more on the total ankle sprain.

Summary

This bachelor thesis is divided in two main parts. The first part is the general part and the second one the special part. In the general part, it is included all the theoretical information about my patient's diagnosis. More specifically, is composed by the basic anatomy of the lower limb, the ankle joint and the foot including muscles, joint, ligaments and bones. Furthermore, the biomechanical and kinesiological field it will be covered. Furthermore, it is explained in details how the mechanism of injury is possible to happen and how serious it can get.

Secondly, the most important part of the bachelor thesis is the special part in which it is covered everything about the case of the patient, all information, examinations, therapy sessions and results which are compared with the first and last examination.

There were performed to the patient about 6 therapies sessions. Starting from Wednesday 5th January 2015 and ending on Friday 16th January 2015. Each therapy session is explained in details including the procedure and the results as well.

Key words: ankle joint, ankle sprain, talofibular ligament, conservative treatment, talus, swelling, physiotherapy.

DECLARATION

I state and declare that this bachelor thesis was managed and organized by myself. I followed the instructions of Mgr. Michaela Stupková. During my practice, I was supervised by PhDr. Edwin Mahr and I had a patient with a total ankle sprain at the C.L.P.A. (Centrum léčby pohybového aparátu), who had six (6) therapy sessions by myself.

Prague, April 2015

Antonios Markantonakis

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1. INTRODUCTION

On the following pages we will analyze and talk about one of the most common conditions affecting the ankle joint which is the ankle sprain. In the first part, the general part, is presented the anatomy of the lower limb, the ankle joint and the foot of the human body. More specifically, is focused to all the muscles, bones and ligaments. About the functionality of the ankle joint and the weight bearing during the gait is also mentioned because this pattern has been affected after this diagnosis. There is a mentioning about the sensory and motor innervation focused on that area. Finally are mentioned the therapeutic treatments about the conservative and surgical approaches.

Generally the ankle sprain is a very frequent injury, especially in the field of sports. This type of injury comes very fast and can get much worse afterwards that the accident happened because in that moment after the injury, the player due to the fact that he is all warmed up, he doesn't feel exactly that he got himself injured and he will continue playing and this can lead to a worse situation e.g. total sprain. Statistically the ankle sprains compose the 85% of injuries annually in USA.

The most important part in my thesis, is the special part in which is presented with details the whole case of total ankle sprain. Initiating with the whole history of the patient and anamnesis. Then all the physical examinations will reveal all the abnormalities and probably some secondly symptoms which could affect the biomechanical and functional field. In the end of the special part is compared the results of the initial with the final kinesiological examination.

2. GENERAL PART

2.1. Anatomy of the lower limb

2.1.1. Bones

2.1.1.1. Tibia and Fibula

2.1.1.1.1. Tibia

The tibia, or shin bone is the larger medial, weight-bearing bone of the leg. It articulates as its proximal end with the femur and fibula and its distal end with the fibula and the talus bone of the ankle. [26, 9, 20]

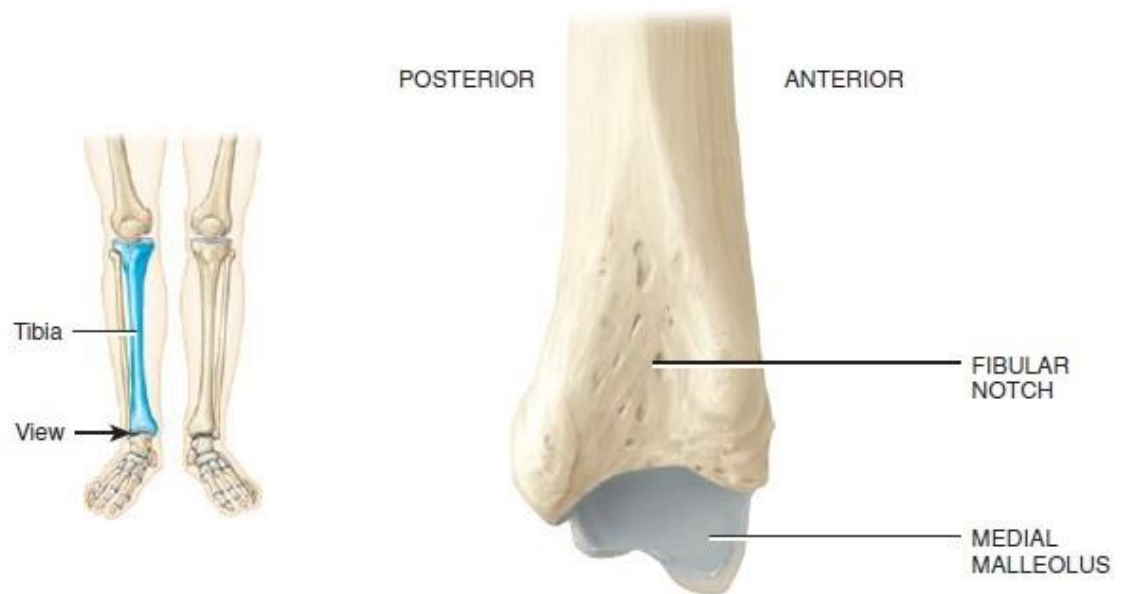


Figure No.1 – Lateral view of distal end of tibia [26]

On the proximal end of the tibia is expanded into *lateral condyle* and *medial condyle*. These two condyles articulate with the condyles of the femur to form the lateral and medial *tibiofemoral (knee) joints*. The inferior surface of the lateral condyle articulates with the head of the fibula. The *tibial tuberosity* is located on the anterior surface on the point attachment where the patellar ligament is ending. [26, 9, 20]

2.1.1.1.2. Fibula

Right next to the tibia is located on parallel and laterally a similar bone but smaller and thinner called the fibula. Which its head or the proximal end articulates with the inferior surface of the lateral condyle of the tibia below the level of the knee joint to form the *proximal tibiofibular joint*. On the other hand, its distal end is more arrowhead-shaped and has a projection which is called *lateral malleolus* that articulates with the talus of the ankle. [26, 9, 20]

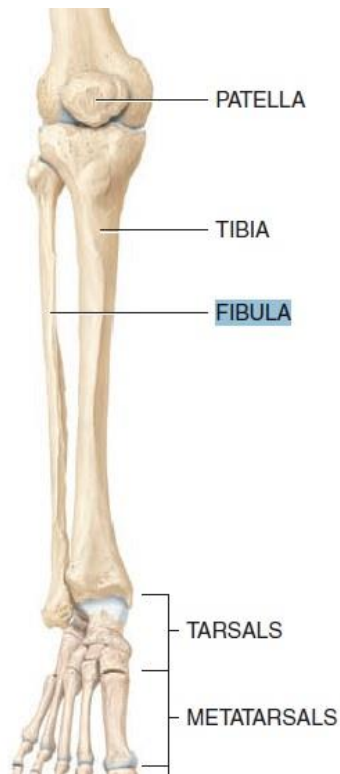


Figure No.2 – Anterior view of free lower limb [26]

2.1.1.2. The foot

2.1.1.2.1. Tarsals, metatarsals and phalanges.

There are three groups of bones in the anatomy of the foot. Seven tarsal bones which form the skeletal framework for the ankle, five metatarsal numbered from I to V which are the bones of the metatarsus and the phalanges which are the bones of each toe.

These bones include the talus and calcaneus which are located in the posterior part of the foot. The calcaneus is the largest and strongest tarsal bone. The anterior tarsal bone are the *navicular*, three *cuneiform bones* called the third, second and first cuneiforms and the cuboid. [26, 9, 19, 20, 25]

a. Proximal group

This group consists of two large bones, the talus which is the main ankle bone and the calcaneus which is the heel bone. The talus is the most superior bone of the foot and sits on the top and is supported by the calcaneus (See Figure No.3-b). It articulates above with the tibia and the fibula forming the ankle joint and also projects forward to articulate with the intermediate tarsal bone, navicular, on the medial side of the foot. On the other hand though, the calcaneus is the largest of the tarsal bones and posteriorly forms the bony framework of the heel and anteriorly projects forward to articulate with one of the distal group of tarsal bones, cuboid, on the lateral side of the foot. [26, 9, 19, 20, 25]

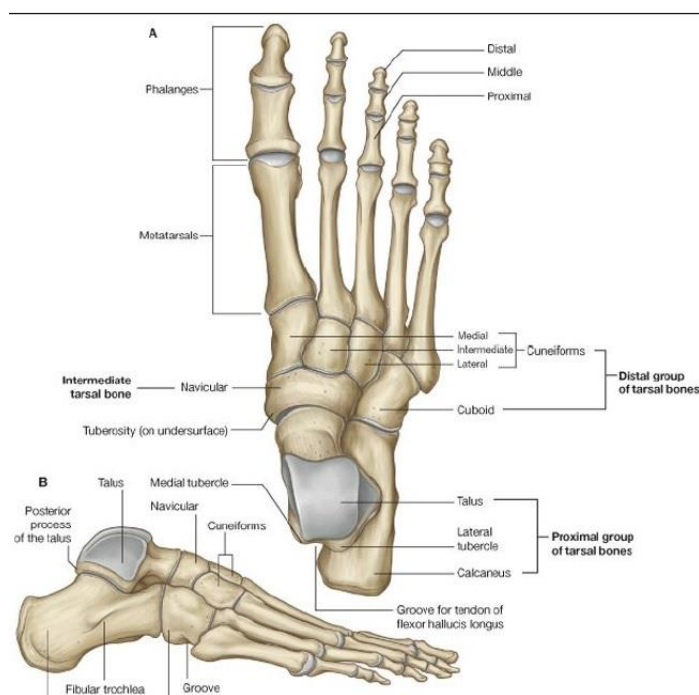


Figure No.3 - Bones of the foot. A. Dorsal view, right foot. B. Lateral view, right foot.

[9]

b. Talus

The talus from a medial of both lateral sides has a snail-like shape. It has a rounded head, which is projected forward and medially at the end of a short broad neck, which is connected posteriorly to an expanded body. [26, 9, 19, 20, 25]

The neck of the talus is marked by a deep groove which passes obliquely forward across the inferior surface from medial lateral and expands dramatically on the lateral side. Posterior to this deep groove which is called sulcus tali is a large facet for articulation with the calcaneus. [26, 9, 19, 20, 25]

The superior aspect of the body of the talus is elevated to fit into the socket formed by the distal ends of the tibia and fibula to form the ankle joint. The upper surface, trochlear, of this elevated region articulates with the inferior end of the tibia, the medial surface articulates with the malleolus of the tibia and the lateral surface articulates with the lateral malleolus of the fibula. [26, 9, 19, 20, 25]

The lower part of the lateral surface of the talus, which supports the lower part of the facet for articulation with the fibula, forms a bony projection which is the lateral process. [26, 9, 19, 20, 25]

The inferior surface of the bony of the talus has a large oval concave facet for articulation with the calcaneus which is called posterior calcaneal articular facet. [26, 9, 19, 20, 25]

The posterior aspect of the body of the talus consists of a backward and medially facing projection, in other words, the posterior process which is marked on its surface by a lateral tubercle and a medial tubercle. This process bracket between them the groove for tendon of the flexor hallucis longus as it passes from the leg into the foot. [26, 9, 19, 20, 25]

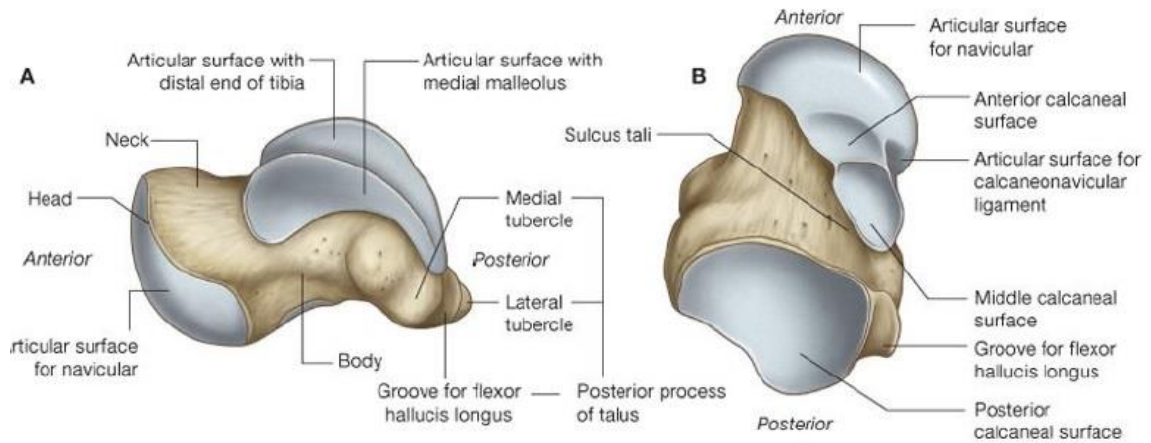


Figure No. 4 - Talus. A. Medial view. B. Inferior view. [9]

c. Calcaneus

The calcaneus is located beneath and supports the talus, is an elongate, irregular, box-like shaped bone with its long axis generally oriented along the midline of the foot. The calcaneus projects behind the ankle joint to form the skeletal framework of the heel. The posterior surface of this heel region is circular and divided into upper, middle and lower parts. The calcaneal tendon or Achilles tendon attaches to the middle part. The upper part is separated from the calcaneal tendon by a bursa. The lower part curves forward is covered by subcutaneous tissue, has a weight-bearing function done with the support of the heel and is continuous onto the plantar surface of the bone as the calcaneal tuberosity. [26, 9, 19, 20]

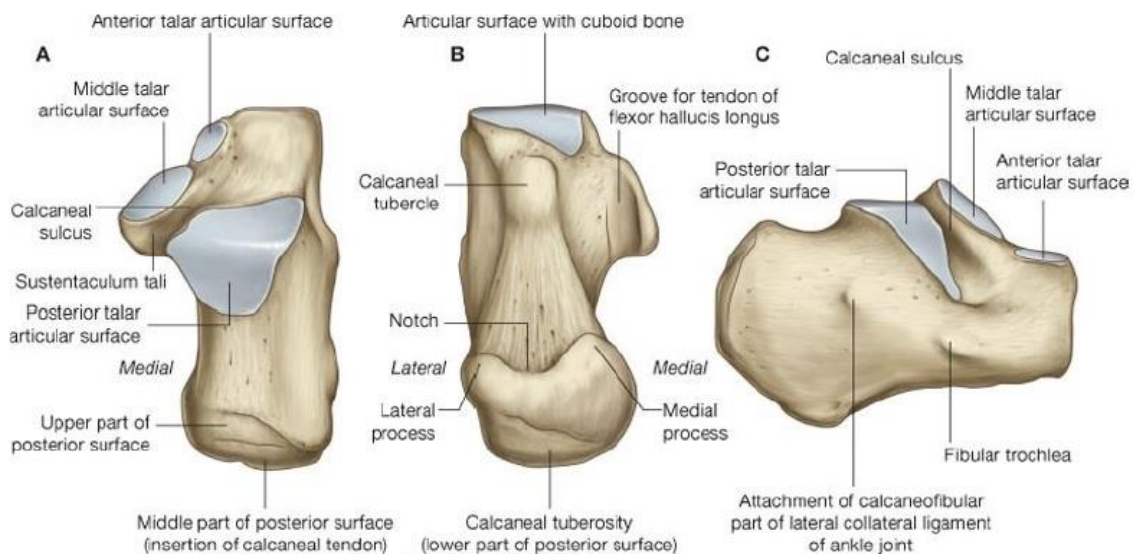


Figure No.5 - Calcaneus. A. Superior view. B. Inferior view. C. Lateral view. [9]

d. Intermediate tarsal bone

The Intermediate tarsal bone on the medial side of the foot is the navicular which has a boat-like shape (See Figure No. 3) the articulation of this bone is posteriorly of the talus and articulates in front and on the lateral side with the distal group of tarsal bones. [26, 9, 19, 20]

e. Distal group

The distal group of the tarsal bones consists from the lateral to the medial the cuboid bone which means cube in Greek and three cuneiforms, the lateral, intermediate and medial cuneiform bones. The cuboid bone articulates posteriorly with the calcaneus, medially with the lateral cuneiform and anteriorly with the bases of the lateral two metatarsals. The cuneiform bones, to be possible to articulate with each other, articulate posteriorly with the navicular bone and anteriorly with the bases of the medial three metatarsals. [26, 9, 19, 20]

2.1.1.2.2. Metatarsals

In foot of the human body there are five metatarsal bones, which are numbered from I to V from the medial to lateral (See Figure No. 6). Each metatarsal has a head at the distal end, an elongate shaft in the middle and a proximal base. [26, 9, 20]

Each metatarsal, its head articulates with the proximal phalanx of a toe and the base articulates with one or more of the distal group of tarsal bones. The plantar surface of the head of metatarsal I also articulates with two sesamoid bones which are bones that are embedded into a tendon and their function is assisting during the weight-bearing and the normal and sliding movement on the joint. [26, 9, 20]

The sides of the bases of metatarsals II to V also articulate with each other. The lateral side of the base of metatarsal V has a prominent tuberosity, which projects posteriorly and is the attachment site for the tendon of the fibularis brevis muscle. [26, 9, 20]

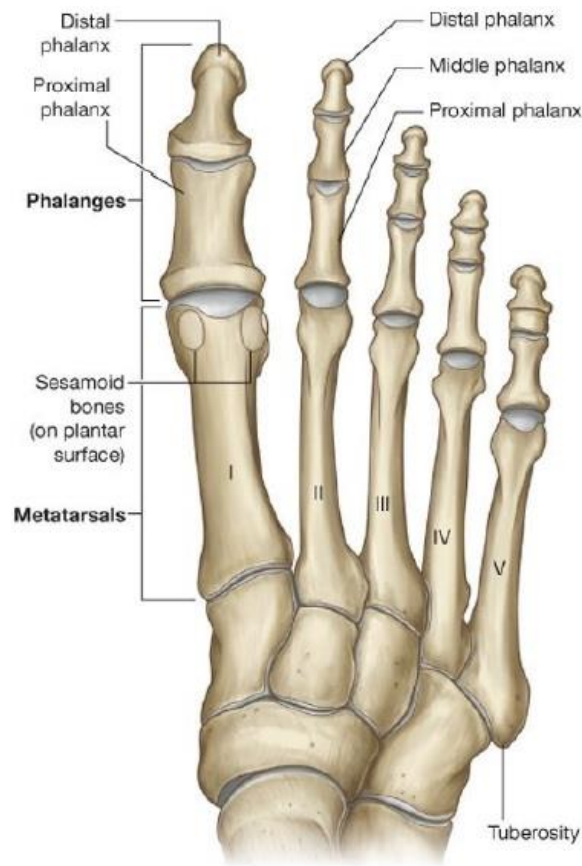


Figure No.6 - Metatarsals and phalanges. Dorsal view. [9]

2.1.1.2.3. Phalanges

The phalanges are the bones of the toes (See Figure No. 6). Each toe has three phalanges, a proximal, middle and a distal part except the great toe which hasn't the middle part. [26, 9, 20]

Each phalanx has a base, shaft and a distal head. The base of each proximal phalanx articulates with the head of the related metatarsal and the head of each distal phalanx is non-articular and flattened into a crescent-shaped plantar tuberosity under the plantar pad at the end of the digit. [26, 9, 20]

The total length of the phalanges on each toe combined is much shorter than the length of the associated metatarsal. [26, 9, 20]

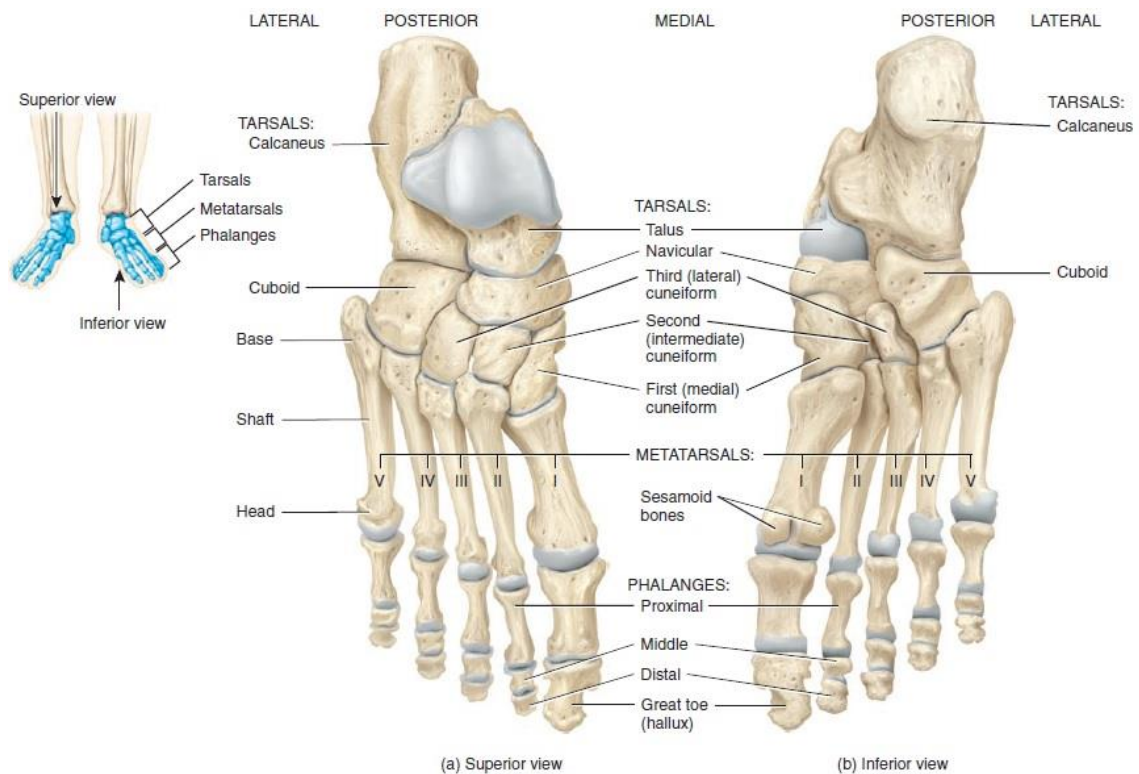


Figure No.7 - Right foot a. superior view b. inferior view [26]

2.1.2. Muscles

The muscles of the lower limb are divided by deep fascia into three compartments, anterior, lateral and posterior. [26, 9, 20]

The anterior compartment of the lower limb consists of muscles that perform dorsal flexion of the foot. One of these muscles is the tibialis anterior which is a long, thick muscle against the lateral surface of the tibia, where it's easy to palpate. Then the extensor hallucis longus is a thin muscle between and partly deep to the tibialis anterior and extensor digitorum longus muscles. It's easy to be palpated as well. The fibularis or peroneus tertius muscle is part of the extensor digitorum m., which they share a common origin. [26, 9, 20]

<u>Anterior compartment</u>				
Muscle	Origin	Insertion	Action	Innervation
Tibialis Anterior	Lateral condyle and body of tibia and interosseous membrane.	First metatarsal and first cuneiform.	Dorsal flexion and inversion of the foot	Deep fibular nerve
Extensor hallucis longus	Anterior surface of middle third of fibula and interosseous membrane.	Distal phalanx of great toe.	Dorsal flexion of the foot and extends proximal phalanx of great toe.	Deep fibular nerve
Extensor digitorum longus	Lateral condyle of tibia anterior surface of fibula and interosseous membrane.	Middle and distal phalanges of toes 2-5	Dorsal flexion of the foot and extends distal and middle phalanges of each toe.	Deep fibular nerve
Fibularis tertius	Distal third of fibula and interosseous membrane	Base of fifth metatarsal	Dorsal flexion and eversion of the foot	Deep fibular nerve.

Table No.1 – Muscles of the leg on the Anterior Compartment [26]

The lateral compartment of the leg contains two muscles which perform plantar flexion and eversion of the foot. These muscles are the fibularis longus and fibularis brevis. [26, 9, 20]

<u>Lateral compartment of the leg</u>				
Muscle	Origin	Insertion	Action	Innervation
Fibularis longus	Head and body of fibula	First metatarsal and first cuneiform	Plantar flexion and eversion of the foot.	Superficial fibular nerve.
Fibularis brevis	Distal half of body of fibula	Base of the fifth metatarsal	Plantar flexion and eversion of the foot.	Superficial fibular nerve.

Table No.2 - Muscles of the leg on the lateral Compartment [26]

The posterior compartment of the leg consists of a muscle in superficial and deep groups. The superficial muscles share a common tendon of insertion, the calcaneal or Achilles tendon, the strongest tendon of the body. It inserts into the calcaneal bone of the ankle. [26, 9, 20]

<u>Superficial posterior compartment of the leg</u>				
Muscle	Origin	Insertion	Action	Innervation
Gastrocnemius	Lateral medial condyles of femur and capsule of knee	Calcaneus by way of calcaneal (Achilles) tendon.	Plantar flexion of the foot and flexion of the knee joint	Tibial nerve
Soleus	Head and fibula and medial border of tibia	Calcaneus by way of calcaneal (Achilles) tendon.	Plantar flexion of the foot	Tibial nerve

Plantaris	Lateral epicondyle of femur	Calcaneus by way of calcaneal (Achilles) tendon.	Plantar flexion of the foot and flexion of the knee joint	Tibial nerve
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Table No.3 - Muscles of the leg on superficial posterior compartment of the leg [26]

The superficial and most of the deep muscles perform plantar flexion of the foot. The superficial muscles of the posterior compartment are the gastrocnemius, soleus and plantaris which these muscles are so called calf muscles. The gastrocnemius muscle is the most superficial muscle and forms the prominence of the calf. The soleus, which lies deep to the gastrocnemius, is broad and flat. The plantaris on the other hand though is a small muscle that may be absent, sometimes there are two of them in each leg. It's located between the gastrocnemius and soleus muscles. [26, 9, 20]

The deep muscles of the posterior compartment are the popliteus, tibialis posterior, flexor digitorum longus and flexor hallucis longus. The popliteus is a triangular muscle which forms the floor of the popliteal fossa. The tibialis posterior is the deepest muscle located in the posterior compartment. It runs between the flexor digitorum longus and flexor hallucis longus muscles. The flexor digitorum longus is smaller than the flexor hallucis longus, even though the former flexes four toes and the latter flexes only the great toe at the interphalangeal joint. [26, 9, 20]

<u>Deep posterior compartment of the leg</u>				
Muscle	Origin	Insertion	Action	Innervation
Popliteus	Lateral condyle of femur	Proximal tibia	Flexion of the leg at the knee joint and medially rotates tibia to unlock the extended knee.	Tibial nerve
Tibialis posterior	Proximal tibia, fibula and interosseous membrane.	Second, third and fourth metatarsals, navicular and all three cuneiforms.	Plantar flexion and inversion of the foot	Tibial nerve
Flexor digitorum longus	Middle third of posterior surface of tibia	Distal phalanges of toes 2-5	Plantar flexion of the foot, flexes the distal and the middle proximal phalanx of each toe.	Tibial nerve
Flexor hallucis longus	Inferior two-thirds of posterior portion of fibula.	Distal phalanx of great toe	Plantar flexion of the foot, flexes the distal and proximal phalanx of each toe.	Tibial nerve

Table No.4 - Muscles of the leg on deep posterior compartment of the leg. [26]

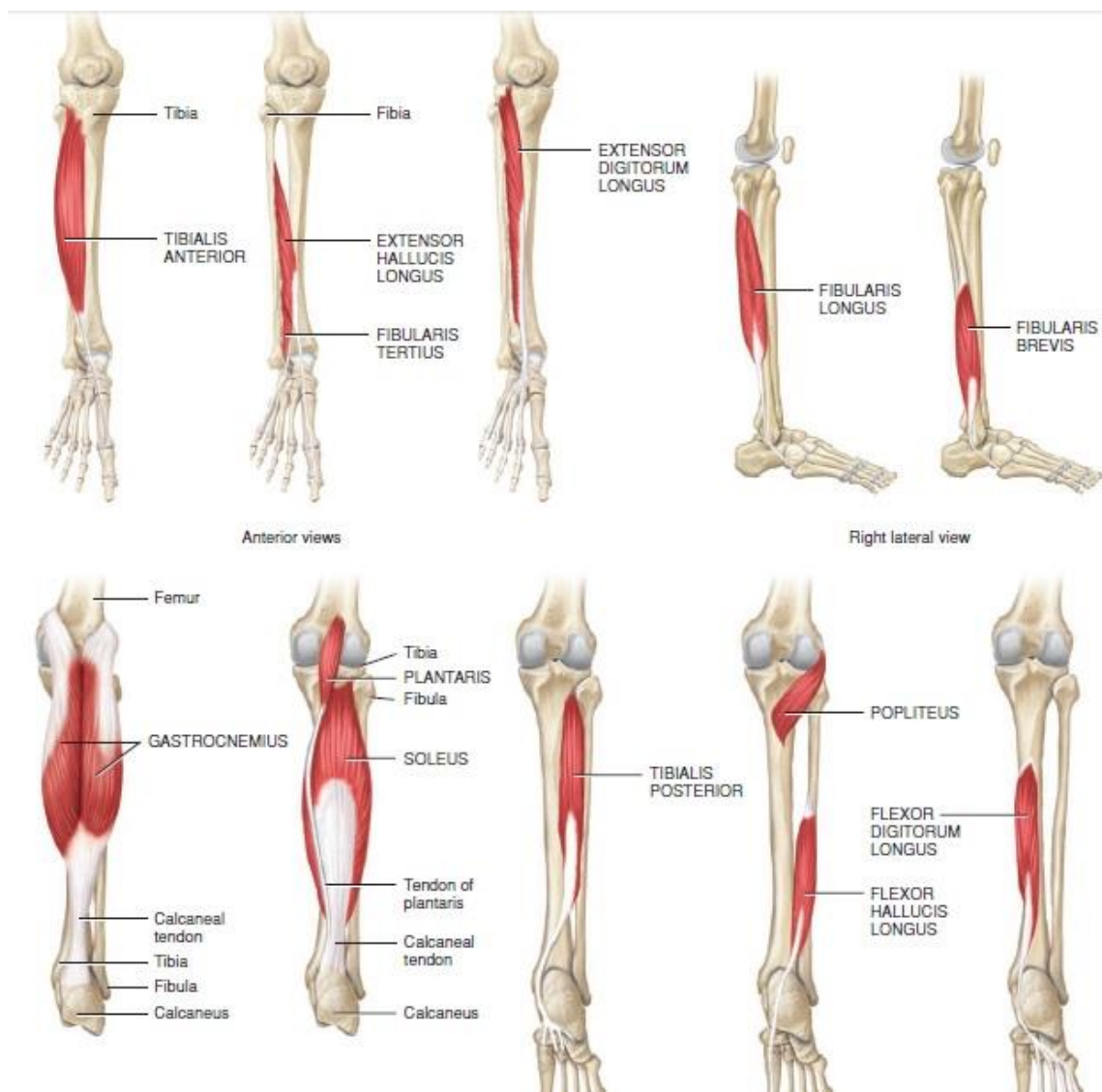


Figure No. 8 - Muscles of the leg that move the foot - Posterior deep views [26]

The Achilles tendon

The Achilles tendon is the largest and strongest tendon of the human body. This tendon connects the calf muscles with the heel bone, calcaneus, with a thick fibrous band of tissue. As the calf muscles contract, this tendon pulls the heel up, allowing you to point your toes and to stand on tip-toes. The Achilles tendon is vital in maintaining a normal walking, running and jumping pattern. [26, 9, 20]

2.1.3. Joints and Ligaments

2.1.3.1. Interosseous membrane of the leg

This kind of ligament is a tough fibrous sheet of connective tissue that spans the distance between the tibia and fibula shafts. The collagen fibers descend obliquely from the interosseous border of the tibia to the interosseous border of the fibula, except superiorly where there is a ligamentous band, which ascends from the tibia to fibula. [26, 9, 18, 20]

There are two apertures in the interosseous membrane, one at the top and the other at the bottom, for vessels to pass between the anterior and posterior compartments of leg. The interosseous membrane not only links the tibia and fibula together, but also provides an increased surface area for muscle attachment. [26, 9, 18, 20]

The inferior aspect of the interosseous membrane holds together the distal ends of the fibula and tibia, which spans the narrow space between the fibular notch on the lateral surface of the distal end of the tibia and the corresponding surface on the distal end of the fibula. This expanded end of the interosseous membrane is reinforced by anterior and posterior tibiofibular ligaments. This firm linking together of the distal ends of the tibia and fibula is essential to produce the skeletal framework for articulation with the foot at the ankle joint. [26, 9, 18, 20]

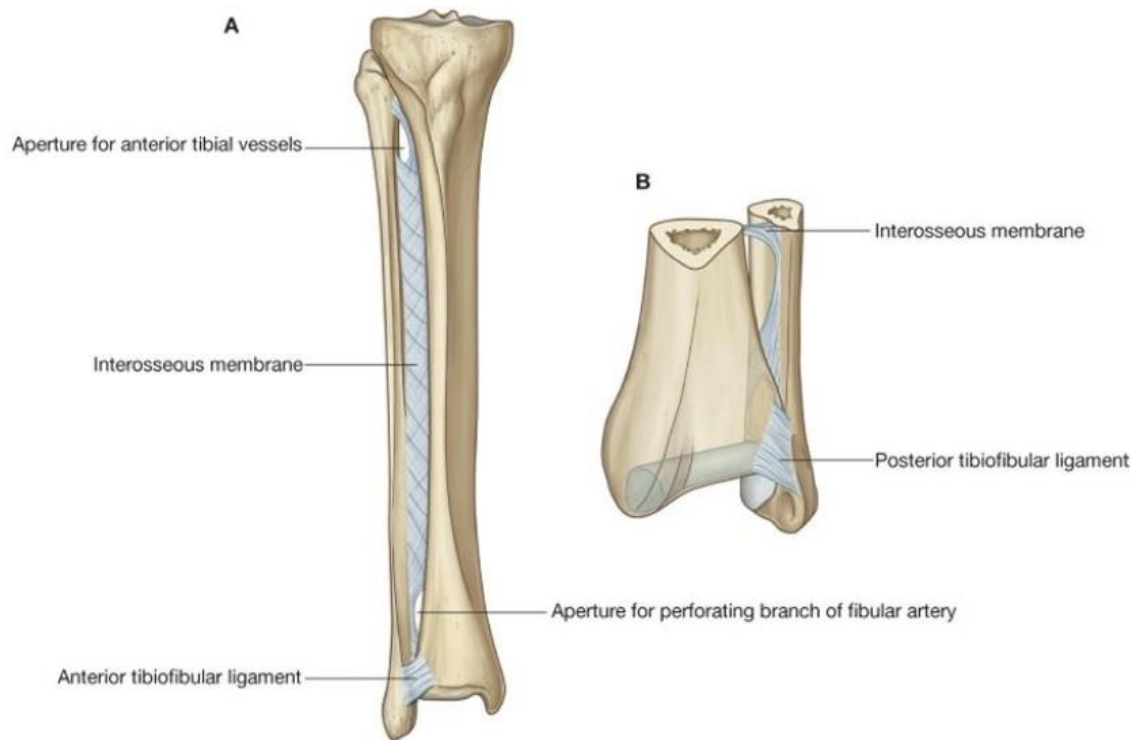


Figure No.9 - Interosseous membrane. **A.** Anterior view. **B.** Posteromedial view. [9]

2.1.3.2. The ankle joint

The ankle joint is a hinge joint which allows only dorsal and plantar flexion movements to be performed. On its joint pattern, the prime and common restriction of this joint is dorsal flexion. There are three important ligaments which make up the lateral ligament complex on the side of the ankle farthest from the other ankle. The anterior talofibular ligament, the calcaneofibular ligament and the posterior talofibular ligament. Another also important ligament is the deltoid ligament. [26, 9, 18, 20]

The *intertarsal joints* are joints between tarsal bones. The talus which is the most superior tarsal bone, is the only bone of the foot that articulates with the fibula and tibia. These articulations form the *talocrural (ankle) joint*. [26, 9, 18, 20]

In the intermediate region of the foot, there is the metatarsus which consists of five metatarsal bones numbered from I to V, starting from the medial position to the lateral. Each metatarsal consists of a proximal *base*, an intermediate *shaft*, and a distal *head*. The articulation of the metatarsals is proximally with the 1st (first) 2nd (second) and 3rd (third) cuneiform bones and with the cuboid to form the *tarsometatarsal joints*. Finally they articulate distally with the proximal row of the phalanges to form the *metatarsophalangeal joints*. [26, 9, 18, 20]

a. Deltoid ligament

The deltoid ligament is a thick ligament which supports the medial side of the ankle joint and is attached at the medial malleolus of the tibia and connect in four places to the sustentaculum tali of the calcaneus, calcaneonavicular ligament, the navicular tuberosity and to the medial surface of the talus. [26, 9, 16, 20, 23]

b. Anterior and posterior talofibular ligaments

The Anterior and posterior talofibular ligaments support the lateral side of the joint from the lateral malleolus of the fibula to the dorsal and ventral ends of the talus. [26, 9, 20]

c. Calcaneofibular ligament

The calcaneofibular ligament is attached at the lateral malleolus and to the lateral surface of the calcaneus. [26, 9, 20]

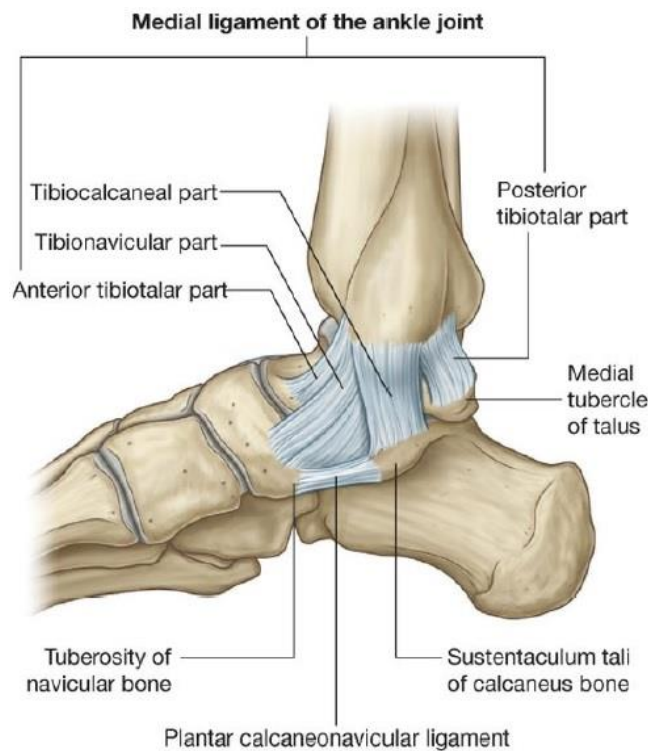


Figure No.10 - Medial ligament of the right ankle joint. [9]

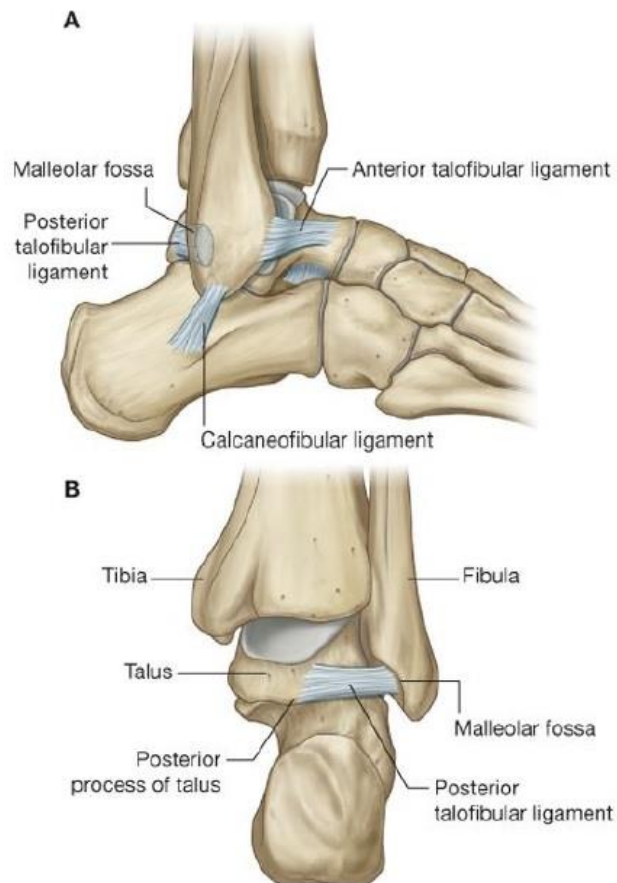


Figure No. 11 - Lateral ligament of the ankle joint. A. Lateral view. B. Posterior view.

[9]

2.1.4. Blood supply and innervation of the lower limb

2.1.4.1. Blood supply of the lower limb

2.1.4.1.1. Popliteal artery

The popliteal artery is the major blood supply to the leg and foot and enters the posterior compartment of leg from the popliteal fossa behind the knee. [26, 9, 10, 20]

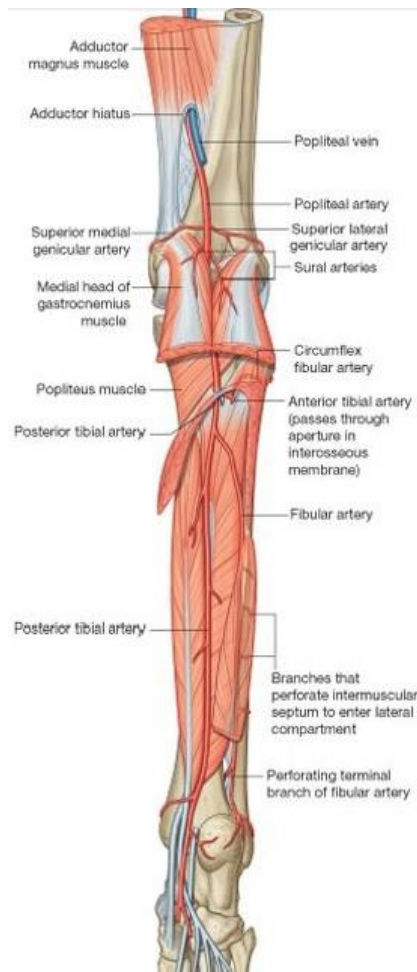


Figure No.12 - Arteries in the posterior compartment of leg [9]

Through the posterior compartment of the leg passes the popliteal artery between the gastrocnemius and popliteus muscles. As it continues inferiorly, it passes under the tendinous arch formed between the fibular and tibial heads of the soleus muscle and enters the deep region of the posterior compartment of the leg where immediately it's divided into an anterior tibial artery and a posterior tibial artery. [26, 9, 10, 20]

In addition the popliteal artery gives rise to branches that contribute to a collateral network of vessels around the knee joint. (See Figure No.13) [26, 9, 10, 20]

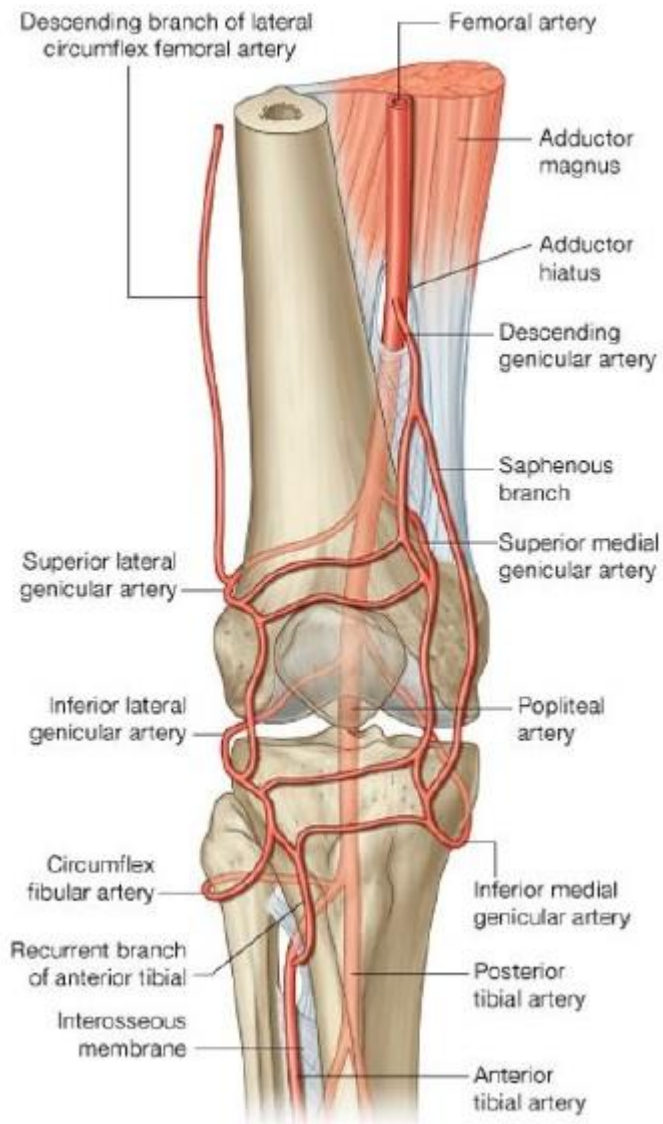


Figure No.13 - Anastomoses of arteries around the knee in anterior view. [9]

2.1.4.1.2. Anterior tibial artery

The anterior tibial artery passes forward through the aperture in the upper part of the interosseous membrane and enters and supplies the anterior compartment of the leg. Then inferiorly continues onto the dorsal aspect of the foot. [26, 9, 20]

2.1.4.1.3. Posterior tibial artery

The posterior tibial artery supplies the posterior and lateral compartments of the leg and continues into the sole of the foot (See Figure No. 12) [26, 9, 20]

The posterior tibial artery descends through the deep region of the posterior compartment of leg on the superficial surfaces of the tibialis posterior and flexor digitorum longus muscles. It passes through the tarsal tunnel behind the medial malleolus and into the sole of the foot. In the leg, the posterior tibial artery supplies adjacent muscles and bone and has two major branches, the circumflex fibular artery and the fibular artery. The circumflex fibular artery through the lateral side passes through the soleus muscle and around the neck of the fibula to connect with the anastomotic network of vessels surrounding the knee (See Figure No. 12 and 13). [26, 9, 20]

The fibular artery parallels the course of the tibial artery, but descends along the lateral side of the posterior compartment adjacent to the medial crest on the posterior surface of the fibula, which separates the attachments of the tibialis posterior and flexor hallucis longus muscles. [26, 9, 20]

The fibular artery passes behind the attachment between the distal ends of the tibia and fibula and terminates in a network of vessels over the lateral surface of the calcaneus.

2.1.4.1.4. Veins

Deep veins in the posterior compartment generally follow the arteries. [26, 9, 20]

2.1.4.2. *Innervation of the lower limb*

2.1.4.2.1. Tibial nerve

The nerve that is associated with the posterior compartment of leg is the tibial nerve (See Figure No. 14). The tibial nerve is a major branch of the sciatic nerve which descends into the posterior compartment from the popliteal fossa. This nerve passes under the tendinous arch formed between the fibular and tibial heads of the soleus muscle and passes vertically through the deep region of the posterior compartment of leg on the surface of the tibialis posterior muscle with the posterior tibial vessels. It leaves the posterior compartment of leg at the ankle by passing through the tarsal tunnel behind the

medial malleolus. It enters the foot to supply most intrinsic muscles and skin. [26, 9, 10, 20]

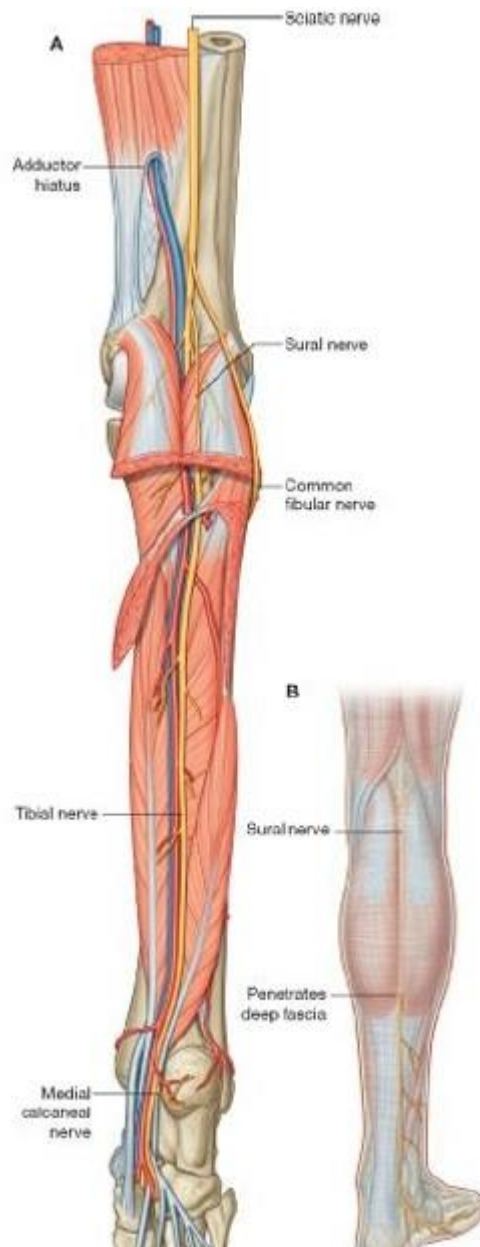


Figure No. 14 - Tibial nerve. A. Posterior view. B. Sural nerve. [9]

In the leg, the tibial nerve gives rise to branches that supply all the muscles in the posterior compartment of leg and to two cutaneous branches, the sural nerve and medial calcaneal nerve. Branches of the tibial nerve that innervate the superficial group of muscles of the posterior compartment and popliteus muscle of the deep group originate high in the leg between the two heads of the gastrocnemius muscle in the distal region of

the popliteal fossa (See Figure No. 15). Branches innervate the gastrocnemius, plantaris, and soleus muscles, and pass more deeply into the popliteus muscle. [26, 9, 10, 20]

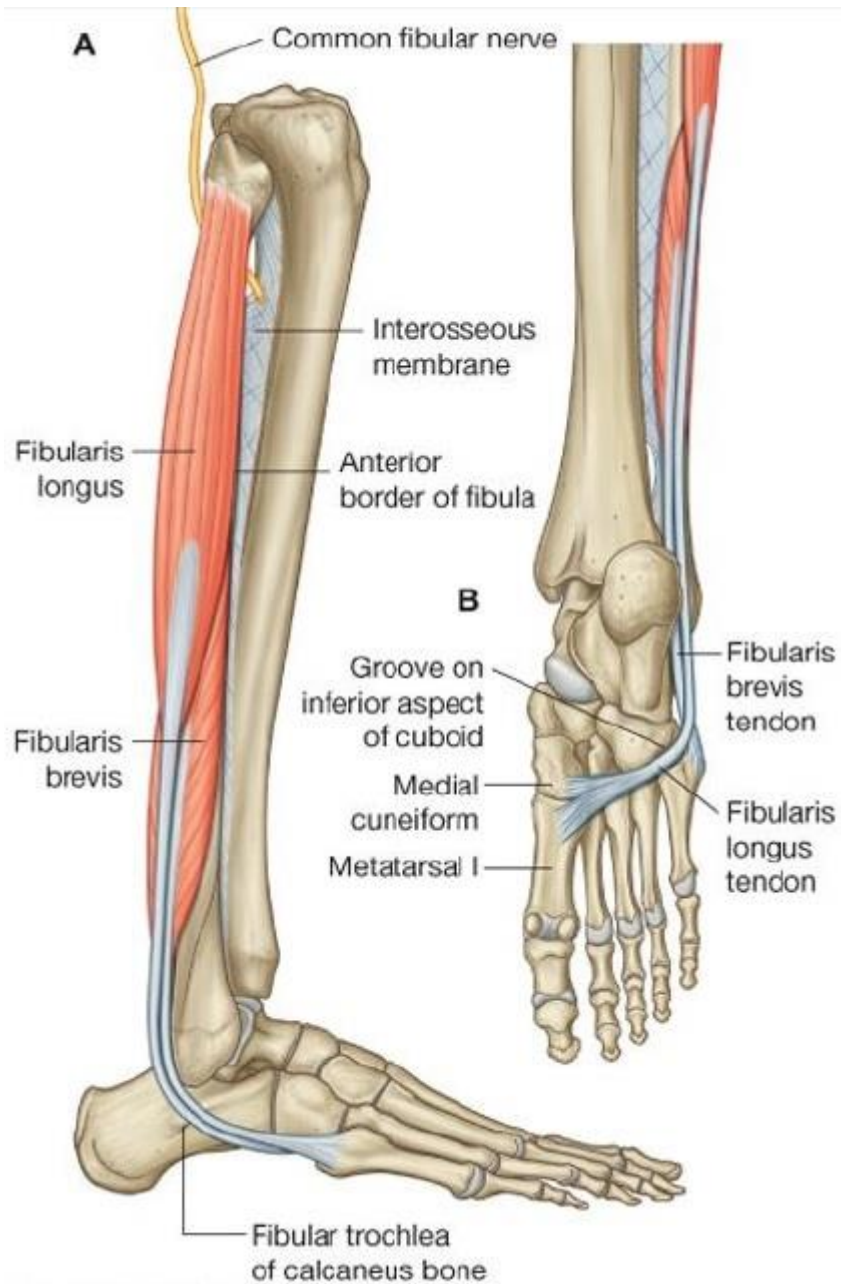


Figure No.15 - Muscles in the lateral compartment of leg. A. Lateral view. B. Inferior view of the right ankle. [9]

Branches to the deep muscles of the posterior compartment originate from the tibial nerve deep to the soleus muscle in the upper half of the leg and innervate the tibialis posterior, flexor hallucis longus, and flexor digitorum longus muscles. [26, 9, 10, 20]

2.1.4.2.2. Sural nerve

The sural nerve originates high in the leg between the two heads of the gastrocnemius muscle (See Figure No. 14). It descends superficial to the belly of the gastrocnemius muscle and penetrates through the deep fascia approximately in the middle of the leg where it is joined by a sural communicating branch from the common fibular nerve. It passes down the leg, around the lateral malleolus and into the foot. The sural nerve supplies skin on the lower posterolateral surface of the leg and the lateral side of the foot and little toe. [26, 9, 10, 20]

2.1.4.2.3. Medial calcaneal nerve

The medial calcaneal nerve is often multiple and originates from the tibial nerve low in the leg near the ankle and descends onto the medial side of the heel. The medial calcaneal nerve innervates skin on the medial surface and sole of the heel. [26, 9, 10, 20]

2.2. Kinesiology of the ankle joint

The ankle joint is a ginglymus or hinge joint uniting the tibia and fibula with the talus. The axis about which motion takes place extends obliquely from the posterolateral aspect of the fibular malleolus to the anteromedial aspect of the tibial malleolus.

2.2.1. Movements of the ankle joint

Flexion and *extension* are the two movements that occur about the oblique axis. Flexion or plantar flexion is the movement which take place on the foot and the part that practically is moving is the plantar surface in a caudal and posterior direction. Extension or dorsal flexion is the movement that the dorsal surface moves in an anterior and cranial direction.

On the *subtalar* and *transverse tarsal joints* permit pronation and supination of the foot. The combination of pronation and forefoot abduction is seen as *eversion of the foot* and the combination of supination and forefoot adduction as *inversion*. Passive or active movements of the foot and ankle reveal that *the foot tends to move outward as it moves upward and to move inward as it moves downward*.

2.2.2. The foot arches

The bones of the foot, instead of lying in a horizontal plane, they form a longitudinal and transverse arches relative to the ground as its seen in figure No. 16. The ground absorbs and distribute downward forces from the body during standing and moving on different surfaces. [9, 15, 24]

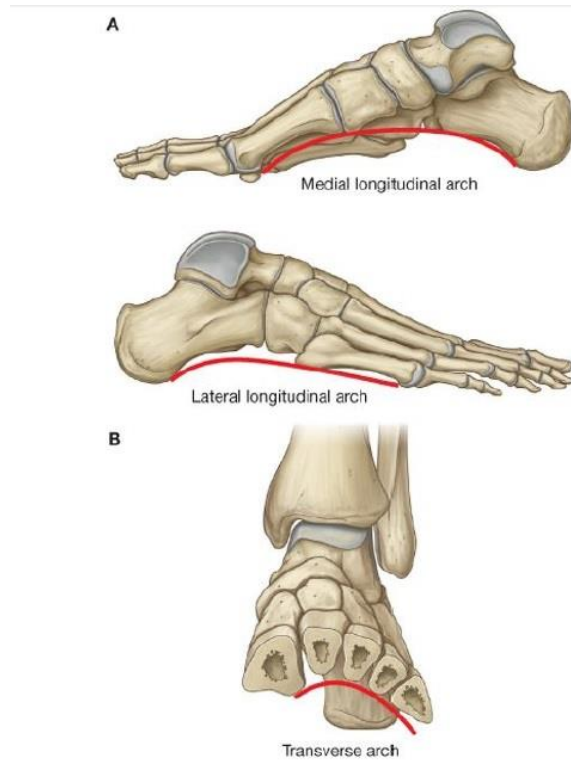


Figure No.16 - Arches of the foot. A. Longitudinal arches, right foot. B. Transverse arch, left foot. [9]

2.2.2.1. Longitudinal arch

The longitudinal arch of the foot is formed between the posterior end of the calcaneus and the head of the metatarsals (Fig. No.16a). It's the highest on the medial side where it forms the medial part of the longitudinal arch and lowest on the lateral side where it forms the lateral part. [9, 15, 24]

2.2.2.2. *Transverse arch*

The transverse arch of the foot is the highest in the coronal plane that cuts through the head of the talus and disappears near the heads of the metatarsals where these bones are held together by the deep transverse metatarsal ligaments as its shown in figure No.16b. [9, 24]

2.2.3. Biomechanics of the foot

2.2.3.1. *Characteristics of the foot*

Characteristics of a triple axial joint which the foot allows this triple axial joint to assume any position. Through the talus area, converge the three main axes of movement. During rotational movements to adapt the foot to an uneven surface, all the joints are involved to some extent the ankle joint. Architectonically, the foot can be compared to a vault which is supported by the three arches of the foot as mentioned before. This vault-structure is very helpful playing an aiding role on analyzing the foot in general. In addition, when the feet are put together, it can be seen the position of both calcanei can be regarded as a vault structure. The position of the calcaneus together with a slight valgus position serves to stabilize the body, particularly during the walking motion of the leg. [1, 6, 12, 13, 14, 17]

2.2.3.2. *The ankle joint*

Referring to the ankle joint, is a hinge joint with a diagonal axis of rotation, which allows a movement of about 20 degrees up and down. This inclination of the ankle joint certainly contributes to stability when carrying weight and can only be fully understood when considered in connection with the talo-calcaneonavicular joint. [1, 6, 12, 13, 14, 17]

2.2.3.3. *The talo-calcaneonavicular joint*

The movement in this joint is more difficult to understand. The axis of the talo-calcaneonavicular joint is obliquely to the axis of the ankle joint from the lateral posterior to the medial anterior. The talo-calcaneonavicular and ankle joint must be regarded as a functional unit. These two joints can be provided movement which can be compared to a sphenoid joint which can be moved freely within its range of motion such as flexion, supination, pronation, abduction and adduction which in some respects corresponds to a rotation. [1, 12, 13, 14, 17]

2.2.3.4. The Chopart's and Lisfranc's joints

These two joints are connected between them with taut ligaments so that there is hardly any friction between them. Primarily, they serve on giving elasticity to the foot during pressure and allow it to adapt better to the foot during pressure and allow it to adapt better to uneven surfaces. [1, 12, 13, 14, 17]

2.2.3.5. Importance of the foot during the gait pattern

The foot plays an important role during the gait pattern. The walking pattern is a dynamic mechanism. The foot should be flexible to provide a correct gait pattern and to accommodate the variations in the external environment, a semirigid foot that can act as a spring and lever arm for the push off during gait and a rigid foot to enable the bodyweight distribution to be carried with adequate stability. The dynamic biomechanics of the foot and ankle complex that allow successful performance of all these requirements can only be understood when studied in relation to the biomechanics of the lower extremities during the gait. The gait cycle provides a standard frame of reference for the various events that occur during walking. [1, 6, 12, 13, 14, 17]

In addition, the gait cycle is the period of time for two steps and is measured from initial contact of one foot to the next initial contact of the same foot. This cycle is composed of two main phases. Firstly the stance phase which is the phase when the foot is in contact with the supporting surface and secondly the swing phase which is the phase when the whole extremity swings forward and the foot loses contact with the surface. The first phase consist of the 60% of the gait cycle. Also in the stance phase are composed some other stages such as the heel-strike, foot flat, mid-stance, heel rise and toe-off. Generally the foot referring the walking pattern plays the most important role that's why most of the abnormalities in the posture during observation even in standing and even during walking pattern are caused by some foot deformities or structural problems. [1, 6, 12, 13, 14, 17]

2.3. Partial and total ankle strain

An ankle sprain usually is when the range of motion of the ankle is surpassing the limit of it and there is a tearing of the ligament in which the ligament belongs to the movement that the degrees of the angle is increased. Of course this is followed by pain and swelling of the area when the tearing is located. The most commonly injured site is the lateral ankle complex which is composed of the anterior talofibular which is the weakest out of the three ligaments and the most common to be injured. Then the second and third ligaments are the calcaneofibular and posterior talofibular ligaments. [5]

The ankle sprain as an injury is categorized into three main grades of severity:

Grade 1: In the first grade there is a microscopic but not a macroscopic tearing of the ligament where the sprain takes place. In general some swelling is present with some or not functional loss and not joint instability. Also the patient is able to fully or partially bear weight. [5]

Grade 2: In the second grade there is partial tearing of the ligament and in this situation there is a moderate-to-severe amount of swelling, ecchymosis, moderate functional loss and mild-to-moderate joint instability. Also, in this state the patient has some difficulties on bearing the weight on the foot. [5]

Grade 3: In the third and last state there is a complete rupture of the ligament with immediate and severe swelling, ecchymosis, an inability to bear weight and moderate-to-severe instability of the joint. Typically, patients cannot bear weight without experiencing severe pain. [5]

2.3.1. Signs and symptoms

The signs and symptoms of an ankle sprain include pain, swelling, cold foot and some muscle spasm. After the injury, pain is located all around the area of the ankle medially or laterally depending on the side of the injury. In addition, the amount of the pain depends on the amount of stretching and tearing of the ligament. Also the patient is unable of course to step on the injured foot. Swelling is located around the whole ankle but more edema there is on the site of the injured ligament. If it's a total ankle sprain, usually comes some hematoma as well. [7]

2.3.2. Diagnosis

Is confirmed by the physical examination that the diagnosis is based on the patient's history because could be some differentiations of the severity of the ankle sprain from a fracture. Some of the physiotherapeutic examination are the anterior drawer test for the ankle joint which includes the examination for the ankle instability (See Figure No.17). [5]



Figure No.17 - Anterior drawer test on the ankle joint [5]

Then the talar tilt test (See Figure No.18) is performed to determine the integrity of the calcaneofibular ligament. The external rotation test is to evaluate the integrity of the syndesmotic ligaments. The Kleiger test which is a variation of the external rotation test is performed to assess the integrity of the deltoid ligament. Squeeze test or fibular compression test is to evaluate for syndesmotic or fibular injury. [5]



Figure No.18 - Talar tilt test [5]

2.3.3. Pathophysiology

The lateral ankle complex is the most commonly injured site of the ankle which is composed of the anterior talofibular, calcaneofibular and the posterior talofibular ligaments. The most frequent ankle sprains come on the lateral site which happens with inversion of the ankle at statistical rate about 85%, 5% is the rate of the ankle sprain which comes with eversion of the foot in which the deltoid or medial ligament and 10% are the syndesmotic injuries. [5, 11]

Surpassing the range of movement of dorsal flexion of the foot the posterior talofibular ligament can be ruptured, with a forced internal rotation movement comes the rupture of the anterior talofibular ligament by the injury of the posterior talofibular ligament. With an extreme external rotation, the deep deltoid ligament can be disrupted on the medial side and an adduction in neutral position and dorsiflexed positions can disrupt the calcaneofibular ligament. And in plantar flexion, the anterior talofibular ligament can be injured. [5, 11]

The deltoid ligament is the strongest ankle capsule-ligament complex which is composed by two parts, the superficial component and the deep component. The superficial component runs the farthest from the medial malleolus to the medial aspect of the calcaneus on the posterior side. The medial malleolus usually fractures before the deltoid ligament fails mechanically. [5, 11, 16, 23]

At any bony ligament attachment may occur ankle spurs. Due to ossification of the hematoma appeared on the lateral radiographs, it's not uncommon to see an anterior spur at the neck of the talus where the anterior ankle capsule attaches. [5, 11]

The syndesmotic ligament due to its great strength has a deep portion between the bones and the superficial, anterior and posterior portions is rarely sprained. This distal tibiofibular ligament holds the distal tibia and fibular bones together at the ankle joint and maintains the integrity of the ankle mortise. This ligament to be strained takes a great amount of strength, which normally does not have much excursion. Surgical treatment is required to a significant tear of ligament. A severe posttraumatic arthritis of the tibiotalar joint or ankle can result quickly if a syndesmosis tear remains unrecognized and without any treatment. Also a syndesmotic ligament tear is usually a part of an ankle fracture that needs to be treated specifically. [5, 11]

2.3.4. Treatment

Treating the acute ankle sprain, there are some goals which should be done immediately. These goals are decreasing the pain, the swelling and protecting the ankle ligaments from secondary injuries. [5, 27, 2]

Grade No.1 Ankle sprain treatment

About grade No.1 use the PRICE treatment which is the Protection followed by the patient to Rest the injured limb for up to 72 hours permitting the ligament to be healed, then a self-treatment with Ice should be provided, the use of a Compression device and keep the injured limb in an Elevated position. [5, 27]

Grade No.2 Ankle sprain treatment

PRICE treatment is necessary to be used but it is needed more time on the healing. About this grade, the time that usually estimates on healing is about 2-3 weeks. [5, 27]

Grade No.3 Ankle sprain treatment

On this grade, it's used surgery because there is a complete rupture of the ligament and physical therapy cannot bring easily and satisfied results, that's why surgery is the "best" first treatment. After that the surgery is done, immediate physical therapy is essential for the best and permanent improvement of the patient. Rehabilitation is used to help to decrease the pain and the swelling. [5, 27, 22]

Conservative Therapy for acute sprain

The acute phase of treatment should last for 1-3 days after the injury. The goals of acute treatment are to control the pain, minimize the swelling and maintain or regain fully the range of movement. [2, 3, 5, 8, 27]

Some protective devices provide some help by stabilizing and protecting the limb and preventing it by secondary injuries. These devices are necessary only when the severity of the sprain is serious or the patient feels more stable and comfortable with it but always it depends from the grade of the sprain. Usually the protecting device is used for 4 to 21 days. [2, 3, 5, 8, 27]

Using ice is one of the best and easiest self-treatments. It helps to reduce the pain, the swelling and the muscle spasms as well. The patient also should always keep in mind that the ice should not be applied directly to the skin but using a towel to prevent some burning of the skin effect done by the ice. [2, 3, 5, 8, 27]

Conservative Therapy for chronic sprain

About the conservative therapy for a chronic lateral ankle sprains should last for approximately 2-3 months. The treatment goals include the patient regaining full strength in the affected ankle, being provided protective support as needed and returning to activity participation. These goals can be accomplished through ROM and strength exercises, sports, specific functional progression, protective support as needed and weight – bearing, multidirectional balance exercises. [3, 5, 21, 27]

Some other therapeutic strategies include the use of lateral heel wedges which is about the peroneal strengthening, proprioceptive exercise, taping and ankle-foot orthoses with ankle and subtalar support. [3, 5, 21, 27]

About chronic sprains referring a medial ligament are used slight modifications to the conservative therapy of lateral sprains. Are included ankle stirrup, bracing, casting and orthoses. Another important thing, is that surgical interventions are necessary only if the measures mentioned before are unsuccessful. [3, 5, 21, 27]

Referring to the syndesmotic injuries, if a diastasis which refers to any loosening in the attachment of the fibula to the tibia at the inferior tibiofibular joint, has been present up to 3 months, significant arthritic changes have probably begun. Usually arthroscopic evaluation of the ankle joint is a very good method of determining the course of management. [3, 5, 21, 27]

About the surgical options of the syndesmotic injuries, if there is a chronic instability of the subtalar joint, usually, requires surgical intervention. In the beginning the treatment is non-surgical and is quite similar with the conservative treatment of the lateral ankle instability. In this, it's included peroneal strengthening, proprioceptive training, Achilles tendon stretching and the use of a brace for a better stability. [3, 5, 21, 27]

Physical therapy

The therapy plan during the recovery phase is aimed at the patient regaining full ROM, strength and proprioceptive abilities. Strengthening is started with isometric exercises and advanced to the use of elastic bands or surgical tubing. [3, 4, 5, 27]

The strengthening exercises are performed in the 4 main ankle movements which are dorsal flexion, plantar flexion, eversion and inversion. The proprioception rehabilitation begins with single – leg stance exercises in a single plane and progresses to multiplanar exercises. [3, 4, 5, 27]



Figure No. 19 - Strengthening exercises using an elastic band [5]

The patient stands on the injured side with the foot and arch in a neutral position and holds the foot of the uninjured side off the ground. This exercise should be performed for safety near to a wall. In the beginning, the patient is looking at the feet and attempts to hold the position. Firstly when the patient would be able to keep himself with ease in this position for 3 minutes will move to the next step which is the same as the first step but with looking forward for 3 minutes and the next and final step is with eyes closed again for 3 minutes. The progress of the proprioceptive rehabilitation can be determined with a modified version of the Romberg test. [3, 4, 5, 27]

Secondary and enough effective exercises are balancing on the tilt board, in which the patient he just steps on the tilt board and tries to balance on it. For preventing falling, the patient holds himself to a lever on the wall or somewhere else which could prevent the falling of the patient. [3, 4, 5, 27]



Figure No. 20 – Tilt board [5]

2.3.5. Prevention

The prevention of the ankle sprains in the future depends on the type of activity the patient is performing. Certain sports as soccer, basketball, volleyball etc. have a high incidence of ankle injuries. [3, 5]

All the athletes should must understand the importance of adequate training and conditioning to prevent any future injury or to minimize injury severity. An adequate warm-up period and a gradual transition into activity are general principles that also can be applied to prevent future injury. The athlete should wear shoes with a good stability and where possible, should exercise on even surfaces. During activities may be added some braces, Velcro ankle braces or ankle taping to prevent further injury. The athletes should have their muscle strength and endurance in a very good state preventing some increasing of body mass and muscle imbalance because it could put them at risk for ankle sprains. [3, 5]



Figure No. 21 - Lace-up ankle support [3]



Figure No. 22 - Brace secured with Velcro straps [3]

3. SPECIAL PART (CASE STUDY)

3.1. Methodology

My clinical work placement started from the 5th of January 2015 and ended on 16th of January 2015. As I mentioned there were provided 6 therapies during this time of period. Of course, a total rupture of the ankle is not possible to be healed only during in this time of period but there will be covered a very important part of the treatment of the patient and the patient should follow our instructions to be this part of the treatment correct and with permanent results.

The therapy sessions come right after the initial kinesiological examinations in which there were performed the initial examinations for the patient to be sure about the abnormalities of the patient and how to deal with them according the progress of the patient to the therapy sessions.

There were performed 6 therapy sessions during my clinical work placement. The first therapy session came on the third day of my clinical work placement because in the two first days were performed the initial kinesiological examinations.

Every day in each therapy session, is a different day and it's possible to see some other results and it's needed to ask every day the patient how was he feeling, what is the pain level. Performing a quick examination of the main problem and set, if it's needed, a different goal in every single therapy session.

Mainly referring to the therapy sessions, I performed several therapeutic methods such physical therapy in which were included TENS which has an analgesic effect and ultra sound which has an anti-edematic effect. For the reinforcement of the weak muscles, I preferred to choose a dynamic treatment instead of classic electrotherapy. I choose Sensomotoric stimulation exercises which were performed at the gym of the clinic under my guidelines to the patient which in this section I took several figures of the exercises as well.

Also, I considered to my patient 3 different self-therapy schedules which gradually the difficulty increases and depending on his improvements, he will move to the next schedule of self-therapy.

My work has been approved by the Ethics Committee of the Faculty of Physical Education and Sport at Charles University in Prague.

3.2. Anamnesis

Patient: T. K., Male

Diagnosis: Total lateral ankle sprain (left)

Year of birth: 1985

Code: 845.00

3.2.1. Personal State

Weight: 90 kg

Height: 1, 86 m

BMI: 27

- Pain level: In a scale from 0 (minimum) to 10 (maximum), during walking up to the stairs, my patient has a pain about 5 to 10. In an erect position, he feels pain about 4 to 10. The pain location is on the lateral side of his left ankle and he mentioned that the pain is more intense during walking. In the beginning right after the accident, the pain was unbearable but right after that he had the surgery for the lateral ligament reconstruction and he got the indication of rehabilitation, the pain started to be reduced and after two months he visited our clinic and he told us that the pain level was the one which was mentioned.
- My patient had this injury during a soccer match while an opponent player, tackled him on the medial side of his left ankle resulting his lateral total ankle sprain.
- After the intense tackle, he couldn't continue playing of course. The patient had the surgery that I mentioned before, the doctor's indication was not to step on his operated ankle and to apply some ice on it. Two months after the surgery he came to our clinic.

3.2.2. Family Anamnesis

- He has two brothers, one younger and the other older.
- The rest of his family is in a healthy condition.

3.2.3. Operation Anamnesis

- None

3.2.4. Medication

- None

3.2.5. Allergy Anamnesis

- None

3.2.6. Social Anamnesis

- He is engaged with his girlfriend and they are living together.

3.2.7. Occupation Anamnesis

- He is a professional soccer player

3.2.8. Hobbies

- He use to swim as an aerobic training or after his soccer training to relax and clear his mind.

3.2.9. Abuses

- Doesn't smoke
- He is a social drinker. He drinks only when he is with his friends.

3.2.10. Previous Rehabilitation

- None other previous rehabilitation.

3.2.11. Statement from patient's medical documentation

- He had X-Ray on his right ankle but he didn't bring it to us.

3.2.12. Indication of rehabilitation

- Improve the ROM on the right ankle joint.
- Decrease completely the swelling.
- Decrease completely the pain.
- Regain muscle strength and stability of the ankle during walking (main ADL).

3.2.13. Differential Diagnosis

As it was mentioned, the patient had a serious tackle on the medial side of his left ankle, medial malleolus, so his ankle went in hyper lateral tilt or hyper inversion which caused the total rupture of the lateral and anterior talofibular ligament as I suppose. Also, some secondary changes which could be found are the atrophy of the muscles on the lower extremity, ROM limitation, pain and swelling. In addition, the pain that our patient feels is completely normal because there was a complete rupture of the lateral ligaments but of course we don't have to be fooled by the pain because the pain can cause the muscle atrophy that I mentioned before and we, definitely, don't want that. Until the complete rehabilitation, probably there would be some muscle strength reduction focused on the area of the left lower leg.

3.3. Initial kinesiology examination

3.3.1. Posture evaluation in standing

a. Anterior view

<u>Distance between feet</u>	Length of both shoulders
<u>Position of the feet</u>	Slightly Parallel
<u>Arch of the feet</u>	Physiological
<u>Weight distribution</u>	More on the right side
<u>Position of the pelvis</u>	Right side higher than the left side
<u>Position of the navel</u>	Not aligned with the distance between the nipples
<u>Position of clavicles</u>	Right higher than the left one
<u>Shoulder girdles</u>	Right higher than the left one
<u>Position of the upper extremities</u>	Pronation of forearms (both sides) Flexion of elbows and slight abduction of the arm.
<u>Opening of the thoracolumbar triangles</u>	Right bigger than the left one
<u>Position of the head</u>	Neutral

Table No. 5 - Initial Kinesiology Examination

Posture evaluation in Anterior view

b. Lateral view (both sides)

<u>Shape and position of the ankle joints</u>	Aligned with the lower limb
<u>Shape and position of the knee joints</u>	Aligned with the lower limb
<u>Pelvis position</u>	Slightly in anteroflexion
<u>Position and curvature of the spine</u>	Normal spine curvatures
<u>Position of the shoulder girdles</u>	Neutral
<u>Head</u>	Neutral

Table No. 6 - Initial Kinesiology Examination

Posture evaluation in Lateral view (both sides)

c. Posterior view

<u>Position of the heels</u>	Symmetrical
<u>Calf area</u>	Symmetrical
<u>Popliteal lines</u>	Symmetrical
<u>Position of pelvis</u>	Symmetrical
<u>Paravertebral muscles</u>	Symmetrical
<u>Scapulae</u>	Slight abduction of the left scapula
<u>Shoulder girdles</u>	Slight protraction on the left shoulder
<u>Positions of upper extremities</u>	Pronation of the forearms and flexion of the elbows
<u>Position of the head</u>	Neutral

Table No. 7 - Initial Kinesiology Examination

Posture evaluation in Posterior view

3.3.2. Dynamic Test (mobility of segments)

Maximal extension

It is performed maximal extension of the whole trunk with the hands fixating on the pelvic region.

Result:

The patient doesn't any issues on performing the movement and also he doesn't have any pain. None restriction is observed.

Lateroflexion

It is performed lateral flexion of the whole trunk, first on the right and then on the left side.

Result:

The patient's ROM toward the right side is bigger than the left side by 2 cm during performing the movement. The movement has a restriction on the thoracolumbar region and the patient does not feel any kind of pain during performing the test.

Maximal flexion

It is performed maximal flexion of the whole trunk starting from the cervical spine and ending with the lumbar spine.

Result:

The patient is able to provide easily flexion of the whole trunk without any kind of pain and numbness or dizziness. The ROM is normal and he can touch the floor with the back of his hands.

3.3.3.Special tests

a. Vele test

On the vele test which was performed on my patient, I noticed that he has a leaning forward of the total body weight and with this results on bearing a slight body weight on the top of his feet and especially on his right side due to the fact that he weight bears more on the right side (non-surgical side) resulting with this that his stability of the total weight is not totally stabilized on his feet. There is postural deficiency resulting with a grade II.

b. Two scales test

Left side	Right side
42 kg	48 kg

Table No. 8 – Initial Kinesiology Examination

Special tests – Two scales test

3.3.4. Examination of basic movemet patterns (according to Janda)

a. Extension of hip joint movement pattern:

The movement was found as negative (both sides). The patient performed the movement with a correct order of muscle activation. Activating first the gluteus maximus then the hamstrings, then contralateral spinal extensors muscles lumbar region, ipsilateral spinal extensors muscles lumbar region, contralateral spinal extensors muscles thoracic and lumbar region, ipsilateral spinal extensors muscles thoracic and lumbar region and in the end the shoulder girdle muscles.

b. Abduction of hip joint movement pattern:

The movement was found as positive with an initial movement of the tensor fasciae latae. The patient didn't perform a correct and pure abduction, there was included a slight hip flexion that the patient performed wasn't a pure abduction of hip. After the activation of tensor fascia latae muscle, there was the activation of gluteus medius and minimus. This movement was noticed in both sides.

c. Curl up (trunk flexion) movement pattern:

The movement was found as negative (both sides). None problem for the patient on moving towards the sitting up position from the supine. The movement was performed smoothly and was observed a curling movement of the trunk during the movement.

3.3.5. Anthropometric Measurements

Lower Extremities Circumference	Left Side	Right Side
Thigh	49 cm	47 cm
Knee	38 cm	43cm
Calf	41 cm	42cm
Malleolus	25 cm	25 cm
Foot	26 cm	26 cm

Table No. 9 – Initial Kinesiology Examination Anthropometric Measurement - Lower Extremities Circumference

Lower extremities Length	Left Side	Right Side
Anatomical length (ASIS)	103cm	103cm
Functional length (Umbilicus)	112cm	112cm
Length of thigh	95cm	95cm
Length of middle leg	48cm	48cm
Length of foot	25cm	25cm
Circumference of thigh (vastus medialis)	50cm	50cm
Circumference of thigh (quadriceps)	60cm	61cm
Circumference of knee	41cm	41cm
Circumference of calf	43cm	44cm
Circumference of ankle	38cm	36cm
Circumference of foot	27cm	27cm

Table No. 10 – Initial Kinesiology Examination

Anthropometric Measurement - Lower extremities Length

3.3.6. Gait examination

Walking forward
Anterior – Posterior view
Asymmetry of upper and lower extremities
Stiff shoulders
Contact floor with heels right one better, the left one.
Lateral view
Asymmetry of steps
Asymmetry of upper extremities
Tilt of head forward
Walk backwards
Not symmetrical step length and not good contact of the left foot comparing with the
On toes
Unstable walking, he loses his balance, cannot walk for too long and feels pain. Spontaneous movements with the hands on trying keeping the balance.
On heels
Unstable walking, he loses his balance, cannot walk for too long and feels pain. Spontaneous movements with the hands on trying keeping the balance.
With eyes closed
He couldn't do it and in this case it was normal because he had too much fear to hurt his foot (psychological fear).

Table No. 11 – Initial Kinesiology Examination
Gait examination

3.3.7. ROM evaluation in SFTR method by Russe and Gerthard

Hip Joint				
Planes	Left Side		Right Side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
Sagittal	20 ⁰ – 0 – 95 ⁰	25 ⁰ -0- 100 ⁰	20 ⁰ -0- 95 ⁰	25 ⁰ -0- 100 ⁰
Frontal	35 ⁰ -0- 30 ⁰	40 ⁰ – 0 – 35 ⁰	35 ⁰ -0- 30 ⁰	40 ⁰ – 0 – 35 ⁰
Rs	45 ⁰ -0-35 ⁰	50 ⁰ -0- 39 ⁰	45 ⁰ -0- 30 ⁰	50 ⁰ -0- 35 ⁰

Table No. 12 – Initial Kinesiology Examination

ROM evaluation – Hip Joint

Knee Joint				
Plane	Left Side		Right Side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
Sagittal	0 ⁰ – 0 – 140 ⁰	0 ⁰ – 0 – 150 ⁰	0 ⁰ – 0 – 140 ⁰	0 ⁰ – 0 – 150 ⁰

Table No. 13 – Initial Kinesiology Examination

ROM evaluation – Knee Joint

Ankle Joint				
Planes	Left Side		Right Side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
Sagittal	45 ⁰ -0- 20 ⁰	50 ⁰ -0- 25 ⁰	45 ⁰ -0- 25 ⁰	50 ⁰ -0- 30 ⁰
Frontal	10 ⁰ -0- 40 ⁰	15 ⁰ -0- 45 ⁰	15 ⁰ -0- 40 ⁰	20 ⁰ -0- 45 ⁰

Table No. 14 – Initial Kinesiology Examination

ROM evaluation – Ankle Joint

3.3.8. Muscle tone examination (Palpation according to Lewit)

Examined muscle	Left Side	Right Side
Piriformis	Hypotone	Hypotone
Hamstrings	Eutone	Hypotone
Tensor fasciae latae	Hypertone	Hypertone
Quadriceps	Hypertone	Hypertone
Iliopsoas	Hypertone	Hypertone
Sartorius	Hypertone	Hypertone
Gluteus maximus	Eutone	Eutone
Gluteus medius	Hypotone	Hypotone
Gluteus minimus	Hypotone	Hypotone
Tibialis anterior	Hypotone	Hypotone
Gastrocnemius	Hypertone	Hypertone
Erector spinae	Eutone	Eutone

Table No. 15 – Initial Kinesiology Examination

Muscle tone examination

3.3.9. Muscle strength test for the Lower extremities (According to Kendall)

Examined Muscle	Left Side	Right Side
Tibialis anterior	4	5
Extensor digitorum longus/brevis	4	5
Peroneus Tertius	3+	5
Tibialis posterior	4	5
Flexor digitorum longus	4	5
Peroneus longus	5	5
Peroneus brevis	5	5
Gastrocnemius	4	5
Soleus	5	4
Hamstrings	5	5
Quadriceps	5	5
Gluteus medius	4	4
Gluteus minimus	4	4
Iliopsoas	4	4
Tensor fasciae latae	5	5
Sartorius	5	5
Piriformis	5	5
Gluteus maximus	5	5
Hip adductors	5	4
Flexor hallucis longus	5	5
Flexor hallucis brevis	4	4
Extensor hallucis longus	4	4+

Table No. 16 – Initial Kinesiology Examination

Muscle strength test for Lower extremities

3.3.10. Muscle length test (According to Janda)

Examined muscle:	Left Side	Right Side
Iliopsoas	0	0
Rectus femoris	0	0
Hamstrings	1	1
Tensor fascia lata	0	0
Gastrocnemius	0	0
Soleus	0	1

Table No. 17 – Initial Kinesiology Examination
Muscle length test

3.3.11. Manual contact examination (Joint Play examination according to Lewit)

<u>Sacroiliac examination:</u>	
Stoddard's crossed-hands	None restriction on both sides
Upper part of sacroiliac joint	None restriction on both sides
Lower part of sacroiliac joint	None restriction on both sides
<u>Patellar examination:</u>	None restriction on both sides
<u>Head of fibula:</u>	None restriction on both sides
<u>Lisfranc's joint:</u>	Restriction on the dorsal and plantar direction on the left L.E.
<u>Chopart's joint:</u>	Restriction on the dorsal direction on the left L.E.
<u>Subtalar joint:</u>	Restriction on both L.E. during traction caudally and upward direction.
<u>Talocrural joint:</u>	None restriction on both sides
<u>Metatarsophalangeal joints:</u>	Restriction on the dorsal and plantar direction on the left L.E.

Table No. 18 – Initial Kinesiology Examination

Manual contact examination (Joint Play examination according to Lewit)

3.3.12. Neurological examination

Superficial sensation	Physiological on both lower extremities
Touch	Physiological on both lower extremities
Tactile	Physiological
Deep sensation	Physiological
Stereognosis	Physiological on both sides
Positioning- Kinesthesia	Physiological on both sides
Tendon reflexes	Physiological on both lower extremities
Patellar reflex	Physiological on both lower extremities
Achilles' tendon reflex	Physiological

Table No. 19 – Initial Kinesiology Examination - Neurological examination

3.3.13. Conclusion of the initial kinesiological examination

After all the examinations, comes the conclusion that the main issues of the patient are that there are some difficulties on weight-bear correctly the body weight from the left to the right side. Also there are some ROM limitations but slight limitations on the injured ankle. There were found several hypertone and hypotone muscles which is normal because usually after this kind of diagnosis the muscle tone changes due to the injury on that area. A good result is that he doesn't have any problems regarding his mobility of the joints, sensitivity and reflexes. There is a big difference on the muscle strength between the left and right side.

3.4. Short-term and long-term rehabilitation plan

- Short-term plan:

- a. Reduce completely the pain and swelling.
- b. Improve the weight-bearing of the body weight using the left ankle joint.
- c. Regain the optimal ROM where there is limitation.
- d. Reinforce the atrophic muscles.

- Long-term plan:

- a. Get the patient back to his training to continue his career without any problem.
- b. Start again training without any psychological fear and pain.

3.5. Therapy sessions

1ST THERAPY: WEDNESDAY 7TH OF JANUARY 2015

Present state

- The patient's mood wasn't so good in the beginning. He had some fear worrying about his foot and his career as well as he told us.
- Pain level: 5 to 10
- There was some swelling at the left ankle joint but it wasn't in a severe condition.
- There were some ADL problems which are during the walking and specifically with the weight-bearing of the body weight on the injured ankle.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.
Time of application: 10 minutes
- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.
Time of application: 15 minutes
- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)
Time of application: 10 minutes
- Kenny method to facilitate weak muscles. Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular facilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Regain the patient's trust and calm him down. Make him feel comfortable with the therapy procedure.
- Decrease the pain level and swelling
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

Before starting the first therapeutic session, I talked to the patient about his problem helping him psychologically. Helping him with his fear which is physiological because is weak and injured. Gaining his trust is the first and most important goal for the best possible treatment not only for this patient but with every patient. We talked about for 20 minutes starting again from how the accident happened and ending explaining him what he has to do for his own good and having the best treatment.

- **Electrotherapy**

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

- **Sensomotoric stimulation exercises**

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.



Figure No. 23 – Sensomotoric Stimulation Exercise No.1

b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed. Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.



Figure No. 24 - Sensomotoric Stimulation Exercise No.2

c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results of the very first therapy session were examined on the next therapy session to check if there were any results and the patient didn't have so much improvement but as he told me, he was feeling his ankle better, the pain was the same but only after that he got tired his ankle. The swelling wasn't so intense and the movements of the ankle joint were easier to be performed. During the Sensomotoric stimulation exercises the patient didn't have any problem but only some time, he got tired, especially on the exercise No. 2.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Wednesday 7rd of January 2015 Self-therapy schedule No.1

1st exercise

R.I.C.E. exercise

Relax the injured ankle when he feels tired, apply ice on the swollen and painful area as much possible, approximately 10 minutes using a towel to prevent skin burns, use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

2nd exercise

Alphabet exercise

Using his foot, try to write on the air from the beginning all the letters of the alphabet. When tiredness comes, stop, take a rest and then continue from the letter that he stopped.

3rd exercise

Elastic Towel resistance exercise

Description

Hold the towel from the two edges with both hands and put the foot in the middle of the towel and try to push against the towel with keep holding the two edges. The opposite movement comes by fixating or hold the two edges to a leg of a table or by an assistant. Inversion and eversion movements are possible to be exercised fixating the towel one from the right and the other from the left side. Perform as much possible until he gets tired.

End of 1st Therapy

2ND THERAPY: FRIDAY 9TH OF JANUARY 2015

Present state

- The patient's mood was better in the second therapy session. He still had some fear worrying about his foot but he told us that he trusts us and this is a very good thing.
- He told us that he did the self-therapies on Wednesday and Thursday and his comment was that the exercises are not difficult but not easy as well, are just right for him. He stopped exercising after he felt pain or tiredness.
- Pain level: 4 - 5 to 10 (more during walking)
- There was still some swelling at the left ankle joint but it wasn't in a severe condition.
- There were some ADL problems which are still during the walking and specifically with the weight-bearing of the body weight on the injured ankle.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.
Time of application: 10 minutes
- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.
Time of application: 15 minutes
- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)
Time of application: 10 minutes
- Kenny method to facilitate to weak muscles. Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular fascilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Keep the trust of the patient and keep his mood in a good state.
- Decrease the pain level and swelling
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

The second therapeutic procedure, begun with a different kind of talk between the patient and me. We talked about football, about something that he is interested in and makes him clear his mind.

- **Electrotherapy**

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

- **Sensomotoric stimulation exercises**

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.

b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed. Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.

c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results on the second therapy session were better, there were some improvements referring to the pain that got decreased by 1. The swelling got decrease slightly and the movements of the ankle joint were even easier to be performed. During the Sensomotoric stimulation exercises the patient didn't have any problem but only some time, he got tired, especially on the exercise No. 2.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Friday 9th of January 2015 Self-therapy schedule No.1

1st exercise

R.I.C.E. exercise

Relax the injured ankle when he feels tired, apply ice on the swollen and painful area as much possible, approximately 10 minutes using a towel to prevent skin burns, use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

2nd exercise

Alphabet exercise

Using his foot, try to write on the air from the beginning all the letters of the alphabet. When tiredness comes, stop, take a rest and then continue from the letter that he stopped.

3rd exercise

Elastic Towel resistance exercise

Description

Hold the towel from the two edges with both hands and put the foot in the middle of the towel and try to push against the towel with keep holding the two edges. The opposite movement comes by fixating or hold the two edges to a leg of a table or by an assistant. Inversion and eversion movements are possible to be exercised fixating the towel one from the right and the other from the left side. Perform as much possible until he gets tired.

End of 2nd Therapy

3RD THERAPY: MONDAY 12TH OF JANUARY 2015

Present state

- The patient's mood was better in the third therapy session. He was feeling much better than before and as he mentioned us, his fear is almost faded away completely.
- He told us that he keeps performing the self-therapies and he didn't face any problem.
- Pain level: 3 – 4 to 10 (more during walking)
- There was still some swelling at the left ankle joint but it wasn't in a severe condition.
- There were some ADL problems which are still during the walking and specifically with the weight-bearing of the body weight on the injured ankle.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.

Time of application: 10 minutes

- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.

Time of application: 15 minutes

- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)

Time of application: 10 minutes

- Kenny method to facilitate to weak muscles. Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular fascilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Keep the trust of the patient and keep his mood in a good state.
- Decrease the pain level and swelling
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

The third therapeutic procedure, begun in the same way as before and also noticing that the patient's mood was better than before and the therapy started with a smile at his face.

- **Electrotherapy**

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

- **Sensomotoric stimulation exercises**

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.

b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed.

Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.

c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results on the third therapy session was even better than before, there were some improvements referring to the pain and the swelling which were decreasing every day. He feels much stronger than before as he mentioned. During the Sensomotoric stimulation exercises the patient didn't have any problem, in opposite, he provided the exercises with ease so this means that on the next therapy session, there will be an upgrade on the self-therapies schedule and not only.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Monday 12rd of January 2015 Self-therapy schedule No.1

1st exercise

R.I.C.E. exercise

Relax the injured ankle when he feels tired, apply ice on the swollen and painful area as much possible, approximately 10 minutes using a towel to prevent skin burns, use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

2nd exercise

Alphabet exercise

Using his foot, try to write on the air from the beginning all the letters of the alphabet. When tiredness comes, stop, take a rest and then continue from the letter that he stopped.

3rd exercise

Elastic Towel resistance exercise

Description

Hold the towel from the two edges with both hands and put the foot in the middle of the towel and try to push against the towel with keep holding the two edges. The opposite movement comes by fixating or hold the two edges to a leg of a table or by an assistant. Inversion and eversion movements are possible to be exercised fixating the towel one from the right and the other from the left side. Perform as much possible until he gets tired.

End of 3rd Therapy

4TH THERAPY: WEDNESDAY 14TH OF JANUARY 2015

Present state

- The patient's mood was even better in the fourth therapy session. Every day he is feeling even better than before and as he mentioned us that his fear is gone and he is looking forward on taking his therapy session.
- He also mentioned that he is providing his self-therapies with a different motivation than before which is the thing that I was waiting the patient to gain sooner or later to have the best rehabilitation. Also none problem was noticed by the patient.
- Pain level: 3 - 4 to 10 (more during walking)
- The swelling is almost gone at the left ankle joint.
- The ADL difficulties that he was facing before are much different. As I noticed the weight bearing of his body weight on the injured ankle is much better and I was very happy when I noticed this very important improvement.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.
Time of application: 10 minutes
- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.
Time of application: 15 minutes
- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)
Time of application: 10 minutes
- Kenny method to facilitate to weak muscles. Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular fascilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Keep up the motivation of the patient and keep his mood in the best state.
- Decrease the pain level and swelling completely.
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

The fourth therapeutic procedure, begun in the same way as before with the best state of the patient's motivation and mood. Every day he was smiling.

- **Electrotherapy**

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

- **Sensomotoric stimulation exercises**

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.

b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed.

Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.

c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results on the fourth therapy session was even better than before, there were some improvements referring to the pain and the swelling. He feels much stronger than before as he mentioned. The new schedule of the self-therapy was better than before as he mentioned and still easy for him but it doesn't mean that is not doing any good of course.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Wednesday 14th of January 2015 Self-therapy schedule No.2

1st exercise

Towel resistance exercise

Using a towel, it's possible to provide some exercises which with this change of the towel, the muscle contraction will be an isometric contraction which each repetition should last for approximately 5 seconds and provide as many as possible for each movement.

Description

Hold the towel from the two edges with both hands and put the foot in the middle of the towel and try to push against the towel with keep holding the two edges. The opposite movement comes by fixating or hold the two edges to a leg of a table or by an assistant. Inversion and eversion movements are possible to be exercised fixating the towel one from the right and the other from the left side. Perform as much possible until he gets tired.

2nd exercise

Swimming in the pool

Taking a swimming focusing on the leg swimming with an arm-board providing only the foot movement for maximum half an hour 3 times per week is the best and most dynamic self-exercise without causing secondary injuries for the patient.

Of course the swimming exercise should have been added from several therapies after that we noticed the first improvements due to the fact that the injured ligaments weren't strong enough not causing more pain or more swelling.

3rd exercise

R.I.C.E. exercise

Especially after the swimming activity, the R.I.C.E. exercise is ideal. So the patient for this exercise needs to relax the injured ankle when he feels tired then apply ice on the swollen and painful area as much possible, approximately for 10 minutes 3 times per day using a towel to prevent skin burn, thirdly use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

End of 4th Therapy

5TH THERAPY: THURSDAY 15TH OF JANUARY 2015

- The patient's mood was even better in the fifth therapy session. Every day he is feeling even better than before and as he mentioned us that his fear is gone and he is looking forward on taking his therapy session.
- He also mentioned that he is providing his self-therapies with a different motivation than before which is the thing that I was waiting the patient to gain sooner or later to have the best rehabilitation. Also none problem was noticed by the patient.
- Pain level: 2 - 3 to 10 (more during walking)
- The swelling is almost gone at the left ankle joint.
- The ADL difficulties that he was facing before are much different. As I noticed the weight bearing of his body weight on the injured ankle is much better and I was very happy when I noticed this very important improvement.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.
Time of application: 10 minutes
- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.
Time of application: 15 minutes
- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)
Time of application: 10 minutes
- Kenny method to facilitate to weak muscles. Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular fascilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Keep up the motivation of the patient and keep his mood in the best state.
- Decrease the pain level and swelling completely.
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

The fifth therapeutic procedure, begun in the same way as before with the best state of the patient's motivation and mood. Every day he was smiling.

• Electrotherapy

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

• Sensomotoric stimulation exercises

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.

b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed. Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.

c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results on the fifth therapy session was even better than before, there were some improvements referring to the pain and the swelling. He feels much stronger than before as he mentioned. The new schedule of the self-therapy was better than before as he mentioned and still easy for him but it doesn't mean that is not doing any good of course. Although at the last two therapy sessions, there will be the last stage of difficulty that I recommend.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Thursday 15th of January 2015 Self-therapy schedule No.3

1st exercise

Going up and down the stairs

This exercise is an advanced exercise which should have been added to the schedule after that we noticed some very important improvements which are the pain and swelling reduction by 50%, a better weight-bearing of the body weight on the injured ankle and of course none fear and total trust of our rehabilitation plan.

Description

To provide this exercise correctly the first thing that the patient should do is to have in his mind is to be patient and not rushing because the permanent and best improvements come slowly and with control and good motivation. So, firstly the patient should go up the stairs with safety by holding himself on the lever next to the stairs. Then, when taking the step on should weight-bear his body weight on the ankle which he used to make the step and then continue to the next step. The same thing on going down the stairs.

Warning: When the patient feels any kind of pain or tiredness or numbness, he should take a break and continue after any of that feeling is gone.

2nd exercise

Swimming in the pool

Taking a swimming focusing on the leg swimming with an arm-board providing only the foot movement for maximum half an hour 3 times per week is the best and most dynamic self-exercise without causing secondary injuries for the patient.

Of course the swimming exercise should have been added from several therapies after that we noticed the first improvements due to the fact that the injured ligaments weren't strong enough not causing more pain or more swelling.

3rd exercise

R.I.C.E. exercise

Especially after the swimming activity and stair-step, the R.I.C.E. exercise is ideal. So the patient for this exercise needs to relax the injured ankle when he feels tired then apply ice on the swollen and painful area as much possible, approximately for 10 minutes 3 times per day using a towel to prevent skin burn, thirdly use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

End of 5th Therapy

6TH THERAPY: FRIDAY 16TH OF JANUARY 2015

- The patient's mood was even better in the sixth therapy session. Every day he is feeling even better than before and as he mentioned us that his fear is gone and he is looking forward on taking his therapy session.
- He also mentioned that he is providing his self-therapies with a different motivation than before which is the thing that I was waiting the patient to gain sooner or later to have the best rehabilitation. Also none problem was noticed by the patient.
- Pain level: 2 - 3 to 10 (more during walking)
- The swelling is almost gone at the left ankle joint.
- The ADL difficulties that he was facing before are much different. As I noticed the weight bearing of his body weight on the injured ankle is much better and I was very happy when I noticed this very important improvement.

Therapy proposal

- Hydrotherapy for a better blood circulation and to reduce the swelling.
Time of application: 10 minutes
- Laser – Phototherapy. Helps on the healing process and it could speed it up by 40%.
Time of application: 15 minutes
- Short-wave diathermy to treat all the inflammations (swelling, pain etc.)
Time of application: 10 minutes
- Kenny method to facilitate to weak muscles Time of application: 10 minutes
- Kinesio tape for pain relief and helping on the healing process. Several applications to complete the treatment.
- PNF (proprioceptive neuromuscular fascilitation) to increase the ROM, to increase strength and to improve the muscle elasticity. Time of application: 10 minutes

Goal of today's therapy

- Keep up the motivation of the patient and keep his mood in the best state.
- Decrease the pain level and swelling completely.
- Increase the ROM on the left ankle joint.
- Relax the hypertoned muscles.
- Reinforce the atrophic muscles.

Procedure

The sixth therapeutic procedure, begun in the same way as before with the best state of the patient's motivation and mood. Every day he was smiling.

- **Electrotherapy**

Decreasing the pain level using the transcutaneous electrical nerve stimulation (TENS) current which has an analgesic effect. Using a frequency of 70 Hz for 2x 10 minutes changing the polarity in each 10 minutes therapy and two electrodes of 5 cm² each. It was applied on the area on the middle leg on the lateral side.

- **Sensomotoric stimulation exercises**

For the reinforcement of the weak muscles, I preferred to choose a dynamic and effective treatment such as sensomotoric stimulation exercises provided with my guidelines to the patient.

Mainly for these kind of exercises, it's needed some equipment such as wobble boards, rocket boards, special mattress etc.

I explained to my patient several and very important exercises which were performed at the gym and of course under the supervision of my supervisor at the clinic.

- a. The first and most simple exercise which was explained to the patient was standing and keep the balance on the weak ankle with the right knee flexed preventing falling. The exercise is shown at the figure No. 22.

- b. After several seconds, we moved to the next exercise which was a little bit more difficult. I put in a line different kind of balance boards such as wobble board, rocket board and a thera-band special balance mat. Then I asked the patient to walk in this order in which the equipment was placed. Between each single step the patient should keep his balance and rise the other leg and make a circle with a soft ball under his thigh and then move to the next step. The steps should be provided slowly and keep focused on the movement. The exercise is shown in the figure No. 23.

The exercise was provided after the walking 5 times on the balance equipment which was equal approximately 10 minutes.

- c. On the next and final exercise the patient stepped with both feet on a bosu balance trainer which is an equipment with a half-ball shape on which is a little bit harder

to keep the balance. Then under my assistance, we played a game by throwing to each other a ball and the patient should catch it without losing his balance.

- **Mechanotherapy**

Decreasing the swelling (edema) using ultra sound (US) with quite deep penetration using a frequency of 1 MHz for 8 minutes around the left ankle joint.

- **Post isometric muscle relaxation (PIR)**

The technique was applied for the hyper tone muscles on both sides and specifically for gastrocnemius, tibialis anterior, quadriceps femoris m. group, iliopsoas and tensor fasciae latae.

Results

The results on the sixth therapy session was much better than before, there were some improvements referring to the pain and the swelling. He feels much stronger every day especially with the self-therapy schedule No.3. The new schedule of the self-therapy was better than before and this schedule is just right for him as he mentioned. This schedule of self-therapies should be kept.

Self-therapy

As a physiotherapist I recommend to my patient, for the self-therapy to perform some exercises which each of these exercises should be provided every day by 3 times, 1 time in the morning, 1 time in the midday and 1 time in the evening.

Friday 16th of January 2015 Self-therapy schedule No.3

1st exercise

Going up and down the stairs

This exercise is an advanced exercise which should have been added to the schedule after that we noticed some very important improvements which are the pain and swelling reduction by 50%, a better weight-bearing of the body weight on the injured ankle and of course none fear and total trust of our rehabilitation plan.

Description

To provide this exercise correctly the first thing that the patient should do is to have in his mind is to be patient and not rushing because the permanent and best improvements come slowly and with control and good motivation.

So, firstly the patient should go up the stairs with safety by holding himself on the lever next to the stairs. Then, when taking the step on should weight-bear his body weight on the ankle which he used to make the step and then continue to the next step. The same thing on going down the stairs.

Warning: When the patient feels any kind of pain or tiredness or numbness, he should take a break and continue after any of that feeling is gone.

2nd exercise

Swimming in the pool

Taking a swimming focusing on the leg swimming with an arm-board providing only the foot movement for maximum half an hour 3 times per week is the best and most dynamic self-exercise without causing secondary injuries for the patient.

Of course the swimming exercise should have been added from several therapies after that we noticed the first improvements due to the fact that the injured ligaments weren't strong enough not causing more pain or more swelling.

3rd exercise

R.I.C.E. exercise

Especially after the swimming activity, the R.I.C.E. exercise is ideal. So the patient for this exercise needs to relax the injured ankle when he feels tired then apply ice on the swollen and painful area as much possible, approximately for 10 minutes 3 times per day using a towel to prevent skin burn, thirdly use a compression device to keep the ankle more stable and protected. In the end, positioning the ankle in an elevated position helping the swelling to be reduced.

End of 6th Therapy

3.6. Final kinesiology

3.6.1. Posture evaluation in standing

a. Anterior view

<u>Distance between feet</u>	Length of both shoulders
<u>Position of the feet</u>	Slightly Parallel
<u>Arch of the feet</u>	Physiological
<u>Weight distribution</u>	Symmetrical
<u>Position of the pelvis</u>	On the same level
<u>Position of the navel</u>	Aligned with the distance between the nipples
<u>Position of clavicles</u>	On the same level
<u>Shoulder girdles</u>	On the same level
<u>Position of the upper extremities</u>	Slightly flexion of elbows and slight abduction of the arm
<u>Opening of the thoracolumbar triangles</u>	On the same level
<u>Position of the head</u>	Neutral

Table No. 20 – Final Kinesiology Examination - Posture evaluation in standing

Anterior view

Note: the green surface are the changes found

b. Lateral view (both sides)

<u>Shape and position of the ankle joints</u>	Aligned with the lower limb
<u>Shape and position of the knee joints</u>	Aligned with the lower limb
<u>Pelvis position</u>	Neutral
<u>Position and curvature of the spine</u>	Normal spine curvatures
<u>Position of the shoulder girdles</u>	Neutral
<u>Head</u>	Neutral

Table No. 21 – Final Kinesiology Examination - Posture evaluation in standing

Lateral view (both sides)

Note: the green surface are the changes found

c. Posterior view

Position of the heels	Symmetrical
Calf area	Symmetrical
Popliteal lines	Symmetrical
Position of pelvis	Symmetrical
Paravertebral muscles	Symmetrical
Scapulae	Slight abduction of the left scapula
Shoulder girdles	Slight protraction on the left shoulder
Positions of upper extremities	Slight flexion of the elbows
Position of the head	Neutral

Table No. 22 – Final Kinesiology Examination - Posture evaluation in standing
Posterior view

Note: the green surface are the changes found

3.6.2. Dynamic Test (mobility of segments)

Lateroflexion

The patient's ROM towards both sides is symmetrical during performing the movement. There isn't any pain level.

3.6.3. Special tests

a. Vele test

On the vele test which was performed on my patient after the therapy sessions I noticed that he doesn't have any more the leaning forward of his body weight that he had before the physiotherapeutic procedures. Also he trusts his surgical ankle more than before meaning that he isn't afraid to weight-bear on the injured ankle as before. With that the stability is much better and if the stability, starting from the feet of the patient, is better so rest of the body weight is more stable and weight-bearred. After the patient's therapy sessions comparing the before and after results the rate of the vele test is Grade I.

b. Two scales test

Left side	Right side
44 kg	46kg

Table No. 23 – Final Kinesiology Examination - Two scales test

Result: 2 Kg of body weight more distributed on the injured ankle.

Note: the green surface are the changes found

3.6.4. Examination of basic movemet patterns (according to Janda)

a. Abduction of hip joint movement pattern:

The movement was found as negative (both sides). The patient was performed with a better hip abduction than before. There wasn't hip flexion that the patient performed before the therapy sessions.

b. Curl up (trunk flexion) movement pattern:

The movement was found as negative (both sides). None problem for the patient on moving towards the sitting up position from the supine. The movement was performed smoothly and was present a curling movement of the trunk during the movement.

3.6.5. Anthropometric Measurements

Lower Extremities Circumference	Left Side	Right Side
Thigh	49 cm	47 cm
Knee	39 cm	43cm
Calf	41 cm	42cm
Malleolus	25 cm	25 cm
Foot	26 cm	26 cm

Table No. 24 – Final Kinesiology Examination - Anthropometric Measurement

Lower Extremities Circumference

3.6.6. Gait examination

Walking forward
Anterior – Posterior view
Symmetrical the upper and lower extremities
Less stiff shoulders
Contact floor with heels almost the same between both sides
Lateral view
More symmetrical steps
More symmetrical arm swing
Less tilt of head forward
Walk backwards
Asymmetry of steps not good contact with floor with the left foot
On toes
More stable walking
On heels
More stable walking
With eyes closed
He could do it better and he wasn't so much afraid than before

Table No. 25 – Final Kinesiology Examination - Gait examination

Note: the green surface are the changes found

3.6.7. ROM evaluation in SFTR method by Russe and Gerthard

Ankle Joint				
Planes	Left Side		Right Side	
	Active Movement	Passive Movement	Active Movement	Passive Movement
Sagittal	45 ⁰ -0- 25 ⁰	50 ⁰ -0- 30 ⁰	45 ⁰ -0- 25 ⁰	50 ⁰ -0- 30 ⁰
Frontal	15 ⁰ -0- 40 ⁰	20 ⁰ -0- 45 ⁰	15 ⁰ -0- 40 ⁰	20 ⁰ -0- 45 ⁰

Table No. 26 – Final Kinesiology Examination - ROM evaluation

Ankle Joint

Note: the green surface are the changes found

3.6.8. Muscle tone examination (Palpation according to Lewit)

Examined muscle	Left Side	Right Side
Piriformis	Eutone	Eutone
Hamstrings	Eutone	Eutone
Tensor fasciae latae	Eutone	Eutone
Quadriceps	Eutone	Eutone
Iliopsoas	Eutone	Eutone
Sartorius	Eutone	Eutone
Gluteus maximus	Eutone	Eutone
Gluteus medius	Eutone	Eutone
Gluteus minimus	Eutone	Eutone
Tibialis anterior	Eutone	Eutone
Gastrocnemius	Eutone	Eutone
Erector spinae	Eutone	Eutone

Table No. 27 – Final Kinesiology Examination - Muscle tone examination

Note: the green surface are the changes found

3.6.9. Muscle strength test for the Lower extremities (According to Kendall)

Examined Muscle	Left Side	Right Side
Tibialis anterior	4+	5
Extensor digitorum longus/brevis	4+	5
Peroneus Tertius	4	5
Tibialis posterior	4+	5
Flexor digitorum longus	4+	5
Peroneus longus	5	5
Peroneus brevis	5	5
Gastrocnemius	4+	5
Soleus	5	4
Hamstrings	5	5
Quadriceps	5	5
Gluteus medius	4	4
Gluteus minimus	4	4
Iliopsoas	4	4
Tensor fasciae latae	5	5
Sartorius	5	5
Piriformis	5	5
Gluteus maximus	5	5
Hip adductors	5	4
Flexor hallucis longus	5	5
Flexor hallucis brevis	4	4
Extensor hallucis longus	4	4+

Table No. 28 – Final Kinesiology Examination - Muscle strength test for Lower extremities

Note: the green surface are the changes found

3.6.10. Manual contact examination (Joint Play examination according to Lewit)

<u>Lisfranc's joint:</u>	Restriction on the dorsal and plantar direction on the left L.E.
<u>Chopart's joint:</u>	Restriction on the dorsal direction on the left L.E.
<u>Subtalar joint:</u>	Restriction on both L.E. during traction caudally and upward direction.
<u>Metatarsophalangeal joints:</u>	Restriction on the dorsal and plantar direction on the left L.E.

Table No.29 – Final Kinesiology Examination

Manual contact examination (Joint Play examination according to Lewit)

3.7. Evaluation of the effect of the therapy

Mr. T.K. had a total ankle sprain on his left ankle during a soccer match when the opponent tackled him on the medial side of his left ankle resulting his ankle going on hyper-inversion and causing him the total sprain. He had the surgery and after 2 months he came to our physiotherapeutic department on Friday 2nd of January 2015 and I saw him on Monday 5th of January 2015 at 9 a.m.

The abnormal results that I found on my patient during the initial kinesiology examination which was performed on the day that I saw him, weren't severe referring the ROM of the movement on the joint, but he was suffering from pain, swelling and he was unable to weight-bear his body weight. There were some restrictions on the Chopart's, Lisfranc's and subtalar joint which are responsible for the limitation of the ROM and for the proper gait pattern. These results are the most important and the short-term plan was set accordingly on treating first these abnormal results.

According to all the results which were found on the final kinesiology examination, I can easily confirm that the result of my patient is in a very good state. Generally, there is an improvement of 75 – 80% which for a therapy session plan composed of 6 (six) therapies and I can approve with ease that my patient is in a very good stage of his treatment.

I noticed a lot of positive improvements such as the pain and the swelling are by 80 – 85 % decreased, there aren't any restrictions which limit the ROM of the ankle joint, he doesn't have any fear on exercising, his mood is very good and generally his weight-bearing of the body weight improved by at least 50%.

Finally, some very helpful therapies which I propose are the following:

- i. Hydrotherapy
- ii. Laser – Phototherapy
- iii. Short-wave diathermy
- iv. Kenny method
- v. Kinesio tape
- vi. PNF (proprioceptive neuromuscular fascilitation) by Kabat

3.7.1. Before and after results referring on the postural examination

3.7.1.1. Anterior view

BEFORE		AFTER	
Weight distribution	More on the right side	Weight distribution	Symmetrical
Position of the navel	Not alighted with the distance between the nipples	Position of the navel	Alighted with the distance between the nipples
Position of clavicles	Right higher that the left one	Position of clavicles	On the same level
Shoulder girdles	Right higher that the left one	Shoulder girdles	On the same level
Position of the upper extremities	Pronation of forearms (both sides) Flexion of elbows and slight abduction of the arm.	Position of the upper extremities	Slightly flexion of elbows and slight abduction of the arm
Opening of the thoracolumbar triangles	Right bigger that the right one	Opening of the thoracolumbar triangles	On the same level

Table No. 30 - Before and after results referring on the postural examination

in anterior view

3.7.1.2. *Lateral view*

BEFORE		AFTER	
Pelvis position	Slightly in anteroflexion	Pelvis position	Neutral

Table No. 31 - Before and after results referring on the postural examination

in lateral view

3.7.1.3. *Posterior view*

BEFORE		AFTER	
Positions of upper extremities	Pronation of the forearms and flexion of the elbows	Positions of upper extremities	Slight flexion of the elbows

Table No. 32 - Before and after results referring on the postural examination

in posterior view

3.7.2. Before and after results referring on the dynamic test

BEFORE		AFTER	
Lateroflexion	ROM towards the right side is bigger than the left side by 2 cm during performing the movement. Restriction during the movement on the thoracolumbar region. There isn't any pain level.	Lateroflexion	ROM towards both sides is symmetrical during performing the movement. There isn't any pain level.

Table No. 33 - Before and after results referring on the dynamic test

3.7.3. Before and after results referring on the special tests

3.7.3.1. Vele test

BEFORE		AFTER	
Vele test	Leaning forward, weight-bearing more on the right side. Grade II	Vele test	No more leaning forward, better weight-bearing Grade I

Table No. 34 - Before and after results referring on the special tests – Vele test

3.7.3.2. Two scales test

BEFORE		AFTER	
Two scales test Left - Right	42 kg – 48 kg	Two scales test Left - Right	44 kg – 46 kg

Table No. 35 - Before and after results referring on the special tests – Two scales test

3.7.4. Before and after results referring on the basic movement patterns

BEFORE		AFTER	
Abduction of hip joint movement pattern	He couldn't do it because he had too much fear to hurt his foot (psychological fear).	Abduction of hip joint movement pattern	<ul style="list-style-type: none"> • Negative • better hip abduction • There wasn't hip flexion

Table No. 36 - Before and after results referring on the basic movement patterns

3.7.5. Before and after results referring on the anthropometric measurements

BEFORE		AFTER	
Knee	38 cm	Knee	39 cm

Table No. 37 - Before and after results referring on the anthropometric measurements -

Lower extremities circumference

3.7.6. Before and after results referring on the gait pattern

3.7.6.1. Walking forward

3.7.6.1.1. Anterior – posterior view

BEFORE		AFTER	
Anterior - Posterior view	<ul style="list-style-type: none"> • Asymmetry of upper and lower extremities • Stiff shoulders • Contact floor with heels right one better, the left one. 	Anterior - Posterior view	<ul style="list-style-type: none"> • Symmetrical the upper and lower extremities. • Less stiff shoulders • Contact floor with heels almost the same between both sides

Table No. 38 - Before and after results referring on the gait pattern – Anterior -Posterior view

3.7.6.1.2. Lateral view

BEFORE		AFTER	
Lateral view	<ul style="list-style-type: none"> • Asymmetry of steps • Asymmetry of upper extremities • Tilt of head forward 	Lateral view	<ul style="list-style-type: none"> • More symmetrical steps • More symmetrical arm swing • Less tilt of head forward

Table No. 39 - Before and after results referring on the gait pattern – Lateral view

3.7.6.1.3. On toes

BEFORE		AFTER	
On toes	<ul style="list-style-type: none"> • Unstable walking, unable to walk for too long and feels pain. • Spontaneous movements with the hands on trying keeping the balance. 	On toes	<ul style="list-style-type: none"> • More stable walking and balance • No pain • No spontaneous movements

Table No. 40 - Before and after results referring on the gait pattern – On toes

3.7.6.1.4. On heels

BEFORE		AFTER	
On heels	<ul style="list-style-type: none"> • Unstable walking, unable to walk for too long and feels pain. • Spontaneous movements with the hands on trying keeping the balance. 	On heels	<ul style="list-style-type: none"> • More stable walking and balance • No pain • No spontaneous movements

Table No. 41 - Before and after results referring on the gait pattern – On heels

3.7.6.1.5. With eyes closes

BEFORE		AFTER	
With eyes closed	He couldn't do it because he had too much fear to hurt his foot (psychological fear).	With eyes closed	He could do it better and he wasn't so much afraid than before

Table No. 42 - Before and after results referring on the gait pattern – With eyes closed

3.7.7. Before and after results referring on the range of motion

Before			After		
Planes	Left Side		Planes	Left Side	
	Active Movement	Passive Movement		Active Movement	Passive Movement
Sagittal	45 ⁰ -0- 20 ⁰	50 ⁰ -0- 25 ⁰	Sagittal	45 ⁰ -0- 25 ⁰	50 ⁰ -0- 30 ⁰
Frontal	10 ⁰ -0- 40 ⁰	15 ⁰ -0- 45 ⁰	Frontal	15 ⁰ -0- 40 ⁰	20 ⁰ -0- 45 ⁰

Table No. 43 - Before and after results referring on the range of motion

3.7.8. Before and after results referring on the muscle tone

BEFORE		Examined muscle	AFTER	
Left side	Right side		Left Side	Right Side
Hypotone	Hypotone	Piriformis	Eutone	Eutone
-	Hypotone	Hamstrings	-	Eutone
Hypertone	Hypertone	Tensor fasciae latae	Eutone	Eutone
Hypertone	Hypertone	Quadriceps	Eutone	Eutone
Hypertone	Hypertone	Iliopsoas	Eutone	Eutone
Hypertone	Hypertone	Sartorius	Eutone	Eutone
Eutone	Eutone	Gluteus medius	Eutone	Eutone
Hypotone	Hypotone	Gluteus minimus	Eutone	Eutone
Hypotone	Hypotone	Tibialis anterior	Eutone	Eutone
Hypotone	Hypotone	Gastrocnemius	Eutone	Eutone

Table No. 44 - Before and after results referring on the muscle tone

3.7.9. Before and after results referring on the muscle strength for the L.E.

BEFORE		Examined Muscle	AFTER	
Left Side	Right Side		Left Side	Right Side
4	-	Tibialis anterior	4+	-
4	-	Extensor digitorum longus/brevis	4+	-
3+	-	Peroneus Tertius	4	-
4	-	Tibialis posterior	4+	-
4	-	Flexor digitorum longus	4+	-
4	-	Gastrocnemius	4+	-

Table No. 45 - Before and after results referring on the muscle strength for the L.E.

3.7.10. Before and after results referring on the manual contact examination

Restriction on the dorsal and plantar direction on the left L.E.	<u>Lisfranc's joint:</u>	None restriction on the dorsal and plantar direction on the left L.E.
Restriction on the dorsal direction on the left L.E.	<u>Chopart's joint:</u>	None restriction on the dorsal direction on the left L.E.
Restriction on both L.E. during traction caudally and upward direction.	<u>Subtalar joint:</u>	None restriction on both L.E. during traction caudally and upward direction.
Restriction on the dorsal and plantar direction on the left L.E.	<u>Metatarsophalangeal joints:</u>	Slight restriction on the dorsal and plantar direction on the left L.E.

Table No. 46 - Before and after results referring on the manual contact examination

3.8. Prognosis

Mr. T. K. had 6 (six) therapy sessions who was diagnosed with total ankle sprain on the lateral side, specifically on the anterior talofibular ligament of his left ankle. The physiotherapeutic methods were based on the goals which were set in every day's therapy and the result was successful according to his important improvements. Also, it's important to mention that these results came not only from the correct therapeutic methods that I used but also with the outstanding cooperation of the patient at home and not only.

About the prognosis now, the patient should keep performing all the self-therapies every day and should keep in his mind that he has to be positive with his mood knowing that if he keeps himself in the schedule as I told him, he will be sooner and healthier in the soccer field training for his career.

4. CONCLUSION

My experience during my clinical work placement played a very important role not only on gaining the experience on how to communicate with the patient but also to my professional career as a physiotherapist.

On the very last therapy session, Mr. T.K. told me that he is very happy with the results and also that I was his physiotherapist. My supervisor at C.L.P.A. was helping me as well and I learned a lot in these ten days of practice. I've learned how to communicate with a patient, how to work more professionally with him and in every therapy session, I felt my patient under my supervision which in the beginning I felt a strange feeling that I had to work by myself but day by day this feeling started to feel good and I was looking forward to perform the therapy on my patient and help him in any different kind of way.

About the improvements, from my point of view as a physiotherapist, I am very satisfied. Firstly starting from the fact that he doesn't have any pain or swelling. And secondly that he doesn't have any ADL difficulties such as proper walking pattern and body weight distribution which are very important improvements to bring him back on the soccer field. Before he was unable to step on his injured ankle but now he distributes his body weight on the side where the impairment is located.

The most important improvements were found firstly on the pain and swelling. Then, on distributing the body weight on the injured ankle, the gait pattern of the patient is much better than before and the posture as well. Referring to the mobility of the foot is much better there without any restrictions on the ankle joint and the neighbor joints expect some slight restriction on the metatarsals.

The only thing that remains for the patient to be treated completely, is to be able on distribute the body weight on the left side completely, improve his strength, to feel good with his ankle, not being afraid and not having any problems on getting back on the soccer field for his training.

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ABBREVIATIONS

BMI – Body mass index

ADL – Activities of daily living

ROM – Range Of Motion/movement.

STFR – Sagittal, transverse, frontal, rotation method.

LE – Lower Extremity

PIR – Post Isometric Relaxation technique, by Lewit

PNF – Post Neuromuscular Facilitation technique, by Kabat.

No. – Number

C.L.P.A - Centrum léčby pohybového aparátu

P.R.I.C.E. – Protect, Relax, Ice, Compression and Elevation

APPLICATION FOR ETHICS BOARD REVIEW

INFORMOVANÝ SOUHLAS

V souladu se Zákonem o péči o zdraví lidu (§ 23 odst. 2 zákona č.20/1966 Sb.) a Úmluvou o lidských právech a biomedicíně č. 96/2001, Vás žádám o souhlas k vyšetření a následné terapii. Dále Vás žádám o souhlas k nahlížení do Vaší dokumentace osobou získávající způsobilost k výkonu zdravotnického povolání v rámci

praktické výuky a s uveřejněním výsledků terapie v rámci bakalářské práce na FTVS UK. Osobní data v této studii nebudou uvedena.

Dnešního dne jsem byla odborným pracovníkem poučena o plánovaném vyšetření a následné terapii. Prohlašuji a svým dále uvedeným vlastnoručním podpisem potvrzuji,

že odborný pracovník, který mi poskytl poučení, mi osobně vysvětlil vše, co je obsahem tohoto písemného informovaného souhlasu, a měla jsem možnost klást mu

otázky, na které mi řádně odpověděl.

Prohlašuji, že jsem shora uvedenému poučení plně porozuměla a výslovně souhlasím

s provedením vyšetření a následnou terapií.

Souhlasím s nahlížením níže jmenované osoby do mé dokumentace a s uveřejněním

výsledků terapie v rámci studie.

Datum:.....

Osoba, která provedla poučení:.....

Podpis osoby, která provedla poučení:.....

Vlastnoruční podpis pacienta /tky:.....