

**CHARLES UNIVERSITY**  
**FACULTY OF PHYSICAL EDUCATION AND SPORTS**  
Department of Physiotherapy

**Case study of physiotherapy treatment of a patient with distal fracture  
of tibia and fibula of right ankle**

Bachelor's thesis

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Prague 2020

**Abstract:**

**Title:** Case study of physiotherapy treatment of a patient with distal fracture of tibia and fibula of right ankle

**Goal:** The goal of this thesis is to point out the importance of the physiotherapy rehabilitation after a fracture. The patient I chose is a man of 31 years old with a comminuted fracture of distal tibia and fibula of the right leg after a motorcycle accident. I am going to focus on the anatomical structure of the ankle joint. In order to treat the patient, it is imperative to have a basic anatomical knowledge of the structure in question.

**Methods:** In the first part, I am going to explain the anatomy and pathologies of the ankle joint. In the second part I am going to focus on the part of the physiotherapist and the assessment plan (initial kinesiology examination and examination conclusion). And then I will lay out my therapy proposal for the short term and long term plan. In the therapy proposal, the different treatment methods and techniques are included. At the end of each session, an evaluation assessment is made in order to quantify the progress. Finally, after the last session (11th), I am doing the final kinesiological examination. And finally I conclude with comparing the initial from the final kinesiological examination.

**Result:** After daily sessions for 11 days, using different techniques of physiotherapy and modalities for the ankle joint, the patient showed improvement in swelling (reduced) , muscle strength increased ,balance improved and gait improved .The patient was feeling much better and could see the clear difference.

**Conclusion:** The therapies performed during the work placement show generally the physiotherapy rehabilitation was very effective on my patient.

**Keywords:** fracture, distal, tibia and fibula, ankle joint, physiotherapy rehabilitation for fracture, ankle fracture.

## **Declaration**

I hereby declare that bachelor thesis is my own, written independently, contained information are from different literature and sources, lectures from FTVS Charles University and from my working experience in hospital. The theoretical informations are obtained from used literature that all sources have been listed in a bibliography present at the end of the thesis.

Ghali AL-shahri

Prague May 2020

## **Acknowledgement**

This section is very important to me, here I would like to thank to all of academic staff of physiotherapy department. Also, I would like to personally thank Mgr. Helena Vomáčková for her support and cooperation during my work on the Bachelor thesis. From my clinical work placement for the Bachelor thesis, which took a place at RNB (Rehabilitační Nemocnice Beroun), I would like to thank my supervisor Mr. Janis Lukáš for his helping and cooperative approach during my work with a patient in the hospital. Last but not least, I cannot forget to thank my classmates for their support during this academic year

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## **1. Introduction**

The case study I have decided to choose - a 31 years old patient with comminuted fracture of distal tibia and fibula of the right ankle. The thesis will be divided into two parts subject which are geranial and practical part. The first part is the general information about the theoretical knowledge of the ankle joint consist of anatomy, kinesiology, biomechanics, fracture of the ankle joint, open reduction internal fixation surgery and treatments. On other hand, the practical part is consist of Initial Kinesiologic Examination, treatment therapy session and Evaluation of effectiveness of therapy on the patient of fracture of the ankle joint. The Initial Kinesiologic Examination will be clinical assessment of the patient, posture, gait, movement patterns, neurological aspect, mobility of the joints play, joint range of motion, soft tissue examination, muscle tone, strength and length and conclusion before and after examination.



## **2. General part**

### **2.1 Anatomy of the ankle joint**

The ankle joint is highly congruent synovial and hinge type. It has freely moving synovial joint between the leg and the foot. The ankle joint is created by the articular surfaces of distal end of fibula, tibia covered by hyaline cartilage and superior talus bone. It consists of three primary articulations: the inner surface of the medial malleolus of tibia with the medial surface of the talus; the distal tibial with the talar dome, and the medial surface of the lateral malleolus of fibula with the lateral process of the talus. In addition, there is also articulation of distal tibia with the distal fibula, just proximally to the talus, made the distal tibiofibular joint. (1, 2)

#### **2.1.1 Bones**

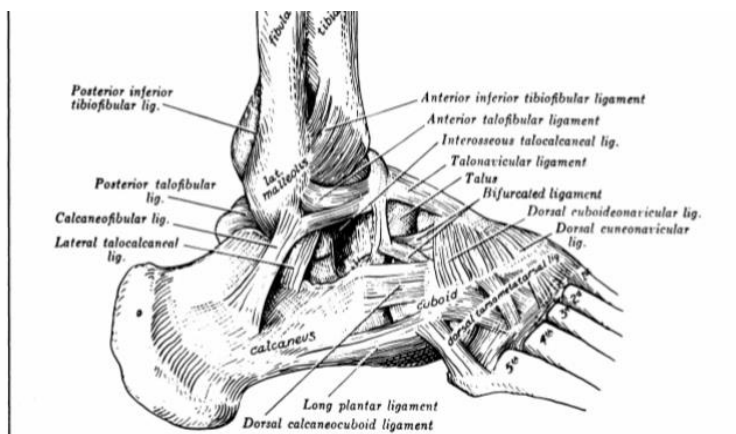
The tibia bone is a long bone and second biggest bone in the body. It receives the weight from the femur to the foot. It consists of upper end, a shaft and lower end. The upper surface of the upper end of the tibia forms a plateau which consists of two articular surfaces (medial and lateral) to articulate with the condyles of the femur. The inferior surface of its lower end with the smooth lateral surface of the medial malleolus articulate with the talus in the ankle joint and articulates with the lower end of the fibula to made inferior tibiofibular joint. (1, 3, 25)

The fibula bone is a very thin and long bone on the lateral side of the tibia. Its lower end extends lower down slightly beyond the lower end of the tibia. It consist of three main parts, which are upper end, shaft and lower end. The upper end of the fibula called head of fibula and articulate with on the lateral condyle of the tibia. The shaft of fibula is connected to the lateral aspect of the tibia by an interosseous membrane to form the middle tibiofibular joint. The lower end of fibula is articulation with the talus. (1, 3, 25)

The talus bone is the second largest tarsal bone after calcaneus and has 7 different articulations divided into 3 regions, which are the head, body and neck. The head articulates with the navicular and calcaneus bone. The body articulates with the tibia, fibula and calcaneus. The last is the neck which articulates with the head and body of talus bone. A very important note is, that talus is the only bone in the lower extremity with no muscular attachments and is held in position by the malleoli of the end of tibia and fibula and ligament attachments. (4, 21)

### 2.1.2 Ligaments in the ankle

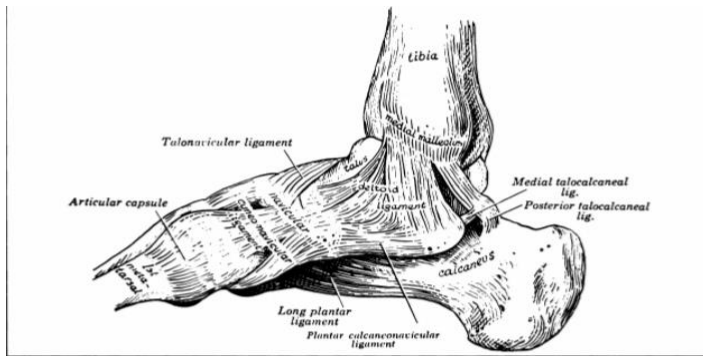
The ligaments around the ankle are divided into three groups, which is lateral collateral ligament, medial collateral ligament and tibiofibular ligament. (5)



Picture No.1: Lateral collateral ligament of the ankle. (1)

The first group is lateral collateral ligament and consists of the anterior talofibular ligament, calcaneofibular ligament and posterior talofibular ligament.

- Anterior talofibular ligament: start from the anterior margin of lateral malleolus to insertion in the lateral aspect of body and neck of talus bone.
- Posterior talofibular ligament: start medially from lateral margin to insertion in posterior process of talus bone. (5)
- Calcaneofibular ligament: start from the malleolar fossa of lateral malleolus posteroinferiorly to insertion in tubercle of lateral calcaneal bone surface.



Picture No.2: Medial collateral ligament of the ankle. (1)

The second group is medial collateral ligament, which consist of two layers: superficial and deep. The superficial layer is composed of the tibiocalcaneal ligament, tibionavicular ligament and posterior tibiotalar ligament. The deep layer consist of deep posterior tibiotalar ligament and deep anterior tibiotalar ligament. (5, 6, 24)

Superficial layer:

- Tibionavicular ligament: start from medial malleolus of tibia and inserts into navicular tuberosity and into plantar calcaneonavicular ligament.
- Tibiocalcaneal ligament: start from the central, from medial malleolus of tibia into insertion sustentaculum tali of calcaneum bone.
- Posterior tibiotalar ligament: start from medial side of tibia and inserts in medial tubercle of talus bone.

Deep layer:

- Anterior tibiotalar ligament: start from medial part of the tibia and insertion is in the talus bone.

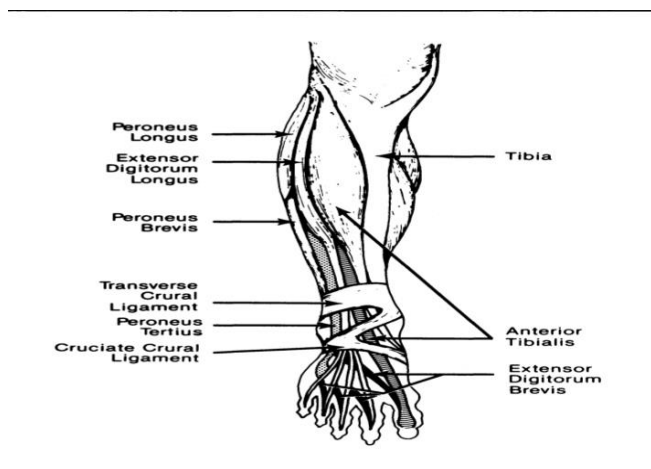
The third group is divided into three ligaments, which are anterior tibiofibular ligament, posterior tibiofibular ligament and interosseous tibiofibular ligament. In addition, there is a big tendon attached to the calcaneal bone called tendon calcaneus or tendon Achilles. This tendon connects the calf muscle group, which consists of three muscles; Gastrocnemius, Soleus and Plantaris. This muscles share a single tendon insertion at the back of the calcaneus. (5, 24)

- Anterior tibiofibular ligament: it extends the band between margins of tibia and fibula bone.
- Posterior tibiofibular ligament: it is the stronger in a similar position and it is posterior deep part between tibia and fibula.

- Interosseous tibiofibular ligament: continuous with interosseous membrane, strengthen and span the tibia to the fibula. (5, 6, 24)

### 2.1.3 Muscles and nerves of the ankle

The plurality of motion in the ankle and foot is created by the group of extrinsic muscles, which are working in different directions of movement of the ankle and foot. The muscles that originate on the leg and extend to insert in the foot. These muscles are divided into typically four groups (anterior group, lateral group, superficial posterior group and deep posterior group). (1, 7)



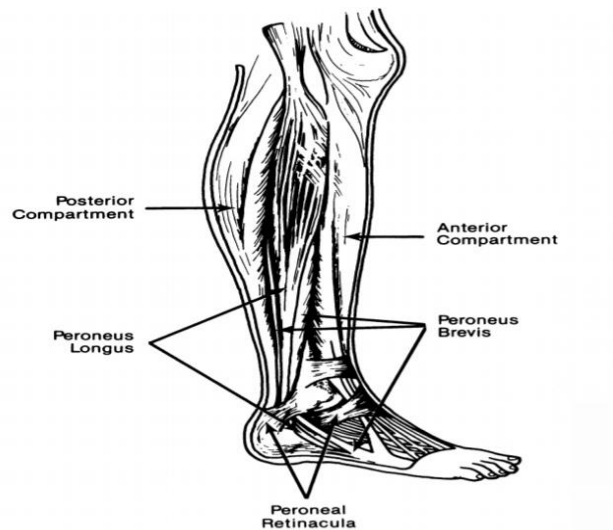
Picture No.3: Anterior compartment of the leg. (1)

The anterior group consists of four muscles, which are the extensor digitorum longus, tibialis anterior, peroneus tertius and extensor hallucis longus. The dorsiflexion and inversion of the foot is generated by the tibialis anterior and extensor hallucis longus muscles. The peroneus tertius muscle create eversion and dorsiflexion of the foot. The extensor digitorum longus produces only one movement, the dorsiflexion of the foot. (1, 7, 23)

- Tibialis anterior: its origin is in upper lateral  $\frac{1}{2}$  shaft of tibia and interosseous membrane. The insertion is in base of the 1st metatarsal (great toe) & medial cuneiform. The nerve supply is by deep peroneal nerve. (1, 23)
- Extensor digitorum longus: its origin is from lateral condyle of tibia and upper  $\frac{2}{3}$  of anterior surface of the shaft of fibula and interosseous membrane. Insertion is

into extensor expansion of lateral four toes, base of distal phalanges of lateral four digits. The nerve supply is by deep peroneal nerve. (1, 4, 7)

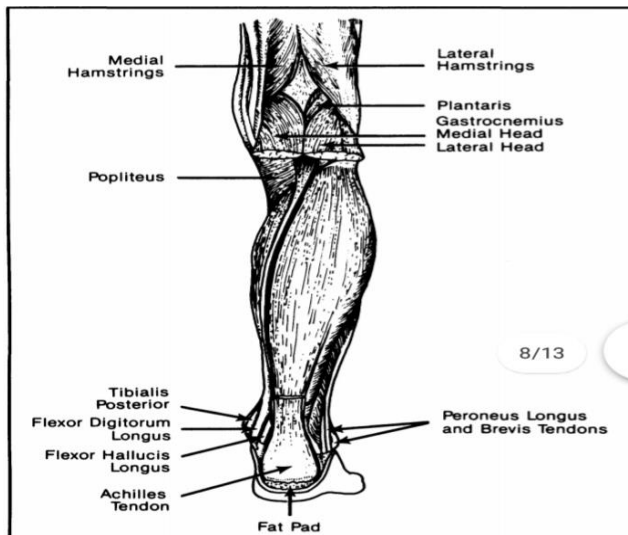
- Peroneus tertius: its origin is from the lower  $\frac{2}{3}$  of the medial surface shaft of fibula and interosseous membrane. Insertion is in base of 5<sup>th</sup> metatarsal bone. Nerve supply by is deep peroneal nerve. (1, 4)
- Extensor hallucis longus: its origin is from the shaft of fibula & interosseous membrane. It inserts into the base of distal phalanx of big toe. Nerve supply is by deep peroneal nerve. (1)



Picture No.4: Lateral compartment of the leg. (1)

The lateral group muscles is consisting of two muscles: the peroneus longus and peroneus brevis. This muscles produce eversion and plantar flexion movement of the foot. (1, 4, 7)

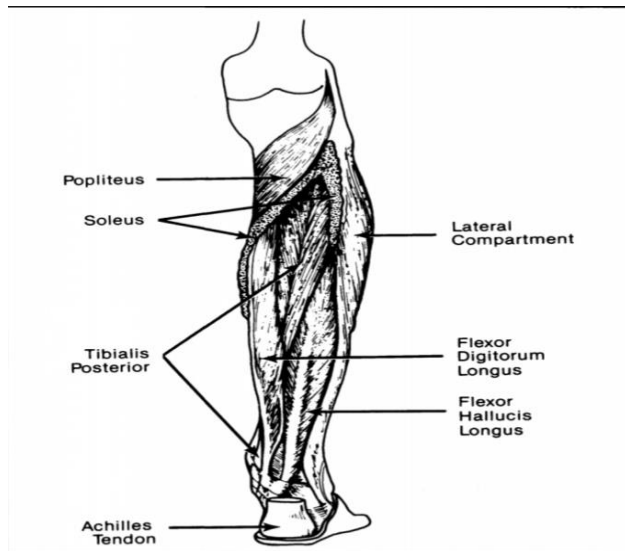
- Peroneus longus: its origin is from upper  $\frac{2}{3}$  of lateral side of fibula and insertion is in base of 1<sup>st</sup> metatarsal bone & medial cuneiform. Nerve supply is by Superficial peroneal nerve.
- Peroneus brevis: originates from lower  $\frac{1}{3}$  of lateral side of fibula and inserts into the base of 5<sup>th</sup> metatarsal bone. Nerve supply is by Superficial peroneal nerve. (1, 23)



Picture No.5: Superficial muscle layers of posterior compartment of the leg. (1)

The superficial posterior group is composed by three muscles. This are gastrocnemius, soleus and plantaris, which produces plantar flexion of the foot. (1, 4)

- Gastrocnemius: its two-headed muscle - medial and lateral head originating from medial and lateral condyles of femur, unite to form one muscle. This inserts via Achilles tendon into calcaneus bone. Nerve supply is by tibial nerve. (1, 7)
- Soleus: originates from shafts back of tibia and fibula. Insertion is by Achilles tendon into calcaneus and nerve supply is by tibial nerve. (1, 7)
- Plantaris: its origin is from lateral supracondylar ridge of femur, and the insertion is sharing together with the gastrocnemius and soleus into calcaneus via Achill tendon. Nerve supply is by tibial nerve. (1, 7)



Picture No.6: Deep muscle layer of posterior compartment of the leg. (1)

The deep posterior group is composed by three muscles, which are the tibialis posterior, flexor digitorum longus and flexor hallucis longus. These muscles produce inversion and plantar flexion of the foot. (1, 4, 7, 23)

- Tibialis posterior: originates from the shafts of tibia and fibula and interosseous membrane. Its insertion passes behind the medial malleolus, then to the tuberosity of navicular bone. The nerve supply is by tibial nerve. (1)
- Flexor digitorum longus: its origin is in posterior surface of tibia below the popliteal line (shaft of tibia) and inserts in the distal phalanges of lateral four toes. Nerve supply is by tibial nerve. (1,4)
- Flexor hallucis longus: its origin is from the lower  $\frac{2}{3}$  of posterior shaft of fibula (below origin of soleus) and insertion is in base of distal phalanx of big toe. Nerve supply is by tibial nerve. (1,7, 23)

#### **2.1.4 Blood supply of ankle joint**

Below the level of the knee joint, the popliteal artery divides into the anterior and posterior tibial arteries. (7)

The anterior tibial artery branch enters the anterior compartment of the leg by passing between the tibia and fibula above the interosseous membrane. It supplies the

structures in the anterior compartment of the leg and continues into the dorsum of the foot as the dorsalis pedis artery, which finally enters the sole of the foot by passing between the first and second metatarsals. (7, 26)

The posterior tibial artery continues through the calf, lying between the soleus and the deeper muscles and giving off the peroneal artery, which enters the lateral compartment. It then enters the sole of the foot by passing behind the medial malleolus. In the sole it divides into the medial and lateral plantar arteries which anastomose (join) with each other and with the dorsalis pedis artery to supply the anterior foot and toes. (7, 26, 27)

## **2.2 Kinesiology of the ankle joint**

The ankle joint is formed by 3 bone articulations: between the talus bone, the proximal and medial malleolus of the tibia, and the talus and the fibula lateral malleolus. In addition, it is a hinge joint that allows the motions of plantar flexion and dorsiflexion. The motion of the ankle joint is often defined as occurring in 2 planes. As follows the sagittal-plane, motion allows the plantar flexion and dorsiflexion movement. The frontal-plane motion allows the inversion and eversion movement of the ankle. (1)

Dorsiflexion is made by tibiotalar movement, which allows motion in the sagittal plane. This made the dorsal surface moves in an anterior and cranial direction. The tip of the foot turns upwards to the ankle. Also, the plantar flexion is made by the tibiotalar joint which allows movement in the sagittal plane - plantar surface moves in a caudal and posterior direction. The tip of the foot turns downwards from the ankle joint. The physiological range of motion of the dorsiflexion is  $10^{\circ} - 30^{\circ}$  and plantar flexion is  $45^{\circ} - 50^{\circ}$ . (1, 2)

Inversion movement is made by tibiotalar movement in the frontal plane, which moves the foot by turning medially and laterally. It opens angle made between the joint surfaces on the tibia and talus bone. The inversion motion is sometimes fixed by talar tilt.

Eversion motion is made by the tibiotalar movement in the frontal plane whereby the foot turns laterally, and medially opens the angle that forms between the

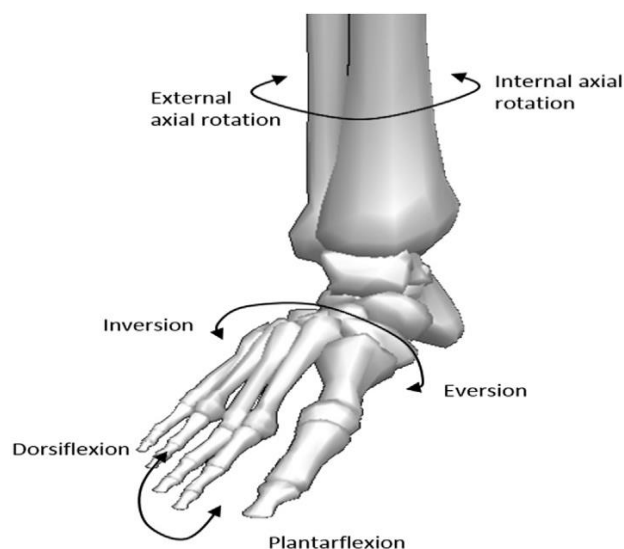


tibia and talus bone. The eversion motion can also design negative talar tilt. The physiological range of motion for inversion is  $35^{\circ}$ –  $50^{\circ}$  and for the eversion is  $15^{\circ}$  – $30^{\circ}$ . (1, 2)

The ankle joint plays an important role in the normal gait cycle of the body. So the normal gait cycle is divided into two phases, which are the stance phase and the swing phase. The stance phase begins with heel-strike and ends with toe-off, and, in terms of duration, constitutes 60% of the cycle of gait (during walking). The swing phase begins with toe-off and ends with heel-strike, comprising 40% of cycle. (1, 2, 28)

### 2.3 Biomechanics of the ankle joint

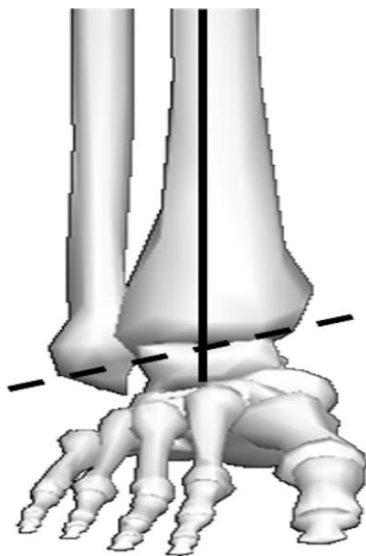
The motion of the ankle and foot are divided into 3 planes, which is the sagittal, frontal, and horizontal plane. However, the movements of the ankle joint complex are dorsiflexion and plantar flexion revolving in the sagittal plane. Then the movement of abduction and adduction are revolving in the horizontal plane and the movement of inversion and eversion are revolving in the frontal plane. It can be combinations of motion of the tibiotalar joint and subtalar joint to made 3 dimensional motions. This can also be called pronation and supination motion. Pronation is happened by combination movement of the dorsiflexion, eversion and abduction causes the position sole face laterally. In supination movement is made by combination of plantar flexion, inversion and adduction movements together act the sole facing medially.



Picture No.7: motions of the ankle joint. (4)

There are two types of the kinetic chain in the ankle joint, which is open and closed. First, in the open kinetic chain, pronation contains of dorsiflexion, eversion and external rotation, while the supination contains the plantar flexion, inversion and internal rotation. However, as second, in the closed kinetic chain it will be opposite, where the pronation contains of plantar flexion, eversion and external rotation movements of the ankle joint, while the supination will consists of dorsiflexion, inversion and internal rotation movement of the ankle. (2, 4)

If we look at picture down, it show us the axis of rotation of the ankle joint. It is a combination in different planes, the first, the sagittal plane happens around the line which goes through the medial malleoli and the lateral malleoli. Then as second, the coronal plane axis of rotation happens through the intersecting point between the malleoli and axis of the tibia bone in the frontal plane. Finally, the transverse plane axis of rotation is happening around the axis of the tibia bone intersecting the midline of foot. (2, 7)



Picture No.8: Planes for the ankle joint. (4)

It is also happening in the axis of the subtalar joint, which can be also an oblique axis, that it starts from posterior direction into anterior direction to make an angle about  $40^{\circ}$  with the anterior posterior axis in the sagittal plane, which make an angle of  $23^{\circ}$  with the midline of foot in the transverse plane. There is one point to note that the similar way between the tibiotalar joint and the subtalar joint made or forms the multiple motion during plantar flexion and dorsiflexion. For example, as shows a result

combination movement in pronation motion and supination motion of the ankle joint. (4, 7, 22)

In the analysis of the normal gait cycle, the stance phase is divided into 3 sub-phases based on the sagittal motion of the ankle joint (heel rocker, ankle rocker and forefoot rocker). The heel rocker phase starts from heel strike, when the ankle is in a slight plantarflexed position. Then, it is end when the foot is flat on the ground. The ankle rocker phase is starting from the plantarflexion of ankle into dorsiflexion. During this phase the tibia and fibula will rotate forward around the ankle joint to allow forward progression of the body. The last phase, which is the forefoot rocker phase, starts when foot rotates around the forefoot phase, the calcaneus lifts off the ground to allow the ankle to made maximum plantarflexion about  $14^{\circ}$ . In the swing phase, the ankle dorsiflexion begins when the foot is lifted from the floor and ends when the swinging foot is opposite the stance foot. The flexion motion is completed by motion at the subtalar joint about  $15^{\circ}$  of eversion and inversion movement. Son, in the inversion position happens at heel-strike and eversion position happen during mid-stance phase, which help or allow the heel to rise and push off into swing. (2, 4, 7, 22)

## **2.4 Ankle Fracture**

### **2.4.1 Etiology**

The fracture is very common in all ages and can happened in any bone of the body. As we know that the ankle fractures are one of the most common fractures more in the adult population. It is the fourth frequent fracture type case after the hip, wrist and hand fractures. It can be present when high force is sufficient to damage of the structural strength of bone. When the bone under tension may break transversely along the axis and alternatively ligamentous rupture can happen at the end of the stressed tendon or ligament. (8, 13)

The ankle fracture can involve one or both malleoli when the force is consist of the disruption alert of at least two bones - tibia and fibula of the ankle ring, and are therefore unstable. These fractures can be result from adduction or abduction forces, the latter being more common. It is called the Bimalleolar ankle fractures that happens when there is external force of trauma that made injury to both, the tibia and the fibula bones of the distal part of the ankle. (4, 30)

The fracture types for long-bone distal part of tibia and fibula bone can divide into 3 part of fracture. (9)

The first one is extraarticular fracture. This means, that there is no involvement of displaced fractures extending into the articular surface of the ankle joint. (9)

The second is the partial articular fracture, which means that there is a part fracture of tibia bone on articular component and is involved and leaving the other part attached to diaphysis of the tibia or fibula bone of the ankle joint. (9)

The third is the complete articular fracture. This means, that the fracture is involved in Articular surface and metaphyseal fracture completely separates articular or bone into component from the diaphysis of the joint. (9)

#### **2.4.2 Epidemiology and Incidence**

There are many causes that can present the fracture of the ankle joint. But, the common causes of ankle fracture can be trauma such as motor vehicle accidents or can be caused by sports injuries like football players. This study shows that by fracture is affected 1 person per 800 people each year and mostly affected were young males and geriatric osteoporotic females. The ankle fracture is about 9% of all fractures. In this studies they were analysis of the causes of ankle fracture by motor vehicle accident. So it was the most common cause of ankle fractures (67.34%) in young people. Sports activities were 8.2% including falls in elderly people. 61.57% were motorcyclists and 3.1% were lorry driver. (10, 20)

There were studies of the epidemiology of ankle fractures in a population of about (200,000). The incidence rate was showing fractures per 1 years in the age of 50 and the ankle fractures were most common in males more than females. In this study weas shown that main cause of fracture was falls on the ground or from a height, mostly (87%). There was 137 fractures of ankle which happened in sports like play or other leisure activities (55%). Some patients were walking or running at the time of injury was mostly (64%). (11)

However, there are another studies done within two years, which shows that 739 ankle fractures occurred in all ages of patients. The 383 patients with ankle fractures is

more increased in men of age-specific incidence up to the age of 60 compared in age specific up to above the age of 50. (12)

The incidence in different studies were shows that from (71 to 87) per (100,000) person-years. The incidence of ankle fractures is more rising, particularly more in elderly and female than men population. (8)

Also, we can see that in this studies were noted incidence of ankle fractures between 2005 and 2014 was affected (168) per (100,000) people per year. They were more in males incidence, which was (157.1) per (100,000) in year, compared with females were about (179.5) per (100,000) in year. After the age of 19 the male incidence were decreased with age. The women were experiencing an increased incidence after the age of 40 patient. (14)

### **2.4.3 Diagnosis**

As we know the patient with ankle fracture will complain of presence a typically with ankle pain, tenderness, swelling around the ankle joint, deformity and inability to weight-bear on the foot or leg. Also, the ankle fracture can affect the joint, muscles and soft tissue damage. Some ankle fracture is present post-injury with minimal swelling around the ankle and no deformity of the shape of the tibia or fibula bone or foot. (15)

There are many complication that can occur in patient with ankle fracture like unrecognized compartment syndrome, which is very common in fractures of the tibia bone, reflex sympathetic dystrophy, which can occur in any fracture and also seen on the patient with a tibia and fibula fracture that by presence of swelling under the cast, pain and stiffness. Thromboembolic disease affects deep vein thrombosis in the injured extremity. Last one is severe soft tissue injury or damage, it is so major that it includes loss of muscle and ligaments function. (13, 29)

To follow the assessment, it is necessary to know the history of the injury that can help to give a good indication of the mechanism of fracture, and also help to get good result or decision for prefect management of the patient's condition. Physical examination of the ankle is very important assessment for observation of any open wounds, colour of skin, neurovascular function, reductions in qualities, palpation is also important for any bony or soft tissue tenderness. (15)

#### **2.4.4 X-rays**

The base radiographic examination of the ankle for fracture is divided in three views, which are radiographs in anteroposterior view, mortise view, and lateral view.

Ottawa ankle rules: the X-rays are only required, if there is pain present in the malleolar zone. Also if there is bone tenderness present at the distal 6 cm of the posterior tibia or tip of the medial malleolus and if there is bone tenderness along the distal 6 cm of the posterior of the fibula or lateral malleolus. (15, 16)

Computed Tomography CT: scanning may be used to better define pilon fractures or triplane fractures and can be also useful in some situations as it may identify invisible medial or lateral malleolar fractures. (15, 17)

Magnetic Resonance Imaging MRI: is not needed for the evaluation of most ankle fractures, but can show some soft tissue injuries such as ligaments and tendons to establish the diagnosis.

Ultrasonography US: it is not usually used for patients with ankle fractures. But can depict fractures and associated soft-tissue injuries like fibular tendons. (15, 16, 17)

#### **2.4.5 Surgical**

Ankle fractures can be treated by two ways, which are the conservatively or surgically according to the type of fracture. The surgeon will select perfect treatment by contain the identification and classification, assessment of stability of bone, or, if needed, immediate reduction of fracture dislocations, soft tissues or neurovascular status and specific treatment and disposition. (15, 17, 18)

Surgical treatment involves comminuted fractures with no bone loss, which is treated by open reduction and internal fixation (ORIF). The surgery is using screws and metal plates to fix or improve the stability of the tibia and fibula bone, where the fracture is present. These operative techniques aim to provide anatomical restoration and immediate stability of bone to facilitate earlier mobilisation of the joint. (13, 19)

## **2.4.6 Therapy and treatment**

### **2.4.6.1 Post –operation**

As we seen many patients with ankle fracture in clinical placement in hospital after the ORIF operation, the ankle joint will be fixed by plate and screw and plaster for 4 to 6 weeks. The patient cannot put full weight bear for 4 to 6 weeks, like walking or standing on the operated ankle. The patient will be at last 6 weeks at rest, so the patient will have pain present over the fracture site, stiffness of the ankle, swelling around joint, decreased ankle movement, weakness in muscles strength surrounding the ankle or leg. So, it is important that pharmacotherapy controls the pain and physiotherapy rehabilitation prevents any stiffness and loss in strength of other joints and muscle power. (19)

### **2.4.6.2 Pharmacotherapy**

Analgesics are often necessary for pain management in ankle injuries. There are many studies proposing that non-steroidal anti-inflammatory agents, acetaminophen, or oral opioids for severe cases are efficacious. Also, the topical diclofenac gel has shown to have efficacy in pain reduction and allowing early mobilization. (17)

### **2.4.6.3 Physiotherapy**

The physiotherapy rehabilitation is very important for patient with fracture after post-surgery. The physiotherapy treatment will start after surgery, because the patient will have pain, joint stiffness, weakness and swelling of the muscles at the ankle. The rehabilitation will start after operation till patient improve and get back to normal as soon as possible. The physiotherapy rehabilitation is divided in two parts: the first part is assessment of the patient by observation of the posture, walking, palpation of the soft tissue, muscle strength test, muscle length test, certain physiotherapy special test, sensation test, range of motion evaluation for passive and active movement, mobilization assessment resulting with conclusion of the assessment. The second part is treatment of the problem according to the examination of the patient having by the assessment. Full details will be described in clinical part. (31)

## **3 Special chapter**

### **3.1 Methodology**

My Bachelor work placement has been done at RNB (Rehabilitační Nemocnice Beroun) in Beroun under the supervision of Mr. Janis Lukáš. The clinical practice started from the 13<sup>th</sup> of January 2020 and ended 7<sup>th</sup> of February 2020.

Before we started the practical part, the consent from patient has been done. The patient obtained the informed consent sheet and read all the conditions related to the use of his personal information in the bachelor thesis and the he signed the document. The application for approval by UK FTVS Ethics Committee request was sent and it has been approved by ethics committee.

The case study I have choose is about 31 years old patient with comminuted fracture of distal tibia and fibula of the right leg resulting from motorcycle accident on the road hitting by car on 18.8. 2017. The operation ORIF was done on 21.8. 2017. The second operation included the metal implant removal and was done on 15.5.2019. All this procedures have been done in Motol hospital. Than patient was admitted in Beroun hospital for rehabilitation.

I used to treat this patient every day one session, so totally 11 sessions therapy was given within 11days. The patient was cooperative with physiotherapy treatment and he follows all of instruction which were given during exercises in all sessions.

### **3.2Anamnesis**

#### **- Status present**

Diagnosis: comminuted fracture of distal tibia and fibula of the right leg

Name: J.W

Birth date: 1989

Height: 190 cm

Weight: 131 kg

BMI: 39

HR: 77

BP: 130/80 mmHg



- **Objective**

Patient is professional, good communication and cooperative. He is sleeping well, no pain is present, patient get full support from his work, so he request to stay in hospital for physiotherapy rehabilitation.

- **Subjective**

Patient is oriented in time and space, conscious and active. He is independent and walk with two crutches with contraindication of partial weight bearing 30% of his body weight on the right ankle. He complains from the swelling around the ankle joint, weakness of the muscles around the right ankle as he said. Patient does not feel any pain of the right ankle and no pain with palpation. He is staying in hospital for physiotherapy rehabilitation to get back to his sport as soon as possible as patient mentioned.

- **History Anamnesis**

Patient with comminuted fracture of distal tibia and fibula of the right leg by motorcycle accident on the road crashed by car on 18.8. 2017. The operation ORIF was done on 21.8. 2017 and the second operation for metal implant removal was done on 15.5. 2019. All this procedures have been done in Motol hospital.

- **Injury Anamnesis**

Except the present problem, the patient didn't have any injuries.

- **Surgery Anamnesis**

Patient didn't have any other surgeries.

- **Family Anamnesis**

Patient is living alone, he use to visit his parents and his sister every month.

- **Social Anamnesis:**

Patient is very professional and cooperative with people around him.

- **Occupational Anamnesis**

Patient is working in software company (office worker). He graduated from Charles University.

- **Allergy Anamnesis**

None

- **Hobbies**

Patient likes to do sport such as playing (basketball, skiing, motorcycle)

- **Abuses**

Social drinker / smoker / coffee drink 4 to 6 times per day

### **3.3 Prior rehabilitation**

The patient continuous rehabilitation after surgery in different clinics in Prague for right ankle.

Except from patient's health care file

None

RHB indications:

- The patient has to put 30% PWB on the right leg
- Practice walking stereotype with 2 crutches
- Practicing ankle dorsiflexion
- Increase muscle power of dorsal flexors
- Soft tissue and scar treatment
- Magnetic therapy
- Mobilization of head of the fibula, ankle joints, foot joints
- Stretching of plantar flexors
- CPM, bike exercise
- Lymphatic drainage massage
- Swimming pool exercise

### **3.6.Initial Kinesiologic Examination**

#### **3.6.1 Postural examination**

##### **Anterior view (front)**

- Toes looks in normal position straight line no show any deformity or claw toes in both sides left and right
- The base of support is 30 degree between feet
- Arches of both foot are normal
- Foot looks normal on right side but left looks that patient put more weight on it
- Shape and position of the ankle joints in neutral position
- The right ankle is generally more swollen than the left
- Contour of the calf muscles (medial and lateral part) are symmetrical
- Right and left patella are at the same levels in both knees
- The right knee is slightly bent compared to left knee, but is not much clear
- Left quadriceps is slightly bigger than the right
- Both arm triangles are at the same level and position of sternum in the middle
- Level of shoulders shows same position
- Head and neck is in neutral position

##### **Lateral view (right)**

- Foot shape is in neutral position, heel contact ground
- Ankle joint in 90 degree and there is swelling around joint
- Malleolus of tibia not prominent (swelling)
- Right knee is slightly bent (3 degree)
- Right hip looks to be positioned slightly forward than the left hip.
- Abdominal muscles are relaxed
- Lumbar spine slightly hyperlordotic
- Shoulders is neutral position under line of the ear
- Neck is normal curve and head straight alignment

##### **Lateral side view (left)**

- Foot shape is neutral position but is look put more weight on it
- Ankle joint in 90 degree more pressure compared with right ankle
- Malleolus of tibia is prominent

- Left knee joint is full extended
- Left hip is natural position
- Abdominal muscle are relaxed
- Lumbar spine slightly hyperlordotic
- Shoulders is neutral position under line of the ear
- Neck has normal curve and head has straight alignment

**Posterior view (back)**

- Shape and contours of the heels are normal
- Shape and thickness of the Achilles tendon in left but right is swelling
- Foot cure of Achilles tendon right not clears comparing with left foot
- Base of support 30 between feet
- The position of the ankle joint is symmetrical
- Calf muscle the right side is small size comparing with left
- Knee joint the right is slight flexion
- The thoracobrachial triangles are same level
- Position of pelvis level is right is lower than left
- Paravertebral the muscle are relax and overweight
- Position of scapula angle is same level
- Head and neck normal cure

**3.6.1.1 Two-scales standing**

Body weight	131 kg
Right leg	68 kg
Left leg	63 kg
Result	Normal

Table No.1: two scales for body weight for both legs.

### 3.6.1.2 Palpation of pelvis

I asked patient to stand straight position for pelvis assessment, noted no pain.

Height and symmetry of	Right	Left
ASIS	Same level	Same level
PSIS	Same level	Same level
Crest	Same level	Same level

Table No.2: assessment the level of pelvis for both sides.

### 3.6.1.3 Conclusion of posture and two scale test

The patient was cooperative during assessment. He wasn't feeling any pain when he stand for posture assessment, so, I'm going to analyze the posture of patient: base of support was 30 degree, the toes were relaxed, the left foot looks that patient put more weight bearing comparing to the right foot. Both feet present normal arches, the ankle joint shows bigger on right leg (swelling) compared to the ankle on left leg, the malleolus of right ankle was not prominent comparing with left ankle. The shape and thickness of Achilles tendon show curve of Achilles tendon, it is not clear comparing right with left foot because of swelling. The right knee is slightly bent around 5 degree. The right crest looks higher than the left. The lumbar spine is slightly lordotic and draw a C curve, both thoracic triangles are at same level. Position of shoulder and scapula angles are at the same level. Head is in straight alignment and neck has normal curve.

According to the visual assessment, the posture looks generally good, patient avoid putting the weight of the right foot, which shows that he bent the knee that leads to affect level of the crest. This shows that right side is slight higher than left. When the patient was instructed to stand on both legs straight, both of the knees show full extension and levels of crest were on same level. The same thing happened when I requested from patient to keep his body and lower limbs straight on two scales test, where was the same result. Patient has recommendation to put 30 % weight baring of the right ankle, the fracture is more than 2 years old and last surgery for metal implant removal was more than 8 months ago. Patient stand on two scales show good result.

### 3.6.1.4 Modification of standing

Standing on tiptoes	negative
Standing on heels	negative
Single - leg stance right	not applied (contradiction)
Single - leg stance left	negative

Table No.3: balance assessment for left and right lower extremities.

### 3.6.2 Gait analysis

- the base of support is narrow
- position of the both feet with angle of 15, symmetrically
- walking rhythm was periodic
- walking speed was normal
- stride length was long steps
- movement of the foot show the right foot was early toe-off
- movement and position of the right knee extension and hip abduction with external rotation while patient walking
- position and movements of the pelvis was rotation, lateral tilt prox 3 cm
- position and movements of the trunk slight rotation
- activity of abdomen muscles is present
- activity of back muscles is present
- position of shoulders is symmetrically
- position and movements of the head is straight and not moving
- movements of the upper extremity was symmetrical movement
- stability of walking is show stable

### 3.6.2.1 Gait modification

- Walking on the heels: negative / he was able to perform it without pain,
- Walking on tip toes: negative / he was able to perform it without pain, he was stable
- Squats walking: negative / he was stable
- Walking with eyes closed: negative/ he was able to perform it without pain, he was stable
- Walking backward or stair walking: He was able to walk backward

The analysis of the gait has been done with crutches (3 point), regarding the contraindication that forbid weight bearing over 30% of the bodyweight on the right leg. Then patient was walking without crutches around the room as he mentioned, he used to walk without crutches sometimes around the room or to bathrooms. We can see from the gait assessment the patient has early toe off of the right foot, in addition of the external rotation and abduction of the right lower limbs. These are important problems I noted from gait analysis.

### 3.6.2.2 Anthropometric measurements

Lower limb	Right cm	Left cm
Functional length-AIAS	113	113
Functional length-umbilicus	110	110
Anatomical length	90	90
Tight	45	45
Middle leg	46	46
Foot	25	25

Table No.4: anthropometric measurements for left and right lower extremities.

### 3.6.2.3 Measurements of circumferences

Lower limb	Right cm	Left cm
Thigh (15 over the knee)	60	62
Thigh (10 over the knee)	57	57
Knee	48	48
Calf	48	46
Ankle (malleolus)	33	29

Table No.5: measurements of circumferences for left and right lower extremities.

Ankle circumference R: 33cm L: 29cm

Right ankle is bigger than the left at malleolus level because of swelling of the right ankle.

### 3.6.3 Observation and palpation examination

- Ankle: right ankle looks swollen around malleolus, no redness, no tenderness, palpated swelling area is not smooth, it's like bone calcification, no pain feeling, the swelling started from both side of malleolus upward 5 cm.
- Scars: on the foot- scars are small (4 suture point), flexible and moveable. Patient already had many physiotherapy session for scar mobilization.

#### - Soft tissue examination (according to Lewit)

- Skin: small area of the skin was stretched between two fingertips in different direction. The result shows soft and elastic founding in the skin layer.
- Subskin: examination by using fingertips, it move cranial and caudal directions, where was found slight restriction in caudal direction. There was no pain, but swelling is present.



- Fascia: on right ankle was slight restricted, not elastic, but moving in all directions
- Muscles: the muscles that I was examining in both lower extremities were provided in supine and prone position by both hands and by this examination I have checked if there is any differences in each lower extremity.

Muscle tone	Left	Right
Vastus medialis	Normal tone	Normal tone
Tensor fascia latae	Normal tone	Normal tone
Hamstrings	Normal tone	Normal tone
Popliteus	Normal tone	Normal tone
Gastrocnemius	Normal tone	Hypertone
Tibialis anterior	Normal tone	Normal tone
Soleus	Normal tone	Hypertone
Plantaris	Normal tone	Normal tone

Table No.6: Palpation of muscles tone for both lower extremities.

### 3.6.4 Muscle length test (According to Janda)

The grading scale for this test is from 0 – 2:

- 0 = no muscle shortness
- 1 = moderate shortness
- 2 = marked shortness

	Right	Left
Iliopsoas	0	0
Tensor fascia latae	0	0
Hip adductors	0	0

Piriformis	0	0
Hamstrings	0	0
Rectus femoris	0	0
Gastrocnemius	1	0
Soleus	1	0

Table No.7: muscle length test evaluation for both lower extremities.

### 3.6.5 Muscle strength test (According to Janda)

The grading scale for this test is from 0 - 5:

- 0 = Zero (no muscle contraction)
- 1 = Trace (contraction felt but no movement)
- 2 = Poor (partial movement but in horizontal position)
- 3 = Fair (hold against gravity)
- 4 = Good (hold against moderate pressure)
- 5 = Normal (hold against strong pressure)

	Right	Left
Gluteus maximus	5	5
Gluteus medius	5	5
Gluteus minimus	5	5
Lateral rotators of hip joint (piriformis, quadratus femoris, obturator internus, obturator externus, gemellus superior, gemellus inferior)	5	5
Hip adductors (pectineus, adductor magnus, gracilis, adductor brevis and longus)	5	5

Tensor fasciae latae	5	5
Sartorius	5	5
Iliopsoas	5	5
Quadriceps	5	5
Biceps femoris	5	5
Semimembranosus- Semitendinosus	5	5
Plantar flexors (gastrocnemius, plantaris)	5	5
Soleus	5	5
Peroneus longus and brevis	4	5
Tibialis posterior	4	5
Tibialis anterior	3+	5
Extensor digitorum longus and brevis	4	5
Flexor digitorum longus	4	5
Flexor digitorum brevis	4	5
Dorsal interossei	4	5
Extensor hallucis brevis	4	5
Extensor hallucis longus	4	5
Flexor hallucis longus	4	5
Flexor hallucis brevis	4	5
Abductor hallucis	4	5

Table No.8: muscle strength test for both lower extremities.

### 3.6.6 Range of motion measurement

#### 3.6.6.1 Active movement (AROM)

According to Janda	Right	Left
Hip joint	S: 15-0-125	S: 15-0-125
	F: 43-0-13	F: 43-0-13
	R: 45-0-35	R: 45-0-35
Knee joint	S: 0-0-130	S: 0-0-130
Ankle joint	F: 18-0-40	F: 30-0-45
	R: 25-0-40	R: 25-0-40
MTP (big toe )	S: 70-0-40	S: 70-0-40
	F: 15-0-15	F: 15-0-15

Table No.9: active range of motion for left and right lower extremities.

#### 3.6.6.2 Passive movement (PROM)

	Right	Left
Ankle joint	S: 25-0-45	S: 30-0-45
	R: 25-0-50	R: 25-0-50

Table No.10: passive range of motion for both ankles.

### 3.6.6.4 Joint play examination (according to Lewit)

- Not restricted: free, smooth barrier
- Present: the joint is blocked

	Right	Left
Knee joint	Not restricted	Not restricted
Patella	Not restricted	Not restricted
Ankle joint	Not restricted	Not restricted
Ankle joint	Not restricted	Not restricted
Talocrural joint	Not restricted	Not restricted
Subtalar joint	Not restricted	Not restricted
Chopart's joint	Not restricted	Not restricted
Lisfranc's joint	Not restricted	Not restricted
Metatarsophalangeal joint	Not restricted	Not restricted
Interphalangeal joint	Not restricted	Not restricted

Table No.11: joint play examination for both lower extremities.

**CONCLUSION:** All joints are free of restriction or pathological barrier. Every joint has been tested in all directions, where I used passive movement while assessment the joint paly to feel the restriction of movement or the barrier in all direction of each joint. The result show all joint are free with smooth barrier, now I would like to focused on right ankle joint. The active ROM assessment shows that there is limited ROM in dorsiflexion compared with left side, but in examination of passive ROM show full ROM in dorsiflexion and planter flexion, inversion, eversion and the join is free with a smooth barrier.

## **3.6.7 Neurological examination**

### **3.6.7.1 Superficial sensation**

#### Sensation in dermatomes

The patient must have closed eyes in order to make more sufficient the examination. I touch him with cotton piece on his both lower limbs in different area. The patient must inform me if he feels the touch and if there is any difference between both lower extremities sensation.

- L3: Both legs present normal physiologic and equal sensations.
- L4: Both legs present normal physiologic and equal sensations.
- L5: Both legs present normal physiologic and equal sensations.
- S1: Both legs present normal physiologic and equal sensations.
- S2: Both legs present normal physiologic and equal sensations.

Temperature (cold –hot tubes): Same successfully results we had on this test, the patient was able to feel the same temperature level.

Pin prick: The patient was feeling the same touch in both lower.

### **3.6.7.2 Deep sensation**

The patient must have closed eyes in order to make more sufficient examination.

- Movement: I move the ankle joint into dorsiflexion and planter flexion several time and I ask patient to explain the movement. He was able to distinguish correctly.

- Position: I have placed the ankle joint in one position (for example in dorsiflexion), than I asked patient in which position the joint is and he has to know. Patient could feel the positions correctly.

### Test for Ataxia

Heel-shin-test: I ask patient to put his right heel on the left knee while lying supine and slight down on the leg to the foot. I have observe the coordination and smoothness of the movement. Patient was able to provide it without any disturbances.

### 3.6.7.3 Deep tendon reflexes (according to Ashworth scale)

The grading scale for tendon reflexes is from 0-4 “plus” (plus, brisk is for every reflex which is a bit higher than the normal rate):

- 0 = Absent
- 1 = Hypoactive
- 2 = Normal
- 3 = Hyperactive without clonus
- 4 = Hyperactive with clonus

	Right	Left
Patella (L2-4)	2	2
Achilles tendon (L4-5)	2	2
Medial plantar (L5-S2)	2	2

Table No.12 deep tendon reflex evaluation for both lower extremities.

### 3.6.7.4 Pyramidal lesion tests

	Right		Left	
	Positive	Negative	Positive	Negative
Babinski sign		✓		✓
Chaddock sign		✓		✓
Oppenheim sign		✓		✓
Brissaud's reflex		✓		✓

Table No.13: pyramidal lesion tests for both sides.

### 3.6.8 Proprioceptive and balance assessment

#### Trendelenburg sign

- stability of right leg: not done ( as doctor recommended not put more 30% weight bearing ).
- stability of left leg: patient has great balance without shaking.

#### Vele test

Not show any claw or hammer toe.

#### Rhomberg test

- I (stand with normal base support ) = negative
- II (feet together) = negative
- II (eyes closed) = negative



The Romberg tests have been successful, the patient has good physiological response.

### **3.6.9 Movement stereotype assessment**

- Hip abduction (According to Janda): The hip abduction is done without compensation of other extra muscles or any signs of overactivation. The test allows me to assess the strength of gluteus medius/minimus.
- Hip extension (According to Janda): The hip extension is done with slight compensation from the low back (slight hyperextension). No other sign of compensation is seen. The test allows me to assess the gluteus maximus's strength. The patient is able to perform the move with instructions.

### **3.7 Conclusion**

Mr J. W. is 31 years old patient. He is oriented in time and space, conscious and active. He is independent and walks with two crutches with contraindication of partial weight bearing 30% of his body weight on the right ankle. Patient with comminuted fracture of distal tibia and fibula of the right leg after motorcycle accident on the road crushed by a car on 18.8. 2017. The operation ORIF was done on 21.8. 2017. The second operation for metal implant removal was done on 15.5. 2019. All these procedures have been done in Motol hospital.

The all Initial Kinesiologic Examination in both lower limbs joint were done in order to compare between right and left limb. The result of the examination shows that the patient is generally fine in posture and muscle power, neurological examination and ROM in both limbs show that patient has continuous to exercise since 2 years after first operation. He used do all of activities such as walking, motorcycling, fitness, gym, full weight bearing on right leg, etc. There was no pain as patient mentioned, but after second operation for metal implant removal patient used 2 crutches, because there was pain in dorsiflexion movement.

The results of our examination shown that patient has swelling on the right ankle, no pain is present, he has limited of AROM in right ankle and dorsiflexion 18° compared with the left ankle 25°. The muscle power has good result in all muscles in both lower limbs, except the muscle around the right ankle joint, which were grade 4

compared with left ankle muscle (grade 5). The weakest muscle was around right ankle joint. It is Tibialis anterior with grade 3<sup>+</sup>. The muscle length test show that there is shortness in muscle length in Gastrocnemius and Soleus of right ankle. Also, Gastrocnemius and Soleus of right leg is hypertonic witch was found after palpation examination. The patient also need gait training, he was using incorrect gait pattern. We can see from the gait assessment that the patient has early toes off of the right foot, in addition of the external rotation and abduction of the right lower limbs.

### **3.7 Rehabilitation plan**

#### **3.8.1 Short term rehabilitation plan**

- Reduce swelling of the right ankle joint .
- PIR relaxing for hypertonic muscles Gastrocnemius and Soleus of right leg .
- Stretching shortness of Gastrocnemius and Soleus muscles.
- Increase AROM of the right ankle in dorsiflexion in all directions .
- Strengthen muscles around of the right ankle, especially Tibialis anterior.
- PNF technique, 1 and 2 diagonals for flexion and extension of lower extremities, strengthening techniques.
- Training and education of gait pattern.

#### **3.8.2 Long term rehabilitation plan**

- Starting to exercise with progress to 100% weight bearing on right ankle .
- Stimulation of ankle joint proprioception.
- Restoring correct posture and weight bearing.
- Balance and proprioception exercise rehabilitation .
- Strengthening exercises for muscle groups in lower extremities.
- PNF technique, 1 and 2 diagonals for flexion and extension of lower extremities, strengthening techniques.
- Strengthening exercises for pelvis and trunk muscles.
- Coordination and sensomotoric exercises.
- Correction for stereotypes (standing, sitting).

- Improve the activity level for the patient .

### **3.8.3 Proposed therapy**

- Magnetotherapy
- Infrared therapy
- Hot therapy
- STT - soft tissues techniques
- PIR
- Active ROM
- Passive ROM
- CMP machine
- Stationary bicycle
- Strengthening techniques
- Stretching techniques
- Gait training
- Stabilization (proprioceptive training)
- Stabilization (sensomotor stimulation)
- PNF technique
- MM - mobilization
- ADL training
- Gym exercise

### **3.9 Therapy progress:**

1<sup>st</sup> session

**Date: 16.1. 2020**

**Status praesens subjective:** patient come for the session with complaint of swelling around the right ankle and limitation of the movement of the right ankle, he used the crutches while walking.

**Status praesens objective:** the patient has swelling of the right joint ankle use tape circumference R: 33cm L: 29cm. Right ankle is bigger than the left at malleolus .the Doris flexion of the ankle is limited 18<sup>0</sup>.

#### **Goal of today's therapy unit**

- Minimize the swelling on the ankle.
- Increase active and Passive ROM in ankle joint in PF, DF, IN, EV directions.
- PIR for (triceps surae) right leg.
- Strengthen tibialis anterior, all muscle around the right ankle.

#### **Procedure**

- Lymphatic massage drainage (done by physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle, to reduce the swollen.
- Infra-red therapy 45 cm distance between the machine and ankle joint 20 minutes patient used to active movement for the ankle to increased blood circulation and also to reduce the swelling.
- Stationary bicycle daily for 15 minutes for increase ROM and strength muscle of the lower limbs.

- CPM for right ankle joint for 30 minutes dorsiflexion 20, plantar flexion 40 degrees.
- Increase ROM used active movement with resistance to improve ROM of dorsiflexion. Patient upright position on the bed, patient do dorsiflexion movement and we give minimal resistance, then move the ankle to dorsiflexion passively to full rang, then repeated 6 times.
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and planter flexion, eversion, inversion direction to keep the joint mobility.
- PIR technique accordig to Lewit to relax and stretch the shortened muscles (gastrocnemius, soleus) right leg - 3 repeated times.
- Resisted ankle dorsiflexion: patient upright position on bed and tie a rubber on bed and fit the rubber band around right foot. Make space for tension on the band to pull agains. Patient pull foot up towards body against the resistance of the band. Hold for 10 seconds, 10 Repeat - 3 times.
- Resisted ankle inversion: patient upright position on bed and left leg crossed over other right leg. Hold both ends of elastic band and loop the band around the inside of left foot. Then press left foot against the band.
- Keeping legs crossed, slowly push right foot against the band so that foot moves away from your left foot. Hold for 10 second, 10 Repeat - 3 times.
- Resisted ankle eversion: patient upright position on bed with legs straight. Hold both ends elastic band and loop the band around the outside of right foot. Then press left foot against the band with keep leg straight, slowly push right foot outward against the band and away from left foot without letting your leg rotate. Hold for 10 second - 10 Repeat - 3 times.

- Resisted ankle plantar flexion: patient upright position on bed with right leg straight and left leg should be bent, Place an elastic band around right foot just under the toes. Hold each end of the band in each hand, with your hands above your knees. Keeping right leg straight, gently flex your foot downward so toes are pointed away from body. Hold for 10 second - 10 Repeat - 3 times.
- Gait re-education: We instructed and explained the patient the normal gait by show him steps of gait cycle and I used to walking in front of him to show him the normal gait cycle. So we put Mirror in front of the patient and asked the patient to follow instruction of normal gait cycle for several time. Noted that when the patient corrected his gait to keep the right limbs on straight show patient was doing well and the foot movement in normal gait from the heel is the first part of the foot to touch the ground and the ankle is dorsiflexed to neutral till the heel rise phase. Short distance patient used to walk without crutches around the room, long distance patient used to walk with elbow crutches.
- Magnetic therapy (done by physiotherapist staff) - pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes - daily for 30 minutes –right ankle joint.

## **Results**

- Swelling no show any change or reduce .
- Palpation the muscles after PIR show slight improvement .
- Increase ROM dorsi flexion 3° right ankle .
- Patient was doing well in gait re- education he keep the leg straight without external rotation and abduction of the hip .

## **Self-therapy**

- Same strengthen exercise at room 3 time (patient has elastic band)

- To minimise the swelling - the patient has to sit in room with leg up to elevate the right foot and at night rest his foot on some pillows to elevate the right foot up.
- Hot therapy for 10 minute on the right ankle joint .
- Patient has to walk in corridor to practice normal gait cycle ,as he mentioned that he was practice this exercise more in different clinic rehabilitation ,but he said that sometime forget to keep the leg straight.

## 2<sup>nd</sup> session

**Date: 17.1. 2020**

**Status praesens subjective:** patient still complaint from the swelling and today he also has fatigue muscle of the right leg while he waking. Patient used hot therapy and exercise one time at room yesterday.

**Status praesens objective:** the swelling is the same no change it 33 cm but dorsi flexion it increased 3<sup>0</sup>.the tibialis anterior is very weak muscle compared with normal left side was 5 grade muscle power.

### **Goal of today's therapy unit**

- Minimize the swelling on the ankle.
- Mobilization of the ROM in ankle joint .
- Stretching shortens muscle calf.
- Strengthen tibialis anterior.
- Strength exercise for lower limbs muscle .
- Gait training exercise.

## Procedure

- Lymphatic massage drainage (done by physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle, to reduce the swollen.
- Hot therapy used by cover by towel and put on the right ankle for 10 minute before exercise to increased blood circulation and reduce the swelling of the ankle.
- Stationary bicycle daily for 15 minutes to strength lower limbs muscle.
- CPM for right ankle joint for 30 minutes on Dorsiflexion 20 - planter flexion 40.
- PROM used maintaining the range of the both ankle joints 10 times for 3 repetition for each direction.
- AROM patient is done all movement of the both leg joint. Hip, knee ankle and toes movement 10 times for each joint.
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and planter flexion, eversion, inversion direction to keep the joint mobility.
- PIR technique to relax and stretch the shortened muscles (gastrocnemius, soleus) right leg - 6 repeated 2 times.
- Strength muscle of the right ankle joint – used elastic band for all four dirtion for both ankle and focused on the tibila anterior muscle. Doris flexion resistance by elastic band each exercise 10 times for 4 repetition.
- Towel Curls: sit with both feet flat and place a small towel on the floor in front of patient try to grab the center of the towel with toes and curl the towel 10 repeat - 3 times.



- Heel Raises: patient stand behind table. Both feet rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises: patient Stand behind the table for support. Both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 - 3 times.
- Gait re-education: we instructed and explained the patient the normal gait by show him steps of gait cycle and I used to walking in front of him to show him the normal gait cycle. So we put Mirror in front of the patient and asked the patient to follow instruction of normal gait cycle for several time. Noted that when the patient corrected his gait to keep the right limbs on straight show patient was doing well and the foot movement in normal gait from the heel is the first part of the foot to touch the ground and the ankle is dorsiflexed to neutral till the Heel rise phase. Short distance patient used to walk without crutches around the room, long distance patient used to walk with elbow crutches.
- 30 minutes swimming pool:
  - Active movement for ankle (dorsiflexion ,planter flexion ,eversion and inversion).
  - Standing on right leg .
  - Walking with focus on the gait .
  - Walking tip toes.
  - Walking with foot with full active ankle plantar flexion .
  - Walking on heels .
  - Walking from heel to toes.
  - Walking with full plantar flexion on tip toes.
  - Patient try walking as normal gait by put FWB.
- Magnetic therapy (done by physiotherapist staff ) - pulse magnetic field- intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes - daily for 30 minutes – right ankle joint.

Fitness (one hour he spent in gym at evening - every day)

- Stationary bicycle he used to do before the exercise.
- Motor rowing machine .
- Adductor / Abductor for hip with 4 kg .
- Leg press patient use both legs to push 5 kg.
- Back extension with 4 kg resistance .
- Abdominal Isolator with 2 kg .
- Push up with body weight .
- Shoulder Press with 5 kg .
- Pectoral fly with 5 kg.
- Leg extension with free weight 2kg, he fix the weight in mild of the leg.
- Leg flexion with free weight 2kg, he fix the weight around mild of the leg.
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise.

## **Results**

- Increase ROM of dorsi flexion 20<sup>0</sup> right ankle.
- PIR show improvement of muscle length of calf muscle right leg.
- Patient was doing well in gait re- education he keep the leg straight with walking long distance the gait is much improved.
- Patient has good muscle balance during walking.

## **Self-therapy**

- Same strengthen exercise at room 3 time (patient has elastic band) .
- To minimalise the swelling - the patient has to sit in room with leg up to elevate the right foot. At night rest his foot on some pillows to elevate the right foot up.
- Patient has to walk in corridor to practice normal gait cycle.

3<sup>rd</sup> session

**Date: 20.1. 2020**

**Status praesens subjective:** patient attend the session. he was feel the swelling is reduce little bit on the right ankle .there was no pain is he reported ,and he continues done hot therapy and active movement exercised on the right ankle same exercise at room .he feel he gait is improve by practice in corridor 5 to 6 times as he mentioned .

**Status praesens objective:** patient come for session, no pain, swelling is present, the ROM is ankle is improved the DF is 20<sup>0</sup>, PF 40<sup>0</sup>. Gait observed also, the patient is walking with keep the leg straight rather than external rotation and abduction of the hip.

### **Goal of today's therapy unit**

- Reduce the swelling on the ankle.
- Increase ROM in ankle joint in PF, DF, IN, EV directions.
- Strengthen all muscle around the right ankle.
- Strengthen the lower limbs muscle.
- PIR calf muscle right ankle .
- Stabilization exercise for pelvis and truck exercise .
- Increased balance of the left leg.
- Gait re-education .

### **3.1 Procedure**

- Infrared therapy 45 cm distance between the machine and the ankle, for 20 minute applied, patient used to active movement of the ankle to increased blood circulation and reduce the swelling on the right ankle.
- Lymphatic massage drainage (done physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle to reduce the swollen.
- CPM for right ankle joint 30 minutes on dorsiflexion 20, planter flexion 40 .

- Stationary bicycle daily for 15 minutes used to strength the lower limbs muscle and movement of the ankle.
- Increase ROM - used active movement with resistance to improve ROM of dorsiflexion. Patient upright position on the bed, patient do dorsiflexion movement and we give minimal resistance, then move the ankle to dorsiflexion passively to full rang and repeated 6 times.
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and, planter flexion, eversion, inversion direction to keep the joint mobility.
- PIR technique according to Lewit: to relax and stretch the shortened muscles (gastrocnemius, soleus) right leg - 3 repeated times.
- Resisted ankle dorsiflexion used the elastic band to give resistance. Hold for 10 seconds, 10 repeat - 3 times.
- Resisted ankle inversion: used the elastic band to give resistance. Hold for 10 second, 10 repeat - 3 times.
- Resisted ankle eversion. Used the elastic band. Hold for 10 second, 10 repeat - 3 times.
- Resisted ankle plantar flexion: thera band used to resistance. Hold for 10 second, 10 repeat - 3 times.
- Stretching exercised for the calf muscle. Patient used stand, hand on the wall, right leg in front, right leg back. Move the body toward the wall, the feet full contact the ground .slightly stretch will start.
- Bridge exercised for pelvis muscle: used ball, patient on supine, knee 90 flexion on the big ball. Patient raise the pelvis up and hold 10 second. 10 Repetition - 3 times.

- Activation the truck muscle and breathing muscle to maintain muscle strength, used boll patient supine position, knee 90 flexion on the boll, patient take deep berthing for activation back muscle, and expirations or relaxing 2 times, 5 repetition.
- Balance exercise, Patient stand in left leg and try to maintain the balance.
- Gait re-education,patient used to walk for long distance with 2 crutches. He is waking with following all instruction by therapist, patient is walking in normal gait cycle.
- Magnetic therapy (done by physiotherapist staff) - pulse magnetic field - intensity 54mt/10- 30cm-max pulse 15 ms - 30 minutes - daily for 30 minutes – right ankle joint.

Fitness: (one hour he spent in gym at evening - every day).

- Stationary bicycle he used to do before the exercise.
- Motor rowing machine .
- Adductor / Abductor for hip with 4 kg.
- Leg press patient use both legs to push 5 kg.
- Back extension with 4 kg resistance .
- Abdominal Isolator with 2 kg.
- Push up with body weight .
- Shoulder Press with 5 kg .
- Pectoral fly with 5 kg .
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg.
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg.
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise.

## Results

- Swelling around the right is reduced
- Palpation of right calf muscle is reduce become normal
- Increase ROM of dorsi flexion  $20^{\circ}$
- Patient was doing well in gait re-education he keep the leg straight without external rotation and abduction of the hip ,the gait much improved
- General exercise for pelvis and lower limbs to maintaining muscle strength
- Generally improved the lower limbs muscle

## Self-therapy

- same strengthen exercise at room 3 time (patient has elastic band )
- self stretch the calf muscle by used the wall
- to minimize the swelling - the patient has to sit in room with leg up to elevate the right foot and at night rest his foot on some pillows to elevate the right foot up.
- bright exercise also he can do it in the room, 2 times, 10 repetition to maintain muscle strength

## 4<sup>th</sup> session

**Date: 21.1. 2020**

**Status praesens subjective:** patient is looks fine and he is feel generally improvement of his right ankle , he report that swelling reduced day by day and he feel improved muscle strength the body .

**Status praesens objective:** patient come for session ,no pain ,he swelling is 31 by used .the DF  $22^{\circ}$  ,PF ROM  $42^{\circ}$  is increased . also muscle around the ankle show increased strength by used resistance to the patient to checked the muscle strength right ankle.

### **Goal of today's therapy unit**

- Minimize the swelling on the ankle.
- Increase Passive ROM in ankle joint in PF, DF, IN, EV directions.
- Strength lower limbs muscle .
- Balance exercises .
- Increase ADL for the patient .
- gait re-education .

### **Procedure**

- Lymphatic massage drainage(done physiotherapist staff) -to stimulate the circulation of lymph fluid around the right ankle ,to reduce the swollen
- Infrared therapy .45 cm distance between the machine and the ankle .20 minute applied ,patient used to active movement of the ankle .to increased blood circulation and reduce the swelling on the right ankle
- Stationary bicycle daily for 15 minutes to muscle strength of lower limbs
- CPM for right ankle joint 30 minutes to dorsiflexion 25 and planter flexion 45 degrees
- Increase ROM used active movement with resistance to improve ROM of dorsiflexion. patient upright position on the bed ,patient do dorsiflexion movement and we give minimal resistance ,then move the ankle to dorsiflexion passively to full rang ,then repeated 6 times.
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and ,planter flexion ,eversion ,inversion direction to keep the joint mobility .
- PNF 1 diagonal flexion , 2<sup>nd</sup> diagonal flexion of lower limbs , all instruction and component movement done in the patient , strength techniques, to strength the muscle of the lower limbs.

- Towel Curls: Sit with both feet flat and place a small towel on the floor in front of patient try to grab the center of the towel with toes and curl the towel . 10 Repeat -3 times.
- Heel Raises : patient stand behind table. Both feet Rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises: patient Stand behind the table for support . both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 -3 times.
- gait re-education : patient is walking as normal gait cycle ,there is no pain present
- 30 minutes swimming pool :
  - standing in one leg (left –right).
  - Walking with focus on the gait .
  - Walking tip toes.
  - walking with foot with full active ankle plantar flexion .
  - Walking on heels .
  - Walking from heel to toes .
  - Walking with full plantar flexion on tip toes.
  - General exercise for strength the upper and lower muscle by swimming .
- Magnetic therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes –right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise.
- Motor rowing machine .
- Adductor / Abductor for hip.



- Leg press patient use both legs to push.
- Back extension .
- Abdominal Isolator.
- Push up with body weight .
- Shoulder Press .
- pectoral fly.
- Leg extension with free.
- Leg flexion .
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise.

### **Results**

- The swelling is reduce much comparing with first session .
- Muscle calf right leg is relaxed and the became to normal length .
- Increased ROM right ankle dorsi flexion 23<sup>0</sup>.
- Muscles around the right ankle is improved strength specially tibiles anterior.
- Patient was doing well in gait re- education ,patient is improved gait way by following all instruction steps.

### **Self-therapy**

- Hot therapy cover by towel for 10 minute ,to reduce the swelling.
- Same strengthen exercise at room 2 time (patient has elastic band ) .
- to minimise the swelling - the patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.
- Gait Practice in corridor at evening time .

5<sup>th</sup> session

**Date: 22.1.2020**

**Status praesens subjective:** patient is in good condition ,he follow all instruction of exercise .he didn't compline of any pain . the patient still worry about the swelling on the right ankle .

**Status praesens objective:** patient come for session, the swelling is reduce compared with first session .and general patient is improve in Doris flexion 23<sup>0</sup> movement muscle strength of the lower limbs and balance in standing one leg .

#### **Goal of today's therapy unit**

- Minimize the swelling on the ankle
- Strength muscle of the lower limb
- Increased rom of DF,PF
- Balance exercise

#### **Procedure**

- Lymphatic massage drainage(done by physiotherapist staff) -to stimulate the circulation of lymph fluid around the right ankle ,to reduce the swollen.
- Infrared therapy .45 cm distance between the machine and the ankle .20 minute applied ,patient used to active movement of the ankle .to increased blood circulation and reduce the swelling on the right ankle.
- Stationary bicycle-Daily for 15 minutes , for strength lower limbs muscle .
- CPM for right ankle joint for 30 minutes dorsiflexion:25 and planter flexion 45.
- PNF 1 and 2 diagonal flexion and extension for lower limbs. all instruction and component movement done for the patient –strengthening technique .

- Balance exercise , patient is standing on the left leg .try to maintaining the balance without hold the wall .
- Wobble board used to standing on it ,and do all four direction of the both ankle to increase rom and strength muscle around the ankle .
- Coordination exercise , patient sitting on the big boll, patient try to sit and stand to increased balance and coordination .
- MAGNETIC therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes – right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip
- Leg press patient use both legs to push
- Back extension
- Abdominal Isolator
- Push up with body weight
- Shoulder Press with
- pectoral fly

## **Results**

- Reduce of the swelling from 33 to 31 right Ankle (malleolus) measurement compared to left ankle 29 .
- Good balance show in left stand leg
- Patient is have good balance from sit to stand without support.
- Palpation the muscle calf right leg is normal tone and muscle length grade was show normal length .
- Increased ROM 23<sup>0</sup> dorsi flexion of right ankle

- Patient was doing well in gait re- education .he was walking normal gait .

### **Self-therapy**

- hot therapy by cover by towel for 10 minute on the right ankle .
- same strengthen exercise at room 3 time (patient has elastic band .
- patient has strength exercised on the lower limbs in gym .
- to minimize the swelling - the patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.

### **6<sup>th</sup> session**

**Date: 23.1.2020**

**Status praesens subjective:** patient is generally is fine , today he said that swelling is much reduced on the right ankle , the muscle fatigue not like before ,he doing exercise at room 2 to 3 times as he mentioned . patient is doing well with all exercise ,he feel more improved of the right ankle

**Status praesens objective:** patient come for session , the swelling is reduce to 30 cm right ankle , muscle of the right ankle so muscle improved by check muscle strength test .the ROM of the ankle also much improved to 24 DF .

### **Goal of today's therapy unit**

- Reduce the swelling on the ankle
- Increase Passive ROM in ankle joint in PF, DF, IN, EV directions
- strengthen lower limbs ,pelvis ,trunk
- balance exercise
- gait re-education

### **Procedure**

- Lymphatic massage drainage(done physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle to reduce the swollen.

- Infrared therapy 45 cm distance between the machine and the ankle .20 minute applied ,patient used to active movement of the ankle .to increased blood circulation and reduce the swelling on the right ankle.
- Stationary bicycleDaily for 15 minutes for strength lower limbs muscle
- CPM--Right ankle joint – for 30 minutes -Dorsiflexion:25 -planter flexion 45
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and ,planter flexion ,eversion ,inversion direction to keep the joint mobility.
- Bridge exercise used the big ball .patient used flexion the knees 90 degree and lifting the pelvis up ,the alternative by on leg right then left .2 time ,10 repetition
- Standing on the Wobble board try to maintain the balance of the left leg . Also standing on wobble board used to do all direction of the ankle movement for the both ankles
- Towel Curls ,Sit with both feet flat and place a small towel on the floor in front of patient try to grab the center of the towel with toes and curl the towel . 10 Repeat -3 times
- Heel Raises , patient stand behind table. Both feet Rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises, patient Stand behind the table for support . both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 -3 times.
- Balance exercise Standing on the left leg and try to close the eyes .with therapist support to avoid fall.

- Magnetic therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes –right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg
- pectoral fly with 5 kg
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

### **Results**

- Swelling is slight reduce comparing yesterday
- Increased ROM dorsi flexion of right ankle
- Increased or maintaining strength lower limbs muscle
- Improved the balance on weber board in standing without support

### **Self-therapy**

- Hot therapy for 10 minute on the right ankle
- Same strengthen exercise at room 2 time (patient has elastic band )
- Gait training on corridor at evening time .

7<sup>th</sup> session

**Date: 24.1.2020**

**Status praesens subjective:** patient feel swelling reduce ,he want more work in balance exercise and strength the muscle exercise ,he feel much improved than before

**Status praesens objective:** patient come for session ,there was no pain ,patient is very excited for the exercises swelling much reduce ,so same exercise will going to work on it

### **Goal of today's therapy unit**

- Minimize the swelling on the ankle
- Soft tissue technique to relation and blood circulation
- strengthen muscle lower limbs
- balance exercise

### **Procedure**

- Lymphatic massage drainage(done by physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle to reduce the swollen.
- Soft tissue technique. Soft boll used cranially direction on the calf muscle to relation hypertonic muscle tone.
- Stationary bicycle daily for 15 minutes to strength lower limbs muscle .
- CPM for right ankle joint for 30 minutes dorsiflexion 25 degrees and planter flexion 45.
- PNF 1 diagonal flexion , 2nd diagonal flexion of lower limbs , all instruction and component movement done in the patient , strength techniques, to strength the muscle of the lower limbs .
- Stretching , Patient stands with both feet on the stretch board for 1 minute, supporting himself on the wall ,then move toward for stretch calf muscle .

- Balance exercise ,standing ,squatting ,one leg stand on webber board
  
- 30 minutes swimming pool :
  - Active movement for ankle (dorsiflexion-planter flexion-eversion – inversion)
  - Standing in one leg (left and right)
  - Walking with focus on the gait
  - Walking tip toes
  - walking with foot with full active ankle plantar flexion
  - Walking on heels
  - Walking from heel to toes
  - Walking with full plantar flexion on tip toes
  - Active movement for all joint lower limbs
  
- Infrared therapy 45 cm distance between the machine and the ankle .20 minute applied ,patient used to active movement of the ankle .to increased blood circulation and reduce the swelling on the right ankle
  
- MAGNETIC therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes – right ankle joint .

Fitness(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg



- pectoral fly with 5 kg
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

### **Results**

- Swelling is much reduced .
- Increased the ROM dorsiflexion 25 of the right ankle
- Patient was doing well in gait re- education .
- Muscle power of the tibialis anterior of the right leg .
- Improve balance on stand one leg

### **Self-therapy:**

- to minimize the swelling - the patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.

8<sup>th</sup> session

**Date: 27.1.2020**

**Status praesens subjective:** patient is fine and he continues same protocol of the exercise every day , the patient report that swelling is reduce and Doris flexion movement is improved ,generally condition is improved

**Status praesens objective:** patient come for session ,no new issue ,patient is stable .the ROM in DF is 25 and PF is 43 ,the swelling is 30 cm tape measurement, that's show much reduce from 33 before treatment this patient start .

### **Goal of today's therapy unit**

- Minimize the swelling on the ankle
- Strength muscle

### **Procedure**

- Lymphatic massage drainage(done by physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle to reduce the swollen.
- Infrared therapy 45 cm distance between the machine and the ankle 20 minute applied patient used to active movement of the ankle to increased blood circulation and reduce the swelling on the right ankle .
- Stationary bicycle-Daily for 15 minutes –for muscles strengthen and ROM for lower limb joints .
- Mobilization passively of the right ankle joint in all direction .
- CPM for right ankle joint for 30 minutes dorsiflexion 30 and planter flexion 45 degrees .
- Heel Raises , patient stand behind table. Both feet Rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises, patient Stand behind the table for support both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 -3 times.
- gait re-education , patient has same instructed here is no issue of gait .

- Magnetic therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes –right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg
- pectoral fly with 5 kg
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

### **Results**

- The is no issue of length muscle of right calf muscles .
- Reduce of swelling is 30 right ankle –left ankle 29 normal side
- Rom of doris flexion 27<sup>0</sup> of right ankle .

### **Self-therapy**

- same strengthen exercise at room 2 time (patient has elastic band ).
- to minimise the swelling , patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.
- Same gait training at evening time on corridor

9<sup>th</sup> session

**Date: 28.1.2020**

**Status praesens subjective:** patient come with complaint from pain or swelling ,he very improved so he want to continues the exercise

**Status praesens objective:** patient come for session ,there was no pain ,patient is very excited for the exercises. The swelling is reduce ,the right ankle DF increased to 27<sup>0</sup>. The muscle strength is grade 5 of the lower limbs

### **Goal of today's therapy unit**

- Minimize the swelling on the ankle
- Increase ROM of right ankle joint
- Improved ADL of the patient

### **Procedure**

- Lymphatic massage drainage(done by physiotherapist staff) -to stimulate the circulation of lymph fluid around the right ankle ,to reduce the swollen.
- Stationary bicycle-Daily for 15 minutes .
- CPM-Right ankle joint – for 30 minutes -Dorsiflexion:30 -planter flexion 45
- Increase ROM -used active movement with resistance to improve ROM of dorsiflexion. patient upright position on the bed ,patient do dorsiflexion movement and we give minimal resistance ,then move the ankle to dorsiflexion passively to full rang ,then repeated 6 times
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and ,planter flexion ,eversion ,inversion direction to keep the joint mobility

- Balance exercise , standing one leg, walking on line ,sit on the big ball, standing without support
  
- 30 minutes swimming pool :
  - Active movement for ankle (dorsiflexion-plantar flexion-eversion – inversion)
  - standing in one leg (left –right)
  - Walking with focus on the gait
  - Walking on lateral side of the foot
  - Walking on medial side of the foot
  - Walking tip toes
  - walking with foot with full active ankle plantar flexion
  - Walking on heels
  - Walking from heel to toes
  - Walking with full plantar flexion on tip toes
  - Active movement for all joint of the lower limbs knee and hip
  - Free Swimming to strength upper and lower limbs muscle
  
- Magnetic therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes –right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg
- pectoral fly with 5 kg

- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

### **Results**

- Reduce of swelling of right ankle 29 and left 29 by tape measurement
- Increase ROM dorsi flexion 29° right ankle
- Normal length of calf muscle right leg
- Gait is no issue show

### **Self-therapy**

- same strengthen exercise at room 1 time (patient has elastic band )
- to minimise the swelling - the patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.

10<sup>th</sup> session

**Date: 29.1.2020**

**Status praesens subjective:** patient is very happy to result of exercise .the swelling is reduce the ankle joint motion of the DF improved and muscle strength he feel much improved .

**Status praesens objective:** patient come for session ,there was no pain ,patient is incresde in DF of right ankle to 29<sup>0</sup> and swelling is reduced ,muscle power much improved to grade 5 .patient improved in stability exercise .

#### **Goal of today's therapy unit**

- Minimize the swelling on the ankle
- Increase Passive ROM in ankle joint in PF, DF, IN, EV directions
- Strengthen all muscle around the right ankle

#### **Procedure**

- Lymphatic massage drainage(done physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle ,to reduce the swollen.
- Stationary bicycle daily for 15 minutes .
- CPM for right ankle joint for 30 minutes dorsiflexion 30 and planter flexion 45 degree.
- Increase ROM used active movement with resistance to improve ROM of dorsiflexion. patient upright position on the bed ,patient do dorsiflexion

movement and we give minimal resistance ,then move the ankle to dorsiflexion passively to full rang ,then repeated 6 times.

- mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and ,planter flexion ,eversion ,inversion direction to keep the joint mobility
- Towel Curls, sit with both feet flat and place a small towel on the floor in front of patient try to grab the center of the towel with toes and curl the towel ,10 Repeat -3 times.
- Heel Raises , patient stand behind table. Both feet Rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises: patient Stand behind the table for support . both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 -3 times.
- MAGNETIC therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes – right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg
- pectoral fly with 5 kg
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg



- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

### **Results**

- Increased ROM of dori flexion to 30 right ankle

### **Self-therapy**

- same strengthen exercise at room 3 time (patient has elastic band )
- to minimize the swelling - the patient has to sit in room with leg up to elevate the right foot . and At night rest his foot on some pillows to elevate the right foot up.

### 11<sup>th</sup> session

**Date: 30.1.2020**

**Status praesens subjective:** patient is fine ,there is much improved of the right ankle .so today is last session ,no new issue patient had.

**Status praesens objective:** patient come for last session , swelling is diminished ,ROM of the ankle DF 30 ,PF 45 . muscle power is grade 5 . so he will do all exercise and will do finial exercise to see after 11 session therapy .

### **Goal of today's therapy unit**

- Reduce the swelling
- Strength muscle exercise
- AROM
- Balance exercise

## Procedure

- Lymphatic massage drainage(done physiotherapist staff) to stimulate the circulation of lymph fluid around the right ankle ,to reduce the swollen
- Stationary bicycle daily for 15 minutes .
- CPM for right ankle joint for 30 minutes dorsiflexion 30 and planter flexion 45 degrees.
- Mobilization the right ankle joint passively to dorsiflexion direction to increased ROM and ,planter flexion ,eversion ,inversion direction to keep the joint mobility .
- Resisted ankle dorsiflexion: patient upright position on bed and tie a rubber on bed and fit the rubber band around right foot. Make space for tension on the band to pull agains. Patient Pull foot up towards body against the resistance of the band. Hold for 10 seconds. 10 Repeat -3times
- Resisted ankle inversion, patient upright position on bed and left leg crossed over other right leg. hold both ends of elastic band and loop the band around the inside of left foot. Then press left foot against the band.
- keeping legs crossed, slowly push right foot against the band so that foot moves away from your left foot. Hold for 10 second ,10 Repeat -3 times.
- PNF 1 and 2 diagonal flexion and extension for lower limbs strength technique.
- Resisted ankle eversion , patient upright position on bed with legs straight ,hold both ends elastic band and loop the band around the outside of right foot. Then press left foot against the band with keep leg straight, slowly push right foot outward against the band and away from left foot without letting your leg rotate. Hold for 10 second -10 Repeat-3 times
- Resisted ankle plantar flexion , patient upright position on bed with right leg straight and left leg should be bent, Place an elastic band around right foot just

under the toes. Hold each end of the band in each hand, with your hands above your knees. Keeping right leg straight, gently flex your foot downward so toes are pointed away from body. Hold for 10 second -10 Repeat -3 times

- Towel Curls ,sit with both feet flat and place a small towel on the floor in front of patient try to grab the center of the towel with toes and curl the towel . 10 Repeat -3 times
- Heel Raises , patient stand behind table. Both feet Rise up on toes, hold for 3 to 5 seconds and then relax. Repeat 10 - 3 times.
- Toe Raises , patient Stand behind the table for support . both feet rise up on heel so that toes come off the ground. Hold this position for 3 to 5 seconds. Repeat 10 -3 times.
- gait re-education gait training same instructed give.
- Magnetic therapy (done by physiotherapist staff )-pulse magnetic field-intensity 54mt/10- 30cm-max pulse 15 ms- 30 minutes -daily for 30 minutes –right ankle joint .

Fitness:(one hour he spent in gym at evening - every day )

- Stationary bicycle he used to do before the exercise
- Motor rowing machine
- Adductor / Abductor for hip with 4 kg
- Leg press patient use both legs to push 5 kg
- Back extension with 4 kg resistance
- Abdominal Isolator with 2 kg
- Push up with body weight
- Shoulder Press with 5 kg
- pectoral fly with 5 kg
- Leg extension with free weight 2kg ,he fix the weight in mild of the leg
- Leg flexion with free weight 2kg ,he fix the weight around mild of the leg
- Stretching muscle exercise for lower limbs and upper limbs muscle after finish exercise

## **Results**

- There is no swelling ,full ROM dor flexion, normal length of calf muscle right left ,gait is normal and much improved .

## **Self-therapy**

- Advice the patient to keep do same exercise every day .

## **3.10 Final Kinesiological Examination**

### **3.10.1 Posture examination**

#### **Anterior view (front)**

- Toes looks in normal position straight line no show any deformity or claw toes in both sides left and right
- The base of support is 30 degree between feet
- Arches of both foot are normal
- Foot is looks normal for right but left is looks patient put more weight on it
- Shape and position of the ankle joints in neutral position
- Contour of the calf muscles (medial and lateral part)
- Right and left patella are same levels in both knee
- Both arm triangle are same level and position of sternum in the middle
- Level shoulders is shows same
- Head and neck is neutral position

#### **Lateral view (right):**

- Foot shape is in neutral position, heel contact ground
- Ankle joint in 90 degree and there is swelling around joint
- Malleolus of tibia is prominent
- Right knee is full extended
- Right hip looks in natural position
- Abdominal muscle are relaxed

- Lumbar spine slightly hyperlordotic
- Shoulders is neutral position under line of the ear
- Neck is normal curve and head straight alignment

### **Lateral side view (left)**

- Foot shape is neutral position but is look put more weight on it
- Ankle joint in 90 degree more pressure compared with right ankle
- Malleolus of tibia is prominent
- Left knee joint is full extended
- Left hip is natural position
- Abdominal muscle are relaxed
- Lumbar spine slightly hyperlordotic
- Shoulders is neutral position under line of the ear
- Neck is normal curve and head straight alignment

### **Posterior view (back)**

- Shape and contours of the heels are normal
- Shape and thickness of the Achilles tendon both is normal
- Foot cure of Achilles tendon both is clear
- Base of support 30 between feet
- The position of the ankle joint symmetrical
- Calf muscles the are same size
- Knee joint the are same level and full extension
- The thoracobrachial triangles are same level
- Position of pelvis level is same
- Paravertebral the muscle are relax and overweight
- Position of scapula angle is same level
- Head and neck normal cure

### 3.10.2 Two-scales standing

Body weight	125 kg
Right leg	61 kg
Left leg	64 kg
Result	Normal

Table No.14: final tow scales weight for both legs.

### 3.10.3 Gait analysis

- the base of support narrow
- position of the both feet with angle of 15, symmetrically
- walking rhythm was periodic
- walking speed was normal
- stride length was long steps
- movement of the foot show the both feet normal
- movement and position of the right knee extension and hip flexion while patient walking
- position and movements of the pelvis was rotation, lateral tilt prox 3 cm
- position and movements of the trunk slight rotation.
- activity of abdomen muscles is present
- activity of back muscles is present
- position of shoulders is symmetrically
- position and movements of the head is straight and not moving
- movements of the upper extremity was symmetrical movement
- stability of walking is show stable

### 3.10.4 Measurements of circumference

Lower limb	Right cm	Left cm
Thigh (15 over the knee)	60	62
Thigh (10 over the knee)	57	57
Knee	48	48
Calf	45	45
Ankle (malleolus)	29	29

Table No.15: final measurements of circumferences for both lower extremities.

### 3.10.5 Muscle tone examination

Muscle tone	Left	Right
Popliteus	Normal tone	Normal tone
Gastrocnemius	Normal tone	Normal tone
Tibialis anterior	Normal tone	Normal tone
Soleus	Normal tone	Normal tone
Plantaris	Normal tone	Normal tone

Table No.16: final assessment of muscle tone both legs.

### 3.10.6 Muscle length test (According to Janda)

The grading scale for this test is from 0 - 2:

- 0 = no muscle shortness
- 1 = moderate shortness
- 2 = marked shortness

	Right	Left
Tibialis anterior	0	0
Gastrocnemius	0	0
Soleus	0	0

Table No.17: final test for muscle length of both legs.

### 3.10.7 Muscle strength test (according to Janda)

The grading scale for this test is from 0 - 5 with:

- 0 = Zero (no muscle contraction)
- 1 = Trace (contraction felt but no movement)
- 2 = Poor (partial movement but in horizontal position)
- 3 = Fair (hold against gravity)
- 4 = Good (hold against moderate pressure)
- 5 = Normal (hold against strong pressure)

	Right	Left
Plantar flexors (gastrocnemius, plantaris)	5	5
Soleus	5	5
Peroneus longus and brevis	5	5
Tibialis posterior	5	5
Tibialis anterior	4+	5



Extensor digitorum longus and brevis	5	5
Flexor digitorum longus	4+	5
Flexor digitorum brevis	4+	5
Dorsal interossei	5	5
Extensor hallucis brevis	4	5
Extensor hallucis longus	5	5
Flexor hallucis longus	5	5
Flexor hallucis brevis	5	5
Abductor hallucis	5	5

Table No.18: final test for muscle strength for both legs.

### 3.10.8 Range of motion measurement

✓ Active movement (AROM):

According to Janda	Right	Left
Ankle joint	F: 30-0-45	F: 30-0-45
	R: 25-0-40	R: 25-0-40

Table No.19: final assessment active movement for both ankle joints.

✓ Passive movement (PROM):

	Right	Left
Ankle joint	S: 30-0-45	S: 30-0-45
	R: 25-0-50	R: 25-0-50

Table No.20: final assessment passive movement for both ankle joints.

### **3.10.9 Conclusion:**

Finally, I would like to thank to the patient for his cooperation with all treatment procedures, because he was following all of instructions and information during 11 session. He received the intensive exercise program that was divided into many sessions every day which took from 2 to 3 hours. Patient was interested in all session exercises, so we were focusing on short term rehabilitation plan, which was focused to minimize the swelling on the ankle, increase passive ROM in ankle joint in all directions, PIR technique for triceps surae muscle on right leg, strengthening of tibialis anterior muscle, all muscles around the right ankle, and gait re-education.

The patient was working to overcome his problems, the swelling was reduce within 8 session, ROM of right ankle after we used different methods for increase of the ROM into dorsiflexion of the right ankle have shown improvement every session. The movement measurement of ROM was DF 30, PF 45, IN 40, EV 25. The PIR technique was used for relaxation and stretching of the calf muscles on the right leg. The result show improvement after 5 sessions. Regarding of a gait pattern, the patient was very cooperative and he was understanding all of instruction to achieve normal gait pattern, as he mentioned, that he was trained in different clinics for rehabilitation since 2 years, but, he said that some time forgot to keep the leg straight. Patient is doing well after first session by following all gait instructions from me that are improving the position of the feet. For the muscle strength exercise was used elastic band to improve strength for Tibialis anterior muscle and all muscles in the ankle joint.

Patient also received a self-treatment plan, which help to achieve all goals set in the short term physiotherapy plan.

### **3.11. Evaluation of effectiveness of therapy**

In this part I'm going to write about the outcome of all treatment sessions. The patient was cooperative and was doing well during all sessions.

The first problem was swelling of the right ankle, but there was no pain. The effectiveness of the sessions was that by lymphatic massage used for 11 sessions and in self-treatment by elevating the foot up, was present reduction of the swelling from 33cm in measurement of circumference in right ankle to 29.

Then, the second problem was limitation of active ROM in DF of right ankle was 18° and PF 40. This was result done by use of the CMP for right ankle, also mobilization and active movement exercise for increased DF. This was 30°, PF 45°, IN 40 and EV 25.

The third problem was a shortness and hypertonicity (gastrocnemius, soleus) on right leg. I used PIR technique with stretching in all sessions. After the treatment was normal tone in muscles and relaxation occurred in gastrocnemius and soleus muscles.

The fourth problem was the weakness of muscle of tibias anterior and all muscles in the right ankle. The use of elastic band for strengthening of the muscle to all direction of ankle and toes was successful.

The fifth problems were the gait pattern, patient used to walk with external rotation and abduction of the right lower limbs, so during the sessions I have instructed the patient. After the re-education and training the result show that the patient was aware and had an ideas and focus on normal gait. From the first session he was doing well with gait, so the problem was solved fast.

Finally, the patient had many sessions, such as group swimming in the pool for 30 minutes, therefore I used to give him a different underwater exercise. This include walking and active movement of ankle and toes. The magnetic therapy used by physiotherapy staff was prescribed every day. Patient has a free time in the afternoon, so he was able to use the gym, which was available in the hospital. There he provided all different exercises for muscle strength, which were mentioned in session therapy. The patient was very cooperative and active, and he followed all self-treatment exercise requirements given him at during the sessions.

Effectiveness	Before	After
Swelling Measurements of circumference right ankle	33 cm	29 cm
Limitation DF right ankle	18 <sup>0</sup>	30 <sup>0</sup>
ROM right ankle PF	40 <sup>0</sup>	45 <sup>0</sup>
Muscle strength around right ankle. According to Kendall	Was grade 4	Improved to grade 5
Muscle length calf muscle. According to Janda	Was grade 1	Normal length
Gait	He used to do external rotation and abduction of the lower limb	Correction to the normal gait
General condition	Patient is has good, balance, muscle strength, faintness, body flexibility	General exercise given to maintain the level of activity.

Table No.21: Summary of examinations results before and after the therapy.

#### **4. CONCLUSION**

The patient had very nice attitude and show his willingness to exercise and follow all instructions given by me. He is young, and speaks English, which was a benefit for me. My supervisor in the hospital recommended this patient for me and for my thesis. I was happy with that. First, the patient was very cooperative and he speaks English, so that help me to have a good communication during all day of treatment.

As we all know, the rehabilitation of ankle joint is very complicated and slow process, but we spent 2 to 3 hours of exercise every day. In addition, the patient did self-treatment, what was a perfect support to the outcome during 11 session of intensive physiotherapy treatment. The patient initiatively woke up early morning for his exercise sessions, and was always doing his best for the recovery of his problems.

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### **5.1 List of Pictures :**

Picture 1: Lateral collateral ligament of the ankle. (1)

Picture 2: Medial collateral ligament of the ankle.(1)

Picture 3: Anterior compartment of the leg.(1)

Picture 4: Lateral compartment of the leg.(1)

Picture 5: Superficial muscle layers of posterior compartment of the leg.(1)

Picture 6: deep muscle layers of posterior compartment of the leg.(1)

Picture 7: motions of the ankle join. (4)

Picture 8: planes for the ankle joint(4)

## **5.2 List of tables :**

Table No.1: two scales for body weight for both legs .

Table No.2: assessment the level of pelvis for both sides .

Table No.3: balance assessment for left and right lower extremities.

Table No.4: Anthropometric Measurements for left and right lower extremities.

Table No.5: measurements of circumferences for left and right lower extremities.

Table No.6: Palpation of muscles tone for both lower extremities.

Table No.7: Muscle length test evaluation for both lower extremities.

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Table No.9:active Range of motion for left and right lower extremities.

Table No.10:passive range of motion for both ankles .

Table No.11: Joint play examination for both lower extremities.

Table No.12 Deep tendon reflex evaluation for both lower extremities.

Table No.13: pyramidal lesion tests for both sides

Table No.14:final tow scales weight for both legs .

Table No.15:final measurements of circumferences for both lower extremities.

Table No.16: final assessment of muscle tone both legs .

Table No.17: final test for muscle length of both legs.

Table No.18 : final test foe muscle strength for both legs .

Table No.19: final assessment active movement for bath ankle joints.

Table No.20: final assessment passive movement for both ankle joints

Table No.21: Summary of examinations results before and after the therapy

## 6. Application Approval by the UK FTVS Ethics Committee

CHARLES UNIVERSITY  
FACULTY OF PHYSICAL EDUCATION AND SPORT  
José Martího 31, 162 52 Prague 6-Vešslavín

### Application for Approval by UK FTVS Ethics Committee

of a research project, thesis, dissertation or seminar work involving human subjects

**The title of a project:** Case study of physiotherapy treatment of a patient with distal fracture of tibia and fibula of right ankle

**Project form:** bachelor thesis

**Period of realization of the project:** January 2020 - February 2020

**Applicant:** Ghali Bakhit Mohammed Al-shahri, UK FTVS- physiotherapy department

**Main researcher:** Ghali Bakhit Mohammed Al-shahri, UK FTVS- physiotherapy department

**Workplace:** Rehabilitacni Nemocnice Beroun

**Supervisor:** Mr. Janis Lukas

**Project description:** this project will be discuss about the aim of the physiotherapy on patient with fracture of distal tibia and fibula of right ankle. during this study we going to show how is important of the physiotherapy rehabilitation to help the patient to recovery his career as soon as possible after fracture. The method we going to used it in this case study we will explain the anatomy of the ankle joint, physiotherapy assessment e.g. initial kinesiology examination and examination conclusion. the second part will be rehabilitation plan short and long term plan. Therapy session include different treatment methods of physiotherapy and outcome result after each session. Finally we will go to do Evaluation of effectiveness of therapy before and after physiotherapy rehabilitation.

**Characteristic of the participants:** A 31 years old male patient with distal fracture of the tibia and fibula of the right ankle.

**Ensuring safety within the research:** we are using non-invasive methods, the case study is taking in the Rehabilitacni Nemocnice Beroun because patient was admitted, we follow all rules and precautions according to hospital policy. the all prescribes treatment and prevention for patient done by the orthopaedic doctor we are following them. All physiotherapy treatment and methods we used it are observe by supervisor (MUDR. Lenka Havrankova) to avoid risk. Risks of therapy and methods will not be higher than the commonly anticipated risks for this type of therapy.

**Ethical aspects of the research:** The collected data will be anonymized within one week after the end of working with the patient. I understand that anonymization means that the text does not use any item of information or combination of items that could lead to the identification of a person. I will be careful not to enable recognition of a person in the text of the thesis, especially within the anamnesis. After the text has been anonymized, any personal data still kept elsewhere will be deleted.

Photographs of the participant will be anonymized within one week after being taken by blurring the face, parts of the body or any characteristics that could lead to identification of the person. After anonymization any non-anonymized photographs will be deleted.

All collected data will be safely stored on a PC safeguarded by a keyword in a locked room, any data in paper form will be kept safely under lock and key in a locked room. The data will be processed, safely retained and published in an anonymous way in the bachelor thesis.

I shall ensure to the maximum extent possible that the research data will not be misused.

**Informed Consent:** attached

It is a duty of all participants of the research team to protect life, health, dignity, integrity, the right to self-determination, privacy and protection of the personal data of all research subjects, and to undertake all possible precautions. Responsibility for the protection of all research subjects lies on the researcher(s) and not on the research subjects themselves, even if they gave their consent to participation in the research. All participants of the research team must take into consideration ethical, legal and regulative norms and standards of research involving human subjects applicable not only in the Czech Republic but also internationally.

I confirm that this project description corresponds to the plan of the project and in case of any change, especially of the methods used in the project, I will inform the UK FTVS Ethics Committee, which may require a re-submission of the application form.

In Prague, 31 of January 2020

Applicant's signature:

### Approval of UK FTVS Ethics Committee

**The Committee: Chair:**

doc. PhDr. Irena Parry Martinková, Ph.D.

**Members:**

prof. PhDr. Pavel Slepíčka, DrSc.

prof. MUDr. Jan Heller, CSc.

Mgr. Pavel Hráský, Ph.D.

Mgr. Eva Prokešová, Ph.D.

MUDr. Simona Majorová

The research project was approved by UK FTVS Ethics Committee under the registration number: 058/2020

Date of approval: 4.2.2020

UK FTVS Ethics Committee reviewed the submitted research project and found no contradictions with valid principles, regulations and international guidelines for carrying out research involving human subjects.

The applicant has met the necessary requirements for receiving approval of UK FTVS Ethics Committee.

Stamp of UK FTVS

Signature of the Chair of

## 6.1 informed consent form

### INFORMOVANÝ SOUHLAS

Vážená paní, vážený pane,

v souladu se Všeobecnou deklarací lidských práv, zákonem č. 101/2000 Sb., o ochraně osobních údajů a o změně některých zákonů, ve znění pozdějších předpisů, Helsinskou deklarací, přijatou 18. Světovým zdravotnickým shromážděním v roce 1964 ve znění pozdějších změn (Fortaleza, Brazílie, 2013) a dalšími obecně závaznými právními předpisy Vás žádám o souhlas s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie prováděné v rámci praxe na1 ....., kde Vás příslušně kvalifikovaná osoba seznámila s Vaším vyšetřením a následnou terapií. Výsledky Vašeho vyšetření a průběh Vaší terapie bude publikován v rámci bakalářské práce na UK FTVS, s názvem2 .....

Cílem této bakalářské práce je

.....

Získané údaje, fotodokumentace, průběh a výsledky terapie budou uveřejněny v bakalářské práci v anonymizované podobě. Osobní data nebudou uvedena a budou uchována v anonymní podobě a po anonymizaci budou smazána.

V maximální možné míře zabezpečím, aby získaná data nebyla zneužita

Jméno a příjmení řešitele .....

Podpis:.....

Jméno a příjmení osoby, která provedla poučení3.....

Podpis:.....

Prohlašuji a svým níže uvedeným vlastnoručním podpisem potvrzuji, že dobrovolně souhlasím s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie ve výše uvedené bakalářské práci, a že mi osoba, která provedla poučení, osobně vše podrobně vysvětlila, a že jsem měl(a) možnost si řádně a v dostatečném čase zvážit všechny relevantní informace, zeptat se na vše podstatné a že jsem dostal(a) jasné a srozumitelné odpovědi na své dotazy.

Byl(a) jsem poučen(a) o právu odmítnout prezentování a uveřejnění výsledků vyšetření a průběhu terapie v bakalářské práci nebo svůj souhlas kdykoli odvolat bez represí, a to písemně zasláním Etické komisi UK FTVS, která bude následně informovat řešitele.

Místo, datum .....

Jméno a příjmení pacienta ..... Podpis pacienta:

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