

PHYSIOTHERAPY MANAGEMENT IN FIFTH WEEK POST OPERATION OF ANKLE FRACTUR WEBER C IN WONOSARI GENERAL HOSPITAL: A CASE STUDY

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Abstract

Introduction: According to the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), there were 178 million cases of fractures in 2019, a 33.4% increase from 1990. There were 76.4 million cases of fractures in women and 120 million in men. One of the top three anatomical sites for fracture in terms of prevalence is the ankle. The Weber C ankle fracture is a fracture that occur above syndesmosis-level and pronation-external ankle rotation is the most common trauma mechanism. The focus of intervention in the first to fifth week after surgery are minimizing the pain, reduce edema, and increase ankle joint range of motion.

Case Presentation: Mr. B, 23, was taken to Wonosari General Hospital's emergency room following a hard impact on his right leg while playing soccer on Sunday, March 13 in the afternoon. An x-ray examination revealed a complete fractured 1/3 of the distal fibula dextra with a Weber C type of fracture. On Monday March 14, the patient underwent surgery using the ORIF approach without syndesmosis stabilization. Mr. B were advised to see an orthopaedic once a week and were taken to physiotherapy in week five. Following the operation, the patient did exercises to strengthen the thigh muscles as well as the upper body, but no ankle exercises were performed.

Management and outcome: Mr. B received a total of six physiotherapy interventions. The physiotherapy interventions given include: ankle elevation, IASTM, active ROM exercise, hold relax stretching, and strengthening. After undergoing the intervention six times, there was a reduction in pain during dorsi flexion and inversion, as well as a reduction in edema, increase of ankle joint range of motion, an improvement in muscle strength, and an improvement of functional ability (AOFAS).

Discussion: The patient went to physiotherapy at week 5 postoperatively with the condition still wearing the bandage, visible signs of inflammation, and using crutches with non weight-bearing. The intervention administered in week 5 and 6 are aimed at reducing pain, reducing edema, and increasing ankle joint range of motion. At week 6-7 the intervention is added with strengthening and weight bearing exercises.

Conclusion: There was a decrease in pain, edema, an increase in range of motion, an improvement in muscle strength, and an increase in functional capacity after receiving the physiotherapy intervention for six times. A significant improvement is a decrease in pain during dorsi flexion and an increase in muscle strength in plantar flexion.

Keywords: ankle fracture, IASTM, Active ROM exercise, hold relax, strengthening

Introduction

Fractures occur in people of all ages, although the type and location of the fracture vary widely depending on factors such as bone quality and the nature of the trauma (1). Fractures can cause not just physical discomfort, but also substantial psychosocial consequences such as anxiety, depression, and sleep difficulties (2).

According to the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD), there were 178 million fracture cases in 2019, a 33.4% increase from 1990. There were 76.4 million cases of fractures in women and 120 million in men. Most fractures in men occur in middle age (15–44 years), while older women are more likely to sustain a fracture (over 64 years). The most common fractures occur in three anatomical locations: the patella, fibula, tibia, or ankle; the radius or ulna, or both; and the clavicle, scapula, or humerus (3).

According to research on the epidemiology of 9767 ankle fractures, lateral malleolus fractures account for 55% of ankle fractures (4), whereas Isolated Fibula fractures are the most common type of fracture (5). The Fibula is one of the two long bones in the leg. In contrast to the Tibia, the Fibula is a non-weight bearing bone. The fibula is located posterolateral to the tibia and is smaller and thinner. Proximally, the fibula is located posterior to the tibia and forms the knee joint. At the ankle joint, it becomes the lateral malleolus distal to the fibula.

According to the Danis-Weber classification, there are three types of ankle fractures seen from the location of the fracture line at the distal fibula to the syndesmosis. Weber A fracture occurs below the level of the syndesmosis; it is typically stable and is treated conservatively. Weber B is fracture at the level of the syndesmosis and can be treated conservatively or surgically depending on whether or not the ligament has been injured. Weber C fracture occurs above the level of the syndesmosis, it is usually unstable and requires operative treatment (6). Weber C ankle fractures can cause instability in syndesmosis (7). Ankle fractures can also be accompanied by injury to the cartilage and ligaments as well as diastasis at the distal tibio-fibular joint (8).

The most frequent causes of distal fibula fractures are torsion, falls, and various levels of sport activity. For type C fracture, torsion represents 3.7% of cases while falls and sports related trauma represent 28% and 21% of cases, respectively (9). The most frequent mechanism of injury in Weber C fractures is pronation-external rotation (PER) of the ankle and mostly unstable (7). Ankle fractures can be treated conservatively or surgically. When the ankle is stable, conservative treatment is usually used, whereas surgical treatment is used when the ankle is unstable (10). The goal of operative or surgical treatment is to restore ankle structure and allow for early mobilization (11). The typical ankle treatment is open reduction internal fixation (ORIF) with a plate and screw (12). Complications of surgical treatment include residual pain, posttraumatic OA, deep infection,

malunion, arthrofibrosis, complex regional pain syndrome, implant breakage, superficial infection, and impaired wound healing (13).

Pain, swelling, decreased range of motion, and decreased muscular strength were discovered in post-operative ankle fractures. Physiotherapy treatments for ankle fractures such as early ankle movement (14), early weight-bearing (15), manual therapy (16), gait retraining (17), strengthening, balance exercise, and coordination (18). Physiotherapy following ankle fracture surgery attempts to reduce pain, reduce edema, increase range of motion, muscle strength, and restore functional ability.

The basis of all rehabilitation protocols in ankle fractures is to look at the biologic and biomechanical aspects of bone and soft tissue healing. According to an analysis of 213 protocols on foot and ankle fractures, it was stated that physiotherapy intervention could be given in the first week after surgery. In week 1 to 5 after surgery the focus of intervention is to minimize pain, reduce edema, and increase joint range of motion. At week 6, the procedure without syndesmosis stabilization was performed with full weight bearing, while the operation with syndesmosis stabilization was performed with partial weight bearing (19).

Case Presentation

Mr. B, 23, was taken to Wonosari Hospital's emergency room following a hard impact on his right leg while playing soccer on Sunday, March 13 in the afternoon. X-ray findings revealed a *complete fractured* 1/3 of the distal fibula dextra with ankle fracture above syndesmosis level and dislocated ankle. The patient was then scheduled for surgery on Monday, March 14. The surgery started at 10 a.m. and finished at 11:30 a.m. At 13.00 pm, the patient began to regain consciousness, and a postoperative x-ray examination was performed. The findings shows the operation using ORIF without syndesmosis stabilization. On Wednesday, March 16, 2022, the patient was discharged.

Mr. B were advised to see an orthopedic once a week on Wednesdays. The bandage was replaced in the first week. Both bandages and sutures are removed in the second week. The patient requested to be referred to medical rehabilitation in the third week. Following the operation, the patient did exercises to strengthen the thigh muscles as well as the upper body, but no ankle exercises were performed. The patient does not move the ankle dextra other than for functional activities. The patient was under the care of a medical rehabilitation specialist in the fourth week after the operation. and in the fifth week following the operation, the patient came to the Wonosari Hospital's medical rehabilitation or physiotherapy installation.

The patient first arrived at the Wonosari Hospital's Physiotherapy clinic using crutches with non-weight bearing. Mr. B still wearing the bandage, and there are indicators of inflammation such as swelling in the right ankle and tarsal-metatarsal area, a blackish red color to the ankle, an increase

in the temperature of the right ankle area (37.6°C), and pain when moving the dorsi flexion and inversion. There are still unhealed wounds. There are limited range of motion in dorsiflexion, plantar flexion, and inversion. The tendon of the gastrocnemius reflex is normal. There is stiffness in the right foot's toes. The right ankle's sensory area was normal. There was no numbness or tingling found.

Table 1. Measurement

Measurement Category	Measurement Tool	Result
Pain	Numeric Pain Rating Scale (NPRS)	Dorsal Flexion: 3/10 Plantar flexion: 0/10 Inversion: 4/10 Eversion: 0/10
Range of Motion	Goniometer	Dextra S: 5°-0-15°, F: 5°-0- 10° Sinistra S: 20°-0-20°, F: 20°-0-10°
Odema	Midline	D: 68 cm, S: 55 cm
Muscle strength	Manual Muscle Testing (MMT)	Plantar flexion = D: 2, S:5 Dorsal flexion = D: 4, S: 5 Inversi = D: 4, S: 5 Eversi = D: 5, S: 5
Functional Ability	The American Orthopaedic Foot and Ankle-Hindfoot Scale (AOFAS)	50 (poor)



(a)



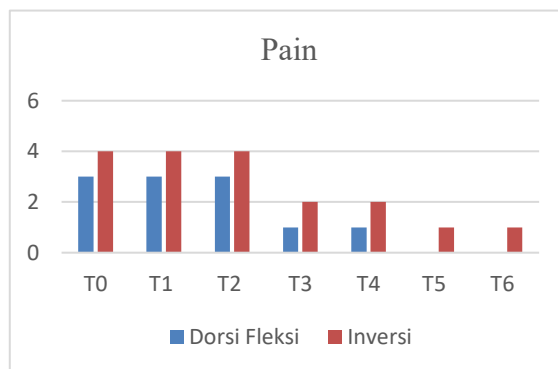
(b)

Picture 1. (a) X-ray pre-op (b) X-ray post-op

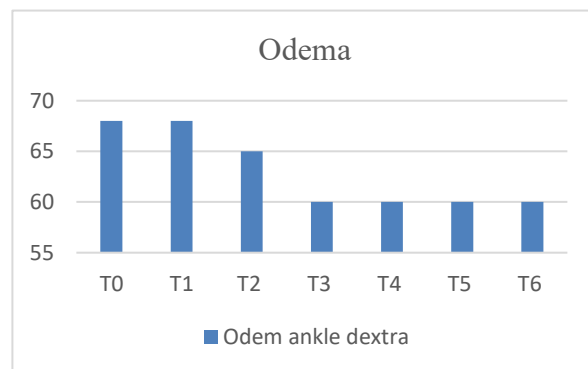
Management And Outcome

Table 2. Physiotherapy Management

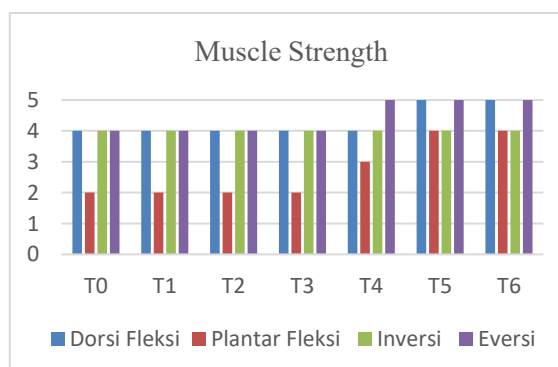
Week 5-6		
Intervention	Dosage	Information
Ankle elevation	5 minutes	Using hard pillow 20 cm heigh
Active ROM exercise	2 set, 8 repetition	Both ankle
Isometric exercise	2 set, 5 sec hold, 8x repetition	Using wall as resisted tool
Knee to wall	2 set, 8x repetition	Distance: 2 cm
Seated calf rise	2-3 set, 8 repetition	Seat on a chair, 2 LA and 3 RA
Towel exercise	2-3 set, 8 repetition	Seat on a chair, 2 LA and 3RA
Week 6-7		
IASTM	5 minutes	Using Easy Move, proximally
Hold-relax	3 set, 8 rep, Passive stretch 7 sec, isometric contractions 7 sec, relax 5 sec, passive stretch 7 sec (20)	Wall as resisted tool
Strengthening exercise	3 set, 8x repetition	Using miniband
Knee to wall	3 set, 8 repetition	Distance: 4 cm
Weight bearing exercise	2 set, hold 5 detik, 8 repetition	Both leg
Calf rise (double leg)	2 set, 8 repetition	Face the wall



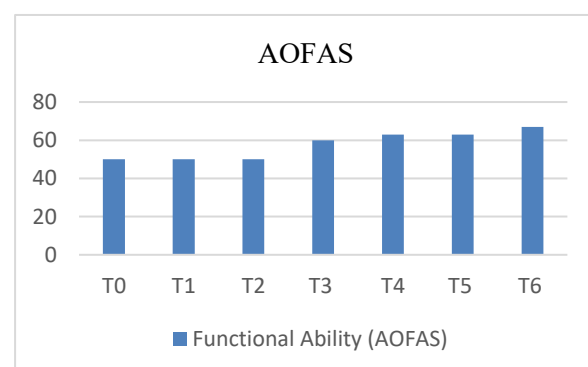
(a)



(b)



(c)



(d)

Picture 2. (a) Pain (b) Odema, (c) Muscle Strength (d) AOFAS

Table 3. Range of motion

Plane	T0	T1	T2	T3	T4	T5	T6
Sagital	5°-0-15°	5°-0-15°	5°-0-15°	10°-0-15°	10°-0-25°	10°-0-25°	10°-0-30°
Frontal	5°-0- 10°	5°-0- 10°	5°-0- 10°	10°-0- 10°	10°-0- 10°	10°-0- 10°	10°-0- 10°

Discussion

Mr. B met a physiotherapist in the fifth week after surgery. The patient only moves the ankle when doing functional activities. There were still signs of inflammation such as swelling, redness, and an increase in temperature. There was no change following the initial intervention. The incision wound closed, the redness began to fade, there was less discomfort, decrease of edema, mincrease muscular strength, and increase joint range of motion after the intervention six times. From the first to the sixth encounter, the patient walks with non weight-bearing.

There is a decrease in pain in the dorsi flexion motion from 3 to 0 and inversion from 4 to 1, a decrease in edema from 67 cm to 60 cm, an increase in muscle strength in the dorsi flexion movement from 4 to 5, plantar flexion from 2 to 4 , eversion from 4 to 5, and there is no increase in range of motion in inversion motion. There is an increase in functional abilities with AOFAS from 50 (poor) to 67 (fair).

Dorsi-plantar flexion (pumping ankle) and inversion-eversion are active rom exercises. Muscle contractions are caused by the pumping ankle in order to pump blood to the heart. Ankle pumping is commonly used to relieve edema and avoid deep vein thrombosis (DVT). Pumping ankle is done supine with the feet lifted by 18° and being hold for 4 seconds. In this case, the patient Mr. B still feels pain when moving the dorsi flexion, so pumping ankle exercises are given in an elevated position so that the blood flow to the heart is assisted by gravity and not cause too much stress while moving the ankle. When compared to pumping ankle without rest, a 4 second rest interval increased peak systolic velocity (PSV) and time-averaged maximum flow velocity (TAMV) (21).

Instrument assisted soft tissue mobilization (IASTM) is an intervention that refers to the James Cyriax principle. IASTM is applied using an instrument or tool in the form of stainless steel which is specially designed for soft tissue mobilization (22). The two most popular approaches to IASTM are the Graston Technique and the Tecnica Gavilan (23). IASTM can provide myofascial release, reduce nociceptive interference, and increase the mobility of underlying tissues (24). The presence of myofascial release and increased mobility of the tissue can indirectly lead to an increase in the range of motion of the ankle joint. In addition to increasing the range of motion of the ankle joint, IASTM can remove scar tissue that forms in soft tissue and aid in the healing process by activating fibroblasts (25).

Normal ankle movement is very important in the walking process. The ankle movement is intended to produce a spinning motion similar to that of a wheel. In the early stance phase, ankle flexion dorsi is essential for initial contact. At the completion of the stance phase and the start of the swing phase (initial swing), ankle plantar flexion is necessary (26). In the walking process, limited dorsi and plantar flexion movements result in a loss of initial contact and swing. Limited ankle dorsi flexion motion in closed kinetic chain (CKC) causes reduced tibial movement in the talus, decreased knee joint motion, and decreased absorption capacity of the talus eccentric loads. This can lead to a compensatory increase in knee and hip movement (27). To increase the range of motion in ankle dorsi flexion, hold-relax and knee-to-wall exercises were given.

Hold-relax is performed with a combination of static stretching and isometric movements of the agonist muscle in an outstretched position (28). When the muscles flex in PNF stretching, the tendons are also stretched. This results in diminished nociception (pain) and inhibition. The glomus tendon organ (GTO) adjusts to changes in the elongation or length and position of the force threshold, allowing for the production of larger forces (29). There was also a decrease in α -motoneuron activity in the antagonist muscle, which resulted in muscular relaxation and decreased resistance (30).

The balance of weight support is critical when walking. Imbalance of weight support might lead to new problems to the dominant side of the body. During the intervention Mr. B walks with non-weight bearing. Therefore needs to learn how to shift body weight in order to do partial weight bearing in near time. Weight-bearing exercises are performed to introduce a comfortable weight-bearing position that is safe and in range of patient's tolerance and give sense of surface to the tarsal. Physiotherapy intervention were given six times and end at the seventh week post operation. Mr. B were assigned to do post check with medical rehabilitation clinician after sixth times physiotherapy session and were given instruction to do partial weight bearing.

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