

# Kinesitherapy in trimalleolar fracture – case report

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## Abstract

The purpose of the paper is to prove the efficacy of a kinesitherapeutic program in the recovery of a patient with trimalleolar fracture of the left lower limb. We present a 42-year-old patient with a trimalleolar fracture and paresis of n. peroneus communis. Kinesitherapy was performed after thirteen weeks of surgery for ten consecutive days. The kinesitherapeutic means included: cryotherapy, lymphatic drainage massage, isometric contractions for the femur muscles, active exercises with and without resistance, active exercises with and on gymnastic apparatuses, post-isometric relaxation for the sciatic musculature and m. triceps surai, training in walking. As a result of the kinesitherapeutic exercises, the ankle swelling decreased. The volume of movement increased, pain was reduced as well as the muscle spasm in the ankle joint. The gait improved.

## Keywords

kinesitherapy, trimalleolar fracture

## Introduction

The ankle structure is consistent with providing stability and mobility in the distal part of the lower limb (Becheva et al. 2016a).

The foot should be a stable base and take the body weight while standing with minimal expenditure of muscle energy. It must be able to absorb the forces of the reaction of the support and adapt to the unevenness of the ground, as well as stand as a rigid mechanical lever, which performs the body propelling force in walking and running (Holevic 2008).

Trimalleolar fractures affect both malleoli and the calcaneus. These fractures are due to high energy trauma. The mechanism of sustaining a trimalleolar fracture can be attributed to forces acting on the longitudinal axis of the shank with strong foot flexion. The talus exerts a strong

pressure on the back of the joint surface, causing a fracture at the back of Volmann (Vladimirov 2000).

Anatomical features are susceptible to various combinations of traumatic injuries (Becheva et al. 2016b).

Ankle joint fractures have an important medical and social significance as they result in a long loss of man's ability to work. The performance of kinesitherapy in patients with trimalleolar fractures is of great importance because it helps to restore the support function of lower limbs and thus avoids the inconveniences that patients are threatened to develop in the absence of kinesitherapy (Popov 2009a).

## Case description

We present a 42-year-old patient who sustained fracture trimalleolaris cruris sinistra of pronation and abduction

type (Lange-Hausen). The patient is subjected to open reposition and metastatic osteosynthesis with a 6-screw plate, a syndesmotic screw, and a spongiotic screw for the medial malleolus. The fracture resulted in paresis of n. peroneus communis. He visited the Diagnostic Center to undergo rehabilitation procedures thirteen weeks after the surgery.

We performed the kinesitherapy procedure on a daily basis – once a day. The duration of the complex was 30–40 minutes. The average number of procedures within the treatment was 10. The kinesitherapeutic means included: cryotherapy, lymphatic drainage massage, isometric contractions for the femur and sternum muscles, active exercises with and without resistance, active exercises with and on gymnastic apparatuses, post-isometric relaxation for the sciatic musculature and m. triiceps surai, training in walking, climbing and descending stairs with aids.

We used a visual analogue scale for pain, centimetry, angulation, manual muscle testing of dorsal and plantar flaps in ankle joints, at baseline and at the end of the rehabilitation course, to determine the functional deficit and to objectify the results. (Table 1, Table 2).

The patient reported a left ankle joint pain in motion assessed at 5 on the VAS at the beginning of outpatient treatment. At the end of the period of the applied kinesitherapeutic program, the pain symptom was assessed at 2.

The results from the ankle joints angulation at baseline and at end indicate a difference of 1.5 cm of persistent left ankle edema.

The purpose of the applied kinesitherapy was maximal functional reconstruction of the ankle joint in order to restore the normal supporting function of the lower limb.

Considering the deficiency of the affected structures, the tasks we have set were to reduce the pain and swelling, normalize the volume of movement in the left ankle joint, prevent contractions, correct muscle imbalance, improve the circulation in the limb and the perceptions in the traumatized ankle joint, as well as gait recovery.

We applied cryotherapy from supine position for 3 minutes. It takes 3×2 minutes with a rest for 3 minutes. During the rest, the patient performed dorsal flexion on a foot with extension of finger-muscular pump. We performed lymphatic drainage massage of the affected limb from proximal to distal. We started with active exercises for the finger joints of the affected limb, careful not to cause painful stimuli.

We debuted with isometric contractions for the femoral and gluteal muscles, pulled the patella latero-laterally and cranio-caudally, then switched to isotonic contractions of an anti-gravitational position for m. quadriceps femoris, and at the end of the procedures we worked out the femoral muscles into eccentric mode. At the beginning of the procedures, we applied an active-assisted left ankle joint of 7–8 repetitions for training the lateral stabilizers of the foot (m.fibularis lonqus et m. fibularis brevis), as well as active-assisted dorsal flexion in the left ankle for the work-out of the m. tibialis anterior.

**Table 1.** Results of ankle joints angulation.

	Left ankle joint	Right ankle joint
At baseline	S: 10°-0°-34°	S: 20°-0°-42°
At end	S: 14°-0°-39°	S: 20°-0°-42°

**Table 2.** Results of muscle strength.

	Left ankle joint	At baseline	At end
1	m. tricep surae	3	4
2	m.tibialis anterior	2	3
3	m.tibialis posterior	3	4
4	mm. fibularis lonqus et fibularis brevis	2	3

To support the arch of the foot, we applied an exercise involving collecting objects with the toes of the injured limb and put the foot on the gym wall. In order to improve the proprioception of the operated limb, from a baseline sitting position we placed a ball under the foot of the damaged limb and instructed the patient to hold the ball, while we carefully pulled the ankle out of equilibrium-latero-laterally and ventrodorsally. We trained the patient in walking, climbing and descending stairs. When climbing, he first put the elbow crutches, then the healthy limb and finally the operated one. On descend, he first put the elbow crutches, then the operated limb before the healthy one.

## Discussion

After the course of treatment, we found a significant improvement in the patient's functional status. The pain symptom reduced due to improved afferentation (Abelton et al. 2007), at the end of the course of treatment, the pain manifested itself only in the final volume of motion in plantar flexion. (Popov 2009b).

Despite the partially improved stabilizer function of mm. fibularis lonqus et fibularis brevis, postural reactions were disturbed in the lateral direction, and therefore we recommended to the patient ankle-foot orthosis, which contribute to the improvement of responses to all perturbations to the affected side (Cikajlo et al. 2016).

The edema in the area of the two malleoli underwent a gradual reversal as a result of the applied cryotherapy and lymphatic drainage massage (Ghozlan 1989). We applied a series of isotonic contractions for the femoral muscles of the left lower limb (Popov et al. 2013). Despite our efforts, the swelling has diminished but has not completely disappeared.

The restoration of the volume of plantar flexion was due to the application of a post-isometric relaxation for m. triiceps surai (Chanussot 2005). The strength of m.tibialis anterior was increased due to the use of analytical exercises for dorsal flexion with ankle joint suppression. Initially, it was only in the antigravity position, and later on moderate resistance. Table 2 shows that there is a lag in mm. fibularis lonqus et fibularis brevis, which, in our opinion, is due to the overlapping pain in the foot lateralization (Quesnot and Chanussot 2010).

We also found improvements in walking with aids, which we attribute to the exercises for the sciatic musculature and m. quadriceps femoris initially in an open kinetic circuit with isotonic and eccentric contractions, and later on the lower limb load in a closed kinetic circuit (Takki Chebihi 2009). At first the gait was uncertain and incorrect. We trained the patient to walk by first putting the crutches forward, and then the sick foot was placed on the crutches line. After placing the weight on the two crutches, he stepped back on his sturdy leg. At the end of the treatment course, the gait was correct and the patient performed self-service activities as well as climbing stairs (Tityanova 2007)

We recommended the patient to using ankle-foot orthosis to improve gait and safety in climbing.(De Bruijn et al. 2007).

## Conclusions

As a result of the studies performed and the results obtained at the end of the treatment, it can be concluded that kinesit-

herapy is a major component in the treatment of trimalleolar fractures. The recovery process is a complex mechanism and is influenced by a number of factors. Swelling around the ankle has reversed. There was also an increase in movement volume in the joints of the affected limb due to the increase in muscle strength and the reduction of pain and muscle spasm. The patient was trained to walk independently and properly with aids and to carry out activities from everyday life.

Patient rehabilitation guidelines were provided to maintain and improve the results achieved. Functional recovery of the lower limb after a tri-malleolar fracture depends both on the correct kinesitherapy methodology and on the patient's activity in the healing and rehabilitation process.

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