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The use of Kinesio Taping in edema treatment after primary knee arthroplasty. A case study

Magdalena Sobiech¹, Maciej Kochman¹

¹ Department of Rehabilitation and Orthopedics, Medical University of Lublin, Jaczewskiego 8 Street 20-090 Lublin, Poland

Corresponding author: Magdalena Sobiech, ORCID ID 0000-0003-4923-5444
e-mail: magda.sobiech@op.pl

Abstract

A knee joint is one of the most exposed to the degenerative injuries causing pain and reducing motion abilities. In case of ineffective conservative treatment and advanced degenerative changes, a patient may be referred for knee arthroplasty. This surgery is often followed by pain and limb edema. Postoperative treatment can be supported by the Kinesio Taping. This paper aims to present the Kinesio Taping as a supportive post-surgery pain and edema treatment after knee arthroplasty. The 67-year-old-patient has been treated conservatively for the last 7 years. Due to the deteriorating changes and increasing pain the patient had been referred for the left knee arthroplasty procedure. After the surgery, the patient was stable, therefore the standard post-surgery procedures were implied. On the 3rd day, the lymphatic technique of the Kinesio Taping was added. After the end of the therapy (10th day after the surgery) the tests have shown a significant decrease of subcutaneous tissue swelling, pain relief, and knee joint circumference reduction.

Key words: arthroplasty; Kinesio Taping; edema; pain; ROM

Introduction

Degenerative diseases are one of the most common causes of pain and disability. The knee joint is one of the most exposed to deformities and degenerative changes. Its vulnerability is directly connected with its construction (with ligamentous system playing the most integral stabilizing role), localization, and function (e.g. carrying heavy loads) [1, 2, 3].

Disease progression causes the malformation of the limb axes, increased pain, decreased range of motion, and edema, which significantly influences the quality of patients' life. In the early stage of the degenerative process, voluntary pharmacological treatment and physiotherapy are implemented. In case of advanced injury, lack of improvements in knee joint functions, and far-reaching degenerative changes confirmed by the radiological tests, the patient is referred for artificial knee joint surgery. The above mentioned procedure aims to correct the degenerated joint position, relieve pain, and increase ROM [4].

Full recovery after the total knee joint replacement depends on many factors such as the advancement of degenerative changes, surgery technique, or periosteal response [5].

In the recovery process, it is essential to undergo physiotherapy, starting from the first day after the surgery. During the recovery, the patient is confronted with the intense pain of the limb and swollen knee, which makes the rehabilitation process slower, and delays full recovery.

One of the physiotherapeutic methods, supporting the healing process 24/7 and possible to apply straight after the surgery is Kinesio Taping.

This paper presents therapeutic measures and post-surgery problems such as subcutaneous tissue swelling, pain, and decreased range of motion, based on the case study of the patient who has undergone the primary knee arthroplasty.

Case description:

The 67-year-old-patient patient has been treated conservatively for 7 years due to knee joint degeneration in the rehabilitation clinic of Independent Public Clinical hospital no 4 in Lublin. In 2018 the patient was referred for the surgery procedure (artificial left knee joint replacement) due to increasing degenerative changes and intensified knee pain. At the time of the initial medical examination in our department, the patient's height was 176cm and body weight was 84.0 kg (BMI=27,1). The overall state of the patient's health before surgery was good, he was able to move independently without any orthopedic equipment. He was unable to walk long distances and climb the stairs. The patient went through orthopedic and anesthesiological tests positively. The measurement of the advancement of the degenerative change on the x-ray scans was based on the Kellgrena-Lawrence and Ahlbäck scales. (Pic. 1a, Pic. 1b) (Tab. 1).



Pic. 1a. X-ray scan of the knee joints before the surgery (front-rear)



Pic.1b. X-ray scan of the left knee joint (side)

Table 1. The analysis of the degenerative disease progression on x-ray scan based on the Kellgrena-Lawrence's and Ahlbäck's scales

The knee joint degenerative disease progression based on:	
Kellgrena-Lawrence scale	4
Ahlbäck scale	4

The patient's surgery took place in March 2019 in the orthopedics and surgery department of Orthopaedics and Rehabilitation Clinic in Lublin. During the surgery the front cemented CR, Genesis II Smith & Nephew knee replacement was inserted. After the surgery patient's state remained stable. The standard procedures in analgesic and anti-inflammatory treatments were

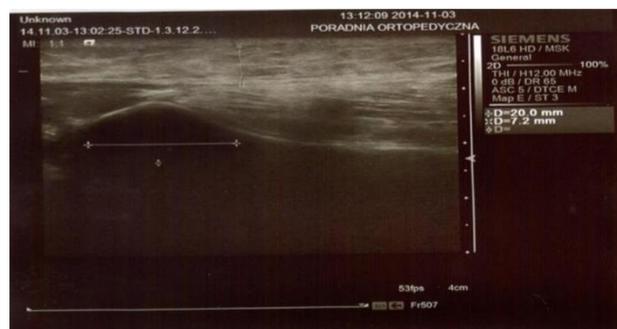
provided. To relieve pain, straight after the surgery, the patient was given opioid painkillers (Oxynorm). To prevent the swelling effect, his leg was bandaged and elevated. From the first day after the surgery, the patient underwent the recovery process. The therapy consisted of:

- Diaphragmatic breathing exercises.
- Blood clots prevention exercises.
- Slow knee and hip bending exercises.
- Isometrics leg muscle exercises.
- Passive range of motion exercises.

The second day after the surgery a surgical drain was removed, and gradual upright sitting exercises were introduced (sitting on the side of the bed). In the following days, the patient started walking exercises with elbow crutches. On the 3rd and 8th day after the surgery, a thickness of edema was tested, using Siemens ACUSON S2000 HELX EVOLUTION with an ultrasound probe 18L6 HD, to measure the swelling thickness of the subcutaneous tissue above the calf bone. The tests were made at a height of the top of the head of the fibula, 25 mm and 50 mm below the neck of the calf bone on the longitudinal leg axis (Pic. 2a, 2b). Additionally, on the 3rd day after the USG test, the treatment was reinforced with Kinesio Taping application, following the lymphatic technique. On the lateral part of the knee, 10 mm wide tapes were applied, in a fan form. The proximal points (tape base) applied without excess tension were placed at height of popliteal fossa, lymph glands, head of calf bone and medial knee. The distal points, so-called tails, were applied with 15% of tape tension and reached the lateral ankle and medial tibia (Pic.3). On the 5th day of the treatment, the tapes were removed, and USG tests were retaken to measure the thickness of the tissue in the above-mentioned points (Pic. 4a, 4b).

On the 3rd and 8th day after the surgery, the range of motion of the knee joint was tested using a goniometer and the thickness of the tissues on the knee joint was examined (using centimeter) at the height of the head of the calf bone, 25 mm and 50 mm below the neck of the calf bone. To measure pain intensity the VAS (1-10) scale was used. Apart from the above-mentioned methods, cold pack compresses were applied.

After the 10th day of the treatment, the patient was discharged home, achieving the strength of quadriceps muscle - 4 on the Lovett scale and 100-degree knee joint angle. The patient was able to walk long distances, and climb the stairs with elbow crutches.



Pic. 2a. Measurement on the USG scan at the height of the top of the head of the calf bone



Pic. 2b. Measurement on the USG scan 25 mm and 50 mm below the neck of the calf bone on the longitudinal leg axis



Pic.3. The application of the lymphatic technique of Kinesio Taping



Pic. 4a, 4b. Pictures of the skin tissue after the dynamic tape removal

The Kinesio Taping application was tolerated well by the patient and did not limit him from daily activities and the rehabilitation process.

Tab 2. Test results of limb circumference, pain responsiveness, and range of motion analyses

Parameters measured on the longitudinal leg axis (mm)	3 day (mm)	8 day (mm)	Difference (mm)
At the top of the head of the calf bone	10,4	8,2	3,2
25 mm below the neck of the calf bone	7,9	5,8	0,2
50 mm below the neck of the calf bone	7,9	4,7	2,2
Circumference at the top of the head of the calf bone	38	36	2
Circumference 25 mm below the neck of the calf bone	37	36	1
Circumference 50 mm below the neck of the calf bone	37	36	1
Knee bending angle	30	75	35
VAS scale	4	3	1

10 days after the knee joint replacement, the results of the tests showed a significant decrease of the edema. Especially, the parameters measured at the height of the head of calf bone (3,2 mm on the USG scan, using 2 cm centimeter) proved the clear improvement in the knee circumference. Moreover, after the 5th day of the therapy, the VAS scale research proved that the knee pain decreased by one point, and the range of motion increased up to 35 degrees.

Discussion

The rehabilitation process after the artificial knee joint replacement is mostly based on traditional therapy focused on kinesiotherapy. Implementing modern and non-invasive physiotherapeutic methods as Kinesio Taping (KT) precipitates the process of recovery. KT method enhances tissue regeneration and subcutaneous absorption reducing pain, and improving joint range of motion (ROM).

The Kinesio Taping was developed in the 70s of the 20th century by Japanese chiropractor dr. Kenzo Kase. It is commonly used in the treatment of soft tissue injuries such as shoulder joint damage, spinal pains, or lymphedemas. It is quite recent that the KT method has been included also in physiotherapy treatments, it is a new but dynamically evolving method.

The Lymphatic technique of KT bases on the application of a special dynamic tape that has a thickness and weight similar to the properties of the skin. Tape application does not limit the joint range of movement because of the elastic and stretching material. This method uses natural self- healing organism processes. The theory of dynamic tape says that applying tape on the skin, makes it move slightly upwards and enlarges the space between skin and fascia. This process causes stasis and edema reduction [6, 7, 8].

One of the theories explaining the analgesic effect of the KT method says that keeping the skin up reduces the pressure on the nociceptors in subcutaneous tissues. It was also included in the treatment of whiplash syndrome, degenerative knee joint injury, spinal pains, or anterior cruciate ligament reconstruction (ACL) [9-16].

KT method causes the normalization of the muscle and fascial tension and facilitates the come back to correct skin and fascia positioning. Additionally, patients' proprioception perception improves. The reconstruction of proprioception plays a significant role in post-surgery joint physiotherapy. Pressure and tension of the tape stimulate skin mechanoreceptors, sending the information about a joint setup [17,12,13].

Another numerous researched topic is the measurement of the range of motion improvement. Thelen and Hsu researched the range of motion of shoulder joints - comparing the results of the patients who applied tapes with those who did not. The research showed that the group treated with the Kinesio Taping method achieved better results and a more significant range of motion improvement in comparison to the control group [18,19].

Kinesio Taping offers a wide range of applications, especially in the lymphatic edema treatment. It can also be used for oncological patients' treatment, e.g. after mastectomy [20,21]. Another test proving the effectiveness of the KT method was researched by Ristov after surgeries of temporomandibular joints[22].

Both ours and Donec's research prove a statistically significant decrease in the injured leg circumference in the group that has undergone the process of KT treatment. Donec et al. applied the KT method in the first days after the knee joint replacement surgery. They analyzed the pain relief, motion range improvement, and minimized swelling.

The measurement of the therapy progress, and decreased edema, using an ultrasound machine, provides more objective test results and detailed parameters of subcutaneous tissue thickness. Furthermore, it displays a broader possibility of soft tissue analysis.

To conclude, the dynamic application is a safe and non-invasive method that reduces swelling effectively, therefore it also improves range of motion and reduces the pain. It is a non-invasive technique applicable within the first days after the surgery, that enhances the self-healing tissue processes.

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