

Evaluation of the effectiveness of kinesio taping application in a patient with secondary lymphedema in breast cancer: a case report

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Abstract

Breast cancer-related lymphedema is one of the complications resulting from treatment. It is defined as arm oedema in the breast cancer patients caused by interruption of the flow of the axillary lymphatic system from surgery or radiation therapy, which results in the accumulation of fluid in the subcutaneous tissue of the arm, with a decrease in tissue distensibility around the joints and an increased weight of the extremity.

Decongestive lymphatic therapy is common management for lymphedema. A program combining skin care, manual lymphatic drainage, exercise, and compression therapy (multilayer bandage or garment) is recognised as the best practice in lymphedema management.

Kinesio taping (KT) for lymphatic drainage is a new choice in the field of physical therapy. The material and the original concept of the taping technique were introduced by Dr Kenso Kase in 1973. K-tape had been designed to allow 30-40% longitudinal stretch. It is composed of 100% cotton fibers and acrylic heat sensitive glue. Development of the technique for its administration is still ongoing.

The paper discusses the case of a woman with breast cancer, in whom lymphedema occurred. The patient had three weeks of therapy. The treatment consisted of 12 manual lymphatic drainage, 12 pneumatic compressions and 3 applications of the KT method (due to the lack of standard multi-layer bandaging). During the measurement of oedema it was noted that KT had a significant effect on the reduction of lymphedema and accelerates healing effects compared to standard methods.

Key words: lymphedema, kinesio taping, physical therapy, breast cancer.

Introduction

One of every four breast cancer patients suffers from lymphedema [1]. Breast cancer-related lymphedema is one of the complications resulting from treatment. It is defined as arm oedema in the breast cancer patient caused by interruption of the flow of the axillary lymphatic system from surgery or radiation therapy, which results in the accumulation of fluid in the subcutaneous tissue of the arm, with a decrease in tissue distensibility around the joints and an increased weight of the extremity [1-3].

Upper limb lymphedema occurs in 24-59% of the cases with total mastectomy and in 2.4-49% of the cases with axillary lymph node dissection [4, 5]. According to Todd [6], in Great Britain and Western Europe, upper limb secondary lymphedema has been reported in 22% of patients after breast cancer therapy.

Breast cancer-related lymphedema may have a physical, psychological, and functional impact, and it increases

the risk of repeated episodes of superficial infection. It is worth placing importance on the intervention of secondary lymphedema [2].

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Kinesio taping (KT) for lymphatic drainage is a new choice in the field of physical therapy. The material used for the KT and the original concept of the taping technique were introduced by Dr Kenso Kase in 1973. K-tape had been designed to allow 30-40% longitudinal stretch. It is composed of 100% cotton fibers and acrylic heat sensitive glue. Development of the technique for its administration is still ongoing. Dr Kase claimed that applying KT would have physiological effects including decreasing pain or abnormal sensation, supporting the movement of muscles, removing congestion of

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lymphatic fluid under the skin, and correcting misalignment of joints. After applying the K-tape, the taped area will form convolutions to increase the space between the skin and muscles. Once the skin is lifted, the flow of blood and lymphatic fluid is promoted [7, 8]. Another advantage is that a patient can take a shower without taking the tape off since it is waterproof. Patients can wear it for 1 to 3 days and even longer if it is applied on the back or buttock area.

Many practitioners use it in clinical practice in Poland, and it has a beneficial effect. However, there is insufficient evidence for its clinical effects on lymphedema limbs.

In this report we present the case of a patient after mastectomy, whose lymphedema was reduced by KT as a part of decongestive lymphatic therapy.

Case study

A 62-year-old woman was admitted for decongestive lymphatic therapy in October 2012. In June 2005, the patient was diagnosed with a tumour in the right breast (after mammography, NMR and needle biopsy, the Paget cancer was recognised) and qualified for modified radical mastectomy (with resection I and II floor of lymphatic nodes). She underwent chemother-



Fig. 1. KT application in the presented case study

apy (Nolvadex for one year) and external radiotherapy (dose of 45 Gy in 20 sessions).

Four years later, the patient started suffering from upper limb lymphedema, located mostly in the arm and forearm. She also complained of limb skin and subcutaneous tissue pressure pain. The skin was stretched and painful and it was not possible to mobilize it.

Finally, in autumn 2012, the woman started a 3-week individual physical therapy program in Lymph – Med Clinics in Chorzow (12 procedures of intermittent pneumatic compression, 12 procedures of manual lymphatic drainage and 3 applications of KT). The K-tapes were recommended due to the lack of standard multi-layer bandaging, because during the interview it appeared that she had been suffering from diabetes for 24 years (and in 2008, she had an episode of diabetic polyneuropathy and consequently permanent impairment of sensation in the hand and forearm, and local paresthesia). She had arteriosclerosis and hypertension, too. There were contraindications for standard multi-layer bandaging or compression hosiery.

From the first to the fourth day of each week, the patient was subjected pneumatic and manual drainages, and from the fifth to the seventh day the woman was under the action of KT dynamic method.

Manual lymphatic drainage was applied by a therapist to develop central (techniques on “venous angles” – in the subclavian vein area on chest), referred to the receptaculum chyli and retroperitoneal nodes (combined with exercises of diaphragmatic breathing) and finally the whole drain segmented upper limb. The massage lasted 50 minutes.

The patient received also 12-chamber intermittent pneumatic compression therapy. The Flowtron Hydroven 12 System device was applied to compress the cuff covers of the hand, forearm and arm. The external pressure was 90 mm Hg. Ventricular filling time in each chamber was 15 s. A single setting lasted 45 minutes.

On the fifth day of each week, a lateral anterior upper limb taping application was used. The fan tape anchor started at the anterior aspect of the hand with no tension. The tails of the tape were applied to the anterior, medial and posterior aspects of the forearm and arm with 5-15% tension, and then on the anterior part of the chest (Fig. 1). The tapes were left on the patient's skin for the next three days.

To assess the volume of the limb we used an optoelectronic Perometer 400 T, co-operating with a personal computer. This method allowed to estimate the volume of the measuring error to be only 0.5%. The assessment technique based on a special ring, equipped with a system of 378 LED diodes (emitting the infrared radiation). The ring also comprised optical sensors that receive electromagnetic stimuli. In the course of measuring, the limb was located inside the ring on the diode-sen-

sor lines. The registered light pulses on the detectors was turned into electronic signals. The graphical software presented the results (Fig. 2).

After a 3-week program a significant reduction of lymphedema was noticed – the upper limb volume decreased by 627 cm³ compared to baseline (Table I). During the first four days of therapy (manual lymphatic drainage and intermittent pneumatic compression) oedema was reduced by 31 cm³. For the next three days, the patient had only K-tapes, which stimulated a reduction by 194 cm³. In the second week of the use of standard treatment, on day 11 a further reduction in the volume of 51 cm³ was observed, but after KT the oedema decreased by 206 cm³. Similarly, in the last week after standard treatment on day 18 a reduction was only 40 cm³, and after application of KT we observed again acceleration in oedema reduction – 105 cm³.

During the whole therapy we recorded a steady and gradual reduction in limb volume, but this process was much faster after K-tapes.

Discussion

The effectiveness of basic lymphedema physiotherapy methods, such as multi-layer bandaging, manual lymphatic drainage or decongestive exercises, has been confirmed by numerous studies carried out among cancer patients. The development of KT administration is still ongoing. There are only a few Polish studies assessing the effectiveness of KT in lymphedema therapy [9-12].

Kiebzak *et al.* [9] performed a meta-analysis of the literature databases: Medline, Embase, PEDro, PubMed, Ingenta, Connect and Google Scholar. The authors analysed 87 scientific publications in peer-reviewed journals on the use of KT in various fields of medicine and sport. The publications comprised only three ran-

domised trials. Among all publications and speeches reporting the efficacy of KT method, there was no paper reporting the dangers or side effects. The review indicated that only three papers were about lymphedema and none with placebo.

Lipinska *et al.* [10] presented the clinical study. The experimental group consisted of 25 women aged 40 to 70 years (average 55.16 years) treated because of breast cancer with lymphedema. All patients received K-tapes during 20 days of therapy. Assessment of the efficacy of an upper limb in women after mastectomy showed oedema reduction of 24%, increased range of motion of 20% and normalization of muscular tension. The weakness of this study was the lack of control groups.

In foreign literature (we found only one randomized clinical trial in PubMed and Medline), Tsai *et al.* [13] presented a study about positive effects of KT. The purpose of this experiment was to compare the treatment and retention effects between standard physical therapy combined with pneumatic compression and modified physical activity, in which the use of a short-stretch bandage was replaced by the use of KT combined with pneumatic compression (44 patients were included in

Table I. Results from case report

	Limb volume
Before therapy	2733 cm ³
After 4 days (first week)	2702 cm ³
After first application of K-tapes	2508 cm ³
After 11 days (second week)	2457 cm ³
After second application of K-tapes	2251 cm ³
After 18 days (third week)	2211 cm ³
After third application of K-tapes	2106 cm ³

Calculation of Volume from 53 mm to 518 mm

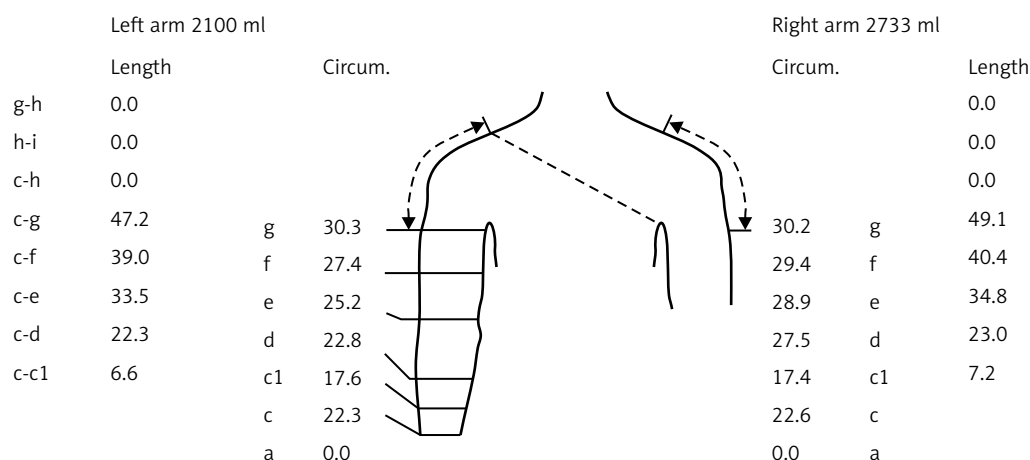


Fig. 2. Graphical presentation from the perometer

the experiment). The study results suggest that K-tapes could replace the bandage in therapy, and could be a good alternative for patients with poor short-stretch bandage compliance. In our opinion, the main weakness of this study is: the Korean authors applied only single-layer compression therapy (15-20 mm Hg, which is not enough to treat any kind of lymphedema) and a lack of estimation of the placebo effect in the following article.

The Taiwan researchers in a case study [14] reported a patient with unilateral secondary malignant breast cancer-related lymphedema and arteriovenous (A-V) fistula for hemodialysis that happened in the same arm. They used KT, manual lymphatic drainage, and exercise to treat this patient because no pressure could be applied to the A-V fistula. The 12-session therapy created an excellent effect. In conclusion, authors stated that K-tapes could not replace short stretch bandaging, but it may be another choice for patients in whom pressure therapy is contraindicated.

An additional problem in secondary upper limb lymphedema is pain feeling and quality of life [15-18]. We could only present articles concerning musculoskeletal disorders, because the literature lacks such reports in patients after mastectomy.

Campolo *et al.* [19] compared the effectiveness of KT versus no tape in subjects with anterior knee pain during a squat lift and stair climbing. A total of 20 subjects (15 females, 5 males) with unilateral anterior knee pain were recruited. Each participant was tested during two functional activities; a squat lift with a weighted box (10% of his/her body weight, plus the weight – 8.5 pounds – of the box) and stair climbing. Pain levels were assessed (verbally) using the 0-10 Numeric Pain Intensity Scale. The results of this study showed that the KT may be effective in reducing pain during stair climbing activities.

Kuru *et al.* [20] recruited thirty patients (26 females, 4 males) with patellofemoral pain syndrome and divided them into two groups; the KT group receiving KT and an exercise program, and the electrical stimulation (TENS) group receiving pulsed current stimulations and the same exercise program. All patients received stretching and strengthening exercises for the lower extremity under the supervision of a physiotherapist in the outpatient clinic 3 times a week for 6 weeks (18 sessions). Patients were evaluated for pain (visual analogue scale), range of motion (using a goniometer), muscle strength (manual muscle test), functional condition (step test, triple-jump test, knee flexion test and Kujala patellofemoral score), and quality of life (SF-36) before and after treatment. Visual analogue scale scores were reduced by 3.33 and 3.93 and Kujala patellofemoral scores increased by 8.93 and 9.66 for the KT and ES groups, respectively. Both these improvements were statistically significant ($p < 0.05$). While improvements were observed in functional tests, range of motion, and muscle strength values in both groups; there were no significant differences

between the two groups ($p > 0.05$). There were statistically significant improvements in the SF-36 scores in both groups ($p < 0.05$) and these improvements were of a similar rate ($p > 0.05$). The authors concluded that KT and electrical stimulation have similar effects on decreasing pain, improving the functional condition, increasing muscle strength and improving quality of life and neither is superior in the treatment of patellofemoral pain syndrome.

Although the mechanism for the treatment effect resulting from the use of K-tape is not clear, this tape is generally applied in clinical practice in Poland. After applying KT, the taped area would form convolutions when adjacent joints move. Physical therapists using K-tape believe that the convolutions increase the space between the skin and muscles and thus promote the flow of blood and lymphatic fluid. More efficient treatment protocol is needed for clinical practice.

Limitations of the study

This case report presents promising results. Our patient did not have any skin allergy after K-tapes and whole therapy appeared safe and successful. However, it is necessary to conduct randomized controlled trials with objective digital measurements to confirm obtained data on a larger group of patients, inclusion/exclusion protocol, randomization, follow-up and statistical analysis.

We will try to conduct the study also as a trial among patients divided into a few groups, for example to present KT as a monotherapy (compared to manual lymphatic drainage, compression therapy and others). Our finding that volume reduction was faster during periods of K-tapes is interpreted as an effect of the KT application, while it could also be interpreted as a time-effect (mobilisation of lymphedema during manual drainage treatment, resorption in the days thereafter). Particularly because the order in which the interventions were carried out was not varied over time, it is difficult to draw firm conclusions about the volume-reducing effect of the K-tape.

The decongestive lymphatic therapy lasted only 3 weeks, we could not continue the treatment just using the tape (the patient chose to discontinue treatment for personal reasons – care at home of her husband suffering from Alzheimer disease, and daughter had to go back to work in Germany).

In the future we would like to prepare a large research and analyse more aspects like the quality of life, pain relief, activities of daily living after K-tapes, too. Further well-conducted research is needed.

Disclosure

Authors report no conflicts of interest.

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