Secondary upper limb lymphedema following mastectomy responses to kinesio taping application: a preliminary study

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Abstract

Background: It is observed that upper extremity lymphedema is one of the most prevalent complications following breast cancer surgery which prompts functional impairment, psychological disaster and social problems. Thepurpose of the study was to investigate the effect of Kinesio taping on secondary lymphedema of the upper extremity following mastectomy after breast cancer.
Material and Methods: In this experimental study, 33women with lymphedema following mastectomy received Kinesio taping (KT). The KT application was 2 times per week for 3 weeks. All patients were evaluated to record the changes of the limb circumference, at baseline and end of intervention.
Results: Sum of limb circumferences was significantly improved after treatment as compared with before treatment in the KT group ($P<0.05$). **Conclusion:**Kinesio Taping is an advanced therapeutic approach in the treatment of subjects with lymphedema after mastectomy that has problems with other modalities.

Keywords: Kinesio taping; lymphedema; Mastectomy; Breast cancer; Limb measurement.

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Introduction

The incidence of the lymphedema in the upper limb is 24-59% of the patients with total mastectomy, 2.4-49% of the patients with a dissection of the lymph node and about 38% of the individuals who likewise experience radiation treatment [1-3].

The development of new treatment techniques to relieve the symptoms of upper limb edema, including pain and sensory abnormalities has resulted in discovering techniques that will significantly reduce the symptoms. One of an important techniques being used is Kinesio taping. Kinesio taping was developed by Dr. KinesoKase in 1973 and it is an extension of the Japanese Kinesioslogy Taping. The concept involves the application of a tape which is attached to the skin. The applied tape is more elastic and thinner than the conventional tape by 120 to 140% [4].

The material used for the Kinesio tape is 100% acrylic, latex free and heat-activated. It is made up of 100% cotton to allow for evaporating and quicken the drying the process. This allows the patient the freedom to wear it even when taking a shower without the need for reapplication. The recommended time to wear the tape is approximately 3-4 days [5].

Kase et al.reported that the effects of Kinesio taping were primarily brought about by facilitating myofascial release, including the re-absorption of lymphatic fluid in the surrounding tissues. Kinesio taping enables the upper layers of the skin to be pulled allowing more space between the dermis and the muscle. Through this action, pressure exerted on the lymphatic vessels and channels is relieved enhancing lymphatic flow resulting in better lymphatic drainage in the affected area. When the lymphatic vessels are obstructed or restricted, lymphatic fluids accumulate behind the congested area, resulting in soft tissue swelling decreases the space located between the muscle tissues and the skin [6].

Nowadays, Kinesio taping treatment effects specifically on the reduction of pain[7, 8] and the reduction in tissue swelling has been recognized by physical therapists in treating lymphedema. The following physiological effects are produced when Kinesio taping is properly applied to decrease pain or abnormal sensation supports the movement of muscles, correcting misalignment of joints, and removing accumulated lymphatic fluid. Other noted effects of Kinesio taping include sensory stimulation, decrease adhesions and contractures, skin softening, improvement of pliability and reduction of scar formation [9].

Henceforth, lymphedema is one of the fundamental issues after breast cancer surgeries. It is critical to look for choices for its lessening and control. The effects of Kinesio taping remains controversial in the application of post-surgical lymphedema after mastectomy.

Objectives

This study aimed to investigate the effects of Kinesio taping on secondary lymphedema of the upper extremity following mastectomy after breast cancer.

Subject, materials and methods

The current study was done according to the declaration of Helsinki principles, and an informed consent form was signed by each patient before beginning the study. Thirty three women with unilateral breast cancer related to lymphedema (stage II and III) for at least for 6 months were invited to participate in the study. Lymphedema was more than 2 cm in arm circumference or less than 8 cm at any level in comparison with the other side.The participants were received Kinesio taping (KT)

The exclusion criteria were any active disease which leads to swelling, medications, especially diuretics, allergy, infection, pregnancy, heart and kidney diseases, bilateral lymphedema, skin diseases and cellulitis.

Assessment

All patients were evaluated to record the changes of the limb circumference. From the clinical point of view, measurement of arm circumference is the most commonly used technique to identify and monitor lymphedema [10]. The measurement of the circumference is reliable and expressed as an intra-class correlation, went from 0.96 to 0.99 for both surgical and non-surgical upper limbs, and the measurement standard error was 0.09 cm to 0.20 cm [11].

The upper Limbs circumferences were measured by using a tape measure with the patient in prone lying position, elbows were straight and arms were relaxed at sides. The limb circumferences were measured each 3 cm starting on the ulnar styloid process and proceeding with 45 cm proximal, and in addition at the metacarpal bones and mid-hand. The tape measure was put around the limb so that there was no slack yet, but additionally so there was no space in the tissue. The total circumference of the sound limb was ascertained similarly. The two measurement difference was identified by "circumference difference".

$\Sigma^{CL}_{affected} - \Sigma^{CL}_{normal} = CD$

$CD_n - CD_0 = TRC$

Where:

$CL_{affected}$ Circumference of affected side at each six anatomical points

CL_{normal} Circumference of normal limb at each six anatomical points,

CD Circumference difference of two limbs at each point

CD_n Circumference differences at each follow up session,

CD_0 Circumference difference at pre-treatment session,

TRC Total reduction in circumference

Intervention

Thepatients received home exercise program in the form of range of motion (ROM) exercises involving shoulder flexion and extension, abduction, elevation up to 180 degrees, external rotation/horizontal abduction, elbow flexion and extension, wall walking and cane stretching. The printed exercise program was given to the women in both groups after showing them how to do these exercises.

All patients instructed to perform the exercise program three times daily with 10 repetitions every time. They were making a request to do these exercises 10 repetitions twice a day. The patients were addressed about

whether they were doing their exercises consistently or not at each visit to make sure that they followed the instructions.

The application of the KT was performed on cleaned and dried skin by an experienced physiotherapist 2 times per week for 3 weeks. The Kinesio taping application consisted of one fan shape for the chest (5 straps), 2 fan shapes for the upper arm (4 straps), forearm (4 straps) and wrist (2 straps).

Statistical Analysis

Descriptive statistics were applied in the form of mean and standard deviation. Inferential statistics analyzed all measurement changes paired *t*-test was used to measure changes within group pre and post intervention, analysis was done using SPSS version 20.0 (SPSS, Chicago, IL) with statistical significance at *p*-value ≤ 0.05.

Results

The demographic and clinical characteristics of the participating patients are demonstrated in table 1.

Table 1 Demographic data and clinical characteristics of patients

Variables	KT group Mean±SD
Demographic Data	
Number of patients	33
Age (years)	54.3±4.16
Height (cm)	167±7.1
Weight (kg)	79.3±7.4
BMI (kg/m^2)	28.4±2.7
Clinical Characteristics	
Duration after mastectomy (Months)	7.6±1.7
Sum of limb circumferences (cm)	177.5±15.4
Type of surgery (mastectomy) n(%)	
Partial mastectomy	5(16.7)
Partial+Axillary mastectomy	7(23.3)
Radical+Axillary mastectomy	5(16.7)
Modified/radical+Axillary mastectomy	13(43.3)
Types of treatment n(%)	
Chemotherapy	17(56.7)
Chemotherapy+Radiotherapy	13(43.3)

Abbreviations: KT, Kinesio taping; SD, standard deviation; P, probability; S, significant; NS, non-significant; F, females

Table 2: Statistical analysis of mean differences in KT pre- and post-intervention

Variables	Pre	Post	P-value
Sum of limb circumferences (cm)	177.5±15.4	153.5±9.24	0.01*

The main findings of this study showed that (↓ sum of limb circumference) were statistically significantly improved at the end of the intervention ($p<0.05$).

Discussion

Subjects who have lymphedema after mastectomy have to be under special care, because the subjects with breast cancer usually have reduced physical activity which may exacerbate the symptoms [12,13]. Reduced physical activity leads to reduced muscle activity which secondarily leads to reduced lymph circulation and the cycle continues repeatedly. Post lymphedema again reduces the normal physical activity of the subjects which adversely affects the quality of life[14,15]. Subjects with post mastectomy lymphedema commonly complained about pain, discomfort, reduced hand grip strength and joint movements in the related extremity. Occasionally the sensation of "tissue burst" may leads to secondary edema and increase the limb circumference[14,16,17].Thissecondary edemamay occur in any time after the surgery that is immediately after the surgery or till the period of 30 years[18].This gradually affects the function of skin, fascia, muscle and joints and reduces the overall quality of life [19].

Hence it is necessary to provide the proper medical treatment and early physical therapy for the post mastectomy lymphedema subjects. Very recently, physical therapists following the latest concepts such as Kinesio taping (KT) for draining lymphatic fluid. The real contribution of each technique and procedures of application was unclear in post lymphedema following mastectomy which makes the application difficult.

Kinesio taping (KT) is new method of application introduced in 1973 for lymphedema subjects[6].This technique is commonly used in the treatment of lymphedema reduction in mastectomy subjects, even though we don't have evidences for the mechanism of its action. It is believed that KT will be helpful to decrease pain, lymph volume, increase hand grip strength, mobilize the joints and improve overall quality of life which is proved by our study. Regardless of the type of application, KT shows significant changes in limb circumference in the affected subjects[6, 20].

KT increases the gap between the connective tissues such as skin and fascia, fascia and muscles and skin and

muscles, which enhances the fluid movement in the body[19, 20]. It has its own advantage that is; the subjects can tolerate the application of tape for about 1-3 days or more. Moreover the water proof property of KT does not need to take the bandage off before or during the wash. Generally the character of the condition of lymphedema following mastectomy progress slowly, hence the ultimate effect of KT depends on the stage of the condition and the method of application[9].

The results of our study showed clinical and statistical significance of KT on the lymphedema when compared to pre application. The KT continuously facilitates the lymph circulation through making the space in the skin and other connective tissues. This enhances the circulation and lymph flow in lymph capillaries to the blood capillaries which also leads to regeneration [21].

Limitations: The limitations of this study were the small sample size and lack of regular follow up period. Future study can be done with large samples and finding the long term effect of KT application in post mastectomy subjects with lymphedema.

Clinical significance: Kinesio taping is an effective method with more comfort to the patient. It can also be advised to apply for 3-5 days without changing in the tension.

Conclusion: Finally, KT is the advanced therapeutic approach in the treatment of subjects with lymphedema after mastectomy that has problems in other modalities. It is also an alternative procedure for other techniques. It also suggests that KT tape is similar to the properties of skin and widely accepted method of application in lymphedema.

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Conflicts of interest
The authors declare no conflict of interest.

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