

Ocena wpływu aplikacji Kinesiology Taping i Standardowej Terapii Udrażniającej na obrzęk limfatyczny u kobiet po mastektomii

Evaluation of Impact of the Application of Kinesio Taping and Standard Complete Decongestive Therapy on the Lymphedema in Women After Mastectomy

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Streszczenie

Wstęp. Celem badania jest ocena efektów leczenia obrzęku limfatycznego kończyny górnej po stronie operowanej u kobiet po mastektomii z zastosowaniem Standardowej Terapii Udrażniającej i zmodyfikowanej Terapii Udrażniającej, gdzie bandażowanie wielowarstwowe zastąpiono aplikacjami limfatycznymi Kinesio Taping. Cel zweryfikowano poprzez hipotezy badane:

1. Aplikacje limfatyczne Kinesiology Taping zastępują bandażowanie wielowarstwowe.
2. Techniki metody Kinesiology Taping mają wpływ na zakres ruchu w stawie ramiennym.
3. Aplikacje dynamicznego plastrowania zmniejszają ból w obrębie kończyny górnej po stronie operowanej.

Materiał i metody. Przebadano 24 kobiety z jednostronną amputacją piersi. Grupa badana to 12 pacjentek, u których zastosowano aplikacje limfatyczne Kinesiology Taping. Grupa kontrolna to 12 pacjentek, u których zastosowano bandażowanie wielowarstwowe. W każdej grupie przez 15 dni przeprowadzono 30-minutowy ręczny drenaż limfatyczny i ćwiczenia usprawniające przez 20 minut. Przed i po terapii oceniano obwody kończyn górnych przy pomocy taśmy centymetrowej. Pomiary zakresów ruchu w stawie ramiennym wykonano za pomocą goniometru. Ból oceniono przy pomocy skali VAS.

Wyniki. Analiza uzyskanych wyników wykazuje, że zastosowane aplikacje limfatyczne zmniejszają obrzęk limfatyczny i ból, oraz zwiększają zakres ruchu w stawie ramiennym kończyny górnej po stronie operowanej u kobiet po mastektomii.

Wnioski. Zastosowane techniki metody Kinesiology Taping w porównaniu z bandażowaniem wielowarstwowym w Kompleksowej Terapii Udrażniającej są porównywalnie efektywne.

Słowa kluczowe:

obrzęk limfatyczny, Kinesiology Taping, Kompleksowa Terapia Udrażniająca

Abstract

Introduction. The objective of this study has been to evaluate treatment results in the upper extremity on the side after surgery, in women after the mastectomy procedure, with the application of the Standard Complete Decongestive Therapy and the Modified Complete Decongestive Therapy, where the multilayer bandaging has been replaced with the lymphatic applications of the Kinesio Taping method. The above objective has been verified by testing the following hypotheses:

1. Lymphatic applications of the Kinesio Taping method can replace the multilayer bandaging.
2. Kinesio Taping techniques affect the range of motion in the shoulder joint.
3. Kinesio Taping applications reduce pain in the upper extremity, on the side after surgery.

Materials and Methods. Total number of 24 women after the unilateral mastectomy have been examined. The test group encompassed 12 patients, to whom the lymphatic Kinesio Taping techniques have been applied. The control group constituted of 12 patients, who have been treated with the multilayer bandaging. Both groups, over the period of 15 days, have been subjected to a 30-minutes manual lymphatic drainage procedure and to 20 minutes of rehabilitation exercises. Before and after the therapy, the upper extremity circumference has been measured using a centimeter tape. The shoulder joint range of motion has been measured with a goniometer. The pain level has been assessed according to VAS scale.

Results. Analysis of the obtained results show, that the lymphatic tape applications used reduce lymphedema and pain sensation, and increase the range of motion in the shoulder joint on the side after surgery, in women after the mastectomy procedure.

Conclusions. The applied Kinesio Taping techniques, when compared with the multilayer bandaging of the Complete Decongestive Therapy, bring about the comparable results.

Key words:

lymphedema, Kinesio Taping, Complete Decongestive Therapy

Introduction

Lymphedema is the edema of tissues, caused by a disorder of the lymphatic system. The factors contributing to the raise of the interstitial fluid amount are the increased hydrostatic pressure in the capillaries, the increased oncotic pressure in the interstitial tissue, the increased transmittance of the capillary vessel walls and the increased flow rate in the capillary vessels over a period of time. From the point of view of the pathophysiology, the lymphatic system insufficiency may be defined as dynamic or mechanical. In the case of the dynamic insufficiency, there takes place overproduction of filtrate, caused by the insufficiency of other systems, e.g. the cardiovascular system. The mechanical insufficiency is due to primary or secondary damage of the lymphatic system. Mechanical insufficiency occurs as a result of inflammatory processes, surgical procedures, injuries, congenital vessels' deformities or radiotherapy, leading in consequence to the irreversible damage of tissues [1]. Nowadays, this disorder constitutes an important health issue, as some 300 million women are affected by it [2].

Lymphedemas may be divided into:

- primary lymphedema, being a consequence of disorders in the development of the lymph vessels, which can be a congenital edema condition, premature - occurring before the age of 35, or late - occurring after the 35 years of age,
- secondary lymphedema, formed as a result of damages to the vessels caused by cancerous disease, removal of lymph nodes, radiotherapy, lymphangitis or a parasitic disease [1].

Lymphedemas, considering their stage of development, may be divided into 3 phases (acc.to Foldi).

- phase I: reversible, where the subcutaneous tissue is stretched, with no signs of fibrosis, and the skin color remains unchanged. Elevation of the upper extremity causes retraction of the edema.
- phase II: spontaneously-irreversible. Changes in the connective tissue (fibrosclerosis) cause the induration of skin. The color of skin remains unchanged or skin becomes slightly reddened. Elevation of the extremity has no therapeutic impact.
- phase III: lymphatic filariasis (elephantiasis) Epidermis becomes calloused (verrucae, condyloma). The color of skin is grey-brown. Nerve fibers and sweat glands disappear. Mobility in the joints is limited [3].

The secondary lymphedema affects a large group of oncological patients. Lymph stasis in patients after mastectomy are a very serious problem and require the immediate application of a physiotherapy procedure. Lymphedema not treated, reduces the physical, mental and functional efficiency of the patients, increases the risk of repeated episodes of the skin surface infections and fosters the development of the lymphatic sarcoma on the upper extremity, on the side of the surgical procedure [4]. The treatment of lymphedema is currently based primarily on the symptomatic treatment. The International Lymphatic Society, as the primary method of treatment for the lymphedema,

recommends the so called Complete Decongestive Therapy, which includes manual lymphatic drainage, multilayer bandaging, rehabilitation exercises and cosmetic skin care [3].

Modern physiotherapy brings new solutions for the lymphedema treatment. One of them is Kinesio Taping [5]. Manual lymphatic drainage is a gentle and slow combination of circular, turning, pumping and pulling massage movements, performed not more than 5-7 times, so the tissues do not get overheated. The lymphatic drainage begins centrally on the areas with no edema, and gradually moves over to the areas swelled up. Its main objective is to drain the lymph trunks, and pass the swelling through them [3]. One of the forms of the lymphedema treatment is the multilayer bandaging. While applying this treatment, one must take into account the patient's clinical condition, choose the proper kind of bandage and the bandaging technique. The bandages applied, are of small and medium stretching ability, so they generate low static pressure at standstill and inactive, pressure generated mostly by muscles during a physical effort. For the lymphedema treatment it is recommended to apply 2-3 bandage layers [6]. An important factor supporting the natural drainage therapy, are the physical exercises. The low intensity active exercises improve the muscle pump function. The respiratory exercises cause the creation of a negative pressure in the rib cage, facilitating the lymph transfer. Those exercises should be individually tailored to a patient's particular condition, so they have a positive impact on her general well-being and minimize the psychological discomfort related to the edema. None of the exercises recommended for the lymphedema patients should be overly intense and heavy [7]. Kinesio Taping is a method utilizing the natural self-healing processes of the human body. Kinesio Taping applications cause the skin to be gently pulled up, thus increasing the space between the dermis and the fascia, which has an impact on the reduction of stasis and lymphedema. Applications of the Kinesio Taping treatment activate the endogenous analgesic system and help to reduce the sensation of pain. By adjusting the placement of the fascia and the skin, the proprioception gets improved, and the muscle and fascia tension becomes normal [8].

The objective of this study has been to evaluate treatment results in the upper extremity on the side after surgery, in women after the mastectomy procedure, with the application of the Standard Complete Decongestive Therapy and the Modified Complete Decongestive Therapy, where the multilayer bandaging has been replaced with the lymphatic applications of the Kinesio Taping method, through the verification of the following hypotheses:

1. Lymphatic applications of the Kinesio Taping method can replace the multilayer bandaging.
2. Kinesio Taping techniques affect the range of motion in the shoulder joint.
3. Kinesio Taping applications reduce pain in the upper extremity on the side after surgery.

Materials and Methods

We have examined 24 women, 47 to 65 years old (M = 57.21; SD = 5.45). The average age in the test group was 56.75 years (SD = 5.88), and in the control group 57.67 years (SD = 5.21). The women in both groups had undergone the mastectomy, on the average one year before the study (control group: M= 1.00; SD = 1.41; test group: M = 1.17; SD = 1.19; $t(22) = -0,31$; $p = 0.758$).

In the Tables 1 and 2, there are presented, respectively, the conditional distribution of side of the body and the development stage phase of the upper extremity lymphedema. In view of the small number of observations, the chi-square tests to compare the equivalence of samples have not been performed. The visual analysis of the number of cells in the Tables allows to confirm, that the structure of the two trials, in terms of the indicated variables, has been similar to each other.

Table 1. Side of surgery

| Side of surgery | Test Group | Control Group | Total |
|-----------------|------------|---------------|-------|
| left | 7 | 5 | 12 |
| right | 6 | 6 | 12 |
| total | 12 | 12 | 24 |

Table 2. Stage of lymphedema

| Stage of edema | Test Group | Control Group | Total |
|----------------|------------|---------------|-------|
| I° | 5 | 6 | 11 |
| II° | 7 | 6 | 13 |
| total | 12 | 12 | 24 |

Before the examination, the patients had been informed about the purpose and the type of the study, and had agreed to it. The patients have undergone the treatment over 15 days. Both groups have been subjected to a 30-minutes manual lymphatic drainage procedure and to 20 minutes of rehabilitation exercises. Both studied groups have answered the question regarding the subjective assessment of the level of pain, felt before and after the therapy. To assess the level of pain VAS scale has been used. The scale took the form of a ruler, 10cm long. The patients indicated the pain intensity by pointing finger to the scale, from 0 - a complete lack of pain to 10 - the strongest imaginable level of pain. The task of the patients has been to identify the specific value, that in their opinion reflected the level of the intensity of pain, which they experienced at a given moment. In both groups the circumferences of both upper extremities have been measured

with a centimeter tape. The measurements have been taken in a seated position, with the upper extremity placed alongside the trunk. The circumferences were measured at three levels: level I - 15 cm above the olecranon; level II - 15 cm below the olecranon; level III - the measurement across the metacarpus, at the height of the 2-4 heads of the metacarpal bones. Both, the test and the control group have been examined for the range of mobility in the shoulder joint. There have been measurements taken of the range of motion in: external rotation, abduction, internal rotation and adduction - using the goniometer [9] (Fig. 1, 2, 3, 4).



Fig.1 Measurement of the range of motion in internal rotation



Fig. 2. Measurement of the range in external rotation



Fig. 3. Measurement of the range in abduction



Fig. 4. Measurement of the range in adduction

In the test group, the lymphatic Kinesio Taping technique of the "Fork" type has been applied, on the days 1-5-10 [5]. The tapes have been applied on the swollen extremities (Fig. 5) and the quadrants adjacent to the areas affected by the lymph stasis (Fig. 6).

In the control group, the daily multilayer bandaging has been applied - 3 layers. The bandages used were of short stretch kind (90%). The first layer was a sleeve - a cotton stocking (Fig. 7). Before applying the second layer, the palm has been bandaged, with each finger bandaged separately, using the narrow (5cm) cotton supporting bandages. The second layer was a soft cotton wadding bandage, applied in a spiral starting from the metacarpal area and ending at the shoulder joint

(Fig. 8), and the third layer was a low-stretch bandage, applied in a spiral, wrapped around in the turtle way around the joints, while observing the principle of the pressure gradation: descending in the proximal direction [10] (Fig. 9). The whole dressing has been left on an edematous extremity for 24 hours.



Fig. 5. Lymphatic application on the upper extremity



Fig. 6. Lymphatic application on the upper extremity and the adjacent quadrants



Fig. 7. Layer 1 - cotton sleeve



Fig. 8. Layer 2 - cotton wool bandage



Fig. 9. Layer 3 - low-stretch bandage

Results

Statistical analysis has been performed using the IBM SPSS STATISTICS 23 package. To assess the changes that have occurred in the test group, between the first and the second measurement, and to compare the range of these changes with the changes that have occurred in the control group, a two-factor analysis of variance in a mixed design has been used. The total of eight analyses of variance have been performed, in which the independent variable has been the group affiliation (the between-groups factor: test group - control group), and the dependent variables (the intragroup factors) there have been:

1. circumference of upper extremity on the side of surgery – 1st level: measurement 15 cm above the olecranon,
2. circumference of upper extremity on the side of surgery – 2nd level: measurement 15 cm below the olecranon,
3. circumference of upper extremity on the side of surgery – 3rd level: measurement across the metacarpal bones’ heads 2-5,
4. range of motion in the glenohumeral scapular joint: adduction,
5. range of motion in the glenohumeral scapular joint: abduction,
6. range of motion in the glenohumeral scapular joint: external rotation,
7. range of motion in the glenohumeral scapular joint: internal rotation,
8. pain intensity in the VAS scale.

All the dependent variables were measured twice, before and after the therapy. Analysis of variance was carried out in the one-way model (ANOVA). In the statistical tests, the acceptable probability of the error type I (i.e. the incorrect rejection of the true null hypothesis), has been set at the level of $\alpha = 0.05$, therefore the hypothesis of the absence of differences has been rejected in the case of the empirical statistical significance of $p \leq 0,05$.

Circumference of the upper extremity on the side of surgery - level 1

As the result of the performed analysis of variance, there has been found a statistically significant effect of the interaction of both factors, $F(1, 22) = 10.06$; $p = 0.004$. This means, that the upper extremity circumference change, which has occurred between the first and the second measurement, has differed depending on the group affiliation. To understand what has caused this effect, in the next step of the analysis, there have been comparisons of pairs carried out for the measurement times, separately in the test and the control group. The following results have come up (the compared means and standard errors are presented in Table 3):

Table 3. Measurements of upper extremity circumferences on the side of surgery: Level 1

| | Before therapy | | After therapy | | difference of means $M_1 - M_2$ | 95% confidence interval for difference | |
|---------------|----------------|------|---------------|------|---------------------------------|--|-------------|
| | M_1 | SE | M_2 | SE | | Lower limit | Upper limit |
| Control group | 33.25 | 0.92 | 29.83 | 0.70 | 3.42 | 2.55 | 4.28 |
| Study group | 34.96 | 0.92 | 34.42 | 0.70 | 1.54 | 0.68 | 2.41 |

In the control group the mean circumference of the upper extremity after the treatment ($M_2 = 29.83$) is lower than before the treatment ($M_1 = 33.25$). The difference is statistically significant at $p < 0.001$. In the test group, the mean circumference of the upper extremity after the treatment ($M_2 = 34.42$) is statistically significantly lower than before the treatment ($M_1 = 34.96$); $p = 0.001$. The size of the difference between the mean values indicates, that the change which has occurred between the first and the second measurement in the control group ($M_1 - M_2 = 3.42$) is greater than the change in the test group ($M_1 - M_2 = 1.54$). The following bar graph shows the graphic interpretation of the interaction effect (Fig. 10).

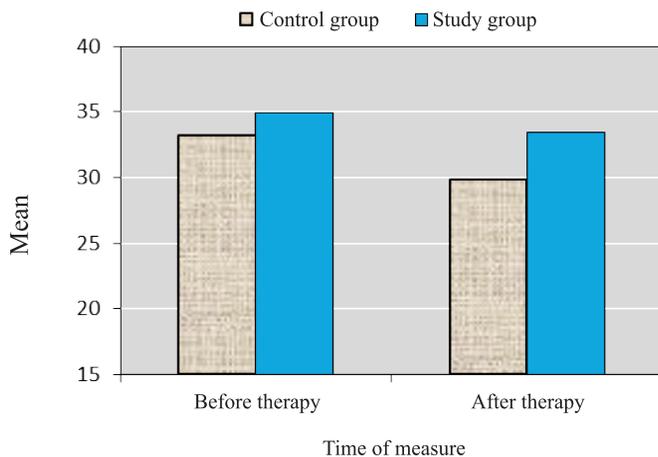


Fig. 10. Measurements of upper extremity circumferences on the side of surgery: Level 1

Circumference of the upper extremity on the side of surgery - level 2

As the result of the performed analysis of variance, there has been found a statistically significant effect of the interaction of both factors, $F(1, 22) = 8.01$; $p = 0.010$. The change in the circumference of the upper extremity, in test and control group, has not been the same. In order to explain the interaction effect, the comparisons have been carried out of the mean circumferences before and after the therapy, separately in the test and the control group. The obtained results (means and standard errors) are presented in Table 4.

Table 4 Measurements of upper extremity circumferences on the side of surgery: Level 2

| | Before therapy | | After therapy | | difference of means $M_1 - M_2$ | 95% confidence interval for difference | |
|---------------|----------------|------|---------------|------|---------------------------------|--|-------------|
| | M_1 | SE | M_2 | SE | | Lower limit | Upper limit |
| Control group | 31.75 | 0.81 | 28.42 | 0.64 | 3.33 | 2.41 | 4.26 |
| Study group | 24.88 | 0.81 | 23.33 | 0.64 | 1.54 | 0.61 | 2.47 |

In the control group the mean circumference of the upper extremity measured after the treatment ($M_2 = 28.42$) has been lower than before the treatment ($M_1 = 31.75$). The difference between the means is statistically significant at $p < 0.001$. In the test group the mean circumference of the upper extremity after the treatment ($M_2 = 23.33$) is statistically significantly lower than before the treatment ($M_1 = 24.88$); $p = 0.002$. The

size of the difference between the mean values indicates, that the change which has occurred during the therapy in the control group ($M_1 - M_2 = 3.33$) is greater than the change in the test group ($M_1 - M_2 = 1.54$). The following bar graph shows the graphic interpretation of the interaction effect (Fig. 11).

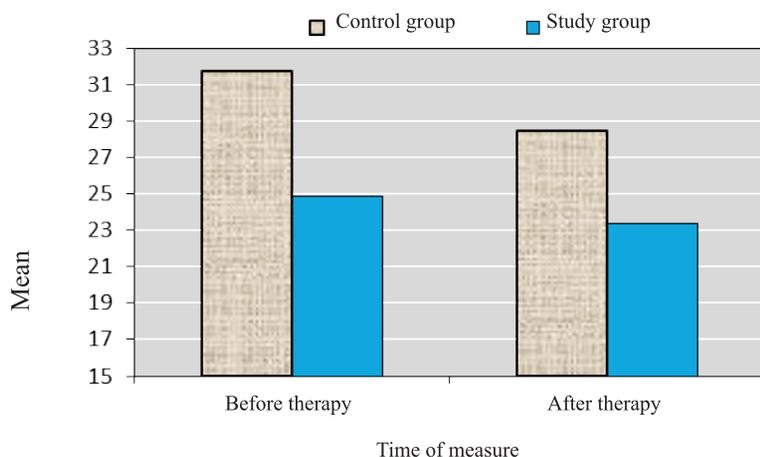


Fig. 11. Measurements of upper extremity circumferences on the side of surgery: Level 2

Circumference of the upper extremity on the side of surgery - level 3

There has been a statistically significant effect of the interaction between the group affiliation and the time of the measurement, $F(1,22) = 24.18$; $p < 0,001$. This means, that the size of the change in the upper extremity circumference, between the first and the second measurement, has differed depending on the group affiliation. In order to allow for the interpretation of the effect, the comparisons in pairs have been carried out between the measurements before and after the treatment, separately in the test and in the control group. Mean values and standard errors are shown in Table 5.

Table 5. Measurements of upper extremity circumferences on the side of surgery: Level 3

| | Before therapy | | After therapy | | difference of means $M_1 - M_2$ | 95% confidence interval for difference | |
|---------------|----------------|------|---------------|------|---------------------------------|--|-------------|
| | M_1 | SE | M_2 | SE | | Lower limit | Upper limit |
| Control group | 24.08 | 0.50 | 21.25 | 0.50 | 2.83 | 2.24 | 3.43 |
| Study group | 19.83 | 0.36 | 19.00 | 0.36 | 0.83 | 0.24 | 1.40 |

In the control group, the test of significance of the differences has shown, that the mean circumference of the upper extremity after the treatment ($M_2 = 21.25$) has been significantly lower than before the treatment (24.08). The difference is statistically significant at $p < 0.001$. In the test group the mean circumference of the upper extremity after the treatment ($M_2 = 19.00$) has also been significantly lower than before the treatment ($M_1 = 19.83$). The difference is statistically significant at $p = 0.008$. The size of the difference between the mean values indicates, that the change which has occurred during the therapy in the control group ($M_1 - M_2 = 2.83$) is greater than the change, which has occurred in the test group ($M_1 - M_2 = 0.83$). The following bar graph shows the graphic interpretation of the interaction effect (Fig. 12).

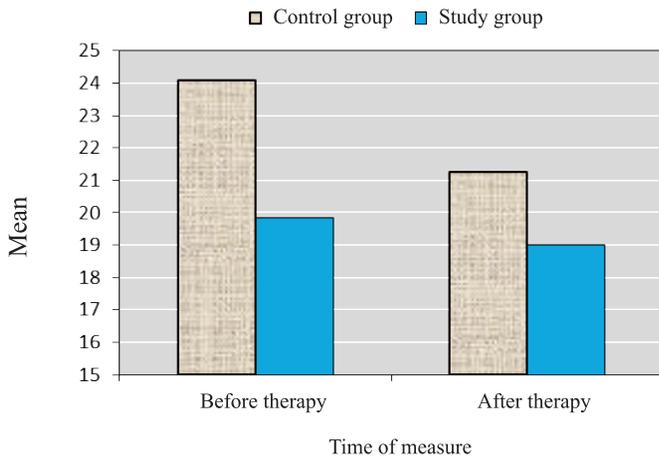


Fig. 12. Measurements of upper extremity circumferences on the side of surgery: Level 3

Range of motion in the glenohumeral scapular joint: adduction

In the carried out analysis, statistically significant has proven to be the main effect of the measurement time, $F(1, 22) = 794.20$; $p < 0.001$. This means, that regardless of the group affiliation, the mean adduction range in the glenohumeral scapular joint after the treatment ($M_2 = 156.04$; $SE = 0.90$) has been statistically significantly greater than before the treatment ($M_1 = 140.21$; $SE = 0.80$). The mean values distribution in the particular subgroups are shown in the following Table 6 and the Figure 13.

Table 6. Measurements of range of motion in the glenohumeral scapular joint: adduction

| | Before therapy | | After therapy | |
|---------------|----------------|------|---------------|------|
| | M_1 | SE | M_2 | SE |
| Control group | 138.33 | 1.13 | 153.33 | 1.27 |
| Study group | 142.08 | 1.13 | 158.75 | 1.27 |

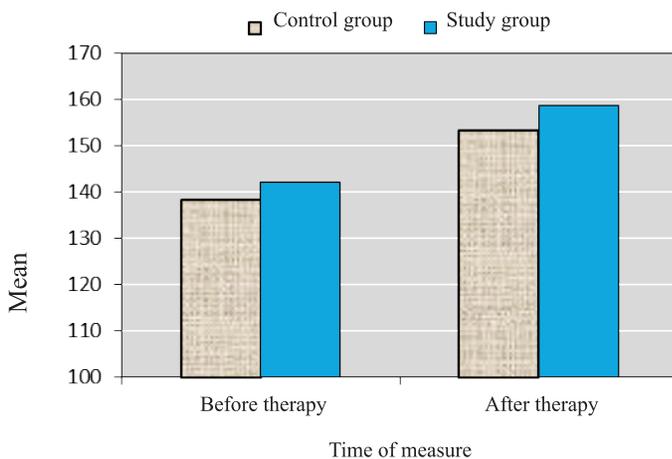


Fig. 13. Measurements of range of motion in the glenohumeral scapular joint: adduction

Range of motion in the glenohumeral scapular joint: abduction

In the carried out analysis, statistically significant has proven to be the main effect of the measurement time, $F(1, 22) = 668.08$; $p < 0.001$. This means, that regardless of the group affiliation, the abduction range in the glenohumeral scapular joint after the treatment ($M_2 = 143.96$; $SE = 1.32$) has been statistically significantly greater than before the treatment ($M_1 = 129.17$; $SE = 1.39$). The mean values distribution in the particular subgroups are shown in the following Table 7 and the Figure 14.

Table 7. Measurements of range of motion in the glenohumeral scapular joint: abduction

| | Przed terapią Before therapy | | Po terapii After therapy | |
|---------------|---------------------------------|------|-----------------------------|------|
| | M_1 | SE | M_2 | SE |
| Control group | 115.00 | 1.96 | 130.00 | 1.87 |
| Study group | 143.33 | 1.96 | 157.92 | 1.87 |

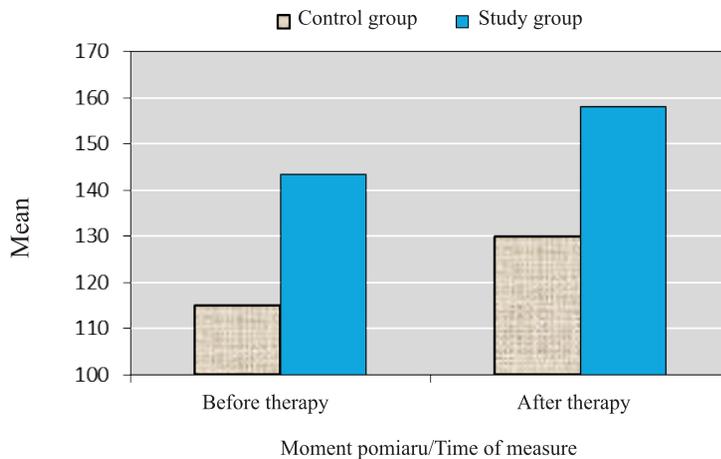


Fig. 14. Measurements of range of motion in the glenohumeral scapular joint: abduction

Range of motion in the glenohumeral scapular joint: external rotation

In the carried out analysis, statistically significant has proven to be the main effect of the measurement time, $F(1, 22) = 726.71$; $p < 0.001$. Regardless of the group affiliation, the abduction range in the glenohumeral scapular joint after the treatment ($M_2 = 57.29$; $SE = 0.71$) has been statistically significantly greater than before the treatment ($M_1 = 43.96$; $SE = 0.75$). The mean values distribution in the particular subgroups are shown in the following Table 8 and the Figure 15.

Table 8. Measurements of the range of motion in the glenohumeral scapular joint: external rotation

| | Before therapy | | After therapy | |
|---------------|----------------|------|---------------|------|
| | M_1 | SE | M_2 | SE |
| Control group | 42.50 | 1.06 | 55.42 | 1.00 |
| Study group | 45.42 | 1.06 | 59.17 | 1.00 |

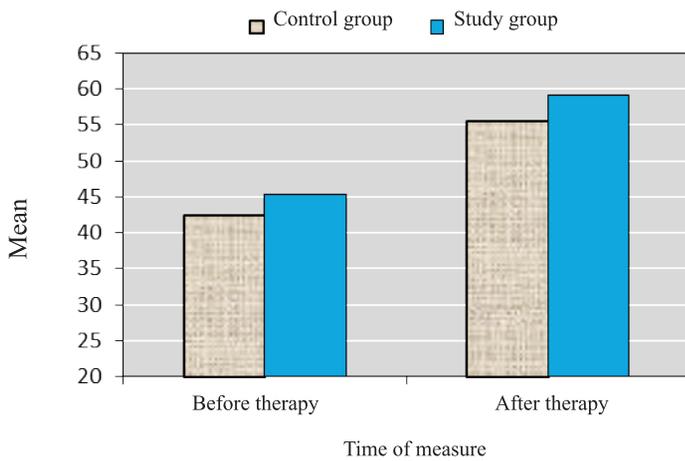


Fig. 15. Measurements of the range of motion in the glenohumeral scapular joint: external rotation

Range of motion in the glenohumeral scapular joint: internal rotation

In the carried out analysis, statistically significant has proven to be the main effect of the measurement time, $F(1, 22) = 91.64$; $p < 0.001$. This means, that regardless of the group affiliation, the mean adduction range in the glenohumeral scapular joint after the treatment ($M_2 = 57.29$; $SE = 0.71$) has been statistically significantly greater than before the treatment ($M_1 = 47.71$; $SE = 0.90$). The mean values distribution in the particular subgroups are shown in the Table 9 and on the Graph 16.

Table 9. Measurements of the range of motion in the glenohumeral scapular joint: internal rotation

| | Before therapy | | After therapy | |
|---------------|----------------|------|---------------|------|
| | M_1 | SE | M_2 | SE |
| Control group | 46.67 | 1.27 | 55.42 | 1.00 |
| Study group | 48.75 | 1.27 | 59.17 | 1.00 |

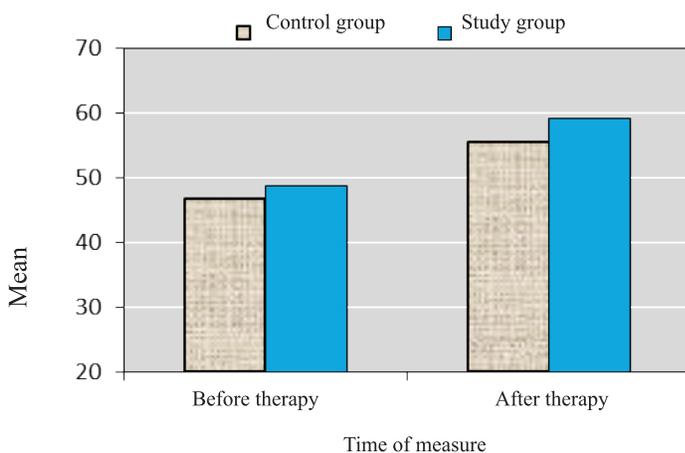


Fig. 16 Measurement of the range of motion in the glenohumeral scapular joint: internal rotation

Pain intensity in the VAS scale

There has been a statistically significant effect of the interaction between the group affiliation and the time of the measurement, $F(1, 22) = 11.99$; $p = 0.002$. This means, that the size of the change in the pain intensity between the first and the second measurement, has differed depending on the group affiliation. In order to allow for the interpretation of the interaction effect, the comparisons in pairs have been carried out between the measurements before and after the treatment, separately in the test and in the control group. Mean values and standard errors are shown in Table 10.

Table 10. Pain intensity in the VAS scale

| | Before therapy | | After therapy | | difference of means $M_1 - M_2$ | 95% confidence interval for difference | |
|---------------|----------------|------|---------------|------|---------------------------------|--|-------------|
| | M_1 | SE | M_2 | SE | | Lower limit | Upper limit |
| Control group | 5.50 | 0.22 | 1.50 | 0.22 | 4.00 | 4.00 | 4.46 |
| Study group | 5.33 | 0.22 | 2.42 | 0.22 | 2.92 | 2.92 | 3.38 |

In the control group, the test of significance of the differences has shown, that the pain intensity after the treatment ($M_2 = 1.50$) has been significantly lower than before the treatment ($M_1 = 5.50$). The difference between the means is statistically significant at $p < 0.001$. In the test group the mean pain intensity after the treatment ($M_2 = 2.42$) has also been statistically significantly lower than before the treatment ($M_1 = 5.33$). The difference is statistically significant at $p < 0.001$. The size of the difference between the mean values indicates, that the change which has occurred during the therapy in the control group ($M_1 - M_2 = 4.00$) is greater than the change, which has occurred in the test group ($M_1 - M_2 = 2.92$). The following bar graph shows the graphic interpretation of the interaction effect (Fig. 17).

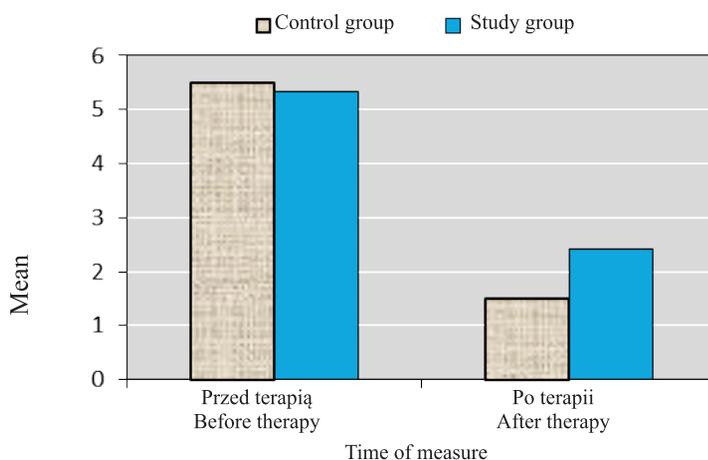


Fig.17. Pain intensity in the VAS scale

Discussion

In early post surgery period, in the patients after prophylactic mastectomy there occurs a slight edema, either in one or both upper extremities. Statistically, majority of edemas happen within 2 years after the surgery (72%). In 70% of women the swelling affects the arm, and in 67% the forearm [11]. In the presented research, after the applied treatment there has been established the reduction of the upper extremity circumferences on the side after surgery, on all levels, as well as the increase of motion range in the external and internal rotations, abduction and adduction of the glenohumeral scapular joint. The above observations confirm in their work Lipińska et al. The team in their own study has shown the reduction of extremity circumferences and the increased range of mobility in upper extremity joints, after the Kinesio Taping lymphatic applications, which have contributed to the improvement of physical fitness and quality of life of the patients [8, 12]. The obtained results indicate, that the application of the multilayer bandaging brings about greater reductions of the extremity circumferences, during the therapy, than it occurs in the case of the lymphatic Kinesio Taping applications, however it is important to stress, that these differences are small. Similar conclusions have reached Tsai et al., who in their research have made a comparative analysis of the effectiveness of the Complete Decongestive Therapy (CDT) in the therapy model: manual lymphatic drainage, multilayer bandaging, physical exercises, vacuum massage - versus the CDT model, where instead of the multilayer bandaging also the Kinesio Taping lymphatic applications have been used [13]. Their results are comparable in both examined groups as well, and the lymphatic tape applications have been considered by the patients more comfortable to wear, than the bandages. Our research has shown, that the Kinesio Taping applications reduce stasis and lymphedemas, as well as they reduce pain and unnatural skin sensations, by activation of the endogenous analgesic system. In the professional literature, there are many articles about the positive impact of Kinesio Taping in patients with various diseases. In their pilot studies Yasukawa et al. have proven, that the used by them Kinesio Taping applications have improved the upper extremity motor skills in children with the brain and spinal cord trauma [14], while Szczegielniak et al., using the Kinesio Taping in patients after lobectomy - due to the structural changes caused by a cancerous disease - where physiotherapy treatments and massage have been contraindicated, have demonstrated, that the Kinesio Taping method has proven to be the safe procedure for healing of the scar, improving functioning of the muscles and reducing the accompanying edemas and pain sensation [15]. Noteworthy are the studies by Fu et al. [16], who have described the beneficial impact of the Kinesio Taping on nerve terminals, and the obtained results they have linked to the stimulation of receptors located within the skin. Both in Poland and around the world, attention given to the Kinesio Taping method is really great. Many authors attempt to assess the beneficial effects of this method in different groups of patients, including the patients with the lymphedema. Physical methods used in combating the lymphedema must be selected on the individual basis, while keeping up the systematic and consistent collaboration with a patient. It must be stressed, that the anti edema therapy is a long term process, demands patience and not always brings about the desired results. The patients, who have undergone mastectomy and show the upper extremity lymphedema symptoms, should be provided with the complete and comprehensive physiotherapy. Sometimes, however, especially in the smaller medical centers, the mastectomy patients are being left to themselves. The deteriorating state of the upper extremity, resulting from the disease or incorrect forms of treatment, difficulty in maintaining the proper personal hygiene and aesthetic discomfort of the people around, on one hand cause the lack of acceptance of such person

in the community, while on the other, the patient tends to alienate herself. The factor intensifying the above state of affairs, is frequent assignment to such persons the permanent disability status. Physicians, because of the suggestive appearance of an edematous extremity in the 3rd or the 4th phase and the insufficient amount of training materials on the lymphedema, almost always decide of the permanent disability to work [17]. The proper treatment of lymphedema in mastectomy patients, provides them with an opportunity to quickly return to functioning in the new conditions, by increasing their self-reliance, allowing them to work professionally, and thus raising their self-esteem [18]. Our findings confirm, that the applied therapy, although it does not lead to the complete reduction of the lymphedema, it constitutes, however, an important tool in combating this disorder. Taking into account, just how dynamically the Kinesio Taping method is developing these days, it is to be expected that very soon more and more studies will be published, evaluating the effectiveness of the method in the area of the lymphedema treatment.

Conclusions

1. The Kinesio Taping applications can effectively replace the multilayer bandaging in the Complete Decongestive Therapy.
2. Applications of the Kinesio Taping method and the Complete Decongestive Therapy, do have an impact on the mobility in the upper extremity shoulder joint, on the side after surgery.
3. Kinesio Taping applications reduce the subjective pain sensation in the upper extremity on the side after surgery.
4. The Kinesio Taping in the treatment of upper limbs edema after the prophylactic mastectomy, in the opinion of the patients is more acceptable than bandaging.

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