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*Aleksandra Kołodziejczyk¹, Wojciech Zegarski^{1,2}, Maciej Kopec²

Evaluation of body posture and upper limb efficiency in women after surgery within the mammary gland

Ocena postawy ciała i sprawności kończyny górnej u kobiet po zabiegu chirurgicznym w obrębie gruczołu piersiowego

¹Department of Surgical Oncology, prof. Franciszek Łukaszczyk Oncology Center, Bydgoszcz
Head of Department: prof. Wojciech Zegarski, MD, PhD

²Ludwig Rydygier Collegium Medicum, Bydgoszcz, Nicolaus Copernicus University, Toruń
Head of Collegium: prof. Jan Styczyński, MD, PhD

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breast cancer, mastectomy, body posture, upper limb, physiotherapy

Słowa kluczowe

rak piersi, mastektomia, postawa ciała, kończyna górna, fizjoterapia

S u m m a r y

Introduction. Breast cancer is the most commonly diagnosed cancer in Polish women. Therefore constitutes approximately 23% of all cancers of the female population in Poland. According to the National Cancer Registry incidence of malignant mammary gland cancer exceeds 16500 cases per year.

Aim. The aim of this study was to evaluate body posture and efficiency of upper limb of operated side after the surgery within the mammary gland, taking into account the different treatments.

Material and methods. In the study involved 30 women after surgical intervention on the mammary gland. To evaluate the range of motion in the joints of the upper limb, the upper limb muscle strength and posture problems resulting from operation, was used Kułakowski and Mika test, and Kasperczyk evaluation.

Results. There was no statistically significant evidence for relation between the type of methods of treatment and the body posture and the efficiency upper limbs of patients. However, some trends were noted, which shows that the efficiency of the upper limb on the operated side (assessed on the basis of the Kułakowski and Mika test) was highest in patients treated with tumorectomy, while the lowest – in patients treated with Patey method. At the same time, there was confirmed a statistically significant relation between age of patients, muscle strength and edema in the upper limbs after the surgery.

Conclusions. There are not significant statistically differences between the effects of different treatments and the body posture and the efficiency of the upper limb after surgery within the mammary gland. Older patients, who underwent surgery characterized by significantly higher muscle strength, but also a bigger edema of the upper limb than younger patients.

S t r e s z c z e n i e

Wstęp. Rak piersi jest najczęściej diagnozowanym nowotworem złośliwym u polskich kobiet. Stanowi tym samym około 23% ogółu zachorowań na nowotwory wśród populacji żeńskiej w Polsce. Według Krajowego Rejestru Nowotworów liczba zachorowań na złośliwe nowotwory gruczołu piersiowego przekracza wartość 16 500 przypadków na rok.

Cel pracy. Celem przeprowadzonych badań była ocena postawy ciała oraz sprawności kończyny górnej strony operowanej po wykonanym zabiegu w obrębie gruczołu piersiowego z uwzględnieniem różnych metod leczenia.

Materiał i metody. W badaniach uczestniczyło 30 kobiet po chirurgicznej interwencji na gruczole piersiowym. Do ewaluacji zakresu ruchu w stawach kończyny górnej, siły mięśniowej kończyny górnej oraz wad postawy wynikających z operacji posłużono się testem Kułakowskiego i Miki, a także oceną według Kasperczyka.

Wyniki. Nie wykazano istotnych statystycznie zależności pomiędzy rodzajem stosowanych metod leczenia a postawą ciała i sprawnością górnej kończyny pacjentek. Zanotowano jednak pewną tendencję, z której wynika, że sprawność kończyny górnej po stronie

Address/adres:

*Aleksandra Kołodziejczyk
Department of Surgical Oncology,
prof. Franciszek Łukaszczyk Oncology Center
ul. Romanowskiej 2
85-796 Bydgoszcz
tel. +48 500-054-957
a.m.kolodziejczyk@o2.pl

operowanej (oceniana na podstawie testu Kułakowskiego i Miki) była najwyższa u pacjentek leczonych za pomocą tumorektomii, najniższa zaś u badanych leczonych metodą Pateya. Jednocześnie, potwierdzono istotną statystycznie zależność pomiędzy wiekiem pacjentek a siłą mięśniową oraz obrzękiem w obrębie górnej kończyny po wykonanym zabiegu.

Wnioski. Nie istnieją istotne statystycznie różnice pomiędzy wpływem poszczególnych metod leczenia a postawą ciała oraz sprawnością kończyny górnej po zabiegu w obrębie gruczołu piersiowego. Pacjentki starsze, u których wykonano zabieg, odznaczają się istotnie większą siłą mięśniową, ale jednocześnie większym obrzękiem w obrębie kończyny górnej, niż pacjentki młodsze.

INTRODUCTION

Breast cancer is the most commonly diagnosed cancer in Polish women. Therefore constitutes approximately 23% of all cancers of the female population in Poland (1). According to the National Cancer Registry incidence of malignant mammary gland cancer exceeds 16 500 cases per year (1). Moreover, in recent years there has been an increase in morbidity, which relates especially breast cancers occur in postmenopausal women. This upward trend resulting mainly due to changes in lifestyle of Polish women (especially those aspects that directly affect the hormonal metabolism), and also from an increase in exposure to carcinogens (1).

Nowadays, the most commonly performed surgical procedures aimed at treatment of breast cancer include: surgical removal of the tumor with a margin of surrounding tissues (tumorectomy), surgical removal of breast quadrant within which the tumor is located, and axillary lymph nodes (quadrantectomy), surgical removal of whole breast (mastectomy), sentinel lymph node excision and removal of the entire axillary lymphatic system (lymph node dissection) (1-3).

Each type of surgery performed within the mammary gland may result in disturbances and irregularities within the patient's body posture occurring after the operation, as well as a reduction in the efficiency of the upper limb on the operated side (2-6). At the same time, the assessment of the efficiency of the upper limb and body posture after the breast surgery allows the prediction and control of the appropriate course of improvement in patient (2, 5, 6).

AIM

The aim of this study was estimation of the parameters for the evaluation of body posture and efficiency of upper limb of surgery women. The study included mainly the impact of the various methods of surgical treatment of breast cancer to the test parameters associated with the efficiency of patients.

MATERIAL AND METHODS

The test group

Test group consisted of 30 women who had undergone surgical treatment of breast cancer. The study did not include a control group, but only patients who had undergone mentioned surgery. The average age of the women was about 50 years old, the youngest patient was 18 years old and the oldest 77 years. Therefore, the median age was 54.5 years.

In female patients, the majority (63.3%) had operated the right breast. The remaining 36.7% of the women the cancerous process took the left breast, and therefore, in their case, the procedure was carried out on this side. To the patients included in the study used the following surgical methods of treatment: removal of the sentinel lymph node, lymph node dissection, quadrantectomy, tumorectomy, modified radical mastectomy – Patey method (removal of the entire breast along with the pectoralis major muscle fascia, axilla lymph nodes and smaller pectoral muscle) and removal of cancerous changes by harpoon method (removal of the lesion after designation it with a hook – harpoon, under the control of mammography). When using the latter method also used the lymphoscintigraphy treatment (introduction of the radioactive tracer to determine the location of any tumor lesions in the lymph nodes).

The most commonly used surgical procedure was quadrantectomy, which was performed in 36.7% of the patients. A slightly smaller group of their patients (26.7%) were underwent mastectomy by Patey method. Other women underwent sentinel lymph node removal (10% of patients), treatment with harpoon and lymphoscintigraphy method (10%), lymph node dissection (10%) and tumorectomy (6.7%).

Area and organization of the study

The study was conducted in the prof. Franciszek Łukaszczyk Oncology Center in Bydgoszcz, in the Department of Surgical Oncology, the Section of Breast Diseases. Conducting the tests was approved by the Head of the Department and the Director of the Center of Oncology. The participants of the study – the patients – were informed about the purpose of the study, which they joined voluntarily. They were also assured that the study is anonymous.

To assess body posture and upper limb efficiency of the patients who underwent the surgery within the mammary gland used research tools discussed below.

The method of scoring by Kasperczyk

According to this method, in the patients made direct observation of selected elements of body construction and posture (7). Subject of the study was the following elements: in the sagittal plane: head, shoulders, scapulas, chest, abdomen, back; in the coronal plane (with front setting): shoulders, chest, knees; in the coronal plane (with back setting): shoulders, scapulas,

spine (7). For each element attributed the appropriate number of points. The point scale as follows: 0 points – the correct system of elements assessed, 1 point – slight deviation from normal, 2 to 3 points – a significant deviation from normal, 4 to 5 points – the distortion of the high-grade, structural changes (7). The maximum number of points that could be given the patient was 28. This would be the worst possible to assess the subject's body posture – providing a very significant distortion of figure. **According to the method of posture scoring by Kasperczyk – the lower the value reached by the patient, the more correct is her posture, and vice versa – poor posture resulting in higher values of the test (7).**

Kuřakowski and Mika test

As pointed out by Kuřakowski and Mika test in the evaluation of upper limb efficiency are included three basic categories: range of motion in the shoulder joint in different planes and directions, muscle strength (squeezing the hand) and the severity of possible edema (8).

By measuring the range of active motion in the shoulder joint were taken into account the range of three movements, which have the greatest limitation after the breast surgery, namely: abduction, external rotation, and straighten in the horizontal plane. Range of motion was measured by goniometer, and then set the percentage reduction compared to normal, assuming that they should be: 180° – for the abduction, 90° – for the external rotation 120° – for the straighten in the horizontal plane (8).

Upper limb muscle strength on the operated side measured with manually dynamometer (squeezing the hand in a sitting position). This parameter was measured in both upper limbs, and then defined the percentage reduction in muscle strength in the limb of operated side compared to the values obtained from the healthy limb study (8).

In order to assess of patients' lymphedema, were evaluated two factors: the circumference of the upper limb on the operated side and the consistency of the edema. Measure made using a centimeter tape in three locations: 10 cm above the lateral epicondyle of the humerus, 10 cm below the lateral epicondyle of the humerus, and in the mid-metacarpal excluding the thumb. Then calculated the difference between the values obtained after the measurement of the healthy limb and the limb circuit board on the operated side. The consistency of the lymphatic edema was evaluated by the method proposed by Singh et al. (9). According to this method, granted 5 points in the case of a patient with a soft consistency of edema, and 10 points for the diagnosis of a hard edema. Score was then included to the overall summary, which allowed to assess in numerical scale the health status of the patient's upper limb (9).

In statistical analysis of the results used parametric and non-parametric tests. Selection of tests for this group was dependent on compliance with the relevant conditions of normality and homogeneity of distributions, which was verified by the Shapiro-Wilk test and Levenen test. The level of statistical significance was set at $p < 0.05$.

RESULTS

The posture of the patients

The average value of the parameters of patients' posture, as measured by scoring method according to Kasperczyk, was 7.6 per 28 points (from 2 to 15 points; SD = 3.1) – performed either before surgery, and after its execution. This means that certain abnormalities of posture in subjects already occurred before the surgery, but none of the surgical techniques used did not alter posture of the patients. No correlation has been found between the type of the method of surgical treatment of breast cancer and the patient's posture, who has been treatment ($p = 0.6355$).

The efficiency of the patients' upper limb on the operated side

In the process of the evaluation of upper limb efficiency with the Kuřakowski and Mika test, the patients could receive a maximum of 80 points; wherein the higher the value of the result, the lower the efficiency of the hand. The average level of efficiency of the upper limb on the operated side in the tested patients was 33 points (from 25 to 41 points, SD = 4.9). This means that the overall level of arm's efficiency in the tested patients was relatively satisfactory – in fact ranged of one-third of the best results obtained during the Kuřakowski and Mika test.

Although did not confirmed statistically significant correlation between the type of surgery performed and the level of the upper limb's efficiency on the operated side, however, have shown some tendency, according to which: the highest level of efficiency of the upper limb occurred in the patients who were operated by tumorectomy method. Slightly lower efficiency of the test showed the patients operated using quadrantectomy and lymph node dissection, and subsequently also by the harpoon method while lymphoscintigraphy. A few points worse performance of the upper limb had patients with removed the sentinel lymph node. The worst results achieved the patients who underwent amputation by Patey method. These relations did not show statistical significance level ($p = 0.0790$), but did not differ very much from the designated limit p value of $p < 0.05$ (tab. 1, fig. 1).

Table 1. The relations between performed type of surgery and the efficiency of the upper limb on the operated side (the sum of the points gained in the Kuřakowski and Mika test).

Type of the surgery	Average	Median	SD	p
Sentinel lymph node	35.3	38	7.4	0.07896
Harpoon and lymphoscintigraphy	32.3	33	6.0	
Axillary lymph node dissection	31.7	33	3.2	
Amputation by Patey method	36.3	38	4.5	
Quadrantectomy	31	32	3.5	
Tumorectomy	27	27	1.4	

SD – standard deviation; p – significance level

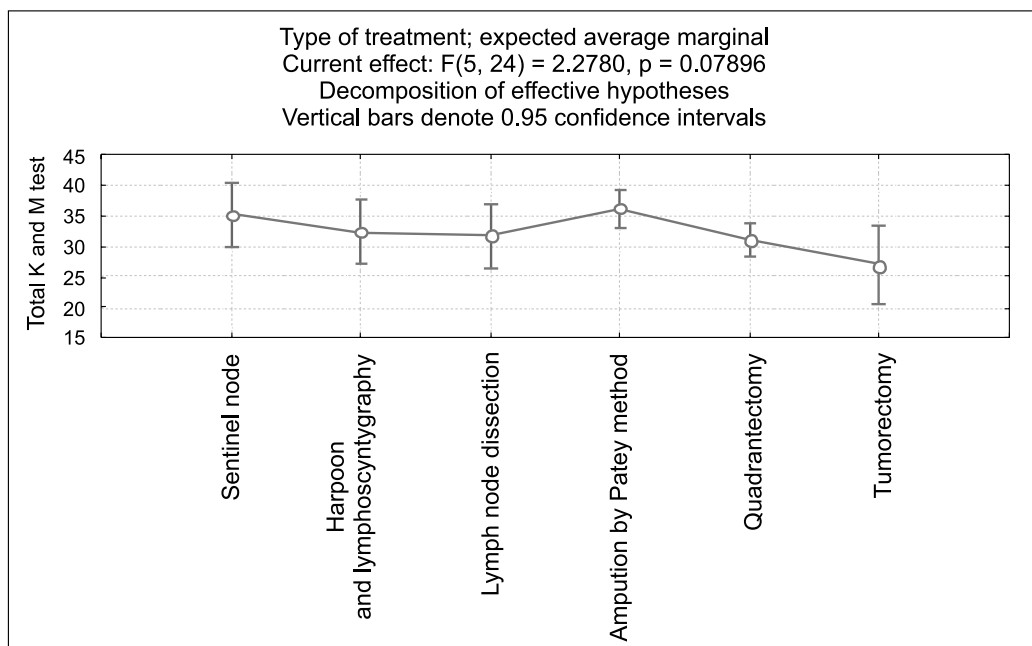


Fig. 1. The relations between the type of surgical procedure performed and the level of the upper limb efficiency as measured by the Kula-kowski and Mika test.

Among the patients studied was confirmed statistically significant ($p = 0.0198$) relation between age and muscle strength of the upper limb on the operated side – as measured by Kula-kowski and Mika test. The obtained results indicate that the older patients had bigger muscular strength of hand on the operated side than younger patients (tab. 2). At the same time, the results obtained indicate that the older patients had significantly higher ($p = 0.0016$) edema of hand on the operated side – after the surgical procedure within the mammary gland (tab. 2). This relations was confirmed using a non-parametric Spearman’s rank correlation test due to the lack of normal distribution for the age of the subjects.

Table 2. The relationship between patient age and muscle strength and edema of the upper limb on the operated side.

	Spearman’s rank order correlation			
	N	R	t(N-2)	p
Age and muscle strength	30	-0.42304	-2.4705	0.01984*
Age and edema	30	0.55057	3.4899	0.00161*

*statistically significant result ($p < 0.05$)

DISCUSSION

Many authors report that the surgery within the mammary gland can result in disorders and abnormalities within the body posture and the effectiveness of upper limb of surgery patients (3, 4, 10, 11).

Malick et al. indicate that women who were treated surgically for breast cancer, can have the disorder of posture – usually manifests itself in the form of thoracic kyphosis, which authors stated more often among operated patients than in the control group (11). These changes were observed in particu-

lar after a long time of surgical intervention (over several months). On similar data rely Haddad et al., who compared postural disturbances occurring in the two groups of women after mastectomy (3). The first of them was represented by patients who had significant postoperative lymphedema, while second – operated, but with no edema. The analysis conducted by Haddad et al. showed that in both groups occurred to abnormalities of the posture, however, among patients with diagnosed lymphedema these disorders were more advanced (3).

Bak and Cieśla reported that changes in the posture of the patients are more common and are the more advanced, the more invasive procedure was performed in a given patient (10). By invasive treatment is meant in this field execution of radical mastectomy without breast reconstruction. Bak and Cieśla compared the postural disturbances in three groups of the patients. The first of these were women after radical mastectomy, the second – the same procedure, but with simultaneous breast reconstruction (Becker-25 prosthesis) (10). The third group was healthy women who had no surgery within the mammary gland. The authors report that there was a statistically significant difference between the first and second group of the patients. This means that women undergo a radical mastectomy without breast reconstruction also exhibited significantly greater disturbance of the posture, which manifested primarily in the position of scapulas, shoulder and pelvis, as well as the inclination of the trunk and the deviation of the line of spinous processes from the vertical axis (10). Noteworthy is that these changes was not observed in women after mastectomy with simultaneously breast reconstruction, and at the same time – there were no statistically

significant differences between this operated group and the group of healthy women (10).

Based on author's own research, was not confirmed statistically significant differences between the posture of the patients prior to surgery within the mammary gland and the body posture of these women after the surgery. This is mainly due to the time in which this assessment was made. In the course of own research the aim was to establish any immediate changes in the body posture of the operated patients, so the evaluate of the posture was done a few days after surgery. Meanwhile, authors such as Bąk and Cieśla, and Haddad et al., indicate that the problems in the posture of patients occur at a later date and gradually get worse (3, 10). This means that after a period of several months, in the group of operated women are visible the abnormal of posture, which may show a gradual deepening. What's more, according to Bąk, relying on own data, as well as to Drummer et al. – in the patients after radical mastectomy irregularities of the posture occur even during the 1.5 years to 2 years, although active participation in the activities of physiotherapy (12). Therefore, these researchers recognize that postural disorders develop gradually over the first few months after surgery, and then – despite the duration of physiotherapy – they can persist for a period of about 3 years after surgery (12).

In the course of a number of studies also demonstrated that the treatments performed on the mammary gland can lead to a reduction in the efficiency of the upper limb on the operated side (2-6, 9, 13). It can manifest among other things, a reduction in muscle strength, reduction of mobility, as well as the occurrence of lymphedema, which significantly reduces the efficiency of the hand and contributes to the perception of pain. Moreover, Haddad et al. showed that between these aspects exists statistically significant correlation (3). This means that in the patients, who had the lymphedema, occurred to significantly more advanced changes in the other characteristics of the efficiency of their hand, than among the patients who had not the edema (3). In the group of the patients with edema occurred, among other things, to a more significant deterioration in the scope of flexion, abduction and external rotation of the arm. In these women also was significantly reduced range of the motion in all joints of the upper limb on the operated side (3).

However, in the course of author's own studies did not confirm statistically significant difference between the efficiency of the upper limb after surgical procedures performed by various techniques, there was confirmed reduction in the efficiency of the hand independent of the technique used. Moreover, despite the lack of statistically significant differences – confirmed some trend relatively close to the level of significance, according to which the worst results in terms of efficiency of the upper limb reached the patients who underwent more radical treatment (mastectomy by Patey method), while the highest efficiency retain women

which the treatment included only tumorectomy and therefore was less invasive and involved the removal of a much smaller volume of tissue.

On the basis of carried out studies noted also worth mentioning relation, according to which older patients have greater the upper limb muscle strength on the operated side. This is probably due to the specificity of the carried out test, which intended to assess the muscle strength – because in the its course is measured the muscle strength of both the upper limbs of the patient. Therefore, as a standard is considered the strength measured in the healthy hand on non-operated side. Probably in the older patients (in the study participated patients in the age to 77 years) performing the surgery were associated with more general weakness, so the hand on the operated side showed a proportionally higher strength than it was in the younger patients.

At the same time, it has been shown that in the older patients is a significantly higher postoperative lymphedema of the upper limb on the operated side. This is probably due to the properties of the circulatory system, that in the older patients works less efficiently than it does in younger persons.

CONCLUSIONS

1. Type of surgical procedure performed within the mammary gland during breast cancer treatment does not significantly affect the posture of the patients evaluated in a few days after the surgery.
2. There is no statistically significant correlation between the type of surgery performed within the mammary gland and the efficiency of the upper limb on the operated side.
3. The patients who underwent treatment of large volume of tissue dissection (mastectomy by Patey method) show worse efficiency of the upper limb on the operated side, than women with only a small area of the removed tumor lesions (tumorectomy). This correlation was not statistically significant.
4. There is a statistically significant relationship between age of patients and the upper limb's muscle strength on the operated side (after the surgery within the mammary gland): the woman is older, she shows greater muscle strength.
5. There is a statistically significant relationship between age of patients and lymphedema of the upper limb on the operated side (after the surgery within the mammary gland): the older a woman is, the greater the edema states after the operation.

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