Assessment of shoulder mobility in women over 60 years of age after one-sided mastectomy

Ocena funkcji barku u kobiet po 60. roku życia leczonych z powodu raka piersi

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Key words
mastectomy, shoulder, muscle strength, Range of Motion (ROM), aged

Abstract
Introduction: The overall risk of contracting various diseases, including breast cancer, increases with age. An on-going process of population ageing challenges modern physiotherapy with the need to have functional capacity in older people appreciably enhanced. The issue of anthropometric assessment of the range of motion and shoulder muscle strength is presently much underrated in the physical rehabilitation management of women patients after radical one-sided mastectomy.

Aim of the study: The study aimed to assess the functional mobility of a shoulder expressed as a range of motion, in conjunction with the assessment of shoulder muscle strength, in women patients over 60 years of age after radical one-sided mastectomy.

Methods: The study comprised 24 patients (mean age 65 years) recruited from the Department of Rehabilitation, Holy Cross Cancer Centre, Kielce. All patients had undergone modified radical mastectomy using the Madden technique, and an adjuvant therapy. The shoulder range of motion, i.e. flexion, abduction, internal and external rotation, was evaluated by a goniometer. Elevation, protraction and retraction movements were evaluated using an anthropometric device. A dynamometer was applied to assess the strength of select muscle groups within the shoulder during elevation, protraction and retraction motions. Statistical analysis was made with the aid of STATISTICA 12.0 software, having adopted a 0.05 alpha level as statistically significant.

Results: The movements of flexion, abduction and external rotation of the upper extremity were significantly reduced on the mastectomy side. The range of motion and muscle strength during shoulder elevation, protraction and retraction were significantly diminished on the operated side (12% - 14%), compared to the non-operated one.

Conclusions: 1. Functional mobility of the shoulder was significantly reduced on the mastectomy side. 2. Results of the present study highlight the need to extend the scope of rehabilitation regimens offered to older women after radical one-sided mastectomy.

Streszczenie
Wstęp: Z wiekiem wzrasta ryzyko zachorowania na różne choroby, w tym raka piersi. Postępujący proces starzenia się społeczności wymaga od współczesnej fizioterapii zwiększenia sprawności funkcjonalnej osób starszych. Problem antropometrycznego pomiaru zakresu ruchu oraz siły mięśni barku jest słabo dostrzegany w procesie usprawniania pacjentek po mastektomii.

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INTRODUCTION

The risk of breast cancer in women over the age of 60 is 3.54%, and rises to 3.84% over the age of 70, being the greatest risk in the studied age groups. Along with advancing age, a decrease in the five-year survival rate is also noticed. In the 60-69-year-old age group, it is 91%, whereas for the over-80s, it is 64%.

In the last 40 years, the average percentage of women with breast cancer who survive 5 years after diagnosis has doubled from 25% to 50%. According to the American Cancer Society, between 2003 and 2011, the five-year survival rate for breast cancer was 1.5% higher in comparison to the measurements conducted in the period spanning 2002 - 2004. Increased survival is associated mainly with improved treatment methods and earlier detection of this disease. In about 40% of women after mastectomy, however, at least one functional loss of the shoulder is noted. Furthermore, anthropometric measurements of the range of motion and shoulder muscle strength do not feature prominently enough in the process of rehabilitation of patients after breast cancer treatment. It is therefore essential to put an extra focus to functional fitness in elderly women after mastectomy.

METHODS

The data was collected during research conducted at the Department of Physiotherapy of the Holy Cross Cancer Centre in Kielce. The study enrolled 24 patients over the age of 60, who, both at the time of the study, as well as prior to the commencement of the treatment, did not feel any pain, dysfunction or restriction of shoulder mobility on the operated or non-operated side, according to their own subjective assessment. Inclusion criteria were: age (≥ 60 years), time passed since mastectomy (≥ 2 years), and the absence of lymphatic edema (greater than 3 cm between the upper limbs) noted during examinations. All patients actively participated in the physical rehabilitation programme used at the Department of Physiotherapy of the Holy Cross Cancer Centre. The rehabilitation programme comprised physical therapy during the hospitalisation (preoperative, postoperative) and ambulatory period, and described in a different publication.

Methods

The study was prospective. The medical records of medical history, clinical classification of breast cancer and the result of pathomorphological breast and lymph node tests were analysed. Data was collected for adjuvant treatment: chemotherapy, radiation therapy, hormonal therapy. A clinical study was conducted at the Department of Rehabilitation of the Holy Cross Cancer Centre in Kielce, making use of commonly applicable measuring equipment, both for testing adults and children. Following standard practice, radiation therapy was applied using the conformal mixed photon-electron beam technique with a total dose of 4500 cGy, where the fractional dose was 225 cGy, and the number of fractions was 20.

The evaluation of motion of the upper limbs was assessed using a goniometer. The range of movement was determined by the ISOM (International Standard Orthopedic Measurement), and the results saved to an SFTR system (Sagittal Frontal Transverse Rotation) for the following movements: flexion, abduction, internal and external rotation of the upper limbs on the operated and nonoperated side. Measurements were made in compliance with generally accepted methodology.

Muscle strength was assessed using a CURSOR ISOBEX 3.1 dynamometer which was attached to the ground with suction cups. For every movement, it took 3 measurements of isometric tension maintained for 3 seconds. The mean value was used for analysis and the results recorded in kilograms (kg). The strength of selected muscle groups in the shoulder was tested during elevation, protraction and retraction in line with the methodology for dynamometric measurements of specified movements. The research was approved by the Insti-
Data analysis

Statistical analysis was completed using the STATISTICA PL v12 package for Windows. Data distribution was examined using the Shapiro-Wilk test (n<100). Descriptive statistics comprised: arithmetic mean, standard deviation, and percentage distributions. The Student t-test and the Mann-Whitney test were applied, depending on the distribution of variables. The statistically significant level was adopted at alpha = 0.05.

RESULTS

Basic description of the study participants

The study comprised patients over the age of 60 (mean 65.4 years), on average, three years after the radical mastectomy procedure. More than 65% of subjects had their left side surgically treated and more than 80% of the women underwent chemotherapy after surgery. More than 65% of patients received adjuvant therapy in the form of radiation and hormone therapy. A complete description is shown in Table 1.

The range of movement in the basic patient description differed significantly between the operated and non-operated limbs in the movements of flexion, abduction and external rotation: 4.4°, 3.5°, 4.5°, respectively.

The range of motion expressed in centimetres during elevation, protraction and retraction movements differed significantly in all these movements: 0.7 cm, 0.6 cm, 0.8 cm, respectively.

The shoulder muscle strength during lifting (a difference of 1.8 kg), protraction (a difference of 1.21 kg) and retraction (a difference of 0.85 kg) differed significantly on the operated side of the breast in relation to the non-operated side.

| Table 1 |
| --- |
| **Description of the study group** |
| **Baseline characteristics of the study group** |
| Variable | N=24 | p |
| Age (years), x ±SD | 65.4 ±4.4 | - |
| Height (m), x ±SD | 1.63 (9.4) | - |
| Weight (kg), x ±SD | 69.5 (9.4) | - |
| BMI (kg/m²), x ±SD | 26 (3.21) | - |
| Time since surgery (years) x±SD | 3.4 (1.5) | - |
| Operated side L/R (%) | 70.8/29.2 | - |
| Education (%) | | |
| Primary | 8.3 | - |
| Occupational | 8.3 | - |
| High-school | 66.7 | - |
| Higher | 16.7 | - |
| Adjuvant therapy yes, (%) | | |
| Chemotherapy before* | 20.8 | - |
| Chemotherapy after** | 83.3 | - |
| Radiation therapy | 70.8 | - |
| Hormonal therapy | 66.6 | - |
| Upper-limb range of motion Op/H mean | | |
| Flexion (°) 163.5/167.9 <0.01 | |
| Abduction (°) 164.8/168.3 <0.01 | |
| Internal rotation (°) 75/77.4 0.07 | |
| External rotation (°) 82.9/87.4 <0.01 | |
| Shoulder range of motion | | |
| Elevation (cm) mean 8.9/9.6 <0.01 | |
| Protraction (cm) mean 7.6/8.2 <0.01 | |
| Retraction (cm) mean 5.3/6.1 <0.01 | |
| Shoulder muscle strength Op/H, mean (kg) | | |
| Shoulder elevation 11.8/13.1 <0.001 | |
| Shoulder protraction 7.1/8.3 <0.001 | |
| Shoulder retraction 5.5/6.4 <0.001 | |

L – left, R – right, * chemotherapy before surgical procedure, ** chemotherapy after surgical procedure, Op – Operated, H – Healthy

DISCUSSION

The study aimed to assess the range of motion and shoulder muscle strength of selected shoulder muscle groups after radical mastectomy in women over the age of 60. The patients, examined 3 years after the surgical procedure, had a significantly limited range of motion of the upper limb on the operated breast side during flexion, abduction and external rotation; this also corroborated by other authors. Furthermore, the range motion of the shoulder when elevating, and during protraction and retraction of the shoulder, was statistically significantly smaller on the side of the radical mastectomy in relation to the non-operated side. Shamley et al. 10, who studied the electromyograph-ic activity of the upper-limb muscles, noted the weakening of serratus anterior and the pectoralis minor muscle activity in the upper limb on the side of the mastectomy.

The deterioration in serratus anterior muscle efficiency was associated with the instability of the shoulder on the operated side 10. The strength of the shoulder girdle on the operated side, compared to the healthy side...
appears to be significantly weakened in each of the tested movements. The muscle strength during elevation, protraction and, retraction of the shoulder was lower on the side of the mastectomy 3 years after the procedure, by 13.8%, 14.5% and 13.3%, respectively.

Restricted mobility and upper limb muscle strength after the mastectomy was also observed by others in-duction, by 13.8%, 14.5% and 13.3%, mastectomy 3 years after the procedure. In the summary of each of the tested movements. The function of the shoulder joint is not only executive, but also protective. About 33% of the elderly fall at least once a year, including twice as many women than men9, Falls may result in fractures, amongst which the fractures of the femoral neck and dis-tal epiphysis of the radius prevail10. The study highlights the need to effectively broaden the scope of physical rehabilitation regimens offered to the patients after radical mastectomy, through introducing a range of tech-niques mobilising the shoulder and enhancing muscle strength responsible for its movements.

CONCLUSIONS
1. The shoulder function in women over the age of 60 on the side of the mastectomy is appreciably limited.
2. The present study highlights the need to broaden the scope of physical rehabilitation regimens offered to the elderly patients after radical breast cancer treatment.

Conflict of interest: none declared

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