Falls-risk in senior women after radical treatment of breast cancer

Ryzyko upadku u starszych kobiet po radykalnym leczeniu raka piersi

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Słowa kluczowe: rak piersi, ryzyko upadku, sprawność funkcjonalna.

Abstract

Introduction: It is estimated that 35–40% people over the age of 65 experience at least one fall per year; for those over the age of 80 this increases to 50%, and for residents of institutional care facilities, to 60%.
Aim of the research: To evaluate the functional capacity and susceptibility to falling among women over 60 years of age, who had been treated for breast cancer.
Material and methods: The study group comprised 173 women aged 61–85 years (mean: 68.75 years), all breast cancer survivors treated at the Holy Cross Cancer Centre in Kielce. Functional efficiency was measured using the Senior Fitness Test (SFT), and the falls-risk assessment was carried out using the POMA Tinetti test. An additional questionnaire was used to assess the anxiety associated with falls. The relationship between functional capacity and the falls-risk, and between the amount of medication used and the falls-risk, were also assessed.
Results: In all SFT tests, the women had lower scores compared to the recommended standards. Medium and high falls-risk were reported in 27% of patients. Apart from an increase in falls-risk, the women reported poorer results in all physical fitness tests. An increase in the number of medications taken was associated with lower Tinetti test results.
Conclusions: Women treated for breast cancer were exposed to a high falls-risk. The treatment management applied to women with breast cancer adversely affected their functional capacities. Furthermore, an increase in the amount of medication taken by post-mastectomy women resulted in a still higher exposure to falls-risk. Task-oriented, physical rehabilitation programmes should therefore promptly be introduced to address the problem of falls and resultant fractures among senior post-mastectomy women.

Streszczenie

Wprowadzenie: Szacuje się, że 35–40% osób po 65. roku życia doznaje co najmniej jednego upadku w ciągu roku, po 80. roku życia prawie 50%, natomiast wśród pensjonariuszy opieki instytucjonalnej odsetek ten sięga 60%.
Cel pracy: Ocena sprawności funkcjonalnej oraz skłonności do upadków wśród kobiet po 60. roku życia leczonych z powodu raka piersi.
Materiał i metody: Badaniami objęto 173 kobiety w wieku 61–85 lat (średnia: 68,75 roku) będące po leczeniu raka piersi w Świętokrzyskim Centrum Onkologii w Kielcach. Sprawność funkcjonalna została oceniona za pomocą Senior Fitness Test (SFT). Oceny ryzyka upadku dokonano za pomocą Tinetti POMA test, a kwestionariusz ankiety posłużył do oceny stopnia

niepokoju związanego z upadkami. Analizie poddano również związki między sprawnością funkcjonalną a ryzykiem upadku oraz między liczbą zażywanych leków a ryzykiem upadku.
Wyniki: We wszystkich próbach SFT badane kobiety miały niższe wyniki w porównaniu z zalecanymi normami. Średnie oraz wysokie ryzyko upadku stwierdzono u 27% badanych. Wraz ze wzrostem ryzyka upadku kobiety osiągały słabsze wyniki we wszystkich próbach sprawności fizycznej. Wzrost liczby zażywanych leków był związany z gorszym wynikiem testu Tinnetti.
Wnioski: U kobiet leczonych z powodu raka piersi występuje wysokie ryzyko upadków. Metody stosowane w leczeniu raka piersi niekorzystnie wpływają na sprawność funkcjonalną. Wraz ze wzrostem liczby zażywanych leków u kobiet po mastektomii wzrasta ryzyko upadku. Należy wdrożyć program usprawniania zapobiegający upadkom i złamaniom wśród kobiet po mastektomii.

Introduction

From a medical point of view, falls refer to an incident involving a sudden, unintended change in body position due to a loss of balance (without external force), while walking or performing any activity, leaving the casualty on the floor, ground, or any other low-lying surface. It is estimated that 35–40% people over the age of 65 years experience at least one fall per year; for those over the age of 80 years this increases to 50%, and for residents of institutional care facilities, to 60% [1].

The causes of falls include internal factors, resulting from changes associated with the ageing process, and external (environmental) factors associated with the individual's surroundings [2].

The significance of falls in older people is linked to their consequences – almost half of these falls lead to injuries, 10–15% cause severe injuries such as concussion or intracranial haematoma, and 5–6% result in various kinds of fractures. Consequently, falls lead to hospitalisation, a decrease in functional capacity, and a decrease in overall quality of life, as well as other complications, potentially resulting in death [3]. In older women treated for breast cancer, falls are even more of a threat as they can lead to lymphoedema.

The side effects of medications are one cause of falls, and this is not frequently discussed in depth. Multiple morbidities in the elderly are associated with taking a variety of drugs, often in the wrong dosage, and often mixed with those not prescribed by a doctor. With the increase in the number of drugs taken, the risk of adverse effects, drug interactions, and the likelihood of falls increases. It has been shown that the use of more than four drugs at the same time (multimedication) causes a significant increase in the falls-risk (especially resulting from the influence of benzodiazepines, phenothiazines, antiarrhythmic drugs, antihypertensive drugs, antidepressants, and diuretics on the central nervous system) [4]. In the present study subjects, the amount of medication increased due to the very nature of the disease, and hormone therapy was recommended for a period of five years, as of the commencement of the treatment management.

The Authors attempted to determine whether the changes triggered by breast cancer and its treatment significantly affected balance and gait abnormalities.

Aim of the research

The study aimed to evaluate the functional capacity, susceptibility to falling, and anxiety associated with falling among women aged 60 years and over, who had been treated for breast cancer. The relationship between functional capacity and the falls-risk, as well as the falls-risk and the number of medications taken in the study group, were assessed.

Material and methods

The study was conducted at the Department of Rehabilitation, at the Holy Cross Cancer Centre in Kielce following express approval issued by the Bioethics Review Committee, Regional Medical Chamber (No. 19/KBL/OIL/2011). The study comprised 173 women who had been operated on for breast cancer. The patients were divided into five age groups, following the recommendations of the authors of the Senior Fitness Test (60–64 years, 65–69 years, 70–74 years, 75–79 years, 80 years and over). The age of the subjects ranged from 61 to 85 years (mean: 68.8 years). Their body height ranged from 145 to 176 cm (mean: 161 cm), the weight from 44 to 116 kg (mean: 71.13 kg), and the body mass index (BMI) from 18.56 to 41.10 kg/m^2 (mean: 27.3 kg/m^2). Eyesight impediments were reported in 80.8% of the women.

4.1% of the respondents took no medications, and the greatest number of medications taken at the same time (15) was reported in 2.3%. The majority of respondents (62.4%) indicated a susceptibility to dizziness. 89.6% of the women reported that they did not use any walking aids. Among those who did use walking aids, most of the respondents admitted to using just a walking stick (64.7%).

Functional capacity was rated using a battery of tests referred to as the Senior Fitness Test (SFT), which is the only test recommended for the seniors by the International Council of Sport Science and Physical Education (ICSSPE) [5].

In order to evaluate balance and gait, the Performance Oriented Mobility Assessment (POMA) was used, as published in 1986 by Tinetti *et al.* [4].

The test consisted of two parts. The first part (POMA-B) contained nine features for the assessment of balance while sitting, rising, standing, turning 360°,

Table 1. Assessment of gait and balance – Tinetti Test Results

Variable	Descriptive statistics						
	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum
Balance	14.37	2.56	4.00	14.00	16.00	16.00	16.00
Gait	10.92	1.87	2.00	10.00	12.00	12.00	16.00
Tinetti test	25.29	4.11	6.00	24.00	27.00	28.00	28.00

Table 2. Falls-risk in the examined group

Falls-risk	Number	Percentage
Low	127	73.41
Medium	25	14.45
High	21	12.14

and sitting down. The second part (POMA-G) contained seven features that assess gait: hesitancy at the initiation of movement, the length and height of steps, step symmetry, step continuity, gait path, and trunk movement. For each feature, the respondent could score 1 or 2 points, providing a maximum score of 28 points. A final score between 25–28 points signified a low falls-risk, 24–19 points a medium falls-risk, and a score of less than 19 points a high falls-risk. A score below 26 points indicated a falls-risk, and below 19 points – a five-fold higher falls-risk.

The survey respondents also expressed some concern about their exposure to falls-risk during various activities. They answered questions concerning the number of falls, problems with getting up, and injuries associated with falls.

The relationship between the results of functional capacity and the falls-risk, as well as the relationship between the Tinetti test scores and the amount of medications taken were also assessed.

Results

Functional capacity – SFT

During the test measuring lower body strength, the participants were able to stand up 11 times in 30 s on average; 52% of them scored within the set standard score, 45.1% achieved results below the standard score, and 2.9% were above the set standard score. The test participants performed, on average, 12 arm flexions with a weight in 30 s in the upper body strength test; 48.6% of the results fell within the standard score. Worse results were achieved in the aerobic endurance test, in which participants lifted the lower limbs for 2 min. The aerobic endurance test results ranged from 2 to 110 lifts, or an average of 66 lifts. 63% of women scored below the standard. The average score in the lower body flexibility test was 2.34 cm, with 63% of test participants achieving normal results. Significant differences between the results were observed in the upper body flexibility test. Due to the nature of the disease, the test was performed on the dominant and non-dominant side of the body, which in half of the cases was the side operated on. In both the operated and non-operated sides, 80% of patients achieved results below the standard score. The 8FT UP & GO test, which measures motor agility and dynamic balance, took an average of 8.23 s, and the majority of patients (69.9%) achieved results below the standard score.

Assessment of gait and balance – the Tinetti test

The Tinetti test results are presented in Tables 1 and 2. They show the medium and high falls-risk in 26.6% of patients.

Questionnaire – rating anxiety associated with falls

The largest group of women surveyed did not express any concern ("not at all concerned") with falls-risk in all activities except walking on slippery surfaces, walking on uneven surfaces, and walking up and down on steep terrain. When answering the survey question *Are you generally afraid that you may fall over?* 46.2% were "a little afraid", 26.6% were "not at all afraid", 17.9% were "very afraid", and 9.3% were "quite afraid". When asked how many times they had fallen during the previous year, 65.3% of the respondents reported no falls, 20.2% – one fall, and 14.5% – more than one fall. The majority of respondents (63.9%) reported no problems standing up. Just over half of the respondents (52.8%) did not report injuries caused by falls.

The relationship between functional capacity results and the falls-risk

The results of the tests assessing the relationship between functional capacity and the falls-risk are presented in Table 3.

A highly significant correlation ($p < 0.01$) between the results of functional capacity tests and the falls-risk was reported. The mean values indicated that the higher the falls-risk, the weaker the results in all the tests assessing physical fitness.

The relationship between Tinetti test results and the amount of medication taken

There was a highly significant ($p < 0.01$) negative correlation observed between Tinetti test results and the amount of medication taken. This correlation ($r = –0.2535$) indicated that the greater the number of medications taken, the lower the Tinetti test results.

Discussion

Currently, the increasing demographic ageing of populations highlights the need to address the problems of the seniors. Serious geriatric problems include falls with related injuries; this being one of the key causes of disabilities among seniors. In the present study, the functional capacity of women over 60 years of age treated for breast cancer was assessed. The risk of falling, and the relationship between functional efficiency and the risk of functional decline, as well as the relationship between the amount of medication taken and the falls-risk, were also addressed.

To date, only a few studies have been completed, so readily available statistical data on these issues is still rather limited, especially in relation to cancer patients.

The results of the above referenced studies of functional capacity assessed with the aid of the "8-foot up and go test" (agility and balance), "2-minute step test" (aerobic endurance), "getting up from a chair" (lower body strength), "arm flexions" (upper body strength), "scratching the back" (upper body flexibility), and "sit down and reach" (lower body flexibility) attested to a significantly lower functional capacity among the women treated for breast cancer, as compared to healthy people. This reflects lower physical efficiency and capacity in the women treated for breast cancer. Many authors highlight that the treatment of breast cancer causes many side effects, which may hamper overall coordination of the systems involved in physical activity, thus significantly reducing individual ability to perform physical actions. The reasons for reduced physical performance include pain, swelling of the lymphs, decreased mobility, and decreased muscle strength leading to a reduction in physical activity and an energy-limiting lifestyle [6–12].

The functional capacity of older women assessed with the aid of the "get up and go" test was also investigated by Kozak-Szopek. In a study of 22 senior women (mean age: 79.2 years), it was found that less time was required to perform the "get up and go" test (from 12.41 s to 11.27 s) after two months of physical rehabilitation. The programme comprised physical exercises for 30 min three times a week. At the same time, patients reported being in a generally better frame of mind (feeling less moody), which was expressed by a significant reduction in the number of points in the GDS (Geriatric Depression Scale) from an average of 6.09 to 4.91 ($p < 0.01$). The study demonstrated that even short-term physical therapy improves both physical and emotional condition [13].

Table 3. Relationships between functional capacity and the risk of falling

SFT	Kruskal-Wallis test
Lower body strength test	< 0.0001
Upper body strength test	0.0025
Aerobic endurance test	0.0002
Lower body flexibility test	< 0.0001**
Upper body flexibility test (right side)	0.0018**
Upper body flexibility test (left side)	0.0099**
Upper body flexibility test (side not operated on)	0.0057**
Upper body flexibility test (side operated on)	0.0037**
Upper body flexibility test (non-dominating side)	0.0049**
Upper body flexibility test (dominating side)	0.0040**
Agility test/dynamic equilibrium test	< 0.0001**

**p < 0.05, **p < 0.01*

In the present study, the results of falls-risk assessment with the aid of the POMA Tinetti test were also analysed. They showed that 27% of women treated for breast cancer were exposed to a medium-to-high falls-risk. It should be noted that all the women examined lived at home, and not, as in the majority of previously published research, in an institutional care centre.

While collecting historical data related to falls and potential falls, Winters-Stone found that 76% of patients with breast cancer experienced a fall during the previous 18 months [14].

In the group of women under study, falls posed a serious threat. Not only was there a risk of fracture, but there was also the risk of possible complications involving the upper limb on the operated side, manifested, among other conditions, by lymphoedema.

In the women with breast cancer, the risk of fracture was significantly higher (although there were no bone metastases observed) than in the healthy women in the same age group. Bone density changes as a result of irradiation, which consequently adversely affects its microarchitecture [15].

Fractures are a particular concern for breast cancer survivors (BCS) due to the combined effect of chemotherapy and adjuvant endocrine therapy on fracture risk factors, including bone mass and falls-risk [14].

In older adults, the main risk factors for falls include a prior history of falls, muscle weakness, gait

and/or balance impairment, and poor vision. Cancer treatment may increase falls-risk because the applied treatment management can exacerbate traditional risk factors, potentiate less common risk factors, or contribute to falls in new ways. Breast cancer chemotherapy may also cause peripheral neuropathy and weakness. Adjuvant endocrine therapy has unknown effects on neuromuscular function, and may alter vision in several ways. Despite the study limitations, i.e. examination of only a few falls-risk factors, and the fact of making use of simple balance and strength assessments only, prior work suggests that both balance and strength deteriorate in oestrogen-deficient BCS, when compared to control groups, and that falls are more common in the BCS affected by muscle weakness [16].

According to a study conducted by Ostrowska, difficulty in maintaining balance and gait increases with age, and the process tends to affect women to a greater extent [17].

In a study of 140 60-year-old patients, Skalska noted that falls occurring in older people contribute to a deterioration of physical fitness, thus demonstrating the relation of age to the decrease in stability expressed by increased trunk sway, poor balance, lateral stability in tandem stand, and slower completion of the "get up and walk" test [3].

Francis [18] and Rubenstein [19] demonstrate that women are at higher risk of balance disorders and falls. They are three times more likely to fall over and twice as likely to suffer fractures. For this reason, they are also five times more likely to be hospitalised [20].

A survey by Pruszyński *et al.* comparing the locomotion in a group of men and women shows that men are more prone to falls [21].

Winters-Stone *et al.* also examined women (n = 59) recovering from breast cancer to assess the falls-risk. The patients were asked about the number of falls they had experienced in the previous year. The results of the study suggested that the women under study reported a higher average number of falls than the average for older adults living in the same community. According to the authors of the study, 58% of the survivors of breast cancer experienced a fall during the year before the study and almost half (47%) fell within 6 months of joining the study. The study included a comprehensive assessment of characteristic balance and neuromuscular features that are acknowledged to be associated with falls. It seemed that balance was the only factor that distinguished the patients who survived breast cancer from those who did not fall. The study results also suggested that the balance problem may be associated with changes in the vestibular system, which were in turn associated with chemotherapy [14].

The study results presented by Winters-Stone *et al.* are in line with the results reported by Chen, who claims that patients with breast cancer report a 15% higher risk of falling than a healthy control group [22].

Significant changes in the stability of body posture were also observed by Wampler *et al.* in their study of 22 women undergoing taxane-chemotherapy, as compared with a control group of healthy women. The researchers also observed that breast cancer patients treated with taxane-chemotherapy had reduced visual acuity at low, but not high, contrast when compared with the healthy control group [23].

The test results reported by Winters-Stone, along with Wampler's studies, suggest that the treatment of breast cancer may adversely affect the vestibular impulse to balance and control, which may lead to falls [14].

Sullard highlights the relationship between equilibrium and cognitive impairment. Cognitive decline is related to problems with memory, language, thinking, and evaluation that are greater than typical age-related changes. Similar symptoms are reported by patients during chemotherapy. Referring to studies involving women who have survived breast cancer, Sullard maintains that they suffer from a greater imbalance compared to the reference values [24], both during and after chemotherapy. Patients were asked about their concerns regarding the possibility of falling. The results showed that women were afraid of falling while walking over steep terrain, as well as slippery or uneven surfaces. The results also showed significant associations between functional capacity and the falls-risk. The mean values showed that the higher the falls-risk, the weaker the results in all the tests assessing physical fitness.

As polypharmacy is considered a factor causing an increased risk of falls, the present study evaluated associations between the risk of falling assessed with the aid of the Tinetti test and the amount of medication taken. The study shows that an increased number of medications leads to poorer test results. The notion that the side effects of medications are frequently the cause of falls has not been discussed in depth, even though, in the seniors, the side effects of taking medications occur two or even three times more frequently than in young people, and the multiplicity of diseases in this age group results in numerous drug combinations, which often include non-prescription medications. At the same time, the risk of side effects increases along with the number of medications taken, and the use of more than four drugs at the same time significantly increases the likelihood of falling [4]. The medications that contribute to falls among the seniors comprise antihypertensives, diuretics (resulting in hypovolaemia, electrolyte disorders, and an increased urgent need to urinate, which in turn causes a frequent and sometimes urgent need to get to the toilet), antiarrhythmic drugs, anti-diabetic drugs, and drugs affecting the central nervous system, such as benzodiazepines, phenothiazines, and antidepressants [25]. These may interfere with cognitive functions, causing a prolonged reaction time, disturbances of consciousness, an intensifica-

tion of orthostatic pressure drops, and the induction of cardiac arrhythmias. It seems that psychotropic drugs attest to the strongest correlation with the occurrence of falls [26].

The Authors of the present study and the results yielded by the studies conducted by other researchers cited effectively corroborate the scale of the problem associated with limited functional capacity and the occurrence of falls in the seniors, especially in women who have been treated for breast cancer. All the above referenced body of evidence calls for a prompt introduction of the task-oriented physical rehabilitation programmes specifically addressing this problem.

Conclusions

In the group of women treated for breast cancer, a high and medium falls-risk was observed in nearly 30% of the patients under study. The high number of medications taken by women after a mastectomy lead to an increased exposure to falls-risk. A task-oriented, physical rehabilitation programme should promptly be introduced to help prevent falls in women after mastectomy, thereby reducing their adverse consequences, such as fractures or even lymphoedema.

Conflict of interest

The authors declare no conflict of interest.

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