Physical Activity in Breast Cancer Patients during Medical Treatment and in the Aftercare – a Review

Freerk T. Baumann Wilhelm Bloch Anke Weissen Marie Brockhaus
Julia Beulertz Philipp Zimmer Fiona Streckmann Eva M. Zopf

Department of Molecular and Cellular Sport Medicine, German Sport University Cologne, Germany

Keywords

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Summary

Most scientific studies regarding physical activity in cancer patients involve breast cancer patients. It is apparent that physical activity during medical treatment and aftercare is not only feasible and safe but also effective. Current studies clearly show that regular and specific endurance and/or resistance training can reduce a number of side effects caused by medical treatment. Among others, improvements in physical performance, body composition, and quality of life as well as a reduction in fatigue, have been observed. Since inactivity appears to exacerbate lymphedema, patients with lymphedema are also encouraged to exercise. Few studies have been carried out regarding physical exercise in metastatic patients. However, experts in the field also recommend regular physical activity for patients with advanced-stage breast cancer.

Schlüsselwörter

Körperliche Aktivität · Sport · Mammakarzinom

Zusammenfassung

Die meisten wissenschaftlichen Untersuchungen zu körperlicher Aktivität bei Krebs wurden mit Brustkrebspatientinnen durchgeführt. Es zeigt sich, dass körperliche Aktivität während der medizinischen Therapie und in der Nachsorge nicht nur machbar und sicher, sondern auch effektiv ist. Die Datenlage zeigt deutlich, dass ein regelmäßiges und gezieltes Ausdauer- und/oder Krafttraining spezifische Nebenwirkungen der medizinischen Therapie reduzieren kann. Dazu zählen die Verbesserung der körperlichen Leistungsfähigkeit und Körperkomposition, Reduktion von Fatigue und die Verbesserung/Stabilisierung der Lebensqualität. Auch Patientinnen mit einem Lymphödem sollten sich körperlich betätigen. Es scheint, dass körperliche Inaktivität zur Verschlimmerung des Ödems beiträgt. Zu körperlicher Aktivität von Patientinnen mit Metastasen gibt es bislang kaum Studien. Dennoch wird auch bei diesen Patientinnen nach Expertenmeinung regelmäßige Bewegung empfohlen.

Introduction

Despite the increasing incidence rate, the chance of cure from breast cancer has improved due to advanced medical treatment options [1]. However, these improved treatment options cause considerable side effects on different levels. Physical symptoms include reduced muscle strength and bone mineral density, impaired range of motion in the arm and shoulder region, hot flushes, and lymphedemas [2]. Depression, anxiety, and reduced self-esteem and self-confidence are commonly experienced on the psychological level. Further,

decreased physical activity levels and other social impairments, such as reduced participation in social and leisure activities, as well as relationship and employment problems may appear [3, 4]. All of these extensive adverse effects of treatment impact breast cancer patients' quality of life [5]. Therefore, it is important to counteract or reduce these side effects by offering specific supportive programs and lead the patient back to her familiar surroundings, daily routine, and family life as quickly as possible [6]. Physical activity can be such a supportive measure.

Rationale and Aim of the Review

The basic objective of exercise therapy in breast cancer patients is to reduce treatment-related side effects and positively influence the patients' quality of life. Physical activities during medical breast cancer treatment as well as during aftercare have been proven to be feasible, safe, and effective [7, 8]. However, aside from the breast cancer itself and its consequences, 2 relevant aspects have to be considered when planning an exercise intervention: i) medical treatment and its side effects; and ii) the individual background of each patient. This holistic approach allows us to expect an effect on the patient's physical, psychological, social, and educative level [9]. This clinical review aims to summarize the current literature on physical activity in breast cancer patients during/after medical treatment. Next to well-known parameters such as physical performance, fatigue, and quality of life, this review focuses on outcomes that have recently been studied, such as lymphedema, metastases, and mortality risk. Based on the results, clinical guidelines will be defined.

Physical Activity during Medical Treatment

To our knowledge, the first study examining the influence of physical activity during chemotherapy was conducted in 1988 with 42 breast cancer patients. Endurance training on a bicycle ergometer positively influenced nausea in the patients [10]. Winningham et al. continued the research and detected further significant positive effects regarding physical performance, body composition, and body weight in 2 randomized controlled trials (RCTs) with patients undergoing chemotherapy [11]. More than 10 years later, first studies also showed positive effects in breast cancer patients receiving radiation. Mock et al., for example, observed that women who exercised less than 90 min per week within a moderate walking program experienced clearly higher levels of fatigue during radiation [12]. In the meantime, numerous other RCTs confirmed the positive effect of physical exercise on the fatigue syndrome occurring during medical treatment [13, 14]. What remains uncertain is evidence concerning specific modes and dosages of exercise; however, in principle, strength and endurance training seem to have a similar effect on fatigue [8].

The effect of therapeutic exercise on patients' physical performance has also been proven in many studies. Both resistance and endurance training during medical treatment can improve or at least stabilize physical performance [13, 15, 16]. Furthermore, endurance training can reduce the resting heart rate and blood pressure in breast cancer patients [17]. Regarding body composition, it remains uncertain whether endurance training or resistance training has a greater impact; however, a positive effect can be observed [11]. Resistance training may be more effective when aiming to prevent weight loss in patients undergoing treatment [15]. Further studies

show that a combined training program composed of endurance, resistance, coordinative, and stretching components can positively influence flexibility, pain, and energy consumption in breast cancer patients [14, 16, 18].

Current studies suggest that moderate endurance training during medical treatment can also improve psychological symptoms, such as depression and low self-esteem, in breast cancer patients [12, 13, 15, 19]. In addition, Payne et al. were able to show that sleep disturbance and serotonin levels can be influenced by a walking exercise intervention in patients receiving hormonal treatment [21]. The holistic effects of physical exercise positively influence quality of life [13, 15, 16].

Physical Activity during Aftercare

Therapeutic exercise interventions during survivorship have proven to increase physical activity levels in breast cancer patients [22, 23]. Both aerobic endurance training over 12 weeks and combined resistance and endurance training over 6 months can positively influence the cardiovascular fitness of breast cancer patients during aftercare [22, 24]. Improvements in muscle strength have been observed primarily in studies conducting either resistance training alone or a combination of resistance and endurance training [24, 25]. In addition, first studies show that combined programs, such as controlled impact and resistance training, may counteract osteoporosis [26]. Regarding shoulder flexibility, breast cancer patients may benefit more from Nordic walking than from a normal walking program [27]. Both endurance and resistance training programs during aftercare of breast cancer treatment have shown positive effects on fatigue and quality of life [22]. Aside from endurance and resistance interventions, an increasing number of studies are also investigating the effects of dancing, yoga, and Tai Chi in breast cancer patients, and have observed physical and psychological improvements [28].

Physical Activity and Mortality Risk

Aside from the positive influence on adverse effects, preliminary evidence suggests that physical activity can influence the overall and breast cancer-specific mortality risk as well as the risk of recurrence in breast cancer patients. A meta-analysis by Ibrahim et al. showed that regular physical activity prior to diagnosis does not affect breast cancer-specific mortality [29]. However, physical activity after diagnosis reduces breast cancer-specific mortality by 34% and overall mortality by 41%. These findings are supported by further studies by Beasley et al., Cadmus et al., Friedenreich et al., Holmes et al., and West-Wright et al. [30–34]. Furthermore, a meta-analysis by Loprinzi et al. revealed significant indications regarding

Table 1. Specific recommendations for physical exercise in breast cancer patients in relation to lymphedema, metastases, and recurrence prevention

	Lymphedema [36–39]	Metastases [7, 8, 40–42, expert opinion]			Preventing recurrence [29–35]
		bone	lung and liver	brain	
Duration of the intervention	8–12 week resistance training, eventually preferred exercise mode	permanent	permanent	permanent	permanent
Exercise mode	physical exercises, also including the arms	patients at low risk of bone fracture: endurance training, light resistance training; patients at high risk of bone fracture: aquatic exercises/swimming, endurance training	light resistance training and moderate endurance training	individual training depending on symptoms and impairments, e.g. coordinative or cognitive exercises	physical activities in general, no specific method
Intensity	begin with short and light exercises and feel the effect; if lymphedema does not exacerbate, intensities can be increased progressively	light to moderate	optimal intensity is dependent on the degree of metastasis/secondary tumors; more pronounced stage: only moderate and slightly strenuous intensities	light to moderate	
Recommendation	What reduces or exacerbates an edema may vary! First, patients need to reexamine themselves to find out what exercises they benefit from. Patients should approach the exercises slowly.	patients at low risk of bone fracture: jogging, (Nordic) walking, cycling, light resistance training; patients at low risk of bone fracture : aquatic exercises/swimming, (Nordic) walking; avoid: activities with a high risk of falling or injury and high impact/ load peaks at frequent intervals	by strengthening the respiratory and trunk muscles respiratory capacity can be influenced in an optimal manner	propensity for seizure: increased risk of injury; avoid swimming or aquatic exercises, avoid overhasty movements	3–5 h of physical exercise per week; 10 MET/h per week with 4 MET/h per session; moderate intensity

the positive effect of physical exercise on the risk of breast cancer recurrence [35] (table 1).

Physical Activity and Lymphedema

Physical activity seems to have a positive influence on the symptoms of lymphedema [36–38]. Studies have shown that upper body exercises do not lead to significant changes in arm volume, not even in patients that have already developed a lymphedema [36–37]. Moreover, physical inactivity or resting can clearly contribute to a worsening of lymphedema among patients at risk [37]. Water therapy seems to have the best effects on the symptoms of lymphedema [38]. In primary prevention, physical exercise is probably not a risk factor for developing lymphedema either [39] (table 1).

Physical Activity and Metastases

The current evidence regarding physical activity in patients with advanced breast cancer is weak. Only few studies with different cancer types, breast cancer among others, have investigated the effect of exercise on fatigue, psychological

stress, somatic complaints, and anxiety. However, a positive influence on these outcomes could be detected [40, 41]. A reduction in fatigue was observed in an RCT with 38 metastatic breast cancer patients receiving chemotherapy. Patients took part in a home-based resistance training program where resistance exercises were conducted in a sitting position [40]. A number of case reports examined the effects of exercising in women with bone metastases and found that physical training can be feasible, safe, and performance-enhancing [42]. Current exercise recommendations are based on expert opinion (table 1).

Discussion

Physical activity in breast cancer patients during medical treatment and aftercare is feasible, safe, and effective [8]. Numerous studies have investigated the impact of therapeutic exercise on the adverse effects of adjuvant treatment. Findings are extensive and positive [43]. Current research focuses on aerobic fitness, muscle strength, quality of life, fatigue, and body composition. Evidence regarding the influence of physical activity on these outcomes is consistent and good. Exercise studies showing positive effects on immune function, flexibil-

ity, and bone mineral density also exist; however, the evidence is comparatively weak and needs to be supported by further investigations. This also applies to studies regarding the effect of therapeutic exercise interventions on psychological outcomes. Current studies in this field of research show wide variations in quality, assessment methods, and exercise intensity and volume; for example, on average, patients exercise approximately 3 times per week for 20–50 min with moderate intensity and varying modes of exercise. Most of the interventions last for 12–24 weeks [7, 8, 44].

This clinical review specifically focused on current research outcomes such as lymphedema, mortality, and metastasis. Another question that will need clarification is whether physical activity can reduce the risk of recurrence in breast cancer patients. A number of observational studies have suggested a positive effect of physical activity with a reduced risk of recurrence of 30% [29]. However, randomized and controlled intervention studies are still missing. Therefore, the evidence is weak in this field of research, in contrast to research results in primary prevention.

Various potential mechanistic aspects that may reduce the risk of recurrence in breast cancer patients are being discussed. On an immunological level, different cytokines as well as a change in natural killer cell activation are taken into consideration [45, 46]. Also, hormonal changes such as a reduction in estrogen and progesterone levels may have a specific influence [47]. Additionally, an improved balance between oxidative stress and anti-oxidative capacity must be considered [48]. Future studies must therefore focus on these potential underlying mechanisms. What seems to have proven true is that physical exercise does not contribute to the exacerbation or onset of lymphedema [39]. On the contrary, an increasing number of findings show that physical inactivity or rest can worsen the symptoms of lymphedema [36, 37]. A positive effect on the lymphatic backflow may be achieved specifically through dynamic intermittent activities such as moderate strength training and Nordic walking and water therapy [38]. Lack of studies and therefore an urgent need of research exist in the field of physical activity and advanced breast cancer, as medical treatment options have improved not only in curative care but also in palliative care. Therefore, patients suffering from advanced breast cancer tend to live for longer with their disease. The quality of life during this ex-

tended period of survival may be improved through physical activity. According to current research, regular physical activity should not only be recommended but seems necessary with this patient group. The primary aim is to maintain functional mobility as long as possible. However, only few studies can be found, and therefore the evidence is weak. Current exercise recommendations are based on expert opinion. Due to the high number of patients with advanced breast cancer, there is a strong need to conduct future studies in this field of research in order to develop evidence-based guidelines.

Future research needs to examine specific and optimal exercise modes in terms of intensity and volume in order to achieve the best possible effect. Despite the above-mentioned positive effects of regular physical activity, most cancer patients during aftercare are not sufficiently active. Observations show that many survivors fail to reach the level of activity they had prior to their cancer diagnosis. Physical activity levels decrease significantly during the course of disease. Generally, they then increase again but often do not reach the original level [49, 50].

Despite the numerous studies on the positive effects of physical activity, findings regarding specific designs and modes of exercise programs are not yet sufficient. In the future, intervention studies need to focus on exercise modes and dosage-response effects in order to figure out the optimal effect of physical activity on individual goals [9]. Which exercise mode and dosage is most effective during the different therapy phases remains uncertain. Within this context, future studies may specifically focus on variables such as mortality risk, lymphedema, and advanced breast cancer. Further research is necessary in order to support breast cancer patients immediately after diagnosis by offering specific therapeutic exercise programs. This would counteract physical inactivity, which in turn could prevent negative effects such as decreased cardiovascular performance and improve quality of life. Physical activity can therefore help reintegrate patients into daily routine, and work and family life.

Disclosure Statement

The authors declare that they have no conflict of interests.

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