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Supporting an Athlete With Breast Cancer: A Case Report

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Abstract

For cancer survivors who also identify as athletes, a rigorous exercise that was once part of their daily routine and fundamental to their physical, psychological, and potentially financial well-being, may be temporarily or permanently altered in ways that exacerbate cancer-related changes in quality of life. This report presents an illustrative case of an endurance athlete who underwent breast cancer treatment and her subsequent return to high-performance, high elevation sport. We identify gaps in oncology research and patient educational tools to counsel athletes with cancer regarding the acute and long-term effects of cancer treatment and possibility of returning to a precancer level of fitness and performance. The report also highlights the need to tailor individualized cancer care treatment, rehabilitation, and the ability to preempt potential clinical and psychological side effects that may substantially impact training and competition.

Keywords

cancer, athlete, sport, breast cancer, exercise, patient-reported outcomes

Introduction

> *As an endurance athlete and high-altitude mountain climber, I am used to discomfort. In fact, I crave it on some level, as it builds my tolerance to cold, lack of oxygen, pain, and refreshes my spirit of physicality and resilience. Even with the discomfort, I must perform at the highest level in order to succeed, indeed, to survive.*

For high-performance athletes, training and competition are fundamental to their identity and quality of life (1). Cancer and associated treatments are often deleterious to physical and mental health, consequently undermining the capacity of athletes to prepare and perform at precancer levels (2). Breast cancer treatment toxicities are well-documented (3) and may result in a number of physical, physiological, and psychological acute and late side effects (4). The iCanCare survey (5) of patients with early stage breast cancer reported substantial treatment-associated toxicities and related burden due to their cancer treatment. Exercise and physical activity have shown to improve and combat many cancer treatment-related side effects with benefits observed in exercise tolerance, strength, endurance, and psychology (6).

This report presents an illustrative case of the experiences and perspectives of a competitive mountain climber and endurance athlete who underwent breast cancer treatment and her subsequent return to sport. As per institutional guidelines, research ethics board approval was not required for this case report. Verbal and written informed consent were obtained from the patient for the use of anonymized information and her direct contribution to the patient experience portion of this report *(patient quotes in italics)*.

Case Description

> *Upon learning that I had cancer, my initial reaction was not fear, rather I was concerned about how it would impact my*

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expedition schedule and set back my physical strength and conditioning.

This 42-year-old female with a background in elite, high-altitude mountain climbing, has set many national and international records. After self-identifying a lump in her right breast, she underwent further evaluation and was diagnosed with an early stage breast cancer measuring 2.8 cm, grade 3, estrogen/progesterone receptor-negative, and human epidermal growth factor receptor 2 positive without evidence of abnormal lymph nodes or metastatic disease (clinical stage T2N0M0 (IIA)). Her physical examination was otherwise unremarkable. She had no significant past medical history or genetic predisposition to breast cancer and was not taking any medications.

The patient received neoadjuvant fluorouracil–epirubicin–cyclophosphamide then docetaxel chemotherapy, with trastuzumab (prescribed for 12-month total) combined with pertuzumab, followed by a right breast lumpectomy and sentinel lymph node biopsy (pathology yielded residual 0.1 mm of ductal carcinoma in situ (pathological stage ypTisN0)). The patient received adjuvant breast-alone radiotherapy (Figure 1, Radiotherapy Plan; Figure 2, Timeline of Events).

The patient underwent a regular clinical review of symptoms, including cardiac monitoring with 2D/3D echocardiograms (ECHO) as part of routine follow-up for her anthracycline and trastuzumab systemic therapies. The 6-month ECHO showed a 9% decrease (67%-58%) in left ventricular ejection fraction (LVEF) from baseline (pre neoadjuvant chemotherapy), but still within the normal range (50%-70%). Her global longitudinal strain (a measure of left ventricular systolic function) had fallen from −22.5% to −16.5% (normal >−18%, borderline −16% to −18% (7)).

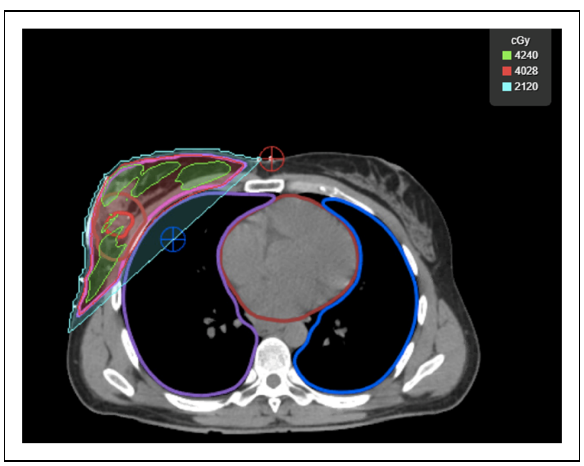

Figure 1. Breast radiotherapy plan. An axial cut of patient A's computed tomography (CT) radiotherapy planning scan, through the thorax, of the right breast at the level of the tumor bed (red), surrounded by planning target volume (brown), breast clinical target volume (pink). Turquoise = 50% isodose line (2120cGy), red = 95% isodose line (4028cGy), Green = 100% isodose line (4240cGy).

At 12 months post baseline, LVEF continued to be within normal range at 53%, and longitudinal strain recovered to within normal limits (−18.7%). Throughout the period of treatment, she experienced minimal reduction in energy and transient skin erythema during radiotherapy with no reported shortness of breath or worsening of quality of life.

> My challenges with the treatment were specific to concerns about lymphedema and its impact on my future as an athlete. I shared my concerns with each of my doctors and care professionals, and I was met with compassion and understanding.

Throughout neoadjuvant and adjuvant treatments, the patient maintained a self-administered regular aerobic and resistance-based training schedule, consisting of a weekly combination of running, walking, rowing, stepping, and biking (Table 1), with a weighted vest, and both free weight and body weight supported exercises targeting large muscle groups (i.e., quadriceps, hamstrings etc.). Following radiotherapy, her fitness goal shifted to progress her aerobic and resistance capacity for a return to high-altitude climbing.

> As I progressed through treatment and I learned more about the potential negative outcomes, I had two memorable occasions when fear gripped my heart and soul as I was faced with the realization that this experience might actually alter my quality of life and continued athleticism. On the whole, however, I remained very positive about the outcome, and I believed that I would find myself in the mountains again. I continued to train as much as my body would allow, and I envisioned climbing toward a high mountain summit as motivation.

On completion of radiotherapy, the patient was referred to cancer rehabilitation and survivorship program for exercise clearance as she aimed to complete high-altitude climbs to 5600 meters and 6800 meters within 8 weeks and at 13 weeks post-radiotherapy, respectively. Her primary rehabilitation team was made up of a physical medicine and rehabilitation specialist (physiatrist), physiotherapist, and kinesiologist with advanced training in clinical exercise physiology. Given the lack of evidence surrounding the safety of high-altitude exercise post cancer treatment and the potential toxicities of her chemotherapy and radiation therapies, she was referred for further cardiac and respiratory testing to better predict cardiorespiratory stress at elevation in the absence of clear testing guidelines.

A high-altitude stimulation test was performed 4 weeks post-radiotherapy assessing her respiratory function status, potential hypoxia, and the impact on cardiac strain at elevations similar to her intended climbs. During the test, she demonstrated expected alveolar hyperventilation, adequate arterial oxygenation on arterial blood gas measures, and no desaturations of the fraction of inspired oxygen (FiO_2) at 15% oxygen. The patient subsequently underwent a

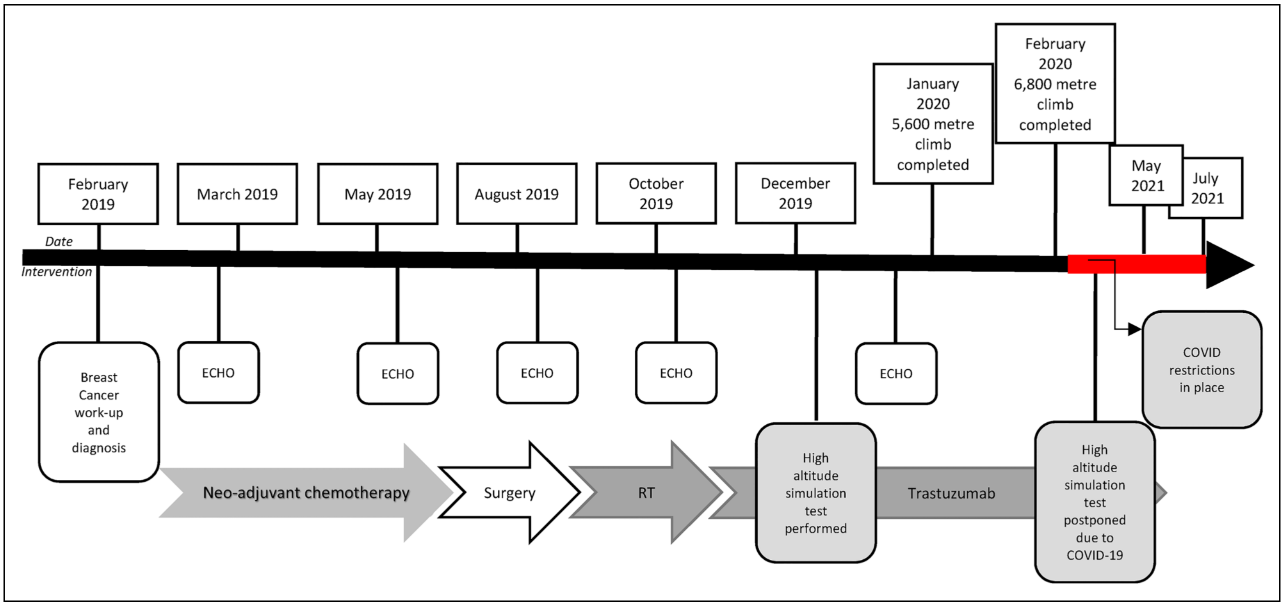

Figure 2. Timeline of events.

Table 1. Weekly Average Exercise Program, per Month, During Breast Cancer Treatment (Chemotherapy, Surgery, and Radiotherapy).

Time—Weekly average	Running (kilometers)	Walking (kilometers)	Rowing (kilometers)	Stepping (minutes)	Biking (kilometers)
2019					
February	6893 meter climb				
March	4	3	Nil	21	9
Chemotherapy start					
April	3	3	Nil	49	9
May	3	6	3	28	9
June	3	3	3	21	15
Chemotherapy end					
July	3	3	6	21	12
Surgery					
August	Nil	3	Nil	49	15
September	3	9	Nil	28	15
Radiotherapy start					
October	3	6	Nil	28	12
Radiotherapy end					
November	3	6	Nil	35	15
December	3	3	9	21	15
2020					
January	5600 meter climb				
February	6800 meter climb				
March	COVID-19 pandemic declared				

cardiopulmonary exercise test using an electronically braked cycle ergometer with electrocardiogram and gas analysis using a ramp protocol. The duration of the test was 15 min and 1 s and the patient achieved an absolute VO_2 peak (maximum rate of oxygen consumption unadjusted for body mass) of 2.48 LO_2/min, and a relative VO_2 peak of 36.6 mL O_2/kg body weight/min. At test termination, the patient reported a rating of perceived exertion of 9/10 and her respiratory exchange ratio was 1.14, with an estimated anaerobic threshold occurring at a heart rate of 150 beats per minute (Figure 3A and B). There were no medical complications or concerns over the course of the test.

With the rehabilitation team, I felt that I was working with practitioners who appreciated the uniqueness of my situation and were curious about the impact of cancer treatment on a high-altitude mountain climber.

The patient successfully reached the summit of the 5600-meter climb at 8 weeks post radiotherapy, followed

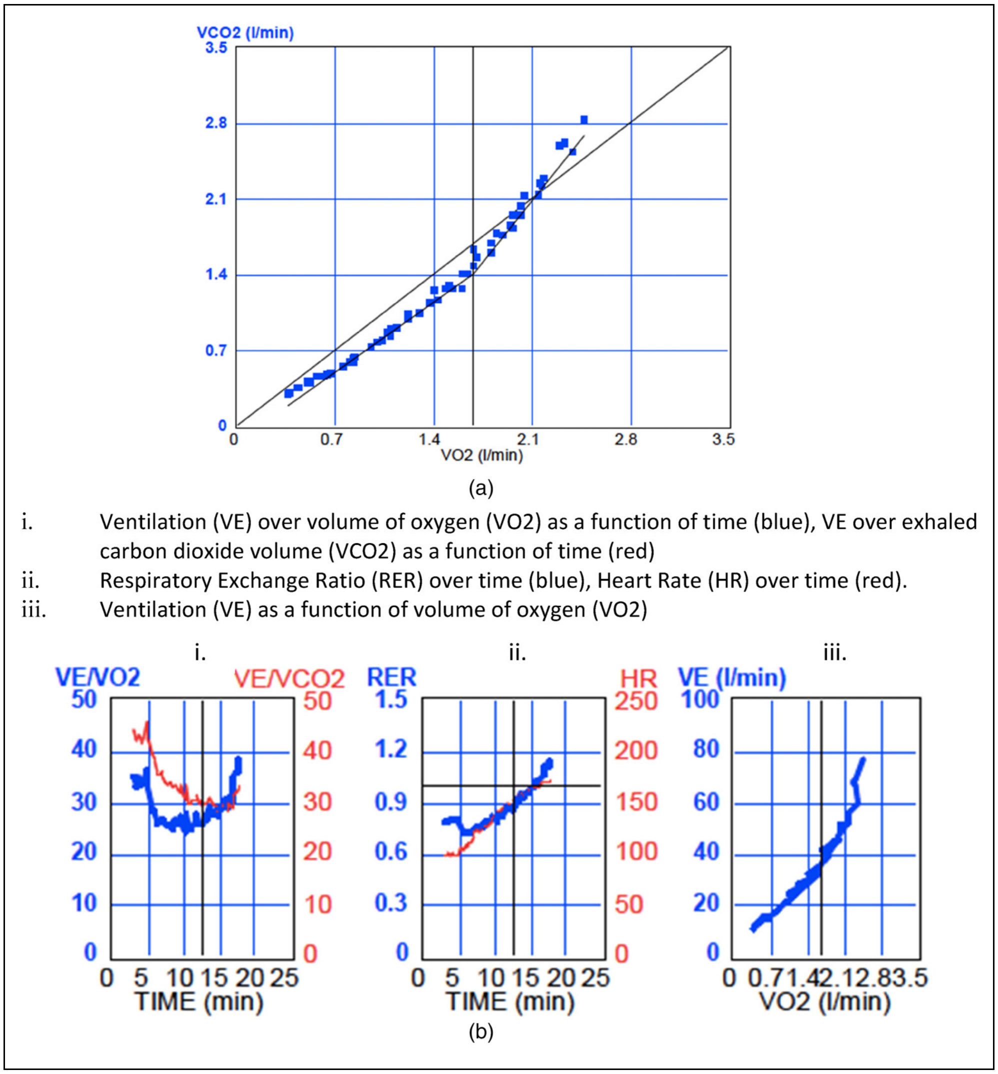

Figure 3. (a) Cardiopulmonary exercise test for patient A. Exhaled carbon dioxide volume (VCO_2) as a function of volume of oxygen (VO_2) uptake during incremental exercise (blue). (b) Cardiopulmonary exercise test results: (i) Ventilation (VE) over volume of oxygen (VO_2) as a function of time (blue), VE over exhaled carbon dioxide volume (VCO_2) as a function of time (red). (ii) Respiratory Exchange Ratio (RER) over time (blue), heart rate (HR) over time (red). (iii) Ventilation (VE) as a function of volume of oxygen (VO_2).

by a 6800-meter climb at 13 weeks post radiotherapy. Upon post-climb follow-up, she reported mild difficulties with acclimatization based on the timing of her climb, denying any significant or long-lasting respiratory symptoms. A post climb cardiorespiratory fitness test was planned but eventually canceled due to the COVID-19 pandemic. The patient remains under ongoing follow-up with the oncology and rehabilitation teams.

Discussion

Breast cancer treatment toxicities are well-documented (3) and may result in a number of physical, physiological, and psychological acute and late adverse effects (4). The importance of physical activity and exercise in cancer prevention and in pre and post cancer treatment rehabilitation is increasing among patients and physicians, as multiple studies show an improvement in cancer-related side effects and potential survival benefits (1–6). High-intensity exercise may be achievable and safe during and after cancer treatment and may mitigate or recover deteriorations in physical functioning and worsening symptoms better than low or moderate intensity (8,9).

A large body of evidence highlights the cardiotoxic effects of breast cancer treatment and subsequent reductions in aerobic performance (10–13); however, there is a paucity of data specifically assessing this in cancer patients who identify as athletes (14). Decreased LVEF and myocyte injury are known causes of cardiac dysfunction (15) and often assessed using aerobic capacity measurements (as low VO_2 max has been associated with poorer cardiovascular outcomes) assessing global cardiac and respiratory function (16). Given the aerobic demands of high-altitude mountain climbing and the known adverse effects of the patient's treatment, cardiorespiratory assessments were prioritized for the patient in the presented case to determine safety and physiological capacity for such events. The patient had a small decline in her LVEF during her neoadjuvant chemotherapy; however, this remained within the normal range and her longitudinal strain recovered. Similarly, her pre-climb aerobic fitness (as measured by cardiopulmonary exercise test) was consistent with reference data from females of a similar age without cardiovascular disease (17).

In addition to the potential physical effects of cancer treatment in athletes, long-term adverse psychological effects may occur, such as trauma of diagnosis, loss of identity, deficits in role, emotional, cognitive, and social functioning (18). For some athletes, this may result in a transition to reduced activity or even involuntary retirement. The athlete described in this case report did not describe acute or chronic deficits in role, cognitive, or social functioning; however, these were not formally assessed with validated quality of life measurement tools. Involvement of a health professional specializing in sport psychology may be warranted to support a patient as they navigate a return to sport or the temporary or permanent cessation of competitive activity.

Lessons Learned:

1. Identifying people with cancer who are also high-performance athletes is relevant to preserving physical, mental, and vocational functions related to their sport.
2. Consideration of additional evaluation of physiological and functional health markers (e.g., cardiorespiratory fitness, muscle mass, and strength), to minimize the impact on performance and time off from training is warranted
3. Capitalizing on advancing technology, such as remote telemonitoring, fitness biometrics, and artificial intelligence, may present us with an opportunity to understand such physiological changes in an athlete's performance following a cancer diagnosis and during and after their cancer treatment.
4. The psychological impact of cancer and its treatment for athlete's may be different than those whose identity is not entrenched with sport-related performance concerns. Pre-empting and managing the potential psychological challenges of athletes who must temporarily or permanently discontinue training and competition is advisable.

Conclusions

A growing number of cancer patients who are athletes are being identified. Additional prospective studies are required to achieve a more personalized treatment approach that aims to maintain or mitigate deleterious effects on sport performance.

> My experience through the disease process was relatively positive, in that I always understood what was to happen to me, and I felt that I had excellent care and treatment. The doctors were patient with my many questions and they allowed me time to research and make thoughtful decisions. I felt supported and heard.

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Authors' Note

Conceptualization, A.B., D.SM., and C.A.K.; methodology, all authors; writing—original draft preparation, A.B.; writing—review and editing, all authors. All authors have read and agreed to the published version of the manuscript. All procedures were conducted as per standard of care policies, therefore not requiring further research ethics board approval. Verbal and written informed consent was obtained from the patient for their anonymized information and their direct contribution to the patient experience portion of the report published in this article.

Declaration of Conflicting Interests

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References

1. Filbay S, Pandya T, Thomas B, McKay C, Adams J, Arden N. Quality of life and life satisfaction in former athletes: a systematic review and meta-analysis. Sports Med (Auckland, N.Z.). 2019;49:1723-38.
2. Robsahm TE, Hestvik UE, Bragelien Veierød M, Fagerlie A, Nystad W, et al. Cancer risk in Norwegian world class athletes. Cancer Causes Control. 2010;21:1711-9.
3. van Londen G, Beckjord EB, Dew MA, Cuijpers P, Tadic S, Brufsky A. Breast cancer survivorship symptom management: current perspective and future development. Breast Cancer Manag. 2012;2:71-81.
4. Runowicz CD, Leach C, Henry NL, Henry KS, Mackey HT, Cowens-Alvarado RL, et al. American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship care guideline. J Clin Oncol. 2015;34:611-35.
5. Friese CR, Harrison JM, Janz NK, Jagsi R, Morrow M , Li Y, et al. Treatment-associated toxicities reported by patients with early-stage invasive breast cancer. Cancer. 2017;123:1925-34.

6. Kleckner IR, Dunne RF, Asare M, Cole C, Fleming F, Fung C, et al. Exercise for toxicity management in cancer—A narrative review. Oncol Hematol Rev. 2018;14:28-37.
7. Cardiology, A.C.o., American College of Cardiology—Assessment of Left Ventricular Global Longitudinal Strain, https://www.acc.org/latest-in-cardiology/ten-points-to-remember/2018/08/10/11/01/assessment-of-left-ventricular-global-longitudinal-strain. Accessed July 29, 2020.
8. Campbell KL, Winters-Stone KM, Wiskemann J, May AM, Schwartz AL, Courneya KS, et al. Exercise guidelines for cancer survivors: consensus statement from international multidisciplinary roundtable. Med Sci Sports Exerc. 2019;51.
9. Mijwel S, Jervaeus A, Bolam K, Norrbom J, Bergh J, Rundqvist H, et al. High-intensity exercise during chemotherapy induces beneficial effects 12 months into breast cancer survivorship. J Cancer Surviv. 2019;13:244-56.
10. Ng AV, Cybulski AN, Engel AA, Papanek PE, Sheffer MA, Leslie J, et al. Triathlon training for women breast cancer survivors: feasibility and initial efficacy. Support Care Cancer. 2017;25:1465-73.
11. Peel AB, Thomas S, Dittus K, Jones LW, Lakoskie SG . Cardiorespiratory fitness in breast cancer patients: a call for normative values. J Am Heart Assoc. 2014;3:e000432-e000432.
12. Mackenzie MJ, Zuniga KE, Raine LB, Awick EA, Hillman CH, Kramer AF, et al. Associations between physical fitness indices and working memory in breast cancer survivors and age-matched controls. J Womens Health. 2015;25:99-108.
13. Furmaniak AC, Menig M, Markes MH. Exercise for women receiving adjuvant therapy for breast cancer. Cochrane Database Syst Rev. 2016;9:CD005001-CD005001.
14. Savage PD, Dittus KIM, Lakoski SG. Fitness during breast cancer treatment and recovery in an athlete: a case study. Med Sci Sports Exerc. 2016;48.
15. Laukkanen JA, Kurl S, Salonen R, Rauramaa R, Salonen JT. The predictive value of cardiorespiratory fitness for cardiovascular events in men with various risk profiles: a prospective population-based cohort study. Eur Heart J. 2004;25:1428-37.
16. Ross R, Blair SN, Arena R, Church TS, Després JP, Franklin BA, et al. Importance of assessing cardiorespiratory fitness in clinical practice: a case for fitness as a clinical vital sign: a scientific statement From the American Heart Association. Circulation. 2016;134:e653-99.
17. Kaminsky LA, Arena R, Myers J. Reference standards for cardiorespiratory fitness measured With cardiopulmonary exercise testing: data From the fitness registry and the importance of exercise national database. Mayo Clin Proc. 2015;90:1515-23.
18. Arndt V, Merx H, Sturmer t, Stegmaier C, Ziegler H, Brenner H. Age-specific detriments to quality of life among breast cancer patients one year after diagnosis. Eur J Cancer. 2004;40:673-80.