Aerobic Fitness in Breast Cancer Survivors: Association Between Sub-maximal and Maximal Cardiopulmonary Exercise Testing
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Introduction

• Maximal oxygen uptake (Vo2 peak) is a gold standard for peak aerobic fitness.
• Vo2 peak has been used to assess risk for all-cause mortality,1 cardiovascular disease (CVD),2 and breast cancer occurrence.3
• Effort during a maximal test may vary in breast cancer patients throughout the continuum of care.
• Sub-maximal exercise testing can be more resilient to symptom fluctuations.
• Arthralgias in the breast cancer (BrCa) population may cause discomfort during maximal treadmill testing.

Purpose

To determine associations between two different sub-maximal testing modalities with a maximal Vo2 peak treadmill test and assess peak aerobic fitness in breast cancer survivors.

Methods

Participants: 30 female BrCa survivors who had undergone chemotherapy and/or left chest radiation. All participants had to be at least 3 months post-treatment (chemotherapy or radiation, but could be on anti-hormonal therapy), and have at least 2 CVD risk factors.

Testing:

• We performed a single maximal cardiopulmonary exercise test (CPET) on a treadmill using indirect calorimetry, while analyzing maximal Vo2 peak.

Methods (cont’d)

• Sub-maximal Vo2 was assessed during the Vo2 peak treadmill test for comparison to the Vo2 peak.
• A second sub-maximal test on an ARC trainer was conducted for comparison to the treadmill maximal Vo2 peak values.
• Criteria for both sub-maximal Vo2 tests was established by using the respiratory exchange ratio (RER >1.0) for determining the anaerobic threshold (AT).
• Confirmation of the AT was made upon visual assessment of 1) V-slope method, and 2) ventilatory equivalent technique.

Data Analysis:

• Pearsons correlation coefficients were used to determine association between the gold standard Vo2 peak maximal test on the treadmill with the sub-maximal test on the treadmill and ARC trainer.

Results

<table>
<thead>
<tr>
<th>Vo2</th>
<th>r value</th>
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<tbody>
<tr>
<td>Maximal Test:</td>
<td>25.4 ± 5.3 ml/kg/min</td>
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<tr>
<td>Sub-maximal TM:</td>
<td>20.5 ± 4.3 ml/kg/min</td>
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<tr>
<td>Sub-maximal ARC:</td>
<td>19.0 ± .26 ml/kg/min</td>
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Discussion

• Treadmill and ARC sub-maximal Vo2 exercise tests showed a strong correlation with maximal Vo2 peak, indicating that sub-maximal testing can be a good measure of aerobic fitness in breast cancer survivors.
• Breast cancer survivors in this study had a marked decrease in Vo2 peak, putting them at a higher risk for all cause mortality, CVD, and breast cancer recurrence.
• No adverse events occurred during maximal or sub-maximal testing.

Future Direction for Clinical Implications

• Sub-maximal exercise testing may serve as a more objective and repeatable measure of exercise tolerance from diagnosis, during treatment, and until end of post treatment secondary to changing levels of fatigue and treatment tolerance.
• Sub-maximal testing can be more accessible in clinical settings and safer to perform than maximal testing in breast cancer patients.
• Cardiorespiratory exercise testing may be used as a risk stratification tool for breast cancer patients/survivors.

References


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