



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

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Introduction

- Maximal oxygen uptake ($VO_{2\text{ peak}}$) is a gold standard for peak aerobic fitness.
- $VO_{2\text{ peak}}$ 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 $VO_{2\text{ peak}}$ 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.

Descriptive characteristics: N= 30; mean +/-SD

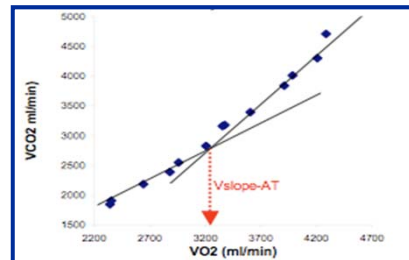
Age:	50.5 ± 5.6 years
Time since diagnosis:	58 ± 27 months
LVEF:	60.4 ± 4.9%
Weight:	172.2 ± 32.8 pounds
BMI:	28.9 ± 5.3 kg/m ²
% Fat:	44.4 ± 7.7%

Testing:

- We performed a single maximal cardiopulmonary exercise test (CPET) on a treadmill using indirect calorimetry, while analyzing maximal $VO_{2\text{ peak}}$.

Methods (cont'd)

- Sub-maximal VO_2 was assessed during the $VO_{2\text{ peak}}$ treadmill test for comparison to the $VO_{2\text{ peak}}$.
- A second sub-maximal test on an ARC trainer was conducted for comparison to the treadmill maximal $VO_{2\text{ peak}}$ values.
- Criteria for both sub-maximal VO_2 tests was established by using the respiratory exchange ratio ($RER \geq 1.0$) 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.



V-slope method for confirming AT. Determined by the point where VCO_2 production rises disproportionately to O_2 consumption.⁴

Data Analysis:

- Pearson's correlation coefficients were used to determine association between the gold standard $VO_{2\text{ peak}}$ maximal test on the treadmill with the sub-maximal test on the treadmill and ARC trainer.

Results

	VO_2	r value
Maximal Test:	25.4 ± 5.3 ml/kg/min	
Sub-maximal TM:	20.5 ± 4.3 ml/kg/min	.83; p= < 0.001
Sub-maximal ARC:	19.0 ± .26 ml/kg/min	.80; p= < 0.001

Discussion

- Treadmill and ARC sub-maximal VO_2 exercise tests showed a strong correlation with maximal $VO_{2\text{ peak}}$, 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 $VO_{2\text{ peak}}$, 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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