Cardio-protection from a single exercise session performed 24 hours prior to doxorubicin treatment in breast cancer patients

Amy A. Kirkham,[1] Neil D. Eves,[2] Don C. McKenzie,[3] Rob. E. Shave,[4] Eric J. Stöhr,[4] Karen Gelmon,[5] Darren E.R. Warburton,[3] Sean A. Virani,[3] Kristin L. Campbell[3]

1 University of Alberta, Edmonton, Canada

2 University of British Columbia Okanagan, Kelowna, Canada;

3 University of British Columbia, Vancouver, Canada;

4 Cardiff Metropolitan University, Cardiff, Wales;

5 British Columbia Cancer Agency, Vancouver, Canada;

In rodents, a single vigorous intensity (75% of peak effort) aerobic exercise bout performed 24 hr prior to doxorubicin injection can attenuate markers of cardiac damage. It unknown whether this intervention would benefit humans receiving doxorubicin.

PURPOSE: To determine the effects of aerobic exercise 24 hr prior to each chemotherapy treatment (tx) with doxorubicin (60 mg/m^2) + cyclophosphamide (600 mg/m^2) on markers of cardiotoxicity in early breast cancer patients.

METHODS: Patients (49±9 y) were randomized to either: EX (no vigorous intensity exercise for 48 hr, then 30 min of vigorous treadmill walking 24 hr prior to each tx; n = 10); or CON (no vigorous exercise for 72 hr prior to each tx; n = 9). Echocardiography-derived left ventricular volumes, longitudinal strain, twist, as well as brachial blood pressure (BP) and serum NT-proBNP were measured at: 1) pre tx; 2) 28±7 hr post 1st tx; 3) 10±2 d post 4th tx. Analyses included generalized estimating equations with a group by time interaction; pairwise contrasts were used to assess interactions with $p \leq 0.05$.

RESULTS: At 28 hr post 1st tx, there was an overall (i.e. no difference between EX and CON) significant decrease in diastolic BP, and increased stroke volume, end-diastolic volume, longitudinal strain, and twist. NT-proBNP was increased in both groups, but was significantly lower in EX (CON 59±36 to 290±166; EX 40±21 to 184±56 pg/mL). At 10 d post 4th tx, there were overall significant decreases in mean arterial BP and systemic vascular resistance, but no changes in volumes, strain, or twist relative to baseline. Resting heart rate (69±13 to 75±11 bpm) and cardiac output (3.0±0.4 to 3.5±0.5 L/min) were significantly increased in CON only. Ejection fraction did not change at either time.

CONCLUSION: A vigorous intensity exercise session performed 24 hr prior to doxorubicin attenuated the acute increase in NT-proBNP, and prevented the increase in resting heart rate and cardiac output at the end of tx that occurred in the control group. These initial findings point toward a potential cardio-protective benefit of exercise prior to tx. Although the acute increase in longitudinal strain and twist following doxorubicin may seem paradoxical (typically a deterioration), it is likely related to the acute change in volume and pressures.

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