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Heart Rate Variability-Guided Exercise During Chemotherapy in Triathlete with Stage 1 BRCA1-Mutated Breast Cancer

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Dear Editor,

Heart rate variability (HRV) is a measurement of the difference in the time interval between each heartbeat.[1] HRV during chemotherapy has been used to help to provide individualised exercise guidance for patients. There are no current guidelines for exercise during chemotherapy for cancer patients in Ireland.

A forty-four-year-old nulliparous female triathlete with a sixteen-pack year history of smoking presented to her GP with night sweats and a right breast lump. Wide local excision (WLE) revealed a grade 3 13.5mm triple negative invasive BRCA1 mutated ductal carcinoma. Sentinel lymph node biopsy confirmed pT1cN0M0 disease. As a competitive triathlete the patient's cardiopulmonary fitness was optimal at baseline involving between one- and four-hours aerobic or strength training per day with one day rest per week. Prior to her diagnosis, HRV measurements were used to optimise training. Throughout treatment, training regimes were altered based on HRV to allow continued training without excessive cardiovascular strain. Exercise during treatment involved between thirty minutes to two hours of physical activity per day. HRV was monitored using a HR monitoring device connected to a smart phone application.[2] Each morning, baseline HR and HRV were recorded over one minute. The root mean square of successive differences (RMSSD) between each heartbeat was used to measure HRV. Reduction in HRV below one standard deviation from baseline HRV of the previous two days was used as an indicator of reduced capacity for intense exercise.[2] The lowest daily HRV recorded was 63.5ms on cycle two day nine of AC chemotherapy. HRV ranged from 63.5ms to 101.8ms during chemotherapy. A meaningful reduction in HRV occurred during both AC and Taxol chemotherapy as compared with daily average HRV at baseline and one year after chemotherapy.

Knowledge of these alterations allowed for adaptation of exercise regimes to avoid excessive cardiopulmonary strain. One year later following completion of chemotherapy with minimal side effects the patient qualified for an international triathlon consisting of a 3.86km swim, 180.25km cycle and 42.2 km run.

Adjuvant chemotherapy involved four cycles of AC (doxorubicin, cyclophosphamide) and ten cycles of paclitaxel chemotherapy. The first cycle of paclitaxel was omitted due to neutropenia (absolute neutrophil count 0.7 $x10^9$/L). Four AC cycles and nine cycles of paclitaxel were subsequently well tolerated. Side effects experienced by the patient included 4lb weight loss, alopecia and fatigue. Fatigue improved with light aerobic exercise. Six weeks following completion of chemotherapy the patient underwent a bilateral mastectomy and bilateral oophorectomy due to familial risk of recurrence. Transabdominal oophorectomy was avoided due to risk of damage to abdominal musculature and impact to future training.

Exercise is an underutilised method of maintaining physical strength and alleviating fatigue during and after cancer treatment. There is often a negligible difference in expectation for physical exercise between all patients undergoing chemotherapy. Despite being an international triathlete, this patient was given the same exercise recommendations as patient with cancer. A study completed by Irish oncology nurses identified the main barrier to exercise as lack of specific guidelines.[3] The Clinical Oncology Society of Australia (COSA) and American Cancer Society recommend 150 minutes of aerobic exercise per week with two resistance sessions incorporated.[4] Tailored exercise regimens based on HRV and baseline fitness should be considered with a view to ultimately formulating evidence-based exercise guidelines for patients in Ireland.

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