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# Exploring the feasibility of exercise training during (neo)adjuvant chemotherapy in women with early-stage breast cancer: a pilot study examining immune and metabolic outcomes

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Background:
Immune function critically influences chemotherapy efficacy. Preclinical evidence is that exercise mobilizes NK and CD8+ T cells, enhances immunosurveillance, and improves treatment response. However, its immunological effects during chemotherapy for breast cancer remain poorly defined.
Methods:
This non-randomized pilot study examined a 12-week supervised combined aerobic- and resistance-exercise program during (neo)adjuvant chemotherapy (± immunotherapy) in women with early-stage breast cancer. The program consisted of 2-3 sessions per week at a moderate to vigorous intensity. Eleven patients completed the intervention and six served as a convenience control group for blood markers. Outcomes included feasibility, peripheral immune cells, cytokines, metabolic biomarkers, body composition, quality of life and fatigue.
Results:
Uptake was 35% (13/37 enrolled). Compared with controls, exercisers showed a greater increase in CD8+ EMRA cells ($p = 0.019$) and reduction in CD8+ naïve T cells ($p = 0.029$). Within-group analyses showed increases in CD8+, CD8+ EMRA, CD8+ CD57+, CD8+ HLA-DR+, CD4+ PD-1 and CD4+ CD57+ cells, with reductions in CD4+ and CD8+ naïve T cells (all $p < 0.05$). NK-cell profiles indicated a greater increase in CD56bright CD16+ NK cells in controls, while exercisers showed signals of increased total NK and NKT cells. In addition, there was a signal toward a reduction in IL-15 in the exercise group ($p = 0.066$). Exercise preserved metabolic stability, preventing the insulin rise seen in controls ($p = 0.034$). Patients maintained body weight and fat mass with a signal toward increased lean mass (0.8 kg, $p = 0.093$). Finally, exercise improved global quality of life ($p = 0.031$) and showed a signal toward reduced fatigue ($p = 0.063$).
Conclusions:
Supervised exercise was feasible during chemotherapy, promoted an activated, cytotoxic immune profile, and mitigated metabolic dysregulation. Exercisers maintained body composition and improved quality of life. Larger, adequately powered trials are warranted.

## Keywords

Exercise oncology, breast cancer, chemotherapy, immunophenotyping

## Conflict of Interest & Ethical Approval

yes

## Abstract submitters declaration

yes

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