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Contribution ID: **79** Type: **1 - Scientific Poster**

Effects of Concurrent Resistance Training on Shoulder Strength and Function in Women with Breast Cancer Undergoing Hypofractionated Radiotherapy

Thursday 23 July 2026 14:55 (20 minutes)

Despite its clinical effectiveness, radiation therapy (RT) is associated with multiple adverse effects that can impair functional capacity and overall recovery in individuals undergoing breast cancer (BC) treatment. Exercise has emerged as an evidence-based adjunctive approach to mitigate treatment-related toxicity and enhance musculoskeletal performance. This study aimed to examine the effects of progressive resistance training (PRT) performed in combination with adjuvant hypofractionated radiation therapy (HFRT) on shoulder complex muscle strength, functional control, and muscle activation patterns in women with BC.

Thirty-one participants were allocated to either an exercise group (EG, n=15) or a control group (CG, n=16). Electromyography (EMG) and torque signals were obtained during isokinetic shoulder internal and external rotation at angular velocities of 1.047 rad/s and 2.094 rad/s on both the surgical and contralateral limbs. Treatment-related side effects were assessed using the Common Terminology Criteria for Adverse Events (CTCAE). Pre and post intervention torque and EMG outcomes were analyzed using linear mixed-effects models.

The EG demonstrated significantly greater increases in internal and external rotation torque across all test velocities compared with the CG ($p < 0.0001$). A significant group-by-time interaction was observed for mean functional control ratio (FCR) and maximal voluntary contraction torque ($p < 0.0001$), indicating superior neuromuscular adaptation in the EG. Similarly, peak EMG amplitudes exhibited significant group-by-time interaction effects ($p < 0.0001$), reflecting enhanced muscle activation following the intervention. No significant differences in CTCAE scores were found between groups ($p > 0.05$), suggesting that PRT did not exacerbate treatment-related toxicity.

In conclusion, PRT performed concurrently with adjuvant HFRT effectively improves shoulder muscle strength, functional control ratios, and EMG-derived activation parameters in women with BC, without increasing HFRT-related adverse effects. These findings support the integration of resistance training into supportive care protocols during hypofractionated RT.

Keywords

Cancer, Hypofractionated radiation therapy, Resistance training, Electromyography.

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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Session Classification: Poster Session