Resistance Exercise Reduces Body Fat and Insulin During Androgen-Deprivation Therapy for Prostate Cancer

Kerri M. Winters-Stone, PhD, Nathan Dieckmann, PhD, Gianni F. Maddalozzo, PhD, Jill A. Bennett, PhD, RN, Christopher W. Ryan, MD, and Tomasz M. Beer, MD

Purpose/Objectives: To determine whether exercise could reduce biomarkers of cancer progression in prostate cancer survivors (PCSs) on androgen-deprivation therapy (ADT).

Design: Randomized, controlled trial.

Setting: Oregon Health and Science University School of Nursing.

Sample: 51 PCSs randomized to one year of resistance and impact training or a stretching control group.

Methods: The authors investigated changes in body composition and cancer-related biomarkers, and the influence of age and fat loss on changes in biomarkers.

Main Research Variables: Body composition (total fat, trunk fat, and lean mass), insulin, insulin-like growth factor-1, and sex hormone–binding globulin.

Findings: In the 36 PCSs with baseline and 12-month data, total fat ($p = 0.02$) and trunk fat ($p = 0.06$) mass decreased in the training group compared to gains in controls. Loss of total and trunk fat each mediated the relationship between groups and one-year change in insulin ($p < 0.05$). Age moderated the insulin response to exercise where insulin reductions were smaller with increasing age ($p = 0.03$).

Conclusions: Resistance and impact exercise may reduce body fat among PCSs undergoing ADT, in turn exerting an insulin-lowering effect.

Implications for Nursing: Nurses should counsel PCSs to exercise to reduce the risk of obesity and associated conditions, including cancer progression.

Key Words: body composition; obesity; physical activity; weight training

ONF, 42(4), 348–356. doi: 10.1188/15.ONF.348-356

Among prostate cancer survivors (PCSs), inactivity, increased adiposity, and weight gain have been associated with poorer survival outcomes. Overweight and obese PCSs have lower survival rates and an increased risk of cancer progression compared to men who weigh less (Gong, Agalliu, Lin, Stanford, & Kristal, 2007). Adiposity may worsen prognosis for PCSs because it can lead to hyperinsulinemia and chronic inflammation, which worsens insulin resistance, and these states are associated with an increased risk of prostate cancer recurrence, as well as prostate cancer and overall mortality (Cao & Ma, 2011; Prins et al., 2012). Two large, observational studies suggested that PCSs who report regular physical activity have a lower risk of disease progression and cancer-specific mortality than sedentary survivors (Kenfield, Stampfer, Giovannucci, & Chan, 2011; Richman et al., 2011). The mechanisms that underlie this observed relationship between physical activity and survival have yet to be substantiated through controlled trials, but because exercise is an accepted weight-control strategy, the protective effect of exercise against cancer recurrence may act through this mechanism (McTiernan, 2008). Some studies in non-cancer populations report that exercise-induced reductions in cytokines or sex hormones only occur in the presence of weight loss and that, among people who exercise, fat loss is directly associated with reductions in inflammation (Kohut et al., 2006; Kraemer et al., 1999). Whether or not changes in adiposity must occur to shift biomarkers of cancer progression in PCSs remains unknown.

About one-third of all PCSs are treated with androgen-deprivation therapy (ADT) to reduce tumor androgen exposure. PCSs undergoing ADT experience significant increases in adiposity, including subcutaneous and visceral fat deposits that could further increase their risk of cancer progression (Haseen, Murray, Cardwell, O'Sullivan, & Cantwell, 2010). In addition to concerns about disease prognosis, PCSs undergoing ADT face additional threats to survival because of the effects of aging or cancer treatment, including osteoporosis, cardiovascular disease, and diabetes (Keating, O'Malley, Freedland, & Smith, 2010). The authors of the current article developed a resistance and impact exercise program, Prevent Osteoporosis With Impact and Resistance (POWIR), that