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# A Comparison of the Scapular Flip Test between Women with Breast Cancer and Healthy Controls

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**Abstract title: A COMPARISON OF THE SCAPULAR FLIP TEST BETWEEN WOMEN WITH BREAST CANCER AND HEALTHY CONTROLS**

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Background: The Scapular Flip test was designed to screen for spinal accessory nerve palsy. The spinal accessory nerve can be damaged in breast cancer surgery and treatment, resulting in scapular dyskinesia and upper limb (UL) impairment in women with breast cancer (BC). This test could be useful to screen for UL impairment in BC.

Purpose: The purpose of this study was to describe shoulder impairments as defined by a positive Flip Test in a group of women with BC at baseline, 1-3 months, and 12+ months post-operatively, as compared to healthy control participants.

Methods: One hundred and forty-three BC ( $53.1 \pm 11.7$  years with a body mass index of  $26.7 \pm 6.1 \text{ kg/m}^3$ ) completed the Flip test pre-operatively and at 1-3 months and 12+ months post-operatively. Fifty-two healthy control participants (HC) ( $51.4 \pm 13.6$  years with a body mass index of  $26.3 \pm 5.7 \text{ kg/m}^3$ ) were tested using the Flip test during a single visit. The Flip test was measured by a physical therapist. Shoulder impairment (+ Flip test) at baseline, 1-3 months, and 12+ months was analyzed using a repeated measures analysis of variance, group by time.

Results: Baseline characteristics of age and body mass index were not significantly different between groups ( $p > 0.05$ ). At baseline, the right Flip test was positive in 21% HC ( $n=11$ ) and 40% BC ( $n=57$ ) ( $p=0.091$ ); the left Flip test was positive in 4% ( $n=2$ ) HC and 33% ( $n=47$ ) BC ( $p=0.001$ ). At the 1-3 month and 12+ months post-operative times compared to HC, the right Flip test for BC was positive in 24% ( $n=13$ ,  $p=0.517$ ) and 29% ( $n=9$ ,  $p=0.225$ ), respectively; the left Flip test was positive in 31% ( $n=16$ ,  $p=0.003$ ) and 26% ( $n=8$ ,  $p=0.019$ ), respectively. Left side Flip test results at baseline, 1-3 months, and 12+ months post-operatively, were significantly different for the BC as compared to the HC.

Conclusion(s): The Flip test on the left was positive in a significantly higher number of women with BC than HC. These findings suggest that shoulder impairment among this group may be greater than that seen in a sample of HC.

Implications: Women diagnosed with BC should be screened for shoulder impairment. Using the Scapular Flip test may be able to identify women with BC who would benefit from rehabilitation for shoulder impairment.

Key-Words: shoulder impairment; scapular dyskinesia; upper limb

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Ethics approval: This study was an NIH and WRMMC IRB approved trial, and informed consent was obtained from all participants.

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