

# A Comparative Analysis of Breast Cancer Treatments and the Role of Chemotherapy-induced Peripheral Neuropathy

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## Background

Twelve percent of women suffer from breast cancer each year, but survivorship is increasing due to improvements in treatments. However it appears there are lasting effects after treatment due to the toxicity of chemotherapy compounds. One of the most severe side effects is chemotherapy induced peripheral neuropathy (CIPN) which results in a decreased sensation in the nervous system. With this loss, an individual's balance and postural stability is likely impacted, leading to an altered quality of life. Monfort et al. at The Ohio State University are among the first to identify balance deficits in breast cancer patients during treatment, even after the first treatment cycle [1]. We joined with them as they extended this work to include long-term follow up testing after completion of treatment. Our efforts specifically investigate the effects of treatments on dynamic and static postural stability, range of motion, and balance control looking at variances between individuals with different treatments and symptoms.

**Hypothesis:** Significant balance impairments would occur in all those who received neurotoxic chemotherapy, however more intensified impairments will occur in those who had chemotherapy and signs of CIPN.

## Methods

3 subjects groups tested after treatment and 6 months post treatment: control (those with cancer without neurotoxic chemotherapy (n=6, 5 testing complete), asymptomatic (those with cancer, neurotoxic chemotherapy, and no reported CIPN (n=8, 3 testing complete)), and symptomatic (those with cancer and neurotoxic chemotherapy with signs of CIPN (n=7, 3 testing complete))

3 hour data collection period : Overground and treadmill walking, static and dynamic balance tests on a balance plate.

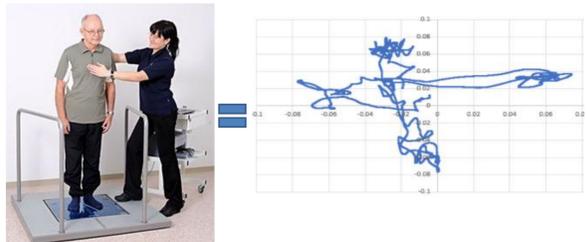


Figure 1: Limits of Stability Tests [2]



Figure 2: Dynamic Standing Foot Reach (SFR) Test [1]

## Results

Center of Pressure (COP) Excursion range in medial-lateral (x) and anterior-posterior (y) direction: shift of person's center of mass

Time to contact (TTC): time it would take one's COP to move outside their base of support given its current position, velocity and acceleration

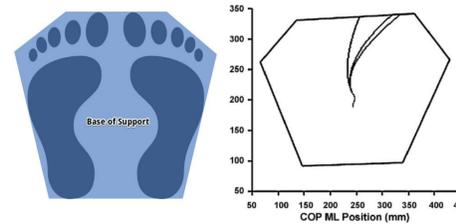


Figure 3: Base of Support and COP trajectory used to find TTC [3]

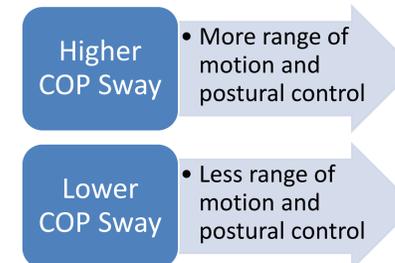


Figure 4: Ideal measures for LOS tests

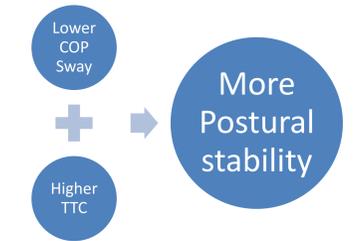


Figure 5: Ideal measures for balance tests (SFR)

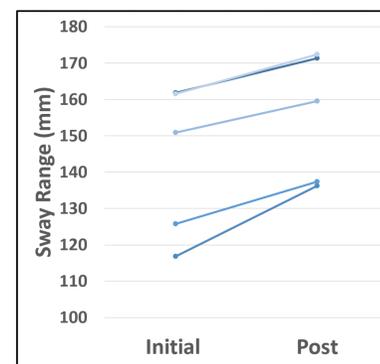


Figure 4: LOS AP Sway for Controls

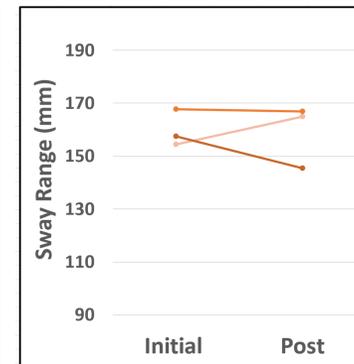


Figure 5: LOS AP Sway for Asymptomatic

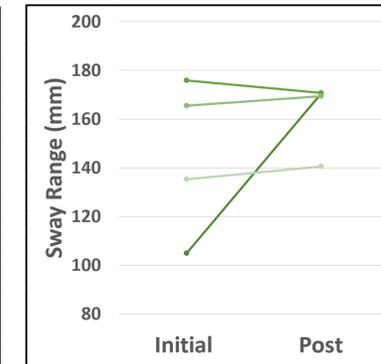


Figure 6: LOS AP Sway for Symptomatic

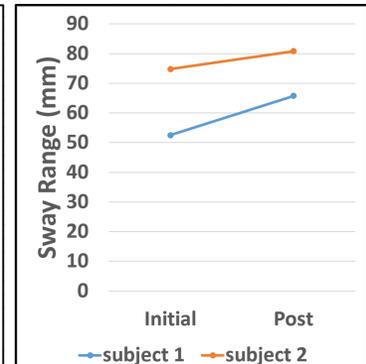


Figure 7: SFR AP Sway for Asymptomatic

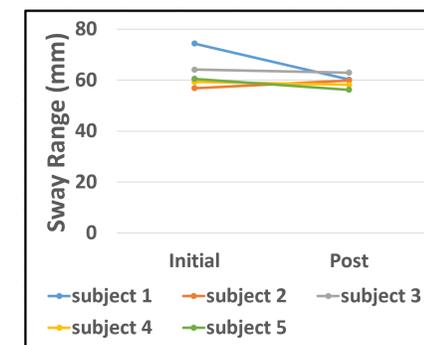


Figure 8: SFR AP Sway for Controls

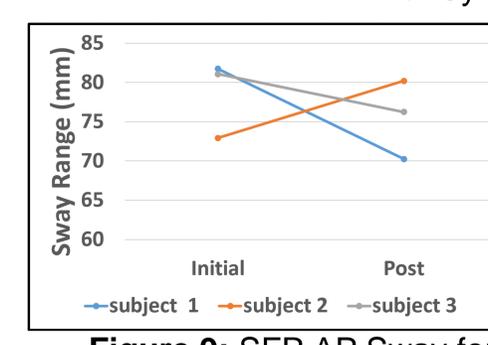


Figure 9: SFR AP Sway for Symptomatic

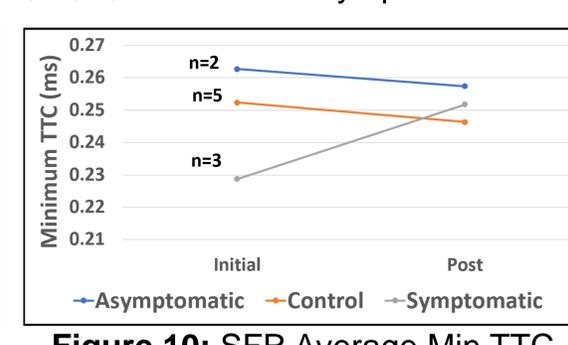


Figure 10: SFR Average Min TTC

## Conclusions

The symptomatic group had varied individual sway responses 6 months post treatment, however showed slight improvement in their average time to contact. Further data analysis is required, however the current results suggests that interventions to improve postural stability for the symptomatic group may be warranted.

### References

- [1] S.M. Monfort, X. Pan, R. Patrick, J. Singaravelu, C.L. Loprinzi, M.B. Lustberg, A.M.MW. Chaudhari, Natural history of postural instability in breast cancer patients treated with taxane-based chemotherapy: A pilot study, *Gait & Posture*. 48 (2016) 237-242.
- [2] What is posturography?-DAGAN, MD, NYC. (2019). Dadabmd.com. Retrieved 15 April 2019.
- [3] J. M. Haddad, J.H. Ryu, J.M. Seaman, Time-to-contact capture posture modulations based on precision demands of task, *Gait & Posture*. 32(2010) 592-596.