# THE GROUND REACTION FORCE ANALYSIS IN STANDING POSITION TO OBSERVE THE POSTURAL CONTROL IMPAIRMENTS AFTER CHEMOTHERAPY

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## 1. Context

Neurotoxic chemotherapy can cause disturbances in postural control[1]

This can potentially increase the effort required to maintain balance

The aim of this ancillary analysis was to assess the effects of neurotoxic chemotherapy on ground reaction force (GRF) parameters during standing in women with gynecological cancer

## 2. Material and methods

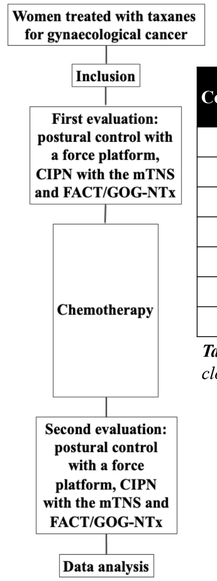


*Fig 1. Experimental protocol*

| Condition | Eyes | Surface | Vibration | Cognitive task |
|---|---|---|---|---|
| **EO** | Open | Rigid | No | No |
| **EC** | Closed | Rigid | No | No |
| **EOF** | Open | Foam | No | No |
| **ECF** | Closed | Foam | No | No |
| **EOV** | Open | Rigid | Yes | No |
| **ECV** | Closed | Rigid | Yes | No |
| **DT** | Open | Rigid | No | Yes |

***Table 1.*** *Experimental conditions. E = eyes, C = closed, F = foam, V = vibration, DT = dual task*

**Parameters:** mediolateral (ML), anteroposterior (AP) and vertical (V) GRF recorded during 30 s at 100 Hz

**Statistics:** Wilcoxon statistical tests with Benjamini-Hochberg corrections

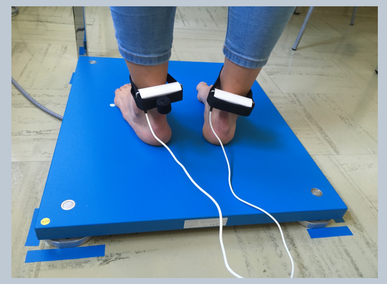

***Fig. 2.*** *Participant standing on the force platform with vibrators*

## 3. Results

33 women aged 48.18 ± 9.94 years

Compared to baseline, maximum peak values increased in all conditions tested after chemotherapy for ML and V GRF components ($p < 0.030$, ***Figure 3***), except those perturbed by vibration

No difference was observed for AP GRF

Correlations between CIPN and GRF were weak to moderate (***Table 2***)

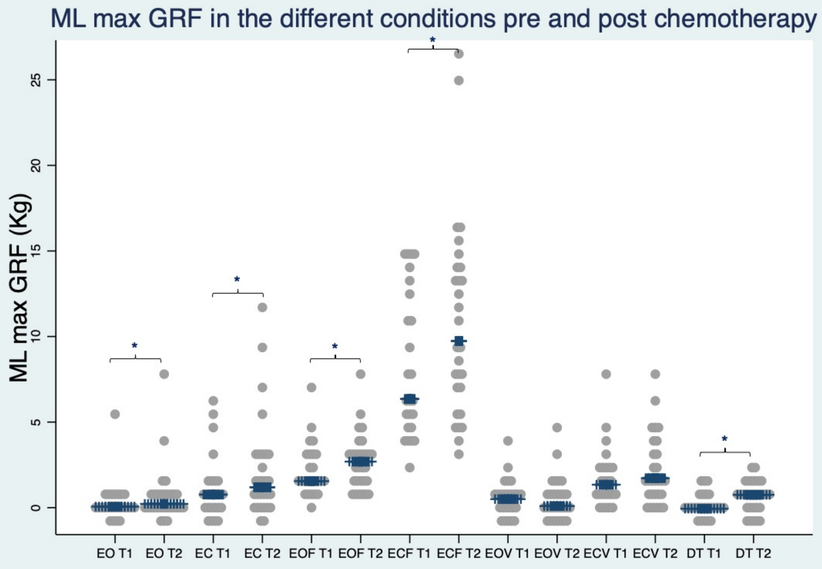


***Fig. 3.*** *Dot plot of the ML GRF in the different conditions. In blue = median, T1 = pre chemotherapy, T2 = post chemotherapy.*

| | Eyes closed on rigid surface | | Eyes closed on foam surface | |
|---|---|---|---|---|
| | FACT-NTx (/44) | mTNS (/24) | FACT-NTx (/44) | mTNS (/24) |
| **ML GRF (Kg)** | -0.52 | 0.31 | -0.08 | 0.17 |
| **V GRF (Kg)** | -0.09 | 0.17 | -0.23 | 0.35 |
| **AP GRF (Kg)** | -0.35 | 0.19 | **-0.53** | 0.16 |

***Table 2****. Spearman correlations between CIPN and GRF. In bold = $p \leq 0.05$*

## 4. Discussion

Greater postural adjustments were required to maintain balance after chemotherapy : impairments in postural balance after chemotherapy

Chemotherapy-induced somatosensory deficits may explain the greater instability in the somatosensory impaired conditions, in the ML and V GRF, as well as the unchanged postural control in the vibration conditions

However weak to moderate, mostly non-significant correlations were found between CIPN and GRF parameters

Other factors including physical inactivity[2], previous treatment[3], cognitive impairments such as attentional deficits linked to anxiety and fatigue[1] should have been assessed using validated objective tools, as they may contribute to postural impairments after chemotherapy

## 5. Conclusion

**In view of the postural control difficulties identified, a systematic assessment of postural control in eyes closed conditions using the ML GRF could be carried out in patients with cancer treated with taxanes**

Appropriate supportive care could be considered to help maintain balance during and after chemotherapy treatment

**References :**

1 Wang AB, Housley SN, Flores AM, Kircher SM, Perreault EJ, Cope TC (2021) A review of movement disorders in chemotherapy-induced neurotoxicity. J NeuroEngineering Rehabil 18:16. https://doi.org/10.1186/s12984-021-00818-2

2 Müller J, Ringhof S, Vollmer M, Jägger LB (2020) Out of balance – Postural control in cancer patients before and after neurotoxic chemotherapy. Gait Posture 77:156–163.

3 Głowacka I, Nowikiewicz T, Siedlecki Z, Hagner W, Nowacka K, Zegarski W (2016) The Assessment of the Magnitude of Frontal Plane Postural Changes in Breast Cancer Patients After Breast-Conserving Therapy or Mastectomy - Follow-up Results 1 Year After the Surgical Procedure. Pathol Oncol Res POR 22:203–208. https://doi.org/10.1007/s12253-015-9995-7