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COMMENTARY

Does grip strength decrease in the very early stages of hematological treatment?

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Abstract Muscle weakness in hematological cancer patients undergoing acute stages of treatment is an important concern and strong predictor of poor outcomes. However, evidence of strength loss in the very early stages of cancer treatment is not addressed. Here, we found that grip strength was compromised within the first 7 days of hematological treatment (− 2.3 kg, $P = 0.002$). These findings are novel in elucidating lower handgrip strength in the first week of hematological treatment and encourage additional research focusing on handgrip strength in oncology patients under initial high-dose chemotherapy routine.

Keywords Muscle strength · Hematology · Cancer · Physical function

Commentary

Onco-hematological inpatients undergoing intensive chemotherapy treatment accelerate functional deconditioning, multiple toxicities, and poor quality of life [1, 2]. Following a few days of hospitalization including inactivity or bed rest, the muscle strength can be rapidly compromised [3, 4]. However, findings are not consistent. Elderly inpatient (median length of stay 7.5 days) or 30-day follow-up showed no change either in isometric knee-extension strength or handgrip muscle strength at both time points [5]. However, hematological cancer patients hospitalized experiencing high-dose chemotherapy and adjuvant-corticosteroid therapy combined display higher risk of rapid muscle strength loss and aerobic capacity [6].

Muscle strength is a strong predictor of mortality and hospitalization [7]. Due to low cost, easy to perform, high sensibility and specificity, and high correlation to whole body muscle strength, handgrip strength (HGS) has been a standardized tool to assess muscle strength in critical patients [8–10]. To date, data for grip strength loss in onco-hematological patients suppress acute stages and represent mostly hospital discharge periods [11–13] or long-term follow-up [14]. Hence, we aimed to investigate whether the first stages of hematological treatment compromise grip strength to test the hypothesis that muscle strength is a sensible marker in the acute stages of hematological treatment. Our data may help clinicians to improve prognosis from the initial stages of intervention and stimulate multidisciplinary team to the relevance of sooner intervention.

Methods

This observational prospective study recruited inpatients from the onco-hematology division of Brazilian National Institute Cancer Hospital, Jose Alencar Gomes da Silva. The study was approved by the local Human Research Ethics committee (#1.576.178) and all patients obtained informed written consent.

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Measurements

Demographic and clinical data were assessed at the first day of admission. Grip strength was evaluated within 24 h following admission (D1) and again 7 days after (D7). The isometric HGS was measured in the dominant hand using the JAMAR hand dynamometer (Lafayette Instrument Company, USA) according to American Society Hand Therapy Guidelines [15]. Briefly, after familiarization, three non-consecutive maximal tests (1-min rest) were assessed. Each attempt took no longer than 3 s. This 3-s maximal isometric contraction was selected since it was possible to reach a peak force without adverse side effects [16]. Data are expressed as the average among three attempts for each patient in kilograms (kg). Statistical analysis included Shapiro-Wilk test to check normality distribution between D1 and D7 followed by paired Student's *t* test as the best fitting test. We consider *P* value < 0.05 as statistical significant. Data were analyzed using Statistical Package For The Social Sciences, version 21 (SPSS Inc., Chicago, IL, USA).

Results

We evaluated 30 participants within 24 h after admission and 7 days after. The median age was 50.5 years (range 18–76) and 53.3% were females. At admission, average body mass index was 24.33 ± 4.48 kg/m^2 and the ECOG Scale of Performance Status (PS) score ranged between 2 (40%) and 3 (53.4%). Seventeen participants (56.7%) were diagnosed with non-Hodgkin lymphoma.

After 7 days, 10 participants did not complete the follow-up. The main reasons for dropouts were early hospital discharge or chemotherapy delay (3 participants each), physician decline (2), dropout within analysis (1), and intensive care unit (1). Nineteen (95%) participants received corticosteroid-adjuvant treatment (Supplementary Table 1). Dexamethasone, a single daily dose of 4 mg, was the most common dosing in our sample (Supplementary Table 2).

We excluded 2 participants from the HGS test due to deep venous thrombosis suspect (1) and upper body pain (1). Therefore, HGS declined significantly within 7 days of treatment, mean 2.3 kg, D1 30.6 (± 12.43) kg to D7 28.2 (± 12.23) kg, *P* = 0.002, Fig. 1. Pairwise analysis demonstrated that 12 (66.67%) of participants decreased HGS in the first week undergoing treatment.

Discussion

Our findings showed that muscle strength is rapidly compromised in hematological cancer patients undergoing the first week of treatment. The relatively accelerated grip strength loss in the early stages of oncology treatment is novel in this setting. According to the current acknowledge that muscle weakness is a strong predictor of functional decline [17]; we underscore the role of grip strength as relevant tool for the very early stages of treatment.

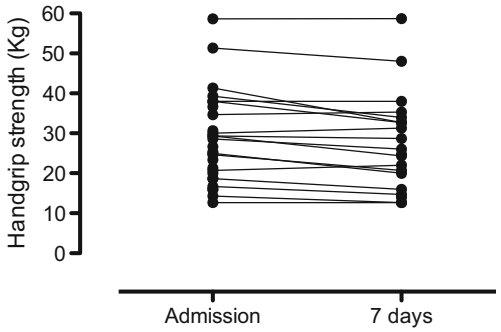

Fig. 1 Individual grip strength variation. Paired Student's *t* test, *P* = 0.002

In cancer survivors, data for muscle strength loss within few days of hospitalization are scarce.

There are conflicting findings on grip strength loss in patients with solid tumors followed surgery [18]. In a mixed sample of cancer patients (30.9% hematological and 60.9% undergoing chemotherapy), 19 days hospitalization did not reduce isometric muscle strength, despite lower physical function [3]. Aligned with the previous investigation reported, HGS decreased 7 to 20% after hospital discharge [11–13] in hematological cancer patients; our findings indicated similar grip strength loss (7.84%) sooner than expected, within the first 7 days of oncology treatment.

Limitations

The findings of this study should be interpreted with caution. The small sample size limits adjustments of covariates such as gender, cancer diagnosis, stage, body mass index, or chemotherapy dosage. Further, our study is underpowered to predict if early muscle weakness will persist or get worse beyond the first week of treatment. Nevertheless, our exploratory investigation calls attention to the role of grip strength as a feasible parameter in the early stages of hematological treatment to predict functional deconditioning.

Future directions

Muscle weakness is a prevalent condition during hospitalization and powered by cancer treatment. Our findings reinforce the need for careful and promptly follow-up of these patients. It remains to be established whether early grip strength loss can predict poor clinical outcomes.

The mechanisms favoring muscle strength loss in hospitalized hematological patients are lacking. For example, dose and duration of corticosteroids were critical to trigger catabolic muscle pathways among patients with allogeneic stem cell transplantation [12]. Here, adjuvant treatment achieved 95% of participants and should not be neglected. Resistance training can target skeletal muscle, favors the anti-catabolic process, and promises to counteract cancer-induced muscle wasting [19]. Despite the substantial evidence, the impact of resistance training in patients during hematological treatment is inconclusive [20]. Thus, future investigations should clarify the main drivers of muscle weakness, if any, for propelling incorporate strategies to reduce strength loss during chemotherapy routine.

Compliance with ethical standards

The study was approved by the local Human Research Ethics committee (#1.576.178) and all patients obtained informed written consent.

Conflict of interest The authors declare that they have no conflict of interest.

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