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Objective: A third of patients with Parkinson's Disease had a deformity of their limbs, neck or trunk [1]. Postural abnormalities, as Camptocormia (CC) and Pisa Syndrome (PS), have recently attracted increasing attention, because they can represent an important source of disability for patients. The exact etiology of these conditions has not been determined yet and treatment options are limited. Recent data suggest the possible role of EO muscles in their pathogenesis [2-3]. To evaluate the role of external oblique muscles (EO) and propose a combined therapeutic approach with lidocaine injections and exercise program, in the management of postural disorders, such as CC and PS, in patients with PD.

Materials: We selected 15 PD patients not significantly different for age ($71,2 \pm 4,2$ years), UPDRS III ($29,6 \pm 10,4$) and cognitive impairment (MMSE $28,6 \pm 1,5$). Nine patients had PS (defined as a trunk lateral deviation $\geq 10^\circ$) and six had CC (with trunk forward flexion $\geq 40^\circ$). Antiparkinsonian therapy was not changed during the whole rehabilitation period.

We performed 3D gait analysis with surface EMG recording of abdominal muscles and needle EMG of EO and paravertebral muscles. Then we inoculated 50 mg per day of lidocaine in EO, under EMG guidance, for 5 consecutive days followed by a regular daily rehabilitative program. The other following 5 days patients continue with the only rehabilitative program. The functional evaluation was performed before treatment (T0), at the end (T1) and at 15 days follow up (T2).



Patients	Mean Values
Age	$71,2 \pm 4,2$ years
Gender	12 men and 3 women
Hoen & Yahr stage	$2,5 \pm 0,6$
PD duration	$5,8 \pm 3,8$ years
UPDRS III	$29,6 \pm 10,4$
MMSE	$28,6 \pm 1,3$

Outcomes measures were: trunk flexion angle (TFA); Camptocormia Questionnaire (CQ); Berg Balance Scale (BBS); Ten-Meter Walk Test (10mWT); Timed Up and Go Test (TUG); Six Minutes Walking Test (6MWT) and Physiological Cost Index (PCI).

Results: All patients with CC showed bilaterale EO hyperactivity while 8 patients with PS showed ipsilateral EO hyperactivity and 2 contralateral to the tilt side.

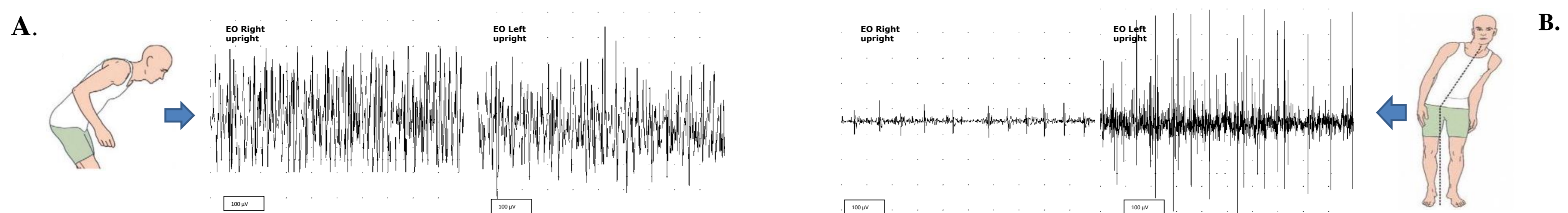


Fig. 1: Upright needle EMG of EO muscles in CC (A) and PS (B).

At T1 we detected a significant ($p \leq 0,05$) reduction of: TFA ($36,8 \pm 16,8$ vs $27,3 \pm 16,4$); CQ ($19,2 \pm 5,5$ vs 14 ± 5); BBS ($50,1 \pm 6,7$ vs $53,1 \pm 4,4$); 6MWT ($307,5 \pm 105,7$ vs $380,3 \pm 98,9$). All patients referred a subjective improvement with greater independence in the ADL (as evidenced by CQ). No significant changes was observed at 10mWT, TUG and PCI. The beneficial effect of combined treatment persisted even at T2 ($p \leq 0,05$) as showed by TFA ($30,9 \pm 17,7$), CQ ($15,2 \pm 5,2$) and 6MWT ($345,3 \pm 80,7$). No correlation was found between disease duration, postural deformity duration and functional outcomes.

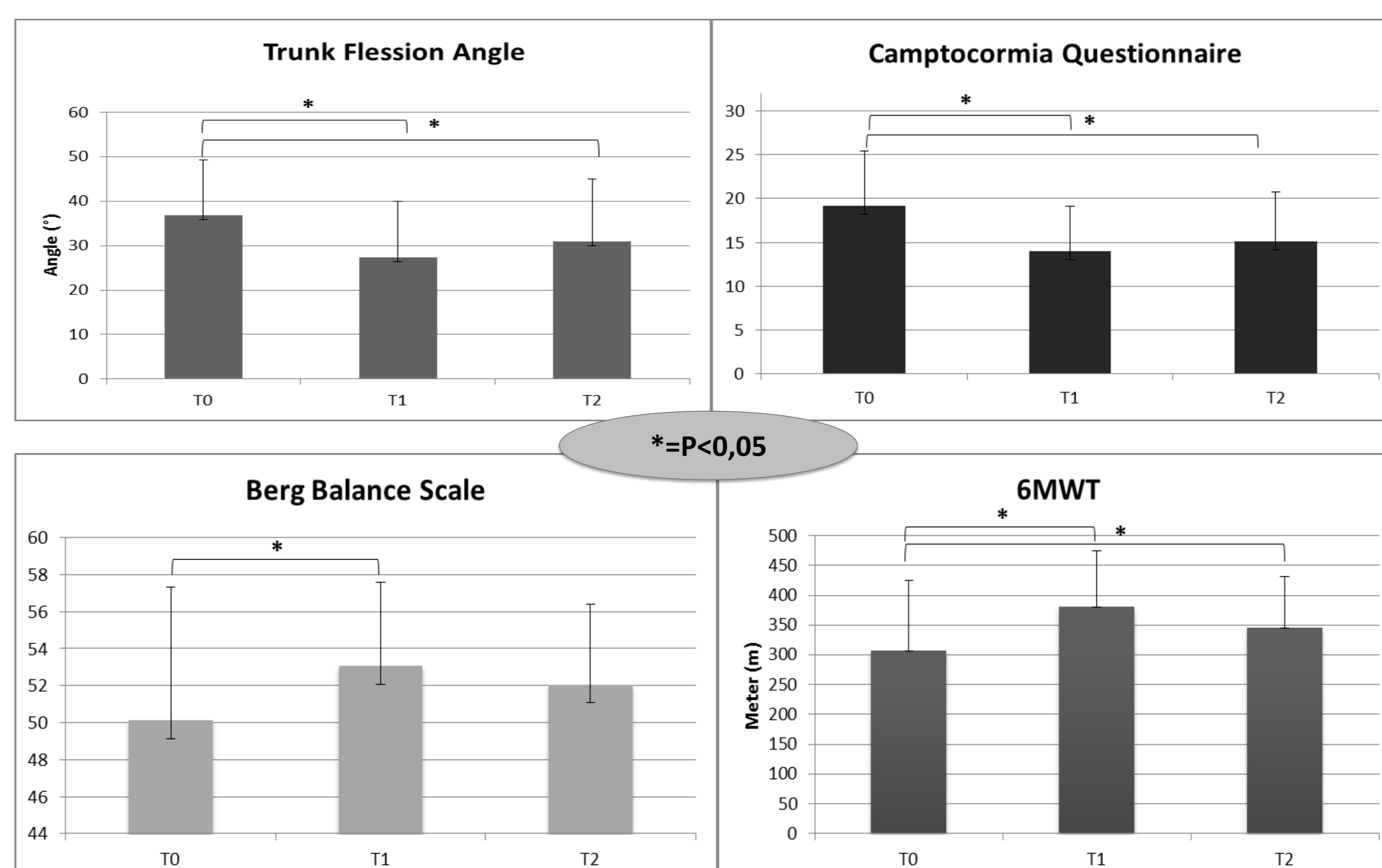


Fig. 2: Outcome measure detected before (T0), after (T1) and 15 days follow-up (T2)

Discussion: In literature there is no consensus about the diagnosis and treatment of postural disorders in PD. Our data highlight the need of an accurate characterization of CC and PS focusing on the role of abdominal muscles and the fundamental role of a specific rehabilitation protocol in the management of this postural disease.

Conclusion: We confirm the possible role of EO in CC and PS. The combined therapeutic approach seems to be a good option for the management of abnormal postures in PD. An expansion of the study is currently in progress.

[1] Doherty KM et al. Postural deformities in Parkinson's disease. *Lancet Neurol.* 2011 Jun;10(6):538-49.

[2] Furusawa Y et al. Long-term effect of repeated lidocaine injections into the external oblique for upper camptocormia in Parkinson's disease. *Parkinsonism Relat Disord.* 2013;19(3):350-354.

[3] Frazzitta G et al. D. Pisa Syndrome in Parkinson's Disease: Electromyographic Aspects and Implications for Rehabilitation. *Parkinsons Dis.* 2015;2015:437190.