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Study of correlation between sway parameters in Sit-to-Stand (StS) and measurements of impairment, activity and participation in a population of chronic hemiplegic patients

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INTRODUCTION

Postural passages, as well as directional changes, represent events that are often difficult to control by individuals with stroke outcomes.
Therefore, measuring equilibrium in standing position may not fully describe disability in the postual control of patient with chronic stroke.
The Sit to Stand (StS) could be a valid integration to classical balance tests [1].
The primary objective is to measure the differences in sway parameters during StS among population of chronic stroke patients and population of normative subjects.
The secondary objective is to correlate the measurements of the population's same stroke parameters with clinical trials with stroke, then to obtain the most significant parameters for the Smallest Detectable Change (SDC), and finally to compare StS instrumental measurement with the clinical dexterity test 5-Repetition Sit-to-Stand Test (5XSST) [2].

METHODS

This is a monocentric case-control observational study. Thirty subjects were recruited, 15 healthy persons and 15 chronic stroke patients. All 30 subjects had undergone to 5 separate StS tests on a force platform (BTS Bioengineering 60x30cm platform) followed by 15 sec of standing (Fig. 1). The chair had backrest, no armrests and a height of 45cm.
The CoP parameters associated with the ball (statochinesiogram) analyzed were the sway area and the sway lenght, and those associated with the oscillations along the X and Y axis (stabilogram) were the minimum and maximum sway path, range of sway path in the antero-posterior (A/P) and medio-lateral (M/L) directions.
Moreover, the following clinical assessments scale were administered to the 15 stroke patients: Unified Balance Scale (UBS) [3], 10 Metres Walking Test (10MWT), 5XStST, Motricity Index (MI), Walking Handicap Scale (WHS), Barthel Index (BI).

Fig 1. Example of thw Sit-to-Stand execution sequence.

RESULTS

In the instrumented StS test, all of CoP parameters were significantly different between healthy and stroke subjects (Tab.1 and Fig. 2, 3, 4, 5). Many parameters were also correlated with function and activity measurements. In particular, the peak-to-peak sway path in M/L direction is the parameter that most closely correlate with all clinical assessments of function and activity (Tab. 2), showing an SDC of 64,1 mm. Finally, 5XSST showed significant correlations with all clinical assessment, in particular with the 10MWT and WHS (Tab. 3).

Area	Lenght	Min. sway path	Max. sway path	Range A/P	Range M/L
$p < 0,01$	$p < 0,01$	$p < 0,01$	$p < 0,01$	$p = 0,015$	$p < 0,01$

Tab 1. Comparison of CoP parameters between normative population with stroke population in StS tests.

	Area	Lenght	Min. sway path	Max. sway path	Range A/P	Range M/L
UBS	-0,38	-0,56	-0,57	-0,49	0,49	-0,72
10M	-0,54	-0,66	-0,53	-0,64	0,22	-0,81
5XSST	0,22	0,32	0,41	0,38	-0,20	0,53
MI	-0,64	-0,73	-0,39	-0,74	0,11	-0,87
WHS	-0,26	-0,45	-0,46	-0,42	0,36	-0,65
BI	0,25	-0,46	-0,58	-0,54	0,38	-0,69

Tab 2. Comparison between CoP parameters of StS test and clinical measurements.

	UBS	10MWT	Motricity Index	WHS	Barthel Index
5XSST	$p = -0,63$	$p = -0,76$	$r = -0,55$	$r = -0,79$	$r = -0,63$

Tab 3. Comparison between 5XSST and the remaining clinical measurements.

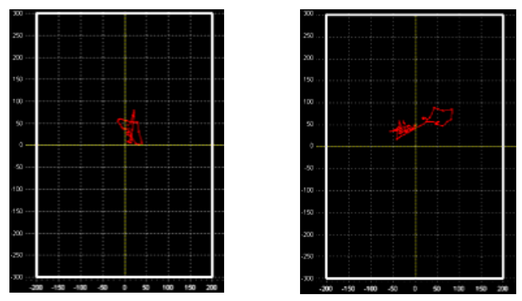

Fig 2 and 3. Statochinesiogram: Example of a ball of a normative subject (left) and of a stroke subject (right).

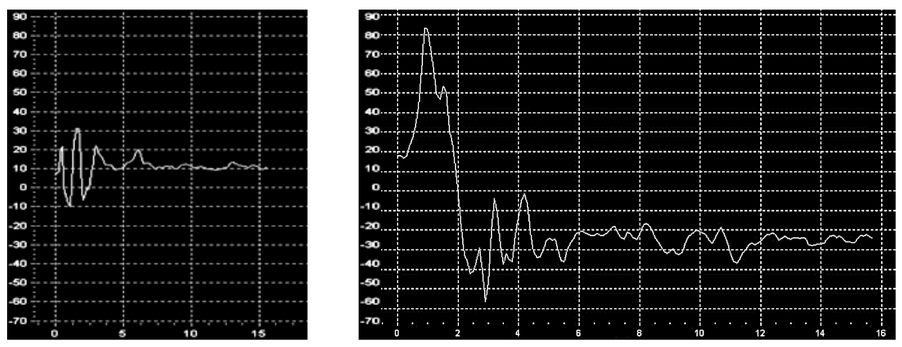

Fig. 4 and 5. Stabilogram: Example of oscillations along the X axis of a normative subject (left) and stroke subject (right).

DISCUSSION

Instrumental StS has been shown to be a simple and easily executable test even in very compromised patients, unlike the 5XSST which is not always executable. In addition, StS instrumentation has a high correlation with multiple clinical measurements of impairment, activity and participation. The peak-to-peak sway path in M/L direction is the most significant parameter in defining the differences between the two populations. The SDC of this last is small and therefore could be a useful parameter to monitor the patient's rehabilitative treatment results.

REFERENCES

[1] Cheng P, Arch Phys Med Rehabil, 1998;79:1043 1046
[2] Frykberg GE, J Rehabil Med. 2007;39:448-453
[3] La Porta F, J Rehabil Med. 2011;43:435-444.

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