Improving verticality perception reduces lateropulsion after hemisphere stroke

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Introduction.– A biased perception of verticality is linked to lateropulsion after stroke which is a cause of postural disability and as a consequence limits the functional recovery. Does a normalisation of verticality perception based on the crucial role played by gravitational somesthesia in the internal model of verticality [1] can both reduce the lateropulsion and improve the dynamic balance?

Objective.– The aim of the study was to assess the existence of a reduction of lateropulsion after hemisphere stroke using a simple ipsilesional body tilt which is known to increase the weight of the somesthetic graviception (unimpaired in the internal model of verticality; [2]).

Method.– The postural vertical (PV) of 18 hemisphere stroke patients (11 rights/7 lefts; age: 54 ± 13 years; delay: 3 ± 2 months) and 12 controls was measured before and after a 10 minutes lateral body tilt of 30°. The effect of this tilt on lateropulsion and dynamic balance was subsequently investigated in the 12 patients and 12 controls who were able to realise a dynamic balance task in sitting position (rocking platform paradigm). The number of aborted trials and the mean orientation of the platform were used as measures of lateropulsion.

Results.– In controls, the PV was accurate (0.1 ± 0.7°) but strongly modulated by a body tilt (P < 0.0001). In patients, the PV was contralesionally biased (3.6 ± 3.7°). After an ipsilesional tilt, the PV was normalised (0.7 ± 0.7°; P < 0.001) and the lateropulsion reduced (−3.2 ± 2.8° vs −0.1 ± 2.0; P < 0.001) resulting in an improvement of dynamic balance with less aborted trials (0.27 ± 0.19 vs 1.56 ± 0.56; P < 0.02).

Discussion.– A simple ipsilesional lateral body tilt (10 minutes at 30°) can improve the sense of verticality and the dynamic balance which are ipsilesional biased after stroke. Our hypothesis were based on a theoretical frame recently established [2] and our results encourage the integration of the ipsilesional tilt in clinical trial of rehabilitation dedicated to verticality and lateropulsion.

References
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Lower limb coordination patterns during gait in hemiparesis – study in a cohort of 41 patients

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**Keywords:** Hemiparesis; Gait; Inter-segmental coordination; Continuous Relative Phase; Gait velocity; Hyperactivity; Soft tissue retraction; Botulinum toxin

Introduction.– Paresis, muscle overactivity and soft tissue contracture are the three main mechanisms responsible for gait disturbance in hemiparesis. In the rehabilitation management of hemiparetic patients, clinicians may try to determine the responsibility of each mechanism and to quantify the impact of treatment on movement organization and gait efficiency. Inter-segmental coordination analysis, using measurement of the Continuous Relative Phase (CRP) in the sagittal plan, may assist in reaching these objectives [1–3].

Methods.– A cohort of 41 patients with chronic hemiparesis and a group of 20 healthy subjects were analyzed [1–3]. The CRP between lower limb segments was quantified during gait at spontaneous and maximal velocity.

Results and discussion.– The amount of dephasing between lower limb segments, in each phase of the gait cycle, sheds light on the coordination pattern. Relevant parameters of the inter-segmental CRP (ie. RMS, peaks, mean, standard deviation, first derivative) may reveal specific information such as the predominance of neurological or orthopedic factors in the kinematic deficits, the impact of various conditions of gait rehabilitation, or treatment-related benefits. This analysis, complementary to routine clinical examination, may also disclose specific motor deficits in the paretic lower limb, [1–3] and compensatory strategies at work in the non-paretic lower limb [1–3].

Conclusion.– These findings may encourage rehabilitation clinicians to carefully study coordination patterns, which may help optimize treatments to lessen gait impairment in spastic paresis.

References

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Spatiotemporal gait characteristics of hemiplegic patients C. Chotard 1,*, M. Labrunee 3, P. Dupiu 2, R. Montoya 4, P. Marque 2, D. Gasq 2
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**Keywords:** Gait speed; Hemiplegia; Asymmetry; Spatiotemporal parameters

Introduction.– The measurement of spontaneous walking speed is the usual descriptor of the gait performance of the hemiplegic. The maximum walking speed, and the parameters of temporal and spatial symmetry also seems interesting to characterize the gait of the hemiplegic. The objective was to study the spatio-temporal asymmetries of the gait with respect to the lateralization of hemiplegia, and to determine the parameters best correlated with motor impairment and function, at spontaneous and maximum walking speed.

Patients and methods.– Thirty-two stroke hemiplegic subjects (50 ± 14 years, 53% of left hemiplegia) conducted a standardized assessment of gait with a Locometer, at spontaneous speed (VS) and maximum speed (VM). The motor level assessed by the motor sub-score of the lower limb Fugl-Meyer (FMinf) is 22.3 ± 7.4 of 34. The functional level assessed with the FIM is 106.8 ± 15 of 126. An index of temporal asymmetry (or IAT, obtained from time to single-leg support right and left) and spatial asymmetry (or IAS, obtained from the step length left and right) were calculated.

Results.– A high temporal asymmetry is always at the expense of hemiplegic side, while a high spatial asymmetry is divided equally between healthy and injured side. The correlation coefficient is high and significant (P < 0.001) between the score FMinf and the IAT at VS and VM (–0.68 for both), the VM (0.66) and the VS (0.65). The correlation coefficient remains significant but with low value between the score FMinf and IAS expressed in absolute value (–0.38 with P = 0.03 at VS and –0.46 with P = 0.008 at VM). The correlation coefficient is high and significant (P < 0.01) between the MIF and the IAS expressed in absolute value at VM (~0.72) and VS (~0.62), the IAT at VM (~0.53) and VS (~0.51), the VM (0.53) and VS (0.49).

Discussion.– The IAT appears to be the most interesting parameter because of its validity and its qualitative aspect. Conducting an assessment at maximum speed seems to improve the validity of gait parameters compared to the spontaneous speed.

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Efficacy of long term physical therapy on walking activity in chronic stroke: Interim analysis

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**Keywords:** Stroke; Hemiplegia; Physical therapy; Gait; Walking activity

Objectives.– The aim of this multi-center, randomized controlled study is to assess the efficacy of continuing physical therapy twice a week during 8 weeks at the chronic phase of post-stroke hemiplegia (six months to two years post-stroke) as compare to an 8 weeks break of the physical therapy.

Methods.– Multicenter (CHU de Saint-Étienne, Angers, Nancy, Bordeaux), randomized, parallel, single-blind study. Included patients were first ever stroke at a chronic stage (6 months to 2 years), living at home and able to walk with or without assistive technologies. The therapeutic group followed an 8 weeks program of gait-oriented physical therapy, whereas the control group stopped the physical therapy during 8 weeks. The main outcome measure was the walking activity as assessed during 3 days (excluding the days with physical therapy) by a magnetometer-based step counter. These measures were performed before and after the therapeutic program.