Rehabilitation in brain-damaged patients

CO015
Mechanical horse, a new rehabilitation method for brain-damaged patients: Focus on postural coordination. A preliminary study
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Objective The mechanical horse (a.k.a. simulated hippotherapy) was created in the 1990s. Early works investigating the use of mechanical horses in rehabilitation have shown a similar effect on posture compared to real hippotherapy. The aim of this study was to analyze the impact of a new rehabilitation protocol on the postural coordination of patients with brain-damaged. The first results of an ongoing study are presented below.
Material/patients and methods Two brain-damaged patients (P1, P2) were recruited for a rehabilitation protocol of 24 sessions of practice with a mechanical horse (one single axis and oscillation frequencies from 12.1 osc.min⁻¹ or 20% of maximal speed to 150 osc.min⁻¹ or 100%). Patients performed different balance exercises and trunk mobilizations on a mechanical horse in movement. During the first and last sessions (i.e., pre- and post-tests), reflective markers were positioned on the patients and continuously tracked (head, C2, C7, S1, horse) for a range of different oscillation frequencies (adapted to abilities of each patient). Through point coordinates of those five reflective markers, three angles between specific limb and the vertical axis were computed (head vs. vertical, trunk vs. vertical, horse vs. vertical). Discrete relative phase (ϕ) between patient oscillations and horse oscillations was then computed, characterizing the ϕHead-Horse and ϕTrunk-Horse coordinations (in-phase = 0 ± 20°, antiphase = 180 ± 20° or out-of-phase).
Results P1 and P2 showed a head-horse coordination in out-of-phase for every oscillation frequencies (e.g., at 40% oscillations frequency, P2: ϕHead-Horse = 118.9° ± 17°); identically to the trunk-horse coordination of P1 (e.g., at 40% oscillations frequency: ϕTrunk-Horse = 90° ± 19°). However, the trunk-horse coordination of P2 was in antiphase (e.g., at 40% oscillations frequency, P2: ϕTrunk-Horse = 166° ± 4°). Finally, a significant reduction of the variability of those coordinations was observed in post-test.
Discussion – conclusion Preliminary results suggest that the use of a mechanical horse allows positive effects on the posture in brain-damaged patients. Indeed after 24 sessions, an increase in patients' ability to control their activity during higher frequencies was observed (e.g., P2 was unable to oscillate faster than 50% frequency in pre-test when he reached 80% of maximal frequency in post-test). Moreover, the postural stability of patients was improved through the practice of balance and trunk mobilization on the mechanical horse.
Keywords Rehabilitation; Mechanical horse; Postural coordination
Disclosure of interest The authors have not supplied their declaration of competing interest.
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CO017
Neuro-orthopedics disorders in intensive care unit (ICU): Perceptions of teams
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Objective In intensive care unit (ICU), the frequent association of organ failure, neurological, orthopedics lesions and undernutrition promotes the development of neuro-orthopedics disorders (NOD). They can affect the acute phase management and the functional prognosis of patients. Caregivers (nurses and nursing auxiliaries) have a sentinel role in their early detection.
Material/patients and methods We investigated the perception of paramedical and medical teams in 3 surgical ICU in university hospitals in Île-de-France. Questionnaires were about the impact of the NOD on patient health and on care as well as on the therapeutic or preventive actions carried out.
Results In total, 79 questionnaires including: nurses (n = 30, median age = 28.5 [23–49]), nursing auxiliaries (n = 17, median age = 31 [20–56]), doctors (n = 28, median age = 32.5 [24–60]) and physiotherapists (n = 4, median age = 50 [26–53]). Among caregivers, 64% have been working for less than 5 years in ICU and 46.8%...
consider NOD to be frequently responsible for pain. There is a correlation between age and the perception of NOD responsibility in pain for caregivers ($P=0.04$), but not for doctors ($P=0.26$). We did not find correlation between the experience in ICU and the perception of NOD responsibility in pain ($P=0.77$), nor between the impact of NOD on pain and the tendency to start action against the NOD from caregivers (modification of the positioning $P=0.26$ or mobilization by caregivers $P=0.57$).

**Discussion – conclusion** The number of responses seems to indicate that ICU teams are interested in NOD. Some results are surprising, with sometimes high variability. Although the methodology (question formulation, subjective declarative data, etc.) induces biases, we may wonder why age seems to influence the perception of the role of NOD in pain, contrary to the experience in ICU or why the pain does not seem to induce modifications of positioning or mobilization by the caregivers. It seems necessary to compare these data with a prospective study to determine the prevalence of NOD in ICU, or even to define a patient profile at risk of developing NOD in ICU.

**Keywords** Neuro-orthopedics disorders; ICU; Nurses; Nursing auxiliaries; Caregivers

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**CO019**

**Proposition of a classification of adult patients with hemiparesis in chronic phase**

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**Objective** Patients who have developed hemiparesis after central nervous system lesion often experience reduced walking capacity. Related gait abnormalities at hip, knee, and ankle joints during swing induce decreased foot clearance and increased risk of falls, and thus need a meticulous management. This study aimed to (1) propose a classification focusing on these abnormalities for adult patients with hemiparesis, (2) evaluate its discriminatory capacity using clinical gait analysis (CGA).

**Material/patients and methods** Twenty-six patients (10 women, 16 men) with hemiparesis (13 left, 13 right) in chronic phase (i.e. hemiparesis more than 6 months old) were included in this study. Clinical examination (i.e. passive range of motion, muscle weakness, and spasticity) and video records were conducted on each patient. The following classification was then applied: group I (GI) was mainly characterized by a decreased ankle dorsiflexion during swing, group II (GII) and group III (GIII) by a decreased knee flexion during swing, completed by a reduced range of hip motion and a hip flexors weakness in GII. Subdivisions were also applied on each group to describe (a) absence or (b) presence of genu recurvatum during stance. The discriminatory capacity of the classification was then evaluated. For that, all patients were instrumented with cutaneous reflective markers and at least 5 gait cycles were recorded using optoelectronic cameras (OQUS, Qualysys, Sweden). A statistical analysis (ANOVA) was then performed between each group and subgroup on 24 kinematic parameters and walking speed.

**Results** Only one patient could not be classified, 5 were classified in GI (1 Gla, 4 GIIb), 15 in GII (7 GIIa, 8 GIIb), and 5 in GIII (1 GIIIa, 4 GIIIb). When subgroups (a) and (b) were combined, 16 of the 25 assessed parameters revealed a statistically significant difference ($P$-level $<0.05$) between at least two groups. In particular, the maximum knee flexion in swing and the total amplitude of hip flexion-extension were significantly different between groups.

**Discussion – conclusion** This classification can be performed in regular clinical practice (using clinical evaluation and video records). It should thus ease the development of clinical management algorithms and the efficiency assessment of related therapies.

**Keywords** Gait abnormalities; Clinical gait analysis; Classification; Central nervous system lesion

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**CO020**

**Parietomotor connectivity in the contralesional hemisphere after stroke: A paired-pulse TMS study**

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**CO021**

**Long-term outcome after severe traumatic brain injury (TBI) and correlation with volumetry and fractional anisotropy**

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