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Movement analysis

Oral communications

CO056

Observational study of 180° turn using Inertial Measurement Units in post-stroke ambulatory patients



Rémi Barrois^{1,*}, Damien Ricard⁴, Laurent Oudre², Leila Tlili³, Clément Provost³, Pierre-Paul Vidal¹, Alain Yelnik³

¹ Université Paris Descartes, neuroscience, Paris, France

² Institut Galilée, université Paris 13, Villetaneuse, France

³ Groupe Hospitalier Saint-Louis, Lariboisière, Fernand-Widal, MPR, Paris, France

⁴ Service de santé des armées, hôpital d'instruction des armées du Val-de-Grâce, neurologie, Paris, France

* Corresponding author.

E-mail address: remi.barroismuller@gmail.com (R. Barrois)

Objective Fall is a common complication in post-stroke populations and more likely occurs in left paretic (LP) than in right paretic patients (RP). Since kinematic characteristics of post-stroke patients' turn have not been clearly established, the goal of this study was to analyze with inertial measurement units (IMUs) spontaneous and constraint 180° turn in those patients and in aged matched healthy controls (HC).

Material/patients and methods Seventeen RP patients (43 to 73 years, mean 57.5), 22 LP patients (43 to 63 years, mean 59.6) and 15 healthy controls (36 to 83 years, mean 56.7) were included. All subjects were right handed. They were instructed to turn 180° in a self-selected direction and then in the constraint direction, wearing 3 IMUs on the trunk and on both feet. A synthetic kinematic data representation allowed to observe turning parameters.

Results Differences were observed in turn duration, number of external steps and mean angular velocity between HC and RP, HC and LP, but not between RP and LP. The spontaneous side of 180° turn was the paretic side for 50% of RP versus 95% of LP. Spontaneous turn to the paretic side was initiated with the paretic foot (i.e. the paretic foot was first in stance phase after turn onset) for 50% of RP versus 90% of LP. Considering that turning to the paretic (and hypoesthetic) side is at high risk of fall, we propose to grade the risk of fall from 1 (low) to 4 (high): turn to the healthy side initiated with the healthy foot (score 1/4), healthy turn with paretic foot (2/4), paretic turn with healthy foot (3/4) and paretic turn with paretic foot (4/4). In recent post-stroke patients (<6 months), none of the RP had a risk 4/4 versus 83% of the LP.

Discussion–conclusion This original study permitted us to observe spontaneous and constraint 180° turn in post-stroke patients using a synthetic representation with IMUs. Thanks to sensors, the foot on which the 180° turn was initiated could be determined and showed differences between RP and LP. Those results are consistent with fall epidemiology.

Keywords 180° turn; Fall; Stroke; Inertial measurement unit

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Kinematic analysis of the scapula after total anatomic and reverse shoulder arthroplasty



Alexandra Roren^{*}, Marie-Martine Lefevre-Colau, Agnès Roby-Brami, Christelle Nguyen, Serge Poiraudou
 CHU Cochin, rééducation, Paris, France

* Corresponding author.

E-mail address: alexandraroren@yahoo.fr (A. Roren)

Objective Scapular motion is essential for full, functional mobility of the arm. Many shoulder pathologies are associated with alterations of scapular kinematics which have been only little studied in total shoulder arthroplasties. The aim of this study was to compare the 3D scapula kinematics in two groups of patients with total shoulder anatomic (aTSA) or reverse (rTSA) arthroplasties to asymptomatic controls of comparable age during two arm elevation tasks (abduction and flexion) and two simulations of activity of daily living (“hair combing” and “back washing”).

Material/patients and methods Scapular kinematics was assessed using a Polhemus Fastrak electromagnetic device in 14 patients with aTSA (and 14 controls) and 9 patients with rTSA (and 9 controls). The 3D rotations and the 3D displacements of the barycenter of the scapula were measured at 30°, 60° and 90° of humerothoracic (HT) elevation. Patient groups were compared with each other by Mann–Whitney *U* test and with their respective controls by Wilcoxon test.

Results Scapulohumeral rhythm was reduced in both patient groups as compared with controls. Patients with aTSA showed more lateral rotation and more linear displacements of the scapula compared to rTSA and control groups. Nevertheless, the global kinematics pattern remained unchanged in both groups of patients.

Discussion–conclusion Patients showed a greater participation of the scapula in HT elevation movements and kinematic