"Age Effects on Upper Limb Kinematics Assessed by the Reaplan Robot in Healthy Subjects Aged from 3 to 93 Years Old"

Gilliaux, Maxime ; Lejeune, Thierry ; Sapin, Julien ; Dehez, Bruno ; Stoquart, Gaëtan ; Detrembleur, Christine

ABSTRACT

Introduction/Background: Kinematics is recommended for the quantitative assessment of upper limb movements. The aims of this study were to determine the age effects on upper limb kinematics and establish reference standards in healthy subjects. Materials and Methods: Three hundred and seventy healthy subjects, aged from 3 to 93 years, participated to the study. Twenty-eight kinematic indices were computed from two unidirectional (i.e., reaching a target and performing a back-and-forth movement) and two geometrical (i.e., drawing a circle and a square) tasks (1). Each task was performed ten consecutive times with the REAplan, a distal effector robotic device that allows upper limb displacements in the horizontal plane. Results: For both unidirectional tasks, the speed index showed an increase during childhood, a maturation in young adults and a decrease in the elderly. Moreover, for the back-and-forth movements, the smoothness results were more reproducible during the ten cycles of mo...

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**TC230**

Electroneuromyographic Results of Patients with a Pre-Diagnosis of Ulnar Neuropathy at the Elbow, Relationship with Clinical Findings and Determination of Sensitivity and Specificity of Electroneuromyographic Tests

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**Introduction/Background:** The aim of this study was to determine the sensitivity and specificity of nerve conduction studies recording abductor digiti minimi (ADM) and first dorsal interosseous (FDI) muscles, which are used in electroneuromyographic (EMG) evaluation of patients with suspicion of ulnar neuropathy at the elbow (UNE). **Material and Methods:** Patients who applied to our ENMG laboratory with suspicion of UNE were evaluated. Ulnar nerve motor (ADM and FDI muscles) and sensory conduction studies were recorded. Needle EMG was performed to flexor carpi ulnaris (FCU), ADM and FDI muscles. Amplitude drops in elbow segment were recorded as conduction block. Conduction velocity slowing was accepted as focal demyelination. Abnormal needle EMG findings were considered as axonal damage. **Results:** A total of 150 patients (80 male, 70 female) between the age of 21-80 were included in this study. ENMG findings were normal in 107 patients. 19 patients were diagnosed with UNE when 4 patients had carpal tunnel syndrome (CTS), 7 patients had CTS + UNE, 1 patient had ulnar neuropathy at the wrist (UNW), 1 patient had CTS + UNW, 4 patients had polyneuropathy (PNP) + CTS + UNW, 1 patient had mononeuritis multiplex, 3 patients had PNP + CTS and 1 patient had anterior interosseus syndrome. Patients were divided into two groups as patients with normal EMG and patients with EMG findings suggesting UNE. Between the two groups demographic features, ADM motor latency, FDI motor latency, sensory latency, FDI motor latency, sensory latency and amplitude, ADM motor latency and amplitude, F latencies were found different (p<0.05). Sensory latency, FDI motor latency, sensory velocity and amplitude, ADM motor latency and amplitude, F latencies were found different (p<0.05). In UNE group, motor focal demyelination ratio was 88.8% when recording ADM muscle and was 80% when recording FDI muscle. Sensitivity block of these measurements were found 47.3 %, and 78.9 respectively. Sensory conduction block was 89.6%. Sensitivity of ADM records was 98.55% and specificity 25%. In FDI group, sensitivity and specificity were 83.3%. **Conclusion:** ENMGs of these patients should be performed carefully because of inconsistency with EMG findings and clinical suspicion. It seems like results when recording ADM muscle are more sensitive compare to FDI, in contrast with specificity.

**TC231**

Age Effects on Upper Limb Kinematics Assessed by the ReaPlan Robot in Healthy Subjects Aged from 3 to 93 Years Old

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**Introduction/Background:** Kinematics is recommended for the quantitative assessment of upper limb movements. The aims of this study were to determine the age effects on upper limb kinematics and establish reference standards in healthy subjects. **Materials and Methods:** Three hundred and seventy healthy subjects, aged from 3 to 93 years, participated to the study. Twenty-eight kinematic indices were computed from two unidirectional (i.e. reaching a target and performing a back-and-forth movement) and two geometrical (i.e., drawing a circle and a square) tasks (1). Each task was performed ten consecutive times with the REAPlan, a distal effector robotic device that allows upper limb displacements in the horizontal plane. **Results:** For both unidirectional tasks, the speed index showed an increase during childhood, a maturation in young adults and a decrease in the elderly. Moreover, for the back-and-forth movements, the smoothness results were more reproducible during the ten cycles of movements in young adults than in children and old subjects. Finally, the accuracy and straightness indices did not show any age effect for both unidirectional tasks. For both geometrical tasks, the speed index showed a decrease along the whole life and the smoothness index showed an improvement during childhood, a maturation in young adults and a deterioration in the elderly. Finally, the accuracy index did not show any age effect for both geometrical tasks. **Conclusion:** This study was the first to use a robotic device to assess the age effects on upper limb kinematics and establish reference standards in subjects aged from 3 to 93 years. **Reference:** (1) Gilliaux et al., J Rehab Med 2014; 46: 117-25.

**TC232**

Electromyographic Assessment of Shoulder Girdle Muscles during Common Rehabilitation Exercises

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**Introduction:** Effective overhead throwing requires a balance between rotational shoulder strength and flexibility. Injuries are common and rehabilitation is central for successful treatment. This study aimed to describe shoulder muscle activation strategies during eight common rotational shoulder exercises. **Method:** EMG was recorded in 30 healthy subjects from 16 shoulder girdle muscles (surface electrodes: anterior, middle and posterior deltoid, upper, middle and lower trapezius, upper and lower latissimus dorsi, upper and lower pectoralis major; fine wire electrodes: supraspinatus, infraspinatus, subscapularis and rhomboid major) using a telemetric EMG system. Five external rotation (EXT.R.) exercises (0° and 90° of abduction, and with towel, prone external rotation, side lying internal rotation) and three internal rotation (INT.R.) exercises (0° and 90° of abduction, zero-position internal rotation) were included. Mean EMG amplitudes between exercises were compared using repeated measures ANOVA. **Results:** EXT.R. Exercises: significantly higher activation of deltoid was seen in