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Efficacy of the neuro-orthopaedic surgery for spastic equinovarus foot after stroke. A prospective longitudinal study based on the ICF model

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Keywords: Hemiplegia; Muscle spasticity; Neurotomy; Tendon lengthening

Background.– To assess the efficacy of the tibial neurotomy, tibialis anterior tendon transfer and/or achille and long toe flexor tendons lengthening in association for spastic equinovarus foot (SEF) after stroke based on the 3 domains of the International Classification of Functioning, Disability and Health (ICF).

Methods.– Eighteen stroke patients with SEF were assessed before, 2 months and 1 year after surgery. The body function and structure (SIAS, gait speed and video, walking aids, spasticity, strenght, ROM), activities (FAC, FWC, ABILOCO) and quality of life (SATISPART, SF-36) were assessed.

Results.– A decrease in spasticity and pain, an increase in ankle range of motion, an improvement in equinus and varus and in gait speed and a reduction in walking aids were observed. Activity, participation and quality of life were not significantly modified.

Conclusions.– This study confirms the efficacy of the neuro-orthopaedic surgical treatment of SEF after stroke to reduce the impairments while the activity, participation and quality of life remain unchanged.

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Effects of tibial nerve neurotomy on posture and gait in stroke patients

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Keywords: Neurotomy; Spasticity; Equinovarus foot; Stroke; Gait; Posture

Background.– To evaluate objective and subjective functional effect of tibial nerve neurotomy (TNN) in post-stroke equinovarus foot.

Methods.– Fourteen patients were assessed before and 4 months after TNN by the Posture and Gait-Impairments and Activities for Stroke Patients scale (PG-IASP), allowing an ecological-like assessment of the main impairments and activities of posture and gait, both by the patient and the examiner. We also analyzed analytical (spasticity), instrumental (baropodometry, videographic gait analysis) and functional parameters (NFAC, Rivermead Mobility Index [RMI]) of posture and gait.

Results.– After TNN, patients reported an improvement in posture and gait impairments ($P = 0.002$), mainly for distal limb deformities, and a functional improvement in daily living ($P = 0.014$). NFAC and RMI scores were not modified. Walking speed in the rapid condition ($P = 0.036$) and ankle kinematics were improved. Baropodometric analysis showed a significant increase of heel bearing.

Conclusions.– TNN leads to a patients' self-perceived improvement in daily living postural and gait activities, more important than revealed by "objective" assessments.

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Spastic distortion in flexion of the elbow after stroke: Anatomic localization of the motor nerve branch of the brachialis

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Keywords: Brachialis muscle; Motor nerve block; Elbow flexion; Spasticity; Hemiplegic

Background.– The aim of this study is to identify the anatomical surface landmarks of the brachialis motor nerve on fresh adult cadaver upper limbs ($n = 20$).

Methods.– Four measurements were taken of the position of the brachial motor branch from the medial epicondyle to the coracoid process (d0); to the exit point of the brachialis motor branch from the musculocutaneous trunk (d1); to the entry point of the brachialis motor branch into the muscle (d2) and "r" the depth of the nerve.

Results.– The brachial nerve of 6 men and 4 females (age range 68 to 84y) were identified. The mean of distances were: d1 (155 ± 10.5 mm); d2 (102 ± 17.9 mm) and r (28.8 ± 4.84 mm). The ratio between d2 and d0 (d2/d0) was ($34.1\% \pm 0.05\%$) and the course of the branch that could be blocked specifically (d1–d2) (53 ± 13.7 mm). In practice, this represents a landmark skin through a hand above the medial epicondyle, just behind the biceps brachii belly.

Conclusions.– This localization of the brachialis motor nerve should help in the performance of nerve blocks to assess the role of each elbow flexor in the spastic flexion distortion of hemiplegic patients.

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Spasticity care in the elderly: Retrospective analysis in a physical medicine and rehabilitation department

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Keywords: Spasticity; Elderly; Botulinum toxin; Stroke

Background.– Study of clinical practice in spasticity care in the elderly in a PMR department.

Methods.– Retrospective study over 5 years (2009–2013) of patients over 80 referred to a PMR department for disabling spasticity. Aetiologies of spasticity, clinical presentation, strategy of care and tolerance of treatment were reported.

Results.– Fifty-nine patients (mean age 83.7) were reported. 59% presented with spastic hemiplegia. Spasticity was caused by stroke (59%), hereditary spastic paraplegia (10%), multiple sclerosis (8%), amyotrophic or primitive lateral sclerosis (4%). Then, 57% patients were treated with botulinum toxin injections, 12% underwent surgery. The aim of the treatment was mostly functional improvement. Follow-up was 3 years for 15% of patients, 53% are still followed, 43% are dead or lost of view one year after the first visit.

Conclusions.– Treatment of spasticity is useful and well tolerated in elderly patients over 80. Therefore, they should be more largely referred to PMR units specialized in spasticity.

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Initial results from the international double-blind phase III study of Dysport® in the treatment of adults with upper limb spasticity

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Background.– This study assessed the efficacy of Abobotulinumtoxin A (Dysport®) on upper limb spasticity (ULS) and function in hemiparetic adults following stroke/traumatic brain injury.
Methods.– Phase III, prospective, double-blind, placebo-controlled study; 243 patients (from 34 sites in 9 countries) were randomized (1:1:1) to Dysport® 500 or 1000 units (U) or placebo.
Primary objective.– To assess the efficacy of Dysport® in reducing upper limb muscle tone (using MAS) in patients' primary targeted muscle group (finger, wrist or elbow flexors). *Secondary objectives*.– Clinical benefit, assessed by Physician Global Assessment (PGA), and improvement in passive function, assessed by the Disability Assessment Scale (DAS).
Results.– A significantly higher proportion of patients compared to placebo were responders:
– ≥ 1 point improvement in MAS as early as 1 week and 4 and 12 weeks post-injection with either dose of Dysport®;
– significant clinical benefit, according to PGA scale, was also observed.
Similarly, a significantly higher proportion of patients demonstrated ≥ 1 grade improvement in DAS at week 4 and 12 with 1000 U. No new safety events were observed.
Conclusions.– Dysport® 500 and 1000 U improved muscle tone and function, and provided clinical benefit in adults with ULS. Safety profile was consistent with the known profile of Dysport® in this indication.

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Muscle structure assessment after botulinum neurotoxin A injection. Literature review

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Keywords: Spastic muscle; Botulinum neurotoxin; Atrophy; Stiffness; Literature review
Background.– Botulinum neurotoxin A manages spasticity disorders in neurological central diseases. But this treatment may induce muscular modifications.
Methods.– We made a literature review in order to explore the structural and passive biomechanical properties of the musculotendinous unit after injections in healthy animal muscles and in spastic human muscles, as well as the methods of evaluation of theses properties.
Results.– Twenty articles have been selected. Histological analyses have been carried out especially on animals. A neurogenic atrophy systematically occurs. In humans, one year after a single injection, the histological recovery is incomplete. The passive biomechanical analysis of muscle stiffness shows on the short term, a modulus elastic increase in animals whereas no change is recorded in humans. 2D US analysis shows gastrocnemius thickness and pennation angle reduce. MRI volumetry analysis shows muscle atrophy, six months or one year after a single injection. Sonoelastometry analysis shows, on the short term, a modulus elastic decrease.
Conclusions.– Very little data exists. The muscle changes need to be taken into account when seeking functional improvement. The protocols are inconsistent. 2D US and Sonoelastometry should be developed in long term monitoring.

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OnabotulinumtoxinA improves spasticity related pain in post-stroke patients: Findings from a randomized controlled trial

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Keywords: Stroke; Spasticity; Pain; Rehabilitation; OnabotulinumtoxinA
Background.– Patients with upper motor neuron syndrome often experience spasticity-related pain due to increased muscle tone and flexor/extensor spasms.
Methods.– A total of 274 post-stroke patients with upper and lower limb spasticity were randomized to OnabotulinumtoxinA (BOTOX®) + standard of care (SC) or saline + SC in the BOTOX® Economic Spasticity Trial's double blind phase. Spasticity-related pain was measured using an 11-point pain numeric rating scale (0 to 10). Change in pain from baseline and proportion of patients with ≥ 30% improvement were compared between treatment groups using Wilcoxon rank-sum and chi^2 or Fisher's exact tests.
Results.– Patient's mean age was 61 years (SD: 11.4); 41% were female. Of 273 patients that received treatment, 202 experienced baseline spasticity-related pain with the majority (64%) having pain intensity ≥ 4. Among patients with baseline pain, the mean change in pain at week 12 among OnabotulinumtoxinA + SC and saline + SC groups were –1.24 (95% CI: –1.8, –0.7) and –0.31 (–0.9, 0.3), respectively ($P < 0.01$). The proportion of patients with ≥ 30% improvement was 51% (37/73) for OnabotulinumtoxinA + SC versus 28% (18/65) for saline + SC ($P < 0.01$).
Conclusions.– This is the first large RCT showing statistically significant and clinically meaningful improvement in spasticity-related pain syndromes from OnabotulinumtoxinA treatment.

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Central effects of botulinum neurotoxin A: Spinal plasticity in stroke patients after injection in ankle plantarflexors

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Keywords: Botulinum neurotoxin A; Reciprocal inhibition; Stroke
Background.– BoNT-A depresses recurrent inhibition of lumbar motoneurons likely due to its retrograde transportation. Because Renshaw cells control group Ia interneurons mediating reciprocal inhibition between antagonists, we tested whether this inhibition particularly affected after stroke could recover after BoNT-A.
Methods.– Effect of posterior tibial nerve stimulation (PTN) on tibialis anterior electromyogram was investigated in 13 stroke patients during treadmill walking before and 1 month after BoNT-A injection.
Results.– After injection, the PTN induced reciprocal facilitation in Ia motoneurons during all the swing phase was depressed at the beginning of swing and reversed into inhibition in midswing.