**CO36-007-e**

**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 these 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 decrease. 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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**CO36-008-e**

**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 chi² or Fisher’s exact tests.

**Results.** – Patient’s mean age was 61 years (5D: 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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**CO41-003-e**

**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 inherent 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 la motoneurons during all the swing phase was depressed at the beginning of swing and reversed into inhibition in midswing.
Conclusions.-- This suggests that BoNT-A induces spinal plasticity leading to the recovery of reciprocal inhibition, which is likely to be due to the withdrawal of inhibitory control from Renshaw cells directly blocked by BoNT-A. This could help in limiting ankle muscle cocontractions in the transition phase from stance to swing, to assist dorsiflexion.

Further readings

CO41-004-e
Central effects of botulinum toxin: Neurophysiological study in post-stroke patients with lower limb spasticity
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Keywords: Stroke; Botulinum toxin; Spasticity; H-reflex

Background.– The therapeutic effects of intramuscular injections of botulinum toxin type A (BTx) on spasticity can be largely explained by its blocking action at the neuromuscular junction. BTx is assumed to also have a central action by affecting the functional organization of the CNS. The aim of the present study is to access the action of BTx on spinal motor networks by investigating the post-activation depression (post-AD) of the soleus H-reflex in post-stroke patients presenting lower limb spasticity.

Methods.– Soleus H-reflex was investigated in chronic hemiplegic patients before and 3, 6, 12 weeks after BTx-injections in soleus. H-reflex amplitude was analyzed in response to electrical stimulation of the tibial nerve at 0.1 Hz and 0.5 Hz. Post-AD was quantified as the ratio H_{0.5Hz}/H_{0Hz}.

Results.– The post-AD was significantly reduced in the affected side compared to the non-affected side before BTx injection. Three weeks after injection, the post-AD was reinforced in the paretic leg and significantly higher than in the non-affected side before BTx injection. Six months after injection, the post-AD was reinforced in the paretic leg and significantly higher than in the non-affected side before BTx injection. Three weeks after injection, the post-AD was significantly reduced in the affected side compared to the non-affected side before BTx injection. Three weeks after injection, the post-AD was reinforced in the paretic leg and significantly higher than in the non-affected side before BTx injection.

Conclusions.– BTx-treatment restores the post-AD of soleus H-reflex in post-stroke paretic patients. As post-AD amount is correlated to the severity of spasticity, it can be assumed that BTx’s effectiveness in post-stroke rehabilitation is also due to induced-changes in spinal motor networks.

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CO41-005-e
Passive mechanical obstacles vs impairment of neurological command in infant vs adult-acquired spastic paresis
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Background.– Compare muscle length, spasticity angle and active range of motion in adult parietic syndromes due to lesions acquired in infancy vs adult-acquired lesions.

Methods.– Cross sectional study from a retrospective chart review.

Population.– Convenience sample of 2 groups of clinic patients with spastic paresis due to an infant lesion (IL, n = 11) or to an adult-acquired lesion (AL, n = 11).

Evaluation.– Muscle length (X_{V1}), angle of catch (X_{V1}), spasticity angle (X = X_{V1}−X_{V1}), active range of motion (A) and angle of weakness (X_{V1}−A) in soleus, gastrocnemius, gluteus maximus, hamstrings, vastus and rectus femoris muscles at the initial evaluation (pre-toxin).

Results.– The IL group had shorter muscle lengths in gluteus maximus (X_{V1}, IL, 101 ± 5; AL, 120 ± 5; P = 0.02, Mann–Whitney) and hamstrings (X_{V1}, IL, 31 ± 7; AL, 63 ± 5; P = 0.004), smaller spasticity angles (X, gluteus maximus, IL, 7 ± 3; AL, 15 ± 4; P = 0.04; hamstrings, IL, 19 ± 4 vs AL, 42 ± 7; P = 0.02) and smaller angle of weakness across all muscles studied (P = 0.04, Wilcoxon). A was strongly correlated with X_{V1} across all muscles in the IL group (P < 0.05) while this was only true for plantar flexors and gluteus maximus in the AL group.

Conclusions.– Passive mechanical obstacles have greater impact on motor deficiencies in infant paresis than in adult acquired lesions.

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Posters

P202-e
Safety profile of 400 U onabotulinumtoxinA for the treatment of upper limb spasticity
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Keywords: Botulinum toxin; Safety

Background.– The safety profile of onabotulinumtoxinA for treatment of upper limb spasticity (ULS) was assessed across a range of doses to evaluate treatment with ≥400 U.

Methods.– Integrated data from 18 studies of onabotulinumtoxinA for ULS were evaluated by 4 dose groups (< 150 U, 150–250 U, 251–399 U, ≥400 U). Treatment exposure, incidence of adverse events (AEs), serious AEs, and possible distant spread of toxin (PDSOT) were assessed, together with the safety profile of patients who received 4 consecutive onabotulinumtoxinA ≥400 U treatments.

Results.– Overall, 1342 patients received ≥1 onabotulinumtoxinA treatment; 183 received ≥400 U, with 6.6% (88/1330), 12.3% (115/936), 23.3% (113/486), and 31.2% (96/308) in treatment cycles 1–4, respectively. AE rates were similar across dose groups, with no consistent increase in incidence of any individual AE/serious AE and no evidence of PDSOT at doses ≥400 U across treatment cycles. The overall AE rate among the subset of patients (n = 51) with 4 consecutive ≥400 U treatments was similar (43.1%, 43.1%, 43.1%, 41.2%), with no overall change in profile for AEs/serious AEs with increasing treatments.

Conclusions.– OnabotulinumtoxinA at doses ≥400 U was well tolerated in ULS patients, with no consistent pattern of increase in AEs at doses ≥400 U, reported systemic AEs, or change in safety profile over consecutive treatments.

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P203-e
Interests of medical hypnosis during toxin botulinic injections: Preliminary study
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Keywords: Toxin; Spasticity; Hypnosis; Pain

Background.– Our study concerns the efficiency of hypnosis during the injections of botulinum toxin. Hypnosis is widely used in medicine to decrease the anxiety and the painful felt, but few publications are appeared in physical medicine and rehabilitation.

Methods.– In this bi-centrique study, the injections are practised at 30 patient’s spastics. Two groups are constituted: the group “hypnosis” (standards analge-