Modular posture orthesis for the lower limbs (POMMI) for the cerebral palsy patient

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Keywords: Cerebral Palsy; Apparatus

Objectives.– Our therapeutic protocol in children with cerebral palsy includes an early introduction of night-posture for the spastic muscles. The polyarticular anatomy of the concerned muscles require a staged immobilization (ankles, knees and hips). In front of the important difficulty for families to set up the big cruropedal orthesis with fixed abduction, we imagined a modular orthesis fixing the different joints (ankles, knees and hips) in an ascending way.

Method.– After having resolved the administrative problems linked to the additional cost of this modular orthosis, we followed the implementation of 46 orthesis in specialized consultations. With the orthotropist, we defined the specifications of this modular orthosis. It consists of anti-equinus ankle-foot orthosis fit into postural kneepads connected by an adjustable and removable system to control the abduction.

Result.– We cannot compare with analytical element the modular orthosis with the fixed one made before, but satisfaction of families about ergonomics and tolerance of the modular orthosis led us to abandon the fixed one.

Discussion.– The modular orthosis has the inconvenience to be more expensive but offers better tolerance, it can be adjusted to adapt to the growth of the child and can be used to posture the limb in a segmental way.

Conclusion.– The modular postural orthosis of lower limbs improves tolerance and compliance with the same orthopaedic aims as the fixed orthosis. We continue to improve it to make the installation simpler and safer.

Further readings


Discussion and conclusions.– These results should be taken with caution because the number of subjects. However, they are encouraging for the use of ISOBEX® in clinical practice to assess muscle strength of the lower limb in children. Note that the significant difference in strength between younger and older children was expected.

References


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Quantification of muscle strength of lower limbs before and after injection of botulinum toxin A in children with cerebral palsy

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Keywords: Spasticity; Botulinum toxin A; Strength; Children

Objectives.– Botulinum toxin, used in case of focal spasticity, has for principal physiological effect to decrease the transmission of the input at the level of the neuromuscular junction, which reduces the intensity of the muscle contraction. For this reason, injections of botulinum toxin could enable decreased strength of the injected muscle and an increased strength of the antagonist muscle [1] through retrograde axonal transport at the medullar level. To confirm this hypothesis, a validated tool for the muscle strength measurement is required. The aim of this study was to validate an electronic dynamometer quantifying muscle strength in healthy children. By this mean it will be usable in children with cerebral palsy.

Materials, patients and methods.– An electronic dynamometer (ISOBEX® 2.1, Cursor AG, Bern, Switzerland) was used to assess 20 healthy children aged six to ten years. Four muscular groups were tested (dorsal and plantar flexors of the ankle and flexor and extensor of the knee) at two times, fourteen days apart. Three trials with a prior test were performed with resting of 15–30 seconds between each trial. The statistical analysis was made on the average of the three measures with a two way RM ANOVA (repeated measures analysis of variance).

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Quantitative measurement of muscle strength of lower limbs in children: Validation study

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Results.– We observed no significant differences in muscle strength immediately before and 2 months after injections of botulinum toxin A (all $P$-values > 0.076).

Discussion and conclusions.– We observe no change in muscle strength for both the injected muscle and his antagonist, two months after the injections of botulinum toxins. We cannot confirm our initial hypothesis. An earlier assessment might be needed to identify this variation.

References


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Effect of shock wave therapy on muscle spasticity in children with cerebral palsy
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Keywords: Shock wave therapy; Muscle spasticity; Cerebral palsy

Aim of the study is to evaluate the effect of radial shock wave therapy on reducing muscle hypertonia in plantar flexor muscles in children with cerebral palsy.

Material and methods.– Eleven children with spastic plantar flexor muscles as a result of cerebral palsy were included in the study: 7 boys and 4 girls, age range 2–7, mean age 3.54 ± 1.013. Radial shock wave therapy was applied to the gastrocnemius and soleus muscle (BTL-5000 shock-wave series): 1000 shots to each gastrocnemius and soleus muscle.

Clinical and instrumental methods were used for the evaluation of the results: passive range of motion, modified Ashworth scale, pedobarometry before the treatment, immediately after it, 2 and 4 weeks later.

Results.– After a single shock wave stimulation, a significant increase in passive range of motion (with 17.13°, $t = 8.81, P < 0.05$) and a significant decrease in the Ashworth scale (from baseline mean 2.81 SD [0.65] to 2.11 SD [0.33]; $t = 6.19, P < 0.05$) were observed immediately after treatment. This effect was persistent two weeks later. The increase in passive range of motion was with 15.95°, $t = 5.22, P < 0.05$. The decrease in the Ashworth scale was preserved 2.11 SD [0.33] ($P < 0.05$). After placebo stimulation no significant difference was observed.

Conclusion.– Radial shock wave therapy could be appropriate adjuvant treatment for reducing muscle spasticity in plantar flexors in children with cerebral palsy. These are preliminary results and further study is needed to follow the long-term effect.

Further reading

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Scapulo-humeral motion in hemiplegic cerebral palsied children
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Keywords: Shoulder; Scapula; Kinematics; Cerebral palsy; Children

Objective.– The aim of this study is to quantify the thoraco-scapulo-humeral motion in hemiplegic cerebral palsied children (HCP) compared with healthy children.

Materials and methods.– Ten children HCP and 10 typically developing children matched for age (11.8 and 11.2 years respectively) and gender (5 females) were included. 3D kinematics of the thoraco-glenohumeral was collected in an optoelectronic system (VICON). The protocol used has been validated in children. It combines an acromial marker cluster, a static calibration of the scapula, and using the Euler XZY sequence for the kinematics of the glenohumeral joint. The children carried out three planar movements (flexion, abduction, horizontal adduction) and 3 tasks (hand to head, head to contralateral shoulder, hand to back). A paired Wilcoxon test was performed at 0% and 100% of the task as well as range of motion during the movement.

Results.– Children with HCP showed significant differences in scapulothoracic and glenohumeral kinematics in the 3 planes of the space according to the tasks.