

Defocused ESW in treatment of district spasticity in children affected by cerebral palsy with special reference to correction of equinus foot deformity: clinical evaluation of the results with gait analysis integrated

Author:

C. Servodio Iammarrone (1), B. Corrado (1), F. Servodio Iammarrone (1), S.Russo (2)

Institutions:

- 1.) Physical Medicine and Rehabilitation, University Federico II of Naples, ITALY
- 2.) Orthopaedic Department, University Federico II of Naples, ITALY

Device and producing company:

Minilith, Storz Medical

Introduction:

In children affected by cerebral palsy spasticity concerns primarily the upper limb flexor muscles and the lower limb extensor muscles and is characterized by increased resistance to passive stretching associated with other clinical signs (hyper-reflexia, clones, spasms, synergies, etc...). The rise of pathological postural tone is due to the lack of the first motor neuron inhibition with consequent prevalence of the second one. The Ashworth is the most used functional scale in order to measure the degree of spasticity and is often associated to the "spasms" scale. The gait analysis is a valid method of objective measurement and is useful to supplement the clinical evaluation, especially for information concerning time parameters. The focal therapy of spasticity is addressed not only to the recovery of articular range of motion but above all to functional and hygienical purposes. The improvement of paretic limbs functionality often leads indirectly to the improvement of the higher functions such as language and learning. Different techniques are used in the treatment of spasticity: FKT, neuromuscular blocks, functional orthopaedic surgery, neurotomies. For several years we have been using low energy shock waves to reduce persistent muscular contractures and to facilitate the rehabilitation treatment for correction of deformity and improvement of postural and motor functions.

Methods:

During the last 4 years we have treated 44 patients affected by equinus deformity of the foot, 31 females and 13 males, with age between 2,5 and 16 years (medium age 6,7). 21 were affected by hemiparesis, 16 by diparesis and 7 by tetraparesis. All the patients were able to walk, 6 only with support. 5 patients have already received a surgical correction of the equinus deformity (Baker procedure), but the contracture was relapsed at a medium follow-up of 3,5 years. 2 patients underwent a surgical release of knee flexors. The protocol includes a cycle of 5 sessions, one per week. 1200-1500 shocks/sessions were applied at an energy level between 1.6 and 2.0 mJ/mm². The device used was the Minilith by Storz Medical. The rehabilitation treatment, based mainly on prolonged muscle stretching and executed immediately after each application and continued in the following days, allowed a persistent and optimal muscular relaxation. In 4 patients, in order to increase and stabilize the correction of deformity after E.S.W.T, we made 2 or 3 cast in gradual correction. 12 patients usually worn dynamic tutors type AFO and managed to restrict their use. However, after ESWT, the tuturation seemed to be more tolerable with an improvement of harmony and fluidity of the walk during and after treatment. In only 5 patients, all aged over 10 years, we have associated to the ESWT an infiltrative therapy by means of botulinum toxin. All patients were studied at the time of recruitment in the study (T0), at the end of treatment (T1) and 3 months later (T3) with functional comprehensive clinical examination, including assessment of spasticity by means of a modified Ashworth scale, functional abilities and articular range of motion, integrated with baropodography and film recording. Some patients were also submitted at an examination of the walk executed with 5 tests of gait analysis according to the protocol of Davis, using an optoelectronic system with 6 cameras and a Kistler force platform.

Results:

The patients included in the study showed in the pre-treatment phase a variable walking dysfunction characterized by an inconstant equinus deformity, persistent for the entire cycle and never completely correctable with passive manoeuvres. Shock wave therapy, applied in the manner following our protocol, has shown effectiveness in reducing focal spasticity and in countering the progression of miotendinous contractures and retractions. After the treatment all patients showed a significant reduction of equinus deformity supported by clinical manoeuvres and during the bearing, with significant increase of dorsiflexion, confirmed also by gait analysis, which at the evaluation of the dynamical parameters did detect a statistically significant increase of the peak plantar flexion moment during push phase and better function in the dynamics of the knee. Positive effects have also been checked concerning the symmetry of the hips and the pelvic tilt, with better stabilization of the centre of gravity and balance of the trunk. Even in these cases the mean and constant rehabilitation treatment accompanied the local treatment by optimizing the treatment results and keeping it for a long time (4-6 months). Repeating cycle therapy with shock waves is subject to the persistence of the result which is periodically reviewed at least every quarter.

Conclusion:

Defocused shock waves represent the completion of the previously used method, which provided the "brushing" of the source on the muscle in order to extend the decontracturant effects of shock waves to a surface as broad as possible. With the new generator an enlarged beam is directly generated at the source in order to engage a surface treatment more widely, facilitating and extending the therapeutic application on the entire muscle mass. The results appear in the complex not only overlapping but definitely better because they allow to use slightly higher energies and to increase efficiently and uniformly the treated area, intensifying and making more long-lasting the decontracturant effects.

Physiotherapy treatment is an essential corollary to any pharmacological or physical methods aimed at inhibiting spasticity and must be carried out with continuity, professionalism and diligence.

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