Keywords: Hemiplegia; Muscle spasticity; Nerve block; Neurotomy; Tendon lengthening

Introduction.— The spastic equinovarus foot is a common deformity among hemiplegic patients. The reasons were shown to be varied and complex explaining why a single procedure does not exist to correct all deformities. The treatments described in the literature are physical therapy, stretching, orthosis, functional electrical stimulation, chemodenervation with botulinum toxin, phenol or alcohol, selective neurotomy, intrathecal baclofen therapy and tendon lengthening and transfer. However, no practical guidelines are available as a guide for the management of the spastic foot.

Aim.— To establish guidelines for the treatment of the spastic equinovarus foot among hemiplegic patients.

Results.— The diagnostic nerve block with anaesthetics of the motor nerve branches of the tibial nerve is mandatory to determine the cause(s) of the deformity. The spastic foot in stance phase is due to spasticity and/or contracture of the calf muscles (soleus, gastrocnemius, tibialis posterior and flexor hallucis and digitorhum). The spastic foot in swing phase is also related to the lack of activation of dorsiflexors and/or to imbalance between tibialis anterior and peroneous muscles. The spasticity will be treated with botulinum toxin injections and neurotomy, the contracture by tendon lengthening, the weakness by orthosis and functional electrical stimulation and imbalance by tendon transfer. These treatments are frequently combined.

Conclusion.— We present our personal guidelines for the treatment of the spastic equinovarus foot. The diagnostic nerve block helps to determine the respective responsibility of the spasticity, of the contracture, of the weakness and of the imbalance in the deformity allowing us to choose the most appropriate treatment(s).

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Quantitative assessment of planar pressure distribution after tibial nerve neurotomy in equinovarus foot by the F-scan® system

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Keywords: Hemiparesis; Gait; Baropodometry; F-Scan®; Center of Cop

Aim of the study.— The F-scan® system (in-shoe pressure measurement) is used to measure baropodometric parameters in hemiparetic patients [3]. This tool gives force and contact pressures distribution during gait. The aim of this study is to analyze the changes in the path of the center of pressure (COP) measured by the F-scan® system, before and after tibial nerve neurotomy in hemiparetic patients with spastic equinovarus foot.

Population and method—Sixteen patients performed a baropodometric assessment by the F-scan® system before and after tibial nerve neurotomy. Mean age was 37.3 years (± 12.3). All were self-sufficient for gait, with or without gait orthosis. Comparisons of the displacement of the COP (anterior-posterior AP displacement, lateral deviation LD, and posterior margin PM) were made between hemiparetic and healthy foot, before and after tibial nerve neurotomy.

Results.— Comparisons between healthy and hemiparetic foot before surgery show significative differences for all parameters: AP p < 0.0001, LD p = 0.0013, PM p = 0.0006. After tibial nerve neurotomy, there was no more difference between the two sides for PM (p = 0.44). After surgery, there were significative improvements for AP (p = 0.005) and PM (p = 0.0002), but no difference for LD (p = 0.34) for the paretic side.

Discussion.— Our results before surgery are similar to those described in literature [2]. Quantitative data to evaluate the efficacy of tibial nerve neurotomy are rare [1]. The F-scan® system is a non invasive tool, easy to use, that allows to analyze objectively gait impairment of hemiparetic patients and to measure the effects of tibial nerve neurotomy. It may be a tool helpful for the indication and evaluation of the treatments of spastic equinovarus foot.

References


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A new approach to treatment of foot-drop syndrome with functional electrical stimulation in chronic stroke patients

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Keywords: Dropfoot; Orthotic effect; Gait; FES; Paralysis

Background.— Functional electrical stimulation in stroke patients showed orthotic and therapeutic effects on foot-drop syndrome [1,2]. Drawbacks of classical methods using footswitch are poor adaptability, muscle fatigue leading to poor foot-drop correction during the day and often wired connection. We are developing a new method to monitor in a continuous manner gait cycles phases with accelerometry, angular rate and magnetic field measurements in combination. Thanks to this approach, we can implement a pre-programmed stimulation pattern adapted to the recorded measures. The aim of this study is to assess validity of gait cycle measurement in stroke patients.

Methods.— Fifteen chronic stroke patients performed three trials in three different conditions: no stimulation, classic stimulation triggered by heel switch and stimulation triggered by gait event detection extracted from the continuous analysis of gait cycles. Data are compared to those given by electronic footprints assessment (Gaitrite®).

Results.— This method of continuous gait analysis is able to accurately detect heel-off and heel-on gait events and thus trigger tibular nerve stimulation when desired.

Discussion.— Only one measure has been done whereas evaluation after a training period and a new adaptation of parameters would have allowed the individualization of the procedure. However, performances are at least similar to the classic footswitch based stimulation.

Conclusion.— This study, validate this new approach. Future developments should permit to assess stimulation timing, adaptation of stimulation pattern to dorsiflexors force in case of fatigability, implement an algorithm able to detect changes in gait circumstances (turn back, obstacle clearance, stairs climbing/ descending, etc.) in order to adapt stimulation parameters according to these circumstances.

References


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