

A NEW REHABILITATION TREATMENT FOR INSTABILITY

Chiara Marchi, Giulio Ostanello, Andrea Beghi *, Francesco Falso *, Claudio Vicini

Department for ENT and Cervical-Facial Surgery, G.B. Morgagni L. Pierantoni Hospital, Forlì - Italy

* Centro Ricerche Equilibrio e Postura, Padua - Italy

Introduction

There are many rehabilitation treatments, instrumental and otherwise, which can be used on patients suffering from instability caused by vestibular and extra-vestibular pathologies. An innovative treatment system for instability is based on the use of a new-generation device for electro-tactile sensory substitution known as BrainPort.

According to the theories and pilot studies carried out by Bach-y-Rita, Danilov and Tyler of Wisconsin University(2-15), the central nervous system possesses significant plasticity and re-organisational capacities, even several years after the occurrence of injury. It is thus able to functionally compensate a sensory dysfunction (for example vestibular) using alternative sensory methods. The BrainPort device receives information from an accelerometer which records movements of the head and sends them to the tongue via electro-tactile stimuli; the subject must keep the signal in a central position on the tongue with the eyes closed, in different positions (feet together, in tandem, on foam, etc.). After a sufficient training period, the patient will be able to use this new sensory channel to obtain information about the movements of the head, and thus to control balance. This type of rehabilitation is indicated in patient with chronic balance impairment (instability) caused by bilateral peripheral vestibular dysfunction and central vestibular dysfunction, and also in cases of unilateral peripheral dysfunction with persistent instability. It is also helpful in elderly patients with multi-sensory dysfunction, particularly those at risk of falling.

Equipment and methods

18 subjects were examined, 7 male and 11 female, aged between 21 and 86 years (average: 60) affected by chronic instability with the following etiology:

Extra-vestibular: 1

Bilateral vestibular dysfunction: 3

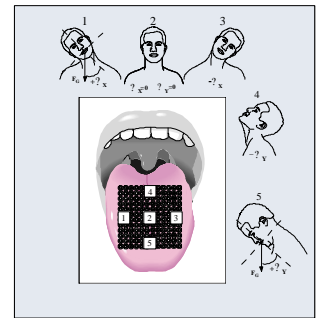
Unilateral vestibular dysfunction: 6

Central vestibular dysfunction: 6

Mixed vestibular dysfunction: 2

The treatment schedule using the BrainPort™ device (Wicab Inc.) provided for two daily sessions lasting 60 minutes each for five days, followed by a week's maintenance consisting of two daily 20-minute sessions.

Each subject was subjected to a non-instrumental clinical assessment (Activities Balance Confidence scale - ABC; Dizziness Handicap Inventory - DHI; Dynamic Gait Index - DGI) and an instrumental assessment using computerised Satel SA posturography with static and dynamic tests on foam and a seesaw platform. The tests were carried out before and after the two weeks of treatment.

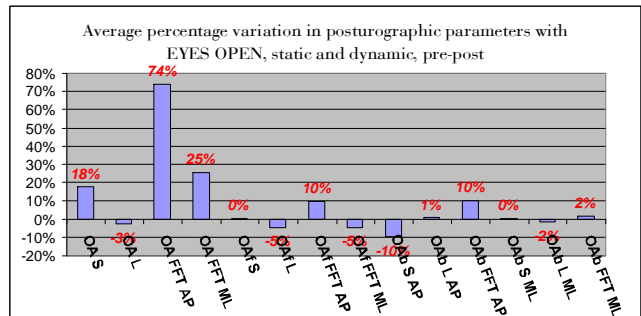
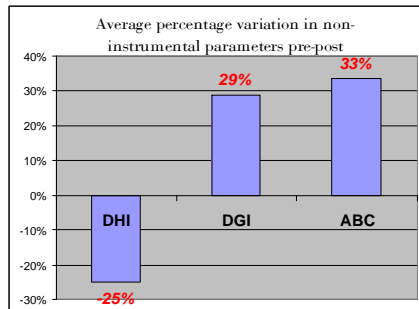


Discussion

Instability is a common symptom in vestibular and extra-vestibular balance impairment and is among the main causes of falls which, in the most severe cases, may have fatal consequences; such episodes increase in those over the age of 65. When conventional rehabilitation techniques fail, patients have limited movement and have to call upon assistance which may have detrimental implications, both physically and psychologically. The availability of an innovative therapeutic device led us to conduct this experiment. The study is still numerically limited, and does not allow us to create statistically significant subgroups per pathology type and/or age band. However, our preliminary data does indicate a trend towards improvement both in clinical parameters (DHI, ABC, DGI) and in instrumental parameters (particularly in tests with eyes closed and on an unstable surface). The instrumental data in particular indicate greater precision with lower energy expenditure when maintaining balance under more critical conditions for those affected by vestibular pathology (with eyes closed on foam or seesaw platform)(1). These results were obtained after a brief treatment period (two weeks) and lead us to hope that a still better outcome could be achieved if the therapy were maintained for several months in such a way as to activate the cerebral plasticity mechanism to a greater extent and to obtain the rehabilitation effect described in the literature(2-15).

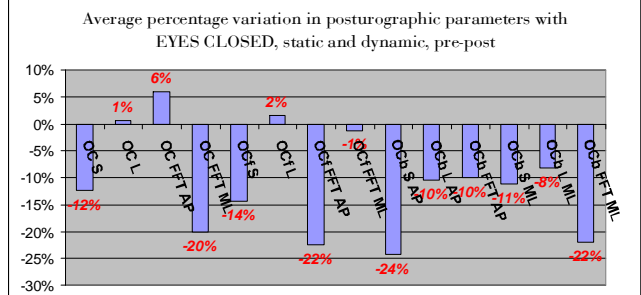
Our working group is continuing its research using a larger number of cases in accordance with the methods applied by prestigious European and North American research groups.

Results



Legenda

OA: Eyesopen
 OC: Eyesclosed
 f: foam
 b: seesaw platform
 L: length
 S: surface
 AP: Anterior-posterior
 ML: Medio-lateral
 ABC: Activities Balance Confidence scale
 DHI: Dizziness Handicap Inventory
 DGI: Dynamic Gait Index



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