Trans-spinal repetitive magnetic stimulation increases the excursion of the spine in Parkinson's disease

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Received 14 March 2014; received in received from 19 March 2014; accepted 24 March 2014

Introduction

Parkinson's disease (PD) is one of the progressive nervous diseases. The patient's condition is complicated with abnormal posture such as head dropped syndrome / camptocormia with frequent aggravation of symptoms. This abnormal posture is treatment-resistant and is the main factor causing deterioration in ability to perform activities of daily living. We performed trans-spinal repetitive magnetic stimulation in PD patients who presented with abnormal posture. The effect on posture and motor function was examined.

Subjects and methods

The subjects were 86 Parkinson patients who presented with abnormal posture. The subjects were classified into three groups; a magnetic stimulation group, a rehabilitation group, and a drug group. The electromagnetic stimulation group received electromagnetic stimulation, rehabilitation and medical treatment. The electromagnetic stimulation group comprised 30 people (age, 71 ± 7.3 years old (mean ± SD); disease duration period, 6.6 ± 2.6 years; Hohen & Yahr stage, 3.7 ± 0.3). The rehabilitation group included 35 patients, who received rehabilitation and medical treatment. The age was 74.9±5.4 years old. The disease duration period was 4.7±2.8 years. Hohen & Yahr disease severity was 3.2 ± 0.4. The drug group received only drug administration, and included 21 patients. The age was 74.4± 5.9 years old, and the disease duration period was 4.3±3.6 years. Hohen & Yahr disease severity was 3.2 ± 0.4. The spinal cord repetition electromagnetic stimulation was performed using MagPro (Medtronic company). The most bent part of the chest lumbar vertebrae was targeted. The measures of 1 cool were eight periods of stimulation at 5Hz, for one second. Patients underwent this twice a week for four weeks (eight cool in total). The end-point used a spinal column anteflexion angle (figure 1) and a spinal column lateral fold / rotation excursion (figure 2). The anteflexion angle compared in three counties. The range of motion was compared only in the electromagnetic stimulation group.

Results

When the trunkal anteversion angle was compared in the three groups, the improvement of this angle was greatest in the electromagnetic stimulation group (figure 3). The trunkal lateral fold excursion of right and left increased after stimulation (figure 4). Excursion increased the trunkal rotation

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excursion on both sides (figure 5)

Discussion

PD may involve skeletal abnormalities including extreme neck flexion (“dropped head") and truncal flexion (camptocormia) [1]. Camptocormia in PD is defined by marked anteroflexion of the trunk, which abates in the recumbent position, with no or minimal response to levodopa [1–4]. The condition is exacerbated by walking and is relieved by sitting, lying in the supine position, or by volitionally extending the trunk when the patient leans against a wall or a table. Although early reports often attributed camptocormia to a conversion disorder, it is now accepted as an axial feature of Parkinson's disease [5–6].

For patients with Parkinson's disease who had the abnormal posture, the effect on abnormal posture and spinal column excursion was examined. When rehabilitation and repetition electromagnetic stimulation were performed, camptospasm was significantly improved with increase of the trunkal excursion. The improvement of the camptospasm posture was accompanied with an increase of the range of motion.

In other words, there is a possibility that posture was improved through improvement of the muscle tone of the paraspinal muscles. Repetitive electromagnetic stimulation of the spinal cord is a noninvasive and safe manual skill that can be completed within one minute in one enforcement. It may be an effective therapy for abnormal posture in Parkinson's disease.

References

1. Ashour R, Jankovic J. Joint and skeletal deformities in Parkinson’s disease, multiple system atrophy, and progressive supranuclear palsy. Movement Disorders. 2006;21(11):1856–1863.

2. Parkinson J. An Essay of the Shaking Palsy. London, UK: Whittingham and Rowland; 1817.

3. Earle H. Reply to the review of Mr Bayton’s essay on the cure of crooked spine. The Edinburgh Medical and Surgical Journal. 1815;11:35–51.

4. Brodie BC. Pathological and surgical observations of the disease of the joints. In: Hurst R, Orme B, editors. Longman. London, UK: 1818;1822. p. 376.

5. Souques A, Rosanoff-Saloff M. La camptocormie; incurvation du tronc, consecutive aux traumatismes du dos et des lombes; considérations morphologiques. Revista de Neurologia. 1914;28:937–939.

6. Djaldetti R, Mosberg-Galili R, Sroka H, Merims D, Melamed E. Camptocormia (bent spine) in patients with Parkinson’s disease—characterization and possible pathogenesis of an unusual phenomenon. Movement Disorders. 1999;14(3):443–447.

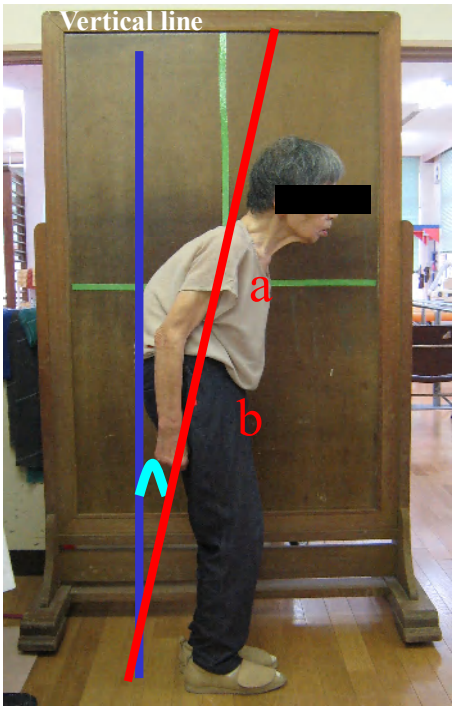

Figure 1. Measurement of the spinal column anteflexion angle. The angle between the perpendicular line and a-b to the floor was defined as the spinal column anteversion angle.

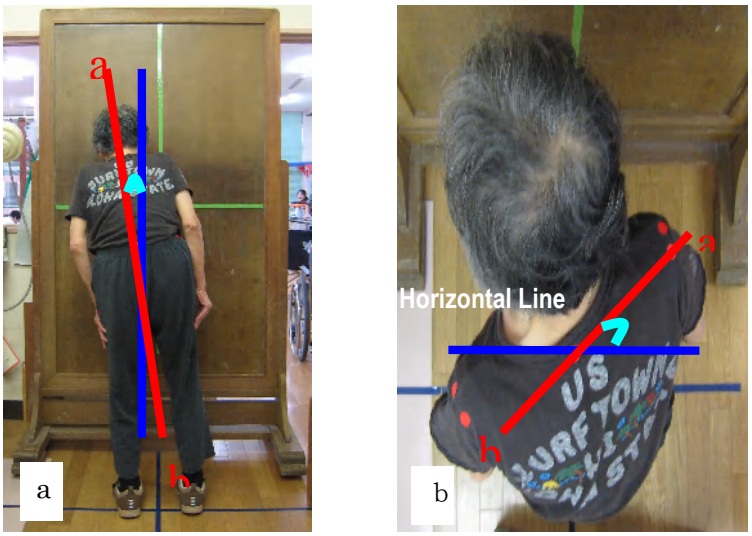

Figure 2. Measurement of a spinal column lateral fold / the rotation range of motion.
a. The angle that the perpendicular line and a - b to the floor made was defined as the spinal column lateral fold excursion.
b. The angle that the horizon and a-b to the floor made was defined as the spinal column rotation excursion.

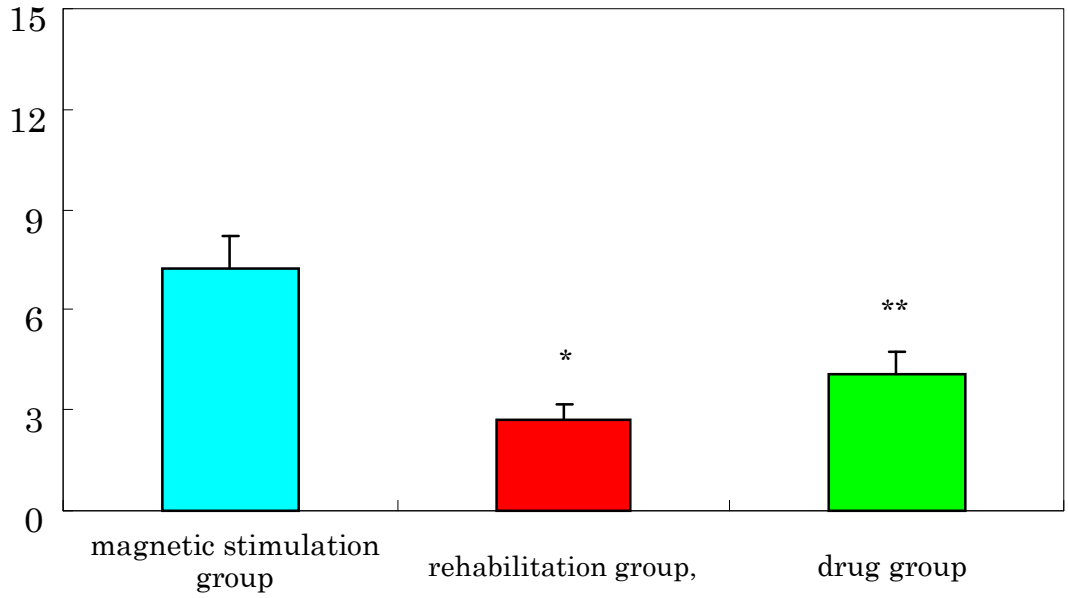

Figure 3. The comparison of the trunkal anteversion improvement angle. An anteversion angle was most improved in electromagnetic stimulation group. *P＜0.05, **P＜0.01, n=86, mean±SE

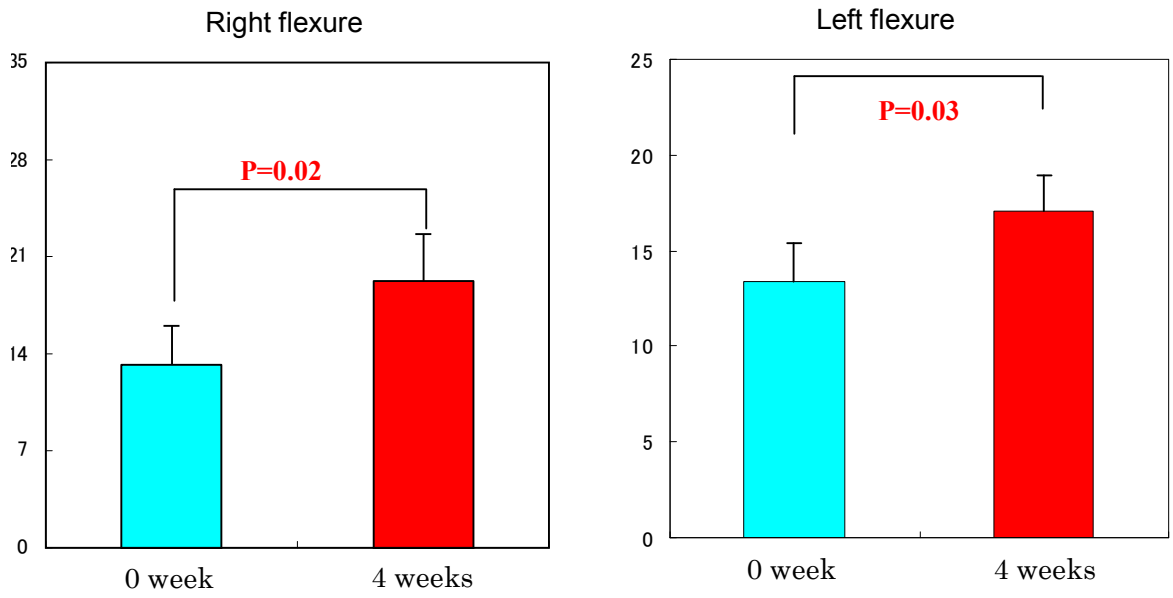

Figure 4. A change of the trunkal lateral fold excursion. The excursion significantly increased at both sides. n=8, mean±SE

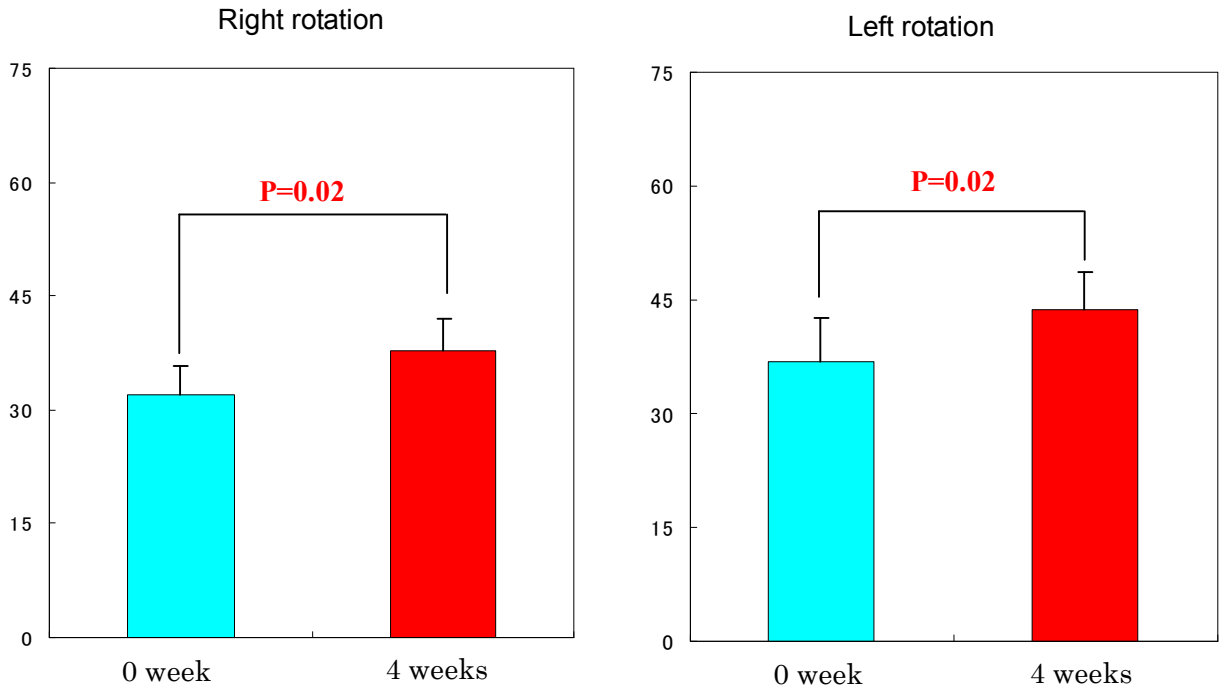

Figure 5. The change of the trunkal rotation excursion significantly increased the excursion in both sides.