Effect of upper thoracic mobilization on cervical alignment in stroke patients with forward head posture: A case study

The purpose of this study was to identify the effect of upper thoracic mobilization on cervical alignment in stroke patients with forward head posture. The subject's of this study were two stroke patients with forward head posture and a cervical curve angle (four-line Cobb's method; FLCM) less than 40°. The intervention, central posterior-anterior (PA) mobilization, was applied to the T1–T4 vertebrae (upper thoracic spine) following the Maitland concept. This mobilization was applied three times per week for four weeks. In the results, the cervical curve angle (FLCM) increased for both subject 1 and 2. However, Jochumsen method score was decreased in subject 1, while it was increased in subject 2. These results demonstrate that upper thoracic mobilization had the positive effect on the cervical curve angle but not on Jochumsen method score. These findings suggest that PA mobilization on the upper thoracic spine could correct cervical curve angle measured by FLMC in stroke patients with FHP.

Key words: Forward head posture; Upper thoracic mobilization; Cervical alignment

INTRODUCTION

Stroke patients usually have muscle weakness and muscle imbalance and decreased postural control and body asymmetry. Especially, the asymmetrical posture in median plane following a stroke causes unstable posture. Upper trunk flexion, which is common in the stroke patients often causes hyperextension of the cervical vertebrae, resulting in forward head posture (FHP). FHP induces mechanical dysfunction of the cervical spine and increases cranial vertical angle (CVA) and cranial rotation angle in long-term work situations. It also referred to as cervical kyphosis and straight neck. Stroke with FHP can have relationship with neck function and upper extremity function, so postural control intervention necessary about FHP.

FHP patients generally have reduced cervical mobility. This can lead to cervical pain and neuropathic pain as well as neurological problems. In neck dysfunction patients, the negative influence of thoracic kyphosis is exerted through an increase in FHP. Movement of the cervical and thoracic spine is biomechanically related, and thus thoracic mobilization can increase the range of motion of the cervical spine and reduce cervical pain. Recently, manual therapy has been developed and applied to the thoracic spine as a treatment for mechanical neck pain. Especially, upper thoracic spine mobilization has been shown to be more effective than upper cervical spine mobilization as measured by range of motion and neck disability index in FHP patients.

However, there are few data available concerning the effect of upper thoracic mobilization in stroke patients with FHP. Therefore, the purpose of this study was to examine the effect of upper thoracic mobilization on cervical alignment in stroke patients with FHP.

Sin Jun Park, Si Eun Park
Gangdong College, Yeoju; Pohang University, Pohang, Republic of Korea

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Address for correspondence
Si Eun Park, PT, Ph.D
Department of Physical Therapy, Pohang College: 60 Sindeok-ro, Heunghae-eup, Buk-gu, Pohang-si, Republic of Korea
Tel: 82–10–3930–2361
E-mail: si–ya@hanmail.net
SUBJECTS AND METHODS

Subjects

The subject of this study were two stroke patients with FHP. The subjects were selected from patients at the Paramil Hospital (Anseong, South Korea). The following inclusion criteria were applied: subject should have a cervical curve angle (four-line Cobb’s method; FLCM) less than 40°, and primary complaint of neck pain (posterior part of cervical spine). In this study, pain score assessed using a visual analogue scale (VAS).

The subject agreed to participate in the study after receiving explanations, and the study protocol was approved by the local ethics committee of Yongin University.

Subject 1 was a 62-year-old female who had been diagnosed with a stroke in August 2016. The patient’s cervical curve angle was 33.4°. She was 175 cm in height and weighted 90 kg. The subject was experiencing neck pain and stiffness. The VAS score of the subject was 7.5.

Subject 2 was a 58-year-old female who had been diagnosed with a stroke in February 2017. The patient’s cervical curve angle was 36.8°. She was 158 cm in height and weighted 72 kg. The subject was experiencing thoracic pain. The VAS score of the subject was 6.

Intervention Methods

The intervention applied to the subjects was central posterior-anterior (PA) mobilization of T1-T4 vertebrae (upper thoracic spine) following the Maitland concept. The treatment was performed with the subjects in the prone position. The mobilization applied to improve the upper thoracic extension. The palm of therapist was placed on the vertebral spinous process of target segment (T1-T4). The upper thoracic mobilization was applied three times per week for four weeks.

We evaluated cervical alignment by measuring the cervical curve angle (FLCM) and via the Jochumsen method (JM). The angle measurement used the lateral view of a cervical spine X-ray. The cervical curve angle (FLCM) was measured by drawing two lines on the film, the first line connecting the anterior and posterior tubercles of the atlas, and the second line drawn under the 7th cervical vertebra. Perpendicular lines were then drawn from each of these two lines, and the angle where the perpendicular lines intersected was measured as the cervical curve angle. The JM used lines drawn from the front of the anterior arch of C1 to the vertebral body of C7. The distances between this line and the front of the vertebral body of C5 were then measured. Measurements were taken prior to the beginning of treatment and after completion of the intervention (4 weeks).

RESULTS

Measurements of cervical curve angle (FLCM) and the Jochumsen method (JM) were measured to quantify the cervical alignment. In the case of subject 1, the FLCM angle increased from 33.4° to 39.1°. The subject’s JM score decreased from 1 mm to 0 mm (Fig. 1). In the case of subject 2, both the FLCM angle and the JM score were increased. The FLCM angle increased from 36.8° to 39.6°, and the JM score increased from -1 mm to 0 mm (Fig. 2).

Fig. 1. Lateral view of the cervical spine in subject 1 (left: pre, right: post)
JM: Jochumsen method; FLCM: four-line Cobb’s method