Recovery of an injured corticoreticulospinal tract in a patient with pontine hemorrhage

Dear editor,

A 53-year-old male underwent conservative treatment for the management of spontaneous hemorrhage in the bilateral pontine tegmentum. Two weeks after onset, when he started rehabilitation, he showed mild quadriplegia with more severe proximal weakness and was not able to stand or walk independently. After four week’s rehabilitation, he had regained his ability to walk independently and showed good recovery of motor weakness.

On two-week diffusion tensor tractography (DTT) (Figure 1), discontinuation of the right corticoreticulospinal tract (CRT) was observed at the midbrain level. Two weeks after onset, the CRT was not reconstructed, indicating a disruption in the corticoreticulospinal pathway. However, by the sixth week, the right CRT was extended to the right premotor cortex (green arrow) and became thicker. In addition, transcallosal fibers originating from the right CRT and descending below the corpus callosum in the left hemisphere were observed. The thin left CRT, which ended at the midbrain level, was also observed (blue arrow). The integrity of the corticospinal tracts in both hemispheres was well preserved, passing through the known corticospinal tract pathway.

Figure 1. (a) T2-weighted MR images show a hematoma in the pons at two weeks; the hematoma is resolved at six weeks after onset. (b) Results of diffusion tensor tractography (DTT). On two-week DTT, the right corticoreticulospinal tract (CRT) shows discontinuation at the midbrain level, and the left CRT is not reconstructed. On six-week DTT, the right CRT is extended to the right premotor cortex (green arrow) and becomes thicker. In addition, transcallosal fibers originating from the right CRT and descending below the corpus callosum in the left hemisphere are observed. The thin left CRT, which ended at the midbrain level, is also observed (blue arrow). The integrity of the corticospinal tracts in both hemispheres is well preserved, passing through the known corticospinal tract pathway.
level (fiber number: 340), and the left CRT was not reconstructed. On six-week DTT (Figure 1), the right CRT was extended to the right premotor cortex, and had become thicker (fiber number: 1076). In addition, transcallosal fibers originating from the right CRT descended below the corpus callosum in the left hemisphere. The left CRT ended at the midbrain level, although it was reconstructed on six-week DTT.

Pontine hemorrhage (PH) accounts for approximately 5–10% of intracranial hemorrhages.\(^1\) The pons is an important area for motor function because the corticospinal tract (CST) and CRT occupy a significant portion of the pons.\(^2,3\) Therefore, patients with PH are known to become highly disabled, and gait dysfunction is one of the most disabling sequelae of PH: residual gait dysfunction has been reported in more than 20% of patients.\(^4,5\) However, the exact causes of gait dysfunction or recovery mechanism of gait function in patients with PH have not been elucidated.

We demonstrated recovery of injured CRTs in a patient with PH. The recovery of both injured CRTs, particularly the right CRT, appears to be one of the main reasons for recovery of gait function in this patient. This is the first study to demonstrate that patients with PH can regain walking ability with recovery of the injured CRTs. We believe that this may be a recovery mechanism of gait function in patients with PH.

**Declaration of conflicting interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Medical Research Center Program (2015R1A5A2009124) through the National Research Foundation of Korea (NRF) funded by the Ministry of Science, ICT, and Future Planning.

**References**


Sung Ho Jang and Min Cheol Chang

Department of Physical Medicine and Rehabilitation, College of Medicine, Yeungnam University, Taegu, Republic of Korea

Corresponding author:

Min Cheol Chang, Department of Physical Medicine and Rehabilitation, College of Medicine, Yeungnam University, 317-1, Daemyungdong, Namku, Taegu 705-717, Republic of Korea.

Email: wheel633@hanmail.net