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Effect of rTMS on the ascending reticular activating system in a patient with disorder of conscious

Yung Hyun Kwon[1,1†], Sung Ho Jang[1,1†], Dong Gyu Kwak[1,1*†]

Department of Physical Medicine and Rehabilitation, College of Medicine, Yeungnam University[1]

Objectives

We report on a stroke patient with disorder of consciousness (DOC) who underwent repetitive transcranial magnetic stimulation (rTMS) and showed recovery of an injured upper ascending reticular activating system (ARAS), which was demonstrated by using serial diffusion tensor tractography (DTT).

Case description

A 45-year-old male patient was diagnosed as subarachnoid and intracerebral hemorrhages in the left fronto-parieto-temporal lobes. At five months from onset, the patient exhibited a persistent vegetative state, with a Coma Recovery Scale-Revised(CRS-R) score of 4. He underwent comprehensive rehabilitative therapy that included drugs for recovery of impaired consciousness and rTMS of the right dorsolateral prefrontal lobe. He recovered to a minimally conscious state(CRS-R: 13) at seven months after onset and was transferred to a local rehabilitation hospital where he underwent similar rehabilitation but without rTMS. At nine months after onset, his CRS-R score remained at 13. He was then readmitted to our hospital and underwent rehabilitation with rTMS until 10 months after onset. His CRS-R remained at 13, but his higher cognition improved. On 7-month DTT, the tract volume (TV) of the neural tract in the right prefrontal lobe in the upper ARAS was higher than that on 5-month DTT. However, compared to the 7-month DTT, the right prefrontal lobe TV was lower on 9-month DTT. On 10-month DTT, the TV of the same neural tract again increased.

Conclusions

Increases in neural-tract volume in the right prefrontal lobe of the upper ARAS that were related to the periods of application of rTMS were demonstrated in a stroke patient with DOC.

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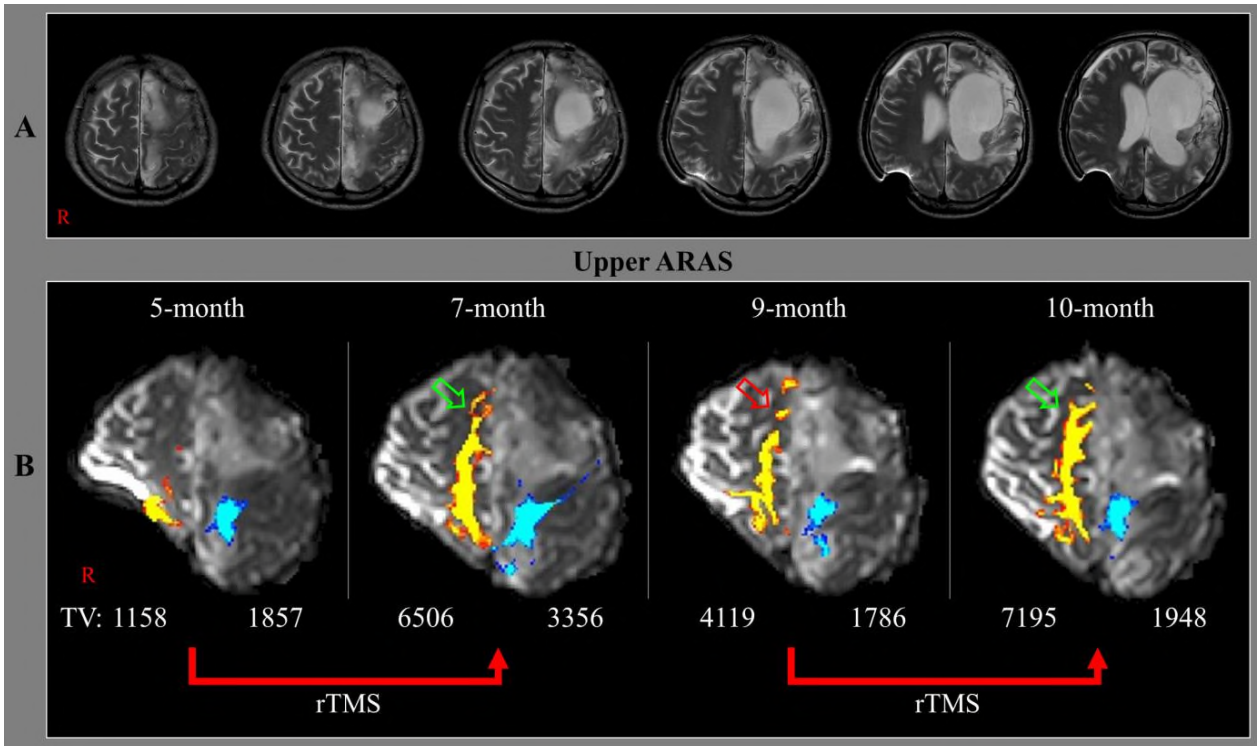

(A) Brain magnetic resonance images at five months after onset show leukomalactic lesions in the left fronto-parieto-temporal lobes.