Neurosurgical Forum LETTERS TO THE EDITOR

Plasticity of the supplementary motor area

TO THE EDITOR: I read with great interest the article by Oda et al.² (Oda K, Yamaguchi F, Enomoto H, et al: Prediction of recovery from supplementary motor area syndrome after brain tumor surgery: preoperative diffusion tensor tractography analysis and postoperative neurological clinical course. *Neurosurg Focus* 44(6):E3, June 2018). In this article, the analysis of diffusion tensor imaging (DTI) tractography revealed interhemispheric connectivity in patients affected by supplementary motor area (SMA) syndrome. Moreover, the authors found a statistical relationship between the extent of fiber connections and clinical recovery from SMA syndrome.

In the last few months, our group has focused attention on this brain region because of its “eloquence” and the possibility of significant postoperative symptoms such as hemiplegia or hemiparesis and dysphasia. Tumor resection in the SMA is challenging given the difficulty in detecting the eloquent regions during tumor removal.

In the last few years, Duffau and coworkers have suggested the presence of negative motor areas, which, if not preserved, can determine the postoperative symptoms

described in SMA syndrome.^{1,3} In order to identify these areas, they have advocated the use of cortical and subcortical stimulation during awake surgery when operating in the SMA.^{4–6} Under stimulation, the interruption or reduction of movement or speech has been considered an indicator of the presence of one of these areas. Our group holds tractography as useful for planning before performing an operation in the SMA.

In a patient affected by an extensive right falcine meningioma, tractography reconstruction surprisingly demonstrated an interesting finding. Applying the region of interest (ROI) in the right hemisphere at the perilesional edema, we found that the reconstruction image showed the presence of crossing fibers going from the ipsilateral SMA to the contralateral one through the corpus callosum. A small representation of the corticospinal tract was present (Fig. 1). Applying the ROI at the left SMA, we found that a wide representation of the tracts was evident (Fig. 2). The most relevant finding was that the left SMA showed the representation of the ipsilateral and contralateral corticospinal tracts, and the latter was activated for the presence of crossing fibers. This finding indicated the high relevance of this area and the importance of preserving it. In this patient, the frontal plasticity of the affected hemisphere was probably able to relegate part of its func-

FIG. 1. Preoperative tractography in a patient affected by an extensive right falcine meningioma (red arrows). The ROI was placed at the perilesional edema in the right SMA (A). In the sagittal view (B), the right SMA showed scarce representation of the fibers going to the corticospinal tract. The coronal view (C) demonstrated the presence of crossing fibers going from the right SMA to the left one through the corpus callosum.

FIG. 2. The ROI was applied at the left SMA (healthy hemisphere, **A**). The sagittal view (**B**) demonstrated a wide representation of the fiber tracts. The coronal view (**C**) demonstrated activation of the contralateral corticospinal tract for the presence of crossing fibers going through the corpus callosum. Diffusion tensor imaging and fiber tractography were performed with a 3-T scanner (Magnetom Verio, Siemens Healthcare). Before the DTI acquisition, 3D T1-weighted MR images were obtained using the following parameters: axial 1-mm-thick sections, TR 1900 msec, TE 2.93 msec, TI 900 msec, matrix 256×256 , FOV 260×260 mm. The DTI was performed with a 64-direction acquisition. Imaging parameters were as follows: TR 3600 msec, TE 106 msec, FOV read 250 mm, slice thickness 5 mm, matrix 128×128 , b values 0 and 1000 sec/mm. Tractography reconstruction of the SMA was done manually by placing the ROI at the SMA white matter.

tion to the contralateral one. In my opinion, this observation further underlines the importance of tractography in preoperative planning.

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Disclosures

The author reports no conflict of interest.

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Response

No response was received from the authors of the original article.

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