Resting-state functional MRI for functional neurosurgery: seeing the light?

TO THE EDITOR: We read with great interest the recent article by Lehner et al. (Lehner KR, Yeagle EM, Argyelan M, et al: Validation of corpus callosotomy after laser interstitial thermal therapy: a multimodal approach. J Neurosurg [epub ahead of print November 16, 2018. DOI: 10.3171/2018.4.JNS172588]), discussing corpus callosotomy performed by laser interstitial thermal therapy (LITT) in a small cohort of 5 patients in the context of a multimodal approach. The authors additionally used resting-state functional MRI (rs-fMRI) to assess the outcome of this functional neurosurgery intervention. Whereas prior to LITT, brain activity showed robust interhemispheric functional connectivity, it was greatly reduced following callosotomy, with intrahemispheric functional connectivity being largely maintained.

Understanding how brain rewiring after functional neurosurgery procedures impacts brain activity is essential for our understanding and for future developments in this extraordinary and continuously expanding field. In that context, rs-fMRI is particularly useful given its ability to map various functional networks simultaneously with minimal cooperation required from the patient.

Boerwinkle et al. have recently suggested that using rs-fMRI might improve outcomes of MRI-guided stereotactic laser ablation in the treatment of hypothalamic hamartomas. We have previously demonstrated how stereotactic radiosurgical thalamotomy (SRS-T) for drug-resistant essential tremor (ET) correlates with changes within large-scale brain networks (Fig. 1). Comparison of pre- and post-interventional imaging allowed confirmation of

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**FIG. 1.** Upper (left to right): Artistic representation of ventral intermediate nucleus (Vim) SRS-T; structural MRI alterations within Brodmann area (BA) 19 and also within BA 18, as depicted by structural (voxel-based morphometry) studies by our group; rs-fMRI changes, using different methodologies, such as independent component analysis and seed-to-voxel analysis. Lower: Artistic illustration (left) of the eye-hand coordination necessary for sensory guidance of movements, as a new concept for tremor generation in ET. Artistic illustration (right) suggesting the extrastriate cortex as a new potential target for the treatment of drug-resistant ET. Figure is available in color online only.
the role of the ventro-intermediate nucleus target in the tremor network.\textsuperscript{7,8} Then, more surprisingly, a visually sensitive structural and functional network was shown to be involved in tremor generation and furthermore with arrest after the intervention, thus pointing toward potential new surgical targets for tremor such as the right extrastriate visual cortex.\textsuperscript{6,7,9,10} We specifically coined the term “cerebello-thalamo-visuo-motor network”\textsuperscript{11} to describe these observations.\textsuperscript{2} In trigeminal neuralgia, Dou et al.\textsuperscript{3} demonstrated how a specific measure of functional connectivity (e.g., regional homogeneity), would change in specific parts of the brain after percutaneous radiofrequency thermocoagulation. More recently, Fox elegantly discussed how relating symptoms with brain connectomics leads to lesion network mapping.\textsuperscript{4}

In conclusion, an important use of rs-fMRI is its further application to interventional studies in the clinical realm, particularly in the functional neurosurgery domain. Whether this would allow us to “see the light” with respect to a better understanding of both the pre- and post-therapeutic state remains to be confirmed by future studies.

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References


Disclosures
The authors report no conflict of interest.

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Response
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Heterogeneous hypothalamic adhesion among third ventricle craniopharyngiomas

TO THE EDITOR: We read with great interest the article by Forbes et al.\textsuperscript{1} (Forbes JA, Ordóñez-Rubiano EG, Tomasiewicz HC, et al: Endonasal endoscopic transsphenoidal resection of intrinsic third ventricular craniopharyngi-