Letter: Microsurgical Anatomy of the Vertical Rami of the Superior Longitudinal Fasciculus: An Intraparietal Sulcus Dissection Study

To the Editor:

We read with great interest the recent article by Alejandro Monroy-Sosa and colleagues entitled "Microsurgical Anatomy of the Vertical Rami of the Superior Longitudinal Fasciculus: An Intraparietal Sulcus Dissection Study."[1]

The authors, by applying the white matter microanatomic technique in 4 cadaveric heads and 1 cerebral hemisphere (9 cerebral hemispheres in total), investigate the subcortical architecture of the parenchymal corridor to the ventricular trigone offered by the intraparietal transsulcal approach and further link their dissections to a sophisticated diffusion tensor imaging (DTI) protocol. Apart from identifying the common and well-described white matter pathways en route to the ventricular trigone, Sosa and colleagues[1] reveal and consistently record a group of fibers branching from the superior longitudinal fasciculus toward the superior parietal lobule approximately at the level of the sulcus of Jensen. They name these fibers the "vertical rami (Vr) of the superior longitudinal fasciculus" and postulate on their functional significance stating that "the Vr are probably responsible for storing and accessing learned behavior within the parietal lobule; hence, disruption of these fibers is often associated with motor, sensory and special sensory apraxias and agnosias." Due to the topography of these fibers, the authors recommend a more posterior point along the length of the intraparietal sulcus (IPS)—close to the intersection of the IPS with the parieto-occipital sulcus (POS)—than previously described by our team,[2] for optimal access to the ventricular trigone. They also, very nicely, include the use of a tubular retractor to enter the atrium through the transparietal trajectory aiming to minimize normal brain transgression and retraction.

Undoubtedly, the authors[1] have to be congratulated for this very meticulous anatomic study and for their very skilled dissections. Photos included are of high quality and demonstrate the subcortical anatomy in a vivid and educational manner. Furthermore, these vertically oriented fibers that we consistently encounter when dissecting the area of the superior parietal lobule and intraparietal sulcus have been adequately identified, mapped, and named, thus raising awareness of their anatomofunctional significance. In addition, we totally agree with the authors' observation that the atrial roof is devoid of optic radiations as we have also explicitly documented in our recently published paper "Defining the relationship of the optic radiation to the floor and roof of the ventricular atrium: a focused microanatomic study."[3]

We feel however that it is appropriate to highlight some surgical and anatomical aspects, which summarize the first author's experience with the intraparietal transsulcal transventricular approach both in clinical scenarios and in the settings of a microneurosurgery laboratory. Anatomically, by tilting the trajectory more posteriorly toward the intraparietal–parietooccipital sulcus meeting point, there is a high chance of injuring the posterior part of the inferior occipitofrontal fasciculus (IFOF). This can be also seen in Figure 2C of the present study, where fibers of the IFOF have been resected along the posterior part of the intraparietal sulcus (marked in the text with gray dots) in order to access the trigone. Thus, it is evident that when this maneuver is performed in the dominant hemisphere it can potentially affect the ventral semantic pathway, mainly subserved by IFOF, and increase language-related morbidity.[4]

Additionally, as the access point along the sulcal length tilts more posteriorly toward the IPS-POS meeting point, the surgical corridor accomplished becomes deeper and steeper, since the respective distance from the sulcal fundus to the atrium increases. This argument is further documented in our anatomic study "Approaching the Atrium through the Intraparietal Sulcus: Mapping the Sulcal Morphology and Correlating the Surgical Corridor to Underlying Fiber Tracts,"[2] in which in Figure 3 the different trajectories along the sulcus length are shown and can be easily compared. Thus, by deepening the operative field, the working corridor becomes considerably narrower and bimanual surgical dexterity more demanding. In our view, when the surgeon has to treat intraventricular lesions with rich vascular supply like meningiomas, papillomas, etc, the operative corridor through the sulcus should ideally be as direct and wide as possible to enhance visibility and augment surgical maneuverability for proper tumor resection and meticulous hemostasis. We therefore strongly believe that the area around the middle of the intraparietal sulcus provides a safe, straight, and effective working field for adequate surgical exploration.

Lastly, although the use of a tubular retractor as a means of minimal transsulcal access to deep-seated lesions is undoubtedly a useful and elegant technique, in our experience splitting the sulcus for at least 3 cm along its length[5] proves to be a prudent surgical precaution especially when the surgeon has to urgently widen the operative field in cases of inadvertent intraventricular hemorrhage.

In conclusion, we agree with the authors that the IPS-POS point avoids hitting the vertical rami of the superior longitudinal fasciculus (SLF) and that by this way the risk of visuospatial agnosia, ideomotor and constructional apraxia could be reduced, even though there is no documented evidence on the functional significance of these newly described fibers. We feel however that the proposed area of transsulcal dissection could be more appropriate than the mid IPS point, for relatively small intra or peri-atrial lesions on the nondominant hemisphere where the risk of spatial hemineglect is high and affects negatively the patients' functional recovery.[6] On the contrary, when it comes to lesions

on the dominant hemisphere the aforementioned transsulcal trajectory risks injury to the IFOF, hence increasing language-related morbidity and therefore the mid IPS area of dissection is deemed as a safer option. The same, in our opinion, applies for the treatment of intraventricular lesions that are bulky or have a hemorrhagic tendency, where the surgical corridor should be as direct and as wide as possible to enhance operability and increase patient safety.

Disclosure

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices described in this article.

Christos Koutsarnakis, MD[*‡¶]
Faidon Liakos, MD[‡§]
George Stranjalis, MD[*‡]
[*]*Department of Neurosurgery*
Evangelismos Hospital, National and Kapodistrian
University of Athens
Athens, Greece
[‡]*Athens Microneurosurgery Laboratory*
Evangelismos Hospital
Athens, Greece
[§]*Department of Neurosurgery*
Hygeia Hospital
Athens, Greece

[¶]*Edinburgh Microneurosurgery Education Laboratory*
Anatomy Department and Department of Clinical Neurosciences
University of Edinburgh
Edinburgh, United Kingdom

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