Letter to the Editor Regarding "Creating a Comprehensive Research Platform for Surgical Technique and Operative Outcome in Primary Brain Tumor Neurosurgery"

Winkler-Schwartz et al[1] propose an interesting model with alginate hydrogel to simulate biomechanical properties of brain tumors. They have also used gadolinium and fluorescein to recreate the imaging pattern of brain tumors with interesting and encouraging results.[1] Presurgical rehearsal is an important practice tool to reduce the neurosurgeon's anxiety and improve confidence before surgery. There is a learning curve in a surgeon's perception of the extent of resection (EOR), which determines maximum possible resection in glioma surgery.[2] Over the years, the simulation module has been a topic of interest in neurosurgery, yet these models have not reached a mature stage. In this context, the research platform proposed by Winkler-Schwartz et al[1] will be useful to practice and reduce the learning curve. The authors have used fluorescein and gadolinium to imitate real-time tumor enhancement and to assess extent of resection.[1] Previously, Valli et al[3] had created a simulation model for fluorescein-guided brain tumor surgery and suggested that such platforms can be useful teaching methods for subpial dissection and to learn technical nuances of glioma surgery.

In addition to the advantages shared by the author, we would like to highlight a few areas of concern that need to be addressed in future studies. Though simulations using virtual reality have been shown to increase the confidence of surgeons before the operative procedure, it needs to be further validated that this presurgical rehearsal improves the surgical outcome.[4] Likewise, the research platform suggested by Winkler-Schwartz et al[1] in the present paper is likely to increase the confidence of surgeon in resecting gliomas, but a study investigating its translation in the operating room will be essential to demonstrate its utility in human patients. It would have been more informative if the authors in the present paper would have conducted feedback of participants on the consistency and tactile response of artificial brain tumor tissue. Error in the surgeon's perception of the extent of resection is maximum in cases where the interface between normal brain and glioma is not well demarcated due to adhesiveness and infiltration. Duffau[5] has introduced the concept of functional neurooncologic surgery for diffuse low-grade glioma and suggested supratotal resection with functional preservation for the optimal neurooncologic outcome. This research platform does not account for tumor adhesiveness and infiltration and hence will not be very useful for diffuse low-grade glioma or lesions with infiltration and poor demarcation plane from the normal brain. Lau et al[2] reported that the accuracy of intraoperative perception of EOR depends on tumor type and tumor location, in addition to other factors. They compared the intraoperative perception of EOR with postoperative magnetic resonance imaging and reported accuracy of 78.1% for low-grade gliomas and 84.5% for high-grade gliomas.[2]

It will also be interesting to mention the methods to measure the stiffness of brain tumor tissue and the artificially created tumor. Stiffness of brain tissue can be measured by various techniques by measuring shear wave velocity.[6] Additionally, magnetic resonance elastography evaluates stiffness of different regions of the brain in a noninvasive and quantitative manner.[7] On the basis of the technique for detection of stiffness, measurements are prone to error in a range of 1% for cortex and up to 7% for subcortical structures.[7] There is a learning curve in a surgeon's perception of the EOR, which determines maximum possible resection in glioma surgery.[2]

Nevertheless, presurgical rehearsal is an important practice tool to reduce neurosurgeon's anxiety and improve confidence before surgery. In this context, the research platform proposed by Winkler-Schwartz et al[1] will be useful to practice and reduce the learning curve. The present study is an excellent effort with its own set of limitations and provides an opportunity to work more to unleash its potential usefulness to the fullest. The current coronavirus disease–19 pandemic has indirectly provided us with an opportunity to develop innovative methodologies for learning and training neurosurgical skills. We anticipate that such innovative research platforms can fill this gap in the training curriculum of neurosurgical residents.

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