

Radiofrequency Ablation in the MRI Era: Back to Our Roots – Commentary on Kostiuk: “Stereotactic Staged Asymmetric Bilateral Radiofrequency Lesioning for Parkinson’s Disease”

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“Think of the rivers of blood spilled by all those generals and emperors so that, in glory and triumph, they could become the momentary masters of a fraction of a dot”
Carl Sagan, Pale Blue Dot

Dear Editor,

The ongoing invasion of Ukraine, which began in 2014 and escalated in February 2022, is a daily reminder of the suffering inflicted by humanity, on humanity. However, amid this tragedy, a voice from Kiev reminds us of the power of competence and compassion within functional neurosurgery.

Neurosurgical advances are driven by technology. Deep brain stimulation (DBS) has dominated stereotactic functional neurosurgery since the turn of the century [1]. More recently, focused ultrasound (FUS) has combined and leveraged MRI and ultrasound to modulate abnormal activity in neural circuits [2]. FUS has reminded our discipline of its roots, highlighting some of the benefits of ablation as opposed to DBS. Ablation avoids symptom rebound with mechanical failure and removal of infected implants, and does not require regular follow-up for programming [3]. However, FUS requires significant capital expenditure and technical support. As a result, there is a renaissance in stereotactic radiofrequency

ablation (RFA), especially in less wealthy countries. Conversely, many younger functional neurosurgeons in wealthier countries, are less familiar with RFA.

One of the major advantages of DBS is the ability to perform simultaneous bilateral interventions. Traditionally, bilateral stereotactic ablation was anathema due to the high morbidity associated with bilateral lesions from the pre-MRI era. A staged approach is thought to minimise this. However, recent publications still report a higher rate of permanent complications with staged “symmetrical” lesions. These were often transient or mild in the case of bilateral FUS and RFA thalamotomy for essential tremor [4, 5]. However, unacceptably high complication rates were seen after bilateral pallidotomy for primary dystonia [6]. Therefore, asymmetric staged lesions have been proposed to reduce the rate and severity of complications [7].

Dr. Kostiuk [8] presents the clinical results in a retrospective study of 28 patients who underwent staged asymmetric bilateral RFA for Parkinson disease (PD) in Ukraine. RFA of the posteroventral pallidum (GPi) or

subthalamic nucleus was performed contralateral to a prior ventral intermediate nucleus (VIM) thalamotomy after a mean delay of approximately 4 years. The GPi was favoured over subthalamic nucleus in patients with levodopa-induced dyskinesia. Targeting benefitted from direct visualisation on appropriate MRI sequences. Clinical testing under local anaesthesia, without the use of microelectrode recording, preceded ablation.

Significant improvement in tremor, rigidity, on- and off-medication UPDRS scores, plus reduction in levodopa therapy dose, are reported 1 year after the second procedure when compared to baseline, before the first procedure. The reported improvements are remarkable, exceeding those reported by many bilateral DBS studies. However, it must be emphasised that this represents a highly selected group (<7%), from a large series of 418 PD patients, with high preoperative tremor scores, who underwent unilateral VIM thalamotomy.

Unilateral RF VIM thalamotomy may appear to be an unusual therapy choice for PD, a bilateral disease. However, VIM thalamotomy reduces both tremor and rigidity [9]; alleviating these symptoms on the dominant side can greatly improve quality of life and does not preclude ongoing medical treatment as the disease advances. Moreover, a cautious exploration of staged bilateral stereotactic lesions in the MRI era appears to be underway.

The lack of clinical outcome data between the staged procedures and absence of hemibody scores is unfortunate. As a result, the additional benefit from the second procedure cannot be quantified. This is especially relevant since no patient experienced complications after the first procedure, but 4 of 28 patients suffered neurological sequela after the second, with permanent hypophonia, dysarthria, and weakness in one. This paper may prompt others to explore staged asymmetric stereotactic ablation. Careful patient selection and meticulous data collection, including hemibody and inter-procedural scores, as well as side effects, will provide a better understanding of the potential benefits and risks of this approach.

Regrettably, recent guidelines downplay the potential advantages of RFA in specific patients and circumstances,

suggesting that RFA is “*not recommended*” [10]. However, guidelines “*are for the obedience of fools*” and “*we might do better not to follow them slavishly*” [11, 12]. Indeed, RFA remains a viable and valuable tool in modern functional neurosurgery. When used judiciously, in the right patients, RFA can offer practical, clinical, and financial advantages over DBS.

Dr. Kostiuk is to be commended on this contribution to the literature, highlighting the importance and potential of RFA in improving patients’ lives, even as his country lives through arduous times. To paraphrase Carl Sagan, neurosurgery “*is a humbling and character-building experience . . . it underscores our responsibility to deal more kindly with one another.*”

Acknowledgment

Researchers at the functional neurosurgery unit are supported by the National Institute for Health and Care Research and University College London Hospitals Biomedical Research Centre.

Conflict of Interest Statement

L.Z. acts as consultant to Boston Scientific, Elekta, and Medtronic.

Funding Sources

This study was not supported by any sponsor or funder.

Author Contributions

Ludvic Zrinzo is responsible for the design, analysis, and interpretation of data for the work as well as drafting, and providing final approval of the version to be published, and also is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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