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Expected Fate of Radiofrequency Lesioning: A Silent Death or a Cold-Blooded Murder

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Current medical education is evidence based. However, the pieces of evidence are frequently morphed in the scientific world due to various inherent biases and hidden motives. The pressure of publications in the academic field is so high that even reputed institutes have been forced to withdraw papers and projects after publication amid high criticism and analysis by other readers [1]. “There are lies, there are big lies, and there are statistics” is a saying that aptly defines the current scenario. A recent article in a leading scientific journal has even proposed to change the *p* value from 0.05 to 0.005 for “really significant studies” [2]. Another bias that is greatly affecting the surgical field is industry-driven bias: the bias of sponsored studies and the bias for financial gains. These biases have corrupted the world literature to an unknown extent [3].

Before the publicity of deep brain stimulation (DBS), lesioning surgeries were the favored and practiced neurosurgical procedures throughout the world. DBS got popularized due to many reasons: (a) reversibility of the effect/side effect; (b) flexibility of the stimulation settings; (c) possibility of sham surgeries; (d) easier identification of new targets; (e) sophistication; and (f) feasibility of bilateral surgeries [4]. Authors have no doubt that these advantages with DBS are real and worth consideration while deciding among treatment options. The initial indication for DBS was predominantly Parkinson disease (PD), and its excellent results with subthalamic nucleus stimulation made it the preferred treatment option to stereotactic lesioning either by radiofrequency or radiosurgery. The results of PD-DBS were compared with lesioning, and stimulation became widely accepted. With wide publicity, DBS took over the lesioning in the last 2 decades. However, it is worth noting that the evidence-based systemic reviews are available only for PD-DBS and not for comparison of stimulation versus lesioning for other movement disorders. The results are extrapolated to other movement disorders without much scientific basis [4]. This trend was welcomed by the industries promoting DBS. DBS is a lifelong source of revenue for the industry. So, with initial scientific boost, companies not only promoted DBS, but also suppressed lesioning to an extent that there is hardly any sponsor or keynote lecture on stimulation in the leading conferences. In the last decade, various leading companies stopped making radiofrequency

apparatus to indirectly promote DBS. Another step is to first buy a company and then to stop manufacture of lesioning apparatus by companies promoting DBS goods. There are few companies left which manufacture stereotactic radiofrequency generators for intracranial procedures. With nearly 3 decades of experience with DBS, it is now clear that it is at best good at controlling the symptoms, not providing any cure. The literature is fractured in terminology such as remission or cure for PD, dystonias, and tremors. Most of these movement disorders are neurodegenerative, and the aim is to control the symptomatology. In this way, DBS extends or at best delays the final outcome in the natural history of these diseases [4].

Still, there are proponents who are actively publishing their experiences with lesioning [4–6]. Over the last 2 decades, the imaging and lesioning have also become sophisticated. It is possible to safeguard the critical neurovascular structures even in the crowded neighborhood of the target. Till now, the old stereotactic lesioning results have been compared with results of advanced DBS techniques. A comparative study of these groups with DBS will undoubtedly prove that lesioning is as good as DBS, if not better. Bulluss et al. [5] and Taira et al. [4] have not only promoted but published lesioning with their contemporary experience with stimulation surgeries especially pallidotomy and thalamotomies apart from targeting for psychosurgery. In safe hands, lesioning is able to provide similar results as stimulation surgeries and even curative in some cases [6]. Gross [7] has strongly commented that bilateral pallidotomy is similar to internal segment globus pallidus DBS in effectiveness and safety for dystonia, and that pallidotomy was not rejected because of lack of effectiveness or safety. Various leading radiosurgical experience groups have also published guidelines for radiosurgical lesioning [8, 9]. There is now enough level of evidence in support of MR-guided focused ultrasound for thalamotomies in patients with essential tremor. It is interesting to note that MR-guided focused ultrasound has level 1 evidence in its support only for thalamotomy. Its limited availability and high investment in infrastructure deters it being a popular modality [10]. Focused ultrasound guided lesioning runs the risk of making lesions unaffordable, if adopted as standard. Ventral intermediate nucleus thalamotomy by any stereotactic procedure, i.e. radiofrequency, radiosurgery, or MR-guided high focused ultrasound, is a safe procedure. Among many indications for stereotactic lesioning, the predominant ones are DBS failure, contraindications for DBS, malware dysfunction, medical comorbidities, psychological burden, and countries with financial constraints [11].

The science of lesioning is dying. Even many established functional neurosurgery centers do not have neurosurgeons experienced in lesioning, or they will be retiring soon. With them, the art of lesioning is also going to die, and any further training would remain insufficient. In the absence of industrial support, promotion, advertisement, and lack of teachers, lesioning will soon be-

come an “orphan procedure” akin to many “orphan drugs.” It is time to candidly accept the limitations of DBS and the need of an alternative/rescue procedure, which is equally sound with its own set of indications. We cannot rule out the role of industries in promoting science and help in new discoveries but the time-honored cost-effective procedures should not be killed for the sake of financial gains. Researchers and practitioners need to be unbiased in such situations.

Disclosure Statement

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