Neurosurgical Forum

LETTERS TO THE EDITOR

Keyhole interlaminar dorsal rhizotomy

TO THE EDITOR: Recently Warsi et al.¹ published an interesting technical review about the variety of operative techniques for dorsal rhizotomy (Warsi NM, Tailor J, Coulter IC, et al. Selective dorsal rhizotomy: an illustrated review of operative techniques. *J Neurosurg Pediatr.* 2020;25[5]:540–547). We want to congratulate the authors for the quality and usefulness of their review, at a time when dorsal rhizotomy is becoming more popular under the pressure of pediatric rehabilitation teams. Also, we thank the authors for having considered our own method, i.e., the keyhole interlaminar dorsal rhizotomy (KIDr) modality.²

In regard to the KIDr method, the authors' article clearly highlighted that the technique contains less invasive, although more challenging to perform, keyhole (enlarged) interlaminar exposures. They pointed out the intention to respect the architecture of the posterior structures of the spine on the one hand, and the targeting of the lumbosacral spinal roots considered the most responsible for spasticity on the other hand. We agree that the cost of such an intervention is a duration of approximately 5 ± 1 hours (for the 3 interlaminar approaches and the mapping of each of all the roots, from L2 to S2 on both sides).

However, we would like to provide some additional clarifications. First, the KIDr technique consists of three interlaminar (enlarged) approaches, each allowing one to access two roots per side: one at the upper part of the approach, the other at the lower part, by adjusting the microscope. Openings are, in fact, as follows: L1–2 interlaminar level for access to L2/L3 roots, L3–4 for access to L4/L5 roots, and L5–S1 for access to S1/S2 roots. Roots are accessed intradurally at their corresponding supraforaminal level, according to Chipault's law.³ Their ventral and dorsal components are individually targeted and stimulated at the exit from/entry to their dural sheath, respectively.

Second, stimulation of the ventral root is conducted to identify its radicular myotome distribution (i.e., to perform anatomical mapping), then stimulation of the corresponding dorsal root as an excitability test of the root circuitry (i.e., physiological testing), with independent identification of muscle responses by the physiotherapist and by electromyographic recording.⁴ Such intraoperative neuromoni-

toring aims to confirm or modify, root level by root level, the preoperative plan established by the multidisciplinary team, and not only relying on the anatomical knowledge because of frequent interindividual variations.⁵

In spite of its rather sophisticated mode, we do think that the described KIDr modality fulfills the criteria of a tailored operation, closely adapted to the clinical features and objectives for every particular child.

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1. Warsi NM, Tailor J, Coulter IC, et al. Selective dorsal rhizotomy: an illustrated review of operative techniques. *J Neurosurg Pediatr.* 2020;25(5):540–547.
2. Sindou M, Georgoulis G. Keyhole interlaminar dorsal rhizotomy for spastic diplegia in cerebral palsy. *Acta Neurochir (Wien).* 2015;157(7):1187–1196.
3. Chipault A. Origin report of spinal nerves and spinous processes. Article in French. *Nouvelle Iconographie de la Salpêtrière.* 1894;7:246–257.
4. Georgoulis G, Brînzeu A, Sindou M. Dorsal rhizotomy for children with spastic diplegia of cerebral palsy origin: usefulness of intraoperative monitoring. *J Neurosurg Pediatr.* 2018;22(1):89–101.
5. Georgoulis G, Sindou M. Muscle responses to radicular stimulation during lumbo-sacral dorsal rhizotomy for spastic diplegia: insights to myotome innervation. *Clin Neurophysiol.* 2020;131(5):1075–1086.

Disclosures

The authors report no conflict of interest.

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Response

We are grateful for the comments of Drs. Sindou and Georgoulis and for their valuable contributions and expansions to our review. The KIDr technique they described¹ is

of great interest and value to surgeons performing selective dorsal rhizotomy (SDR). We appreciate their added insights and nuances. As Drs. Sindou and Georgoulis emphasize, SDR is a highly tailored procedure with numerous technical variations described in the literature. Future work comparing long-term outcomes and complications between the various approaches, including surgical techniques, usage of intraoperative neuromonitoring, and varying postoperative rehabilitation strategies, will help inform and direct patient care. As this field continues to grow and evolve, we look forward to ongoing discussion and collaboration to combine our experience in order to provide safer, less invasive, and more effective procedures for each of our patients.

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References

1. Sindou M, Georgoulis G. Keyhole interlaminar dorsal rhizotomy for spastic diplegia in cerebral palsy. *Acta Neurochir (Wien)*. 2015;157(7):1187–1196.

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