Para-split laminotomy

Conventional posterior approaches, which may involve multilevel laminectomy and facetectomy, may lead to spinal deformity, instability, and subluxation.

Padanyi et al. developed the multilevel spinous process splitting and distraction laminotomy technique, which is an option for approaching midline intramedullary spinal pathologies with preservation of mechanically relevant bone and muscle structures. In some cases, midline splitting is not feasible or convenient because of anatomical differences of spinous processes and laminas. The objective was to develop a minimally invasive rescue approach technique that makes it possible to remove intramedullary lesions but does not increase the risk of damage to the crucial posterior stabilizers of the spine.

They used the para-split laminotomy technique for opening the spinal canal not in the midline but rather in the parasagittal plane. The technique can be combined with the basic split laminotomy technique. This novel technique was used in five adult patients with midline intramedullary pathologies of the cervical and cervicothoracic spine.

The operating field under the microscope was sufficient for tumor removal according to the keyhole concept. The approach used did not affect the extent of resection or neurologic outcome. The average number of split laminae was 6 (range: 3-10). Average follow-up was 18 months (range: 13-36 months). Histologic results were as follows: two ependymomas, two astrocytomas, and one primitive neuroectodermal tumor (PNET). To confirm the extension of resection, all patients underwent postoperative magnetic resonance imaging evaluations. The resections were complete in the cases of two ependymomas, subtotal in one astrocytoma, and partial in the other astrocytoma case and the PNET case. Computed tomography scans showed the extension of para-split approaches and the moderately disturbed bony structures. Instability was detected in none of the patients on the flexion-extension lateral radiographs during the follow-up period.

The minimally invasive multilevel para-split laminotomy approach as a rescue technique for split laminotomy is a safe and effective surgical procedure, suitable for exploring different intramedullary pathologies located in the midline of the spinal canal. This modified surgical approach fulfills the requirements of other minimally invasive techniques and lowers the risk of damage to the crucial posterior stabilizers of the spine; furthermore, disintegration of the vertebral arches and facet joints is reduced [1)].

Wang et al. retrospectively review the clinical data of 15 patients suffering lumbar intraspinal tumors, who underwent tumor resection using the para-split laminotomy, from October 2016 to May 2018. Observation indicators were as follows: (1) surgical and postoperative recovery situations; (2) the neurological function of the spinal cord and the follow-up situations.

Mean blood loss was 95.3 ± 58.2 ml, and the mean duration of the surgical procedure was 176.7 ± 35.2 min. All lumbar intraspinal tumors were resected completely. There were no operative complications. The postoperative CT scans showed no pedicle or vertebral fractures. During the follow-up period of 6-18 months (average 10.8 ± 3.9 months), no tumor recurrence or spinal deformation was found according to the imaging examination. CT 3D reconstructions showed that the split laminae tended to heal. The average preoperative JOA score was 15.5 ± 4.9 and the average postoperative JOA score improved to 24.0 ± 3.5 (average improvement rate 65.9 ± 19.6%).

The para-split laminotomy could reduce the damage to the posterior spinal tension band and help to protect the stability of the spine. It is feasible and effective to apply the para-split laminotomy to the operation of a lumbar intraspinal tumor, and this technique may be a promising option when considering surgical methods for some multilevel well-circumscribed intraspinal tumors [2].

1)
Padanyi C, Vajda J, Banczerowski P. Para-split laminotomy: a rescue technique for split laminotomy approach in exploring intramedullary midline located pathologies. J Neurol Surg A Cent Eur Neurosurg. 2014 Jul;75(4):310-6. doi: 10.1055/s-0033-1356487. Epub 2013 Oct 25. PMID: 24163263.
2)
Wang X, Liao X, Zhang H, Xu Z, Yan Z, Li Y, Wei M, Wang X, She L, Dong L. Surgical treating lumbar intraspinal tumor through a para-split laminotomy. Br J Neurosurg. 2022 Feb 8:1-4. doi: 10.1080/02688697.2021.1872772. Epub ahead of print. PMID: 35132931.