# Surgical Approaches to the Lumbar Hidden Zone: Current Strategies and Future Directions#

The Harvard community has made this article openly available. Please share how this access benefits you. Your story matters

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Published Version</td>
<td>doi:10.1016/j.ebiom.2015.09.010</td>
</tr>
<tr>
<td>Citable link</td>
<td><a href="http://nrs.harvard.edu/urn-3:HUL.InstRepos:23473901">http://nrs.harvard.edu/urn-3:HUL.InstRepos:23473901</a></td>
</tr>
<tr>
<td>Terms of Use</td>
<td>This article was downloaded from Harvard University’s DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at <a href="http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA">http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA</a></td>
</tr>
</tbody>
</table>

In Focus

Surgical Approaches to the Lumbar Hidden Zone: Current Strategies and Future Directions

Clemens Reinshagen a,⁎, Navid Redjal b, Marek Molcan y c, Bernhard Rieger d

a Department of Radiology, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA
b Department of Neurosurgery, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA
c Institute of Neurophysiology, Medical Faculty, University of Cologne, Cologne, Germany
d Department of Neurosurgery, University of Dresden, Fetschersstraße 74, Dresden, Germany

The lateral lumbar spinal canal may be subdivided into the subarticular (lateral recess), the foraminale (pedicle) and the extraforaminal (far lateral) zone. Within these regions lies the “hidden zone”, an area known for its difficult surgical exposure (Fig. 1A) (Macnab, 1971). Common pathologies of this region include foraminal osseous stenosis (narrowing of the foramen through which the nerve root exits the spinal canal) as well as disc herniations. It has been estimated that roughly 10–20% of all disc herniations migrate in a cranial-lateral direction and may hence be located in the preforaminal and foraminal regions of the “hidden zone”. Due to the local anatomy, these lesions may affect both the traversing (level below) as well as the exiting (same level) nerve root. Patients typically present with neurological symptoms of (poly-)radiculopathy, including pain, weakness and numbness. Commonly, and in contrast to the above-mentioned zones, all types of disc herniations that affect the exiting nerve root at the same level are referred to as “far- or extreme-lateral”, including pre-, intra- and extra-foraminal herniations. Whilst a variety of effective techniques for approaching extraforaminal and purely intraforaminal lesions have been developed, there continues to be disagreement with regard to the optimal approach to lesions located in the pre- and intra-foraminal regions of the hidden zone.

In order to understand this discord, it is crucial to comprehend the difficulties and patient-specific concerns associated with the surgical exposure of this region. Anatomically, the medial hidden zone is an area bordered laterally by the pedicle, ventrally by the dorsal part of the vertebral body and covered dorsally by the pars interarticularis of the hemilamina (Fig. 1A). Open surgical exploration of this region via the traditional interlaminar route (Fig. 1B) is therefore only possible through the hemilamina (Fig. 1A). Open surgical exploration of this region via the vertebral body and covered dorsally by the pars interarticularis, however, has been linked to an increased risk of stress fracture and instability (Ivanov et al., 2007). This becomes more relevant as the relative risk of cranial disc sequestration increases significantly in higher lumbar levels and cranial sequestration is strongly correlated with increased age (Daghighi et al., 2014). Since older patients are also more likely to suffer from osteoporosis and degenerative spinal disorders such as facet joint hypertrophy, which may manifest segmental instability, less invasive medial approaches to the hidden zone are warranted.
Recently, Reinhagen et al. (2015) suggested approaching cranial-lateral disc herniations via a crossover translaminar approach (cTLA), which utilizes a fenestration of the contralateral hemilamina at the base of the spinous process to reach the hidden zone (Fig. 1E). Besides avoiding disruption of the lateral half of the hemilamina, this facet-sparing technique might additionally offer advantages when treating recurrent patients who previously underwent extended laminotomy, as approaching the recurrent pathology from the contralateral side avoids additional ipsilateral bone resection. A minimally invasive technique, similar to that reported by Reinhagen et al., has been proposed by Alimi et al. (2014). Although not a translaminar approach, Alimi’s technique also features a crossover route to the foraminal region and demonstrated good results for treating foraminal stenosis in a series of 32 patients.

The main limitation of both TLA and cTLA techniques is their restricted access to the intervertebral disc space, especially at lower lumbar levels. Although cranial disc herniations mostly appear as completely sequestered fragments, preoperative imaging and meticulous surgery planning is crucial in order to minimize reversion to conventional approaches. In the future, combining the TLA or cTLA with preoperative simulation software as well as intraoperative neuronavigation might prove helpful in further minimizing surgical tissue trauma when treating these challenging pathologies.

In conclusion, access to the hidden zone remains surgically challenging. However, with an increasing number of reliable techniques the surgeon can now decide which procedure is the most appropriate for a patient’s individual pathology. Furthermore, even though common sense implies that less bone disruption increases spinal stability, data on TLA and cTLA approaches still need to be supported by a large prospective randomized trial to assess the preservation of spinal stability and patient outcomes compared to conventional approaches.

Acknowledgements
All illustrations were created by Sebastian Zachar (artwork inquiries: zachar.sebastian@gmail.com).

References


