Radiological data of brachial plexus avulsion injury associated spinal cord herniation (BPAI-SCH) and comparison to anterior thoracic spinal cord herniation (ATSCH).

Andrew Jack  
*Department of Neurosurgery, Swedish Neuroscience Institute, Swedish Medical Center, Seattle, Washington, USA*

Jens R Chapman  
*Swedish Neuroscience Institute (SNI), Swedish Medical Center, 550 17th Ave #540, Seattle, WA, 98122, USA*

Praveen V Mummaneni

Carter S Gerard  
*Swedish Neuroscience Institute (SNI), Swedish Medical Center, 550 17th Ave #540, Seattle, WA, 98122, USA*

Line Jacques

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Radiological data of brachial plexus avulsion injury associated spinal cord herniation (BPAI-SCH) and comparison to anterior thoracic spinal cord herniation (ATSCH)


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Abstract
Spinal cord herniation (SCH) is a rare cause of myelopathy. When reported, SCH has most commonly been described as occurring spontaneously in the thoracic spine, and being idiopathic in nature (anterior thoracic spinal cord herniation, ATSCH) [1–3]. Several theories have been proposed to explain its occurrence, including congenital, inflammatory, and traumatic etiologies alike [1–4]. Even more rarely, SCH has been described to occur in the cervical spine in association with brachial plexus avulsion injuries (BPAI-SCH). In our accompanying article, “Late Cervical Spinal Cord Herniation Resulting from Post-Traumatic Brachial Plexus Avulsion Injury,” two cases of BPAI-SCH are presented and discussed in the context of the reviewed literature [5]. Here, pertinent accompanying follow-up data was collected and is presented for the cases, including postoperative radiographic outcome imaging. Furthermore, a table is presented comparing and contrasting ATSCH to BPAI-SCH. Although the two phenomena have been previously grouped together, this table highlights ATSCH and BPAI-SCH as distinct entities; more specifically, BPAI-SCH is a separate, long-term complicating feature of BPAI. This supplementary data helps treating physicians by increasing awareness and knowledge.
of BPAI-SCH as a distinct entity from ATSCH and cause of delayed neurological deterioration.

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1. Data description

The radiological data included in Fig. 1 are the preoperative myelogram, intraoperative CT, and postoperative follow-up imaging obtained for Case 2 presented in the accompanying article [5]. The data shown were collected and included to highlight the problem in question and demonstrate the surgical approach taken for its treatment. Furthermore, the postoperative radiological data emphasize that recognition and accurate diagnosis BPAI-SCH can lead to successful treatment of this rare phenomenon. Fig. 1, panel A is an axial cut of a preoperative CT myelogram showing spinal cord herniation.
through a dural defect after C8 nerve root avulsion (white arrowhead), and compression due to associated pseudomeningocele. Panel B is an axial cut of an intraoperative CT scan at the same level as panel A showing a right-sided lateral mass screw, and the extent of bony resection completed to facilitate dural repair (fascetectomy, pedicular resection). Panel C is a coronal view, T2-weighted sequence from the postoperative MRI neurogram of Case 2. Instrumentation artifact and previously repaired BPAI-SCH with absence of nerve root sleeve pseudomeningocele (white arrowhead) are visualized. Panel D is an axial cut from the same MR neurogram sequence showing postoperative seroma (black asterisk), instrumentation artifact, and previously repaired BPAI-SCH with absence of nerve root sleeve pseudomeningocele. Panels E and F are lateral and anteroposterior plain XR views, respectively, of the postoperative radiograph from Case 2 with instrumentation in place. Key patient and disease demographic, clinical, radiographic, and technical features pertaining to ATSCH and BPAI-SCH identified and collected from the outlined literature review are shown in Table 1. This data was collected and included in table format to compare and contrast these two phenomena as distinct entities, and supplements such a discussion found in the accompanying article.

2. Experimental design, materials, and methods

An electronic medical database was utilized as part of routine follow-up care to obtain patient demographic, clinical, and radiographic information pertaining to the cases discussed in the accompanying article [5]. More specifically, postoperative radiographic imaging (MRI neurogram and plain XR views) was utilized to visualize the extent of bony resection, dural repair, instrumentation artifact, and absence of nerve root sleeve pseudomeningocele.
Two cases, data from the literature search were used to create a summary table comparing the two entities.

Table 1
Table contrasting anterior thoracic spinal cord herniation (ATSCH) and brachial plexus avulsion injury associated spinal cord herniation (BPAI-SCH), highlighting the two as distinct entities.

<table>
<thead>
<tr>
<th>ATSCH [1–4,6]</th>
<th>BPAI-SCH [5,7–10]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean age</strong> (years; range)</td>
<td>Middle-older age adult (51; 21–78)</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>M:F 1:1.8</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>Commonly: Brown-Sequard syndrome, Paraparesis</td>
</tr>
<tr>
<td><strong>Spinal location (dural defect)</strong></td>
<td>Thoracic (ventral/lateral)</td>
</tr>
<tr>
<td><strong>Mean symptom duration at diagnosis (years; range)</strong></td>
<td>4.5 (range: 1.0–12.0)</td>
</tr>
<tr>
<td><strong>Mean time to presentation post-injury (years; range)</strong></td>
<td>9.0 (range: 2.0–19.0)</td>
</tr>
<tr>
<td><strong>Etiologies</strong></td>
<td>Multiple: - Spontaneous - Inflammatory/erosive - Congenital - Traumatic - Iatrogenic</td>
</tr>
<tr>
<td><strong>Associated pathology and Operative findings</strong></td>
<td>- Dural duplication - Arachnoid cyst - Spinal cord herniation - Adhesions/tethering - Syrinx - Bony erosion - Disc Herniation - Previous bony fracture</td>
</tr>
<tr>
<td><strong>Natural History</strong></td>
<td>Variable: - Conservative treatment reported with neurological deterioration and stabilization being described</td>
</tr>
<tr>
<td><strong>Treatment/Dural repair techniques</strong></td>
<td>Multiple - Cord release (untethering/reduction) - Dural defect widening (dural duplication present) - Direct suture (space permitting) - Dural-patch graft - Fat graft - With/without bony instrumented fusion</td>
</tr>
<tr>
<td><strong>Operative outcome</strong></td>
<td>- Improvement: 74% - Stabilization: 18% - Worsening: 8%</td>
</tr>
<tr>
<td><strong>Prognostic Factors (motor deficit improvement)</strong></td>
<td>- Brown-Sequard syndrome - Cord release (untethering/reduction) - Dural defect widening (dural duplication cases)</td>
</tr>
</tbody>
</table>

XR) was obtained from the attending health care institution for the creation of Fig. 1 in Adobe Photoshop Creative Suite 6 software (San Jose, California, USA). Table 1 was created through literature search. PubMed, Ovid-Medline, and Google Scholar databases were searched from inception to 2019 for clinical articles in English related to spinal cord herniation. Duplicate articles were excluded; article titles and abstracts including case reports, case series, and meta-analyses were then searched and grouped into those pertaining to ATSCH and cervical SCH, which were then further refined into those dealing with BPAI-SCH. Article references were searched for inclusiveness. The articles were then examined for data pertaining to demographic, clinical, radiographic, and technical features for the two entities. With our two cases, data from the literature search were used to create a summary table comparing the two entities.
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None.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References