Poster Title: Radial Arterial Access For Intraoperative Thoracic Spinal Angiography In The Prone Position

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Disclosure

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Introduction

Verification of complete occlusion or resection of neurovascular lesions is frequently done with intraoperative angiography.

Surgery for spinal vascular lesions such as arteriovenous malformations (AVMs) and arteriovenous fistulas (AVFs) is typically performed in the prone position but there is no standard for intraoperative confirmation of complete resection of these lesions.

We describe our experience with using transradial artery access for intraoperative angiography in thoracic spinal neurovascular procedures performed with patients in the prone position.
Methods

We reviewed the charts of all patients treated in 2019 at our institution who had transradial artery access for intraoperative angiography and underwent surgical resection of spinal vascular lesions while placed in the prone position.
Results

Four patients were included in this study. There were no perioperative or postoperative complications and there was no evidence of new neurologic deficits in the immediate postoperative period.

<table>
<thead>
<tr>
<th>Patient #</th>
<th>Vascular lesion</th>
<th>Spinal Level of Lesion</th>
<th>Arterial Access</th>
<th>Catheter &amp; length (cm)</th>
<th>Segmental branch catheterized</th>
<th>Angiogram duration (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dural AVF</td>
<td>T4</td>
<td>R radial</td>
<td>5F Simmons 1 (100)</td>
<td>R T4</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>Pial AVF</td>
<td>T10</td>
<td>L radial</td>
<td>5F Simmons 1 (100)</td>
<td>R T11 &amp; L T10</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>AVM</td>
<td>Filum terminale</td>
<td>L radial</td>
<td>5F vertebral (125)</td>
<td>R T10</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>Dural AVF</td>
<td>T8</td>
<td>R radial</td>
<td>4F vertebral (100)</td>
<td>R T8</td>
<td>48</td>
</tr>
</tbody>
</table>

AVF, arteriovenous fistula; AVM, arteriovenous malformation; L, left; R, right
Figure 1: Patient positioning during operation. Note the position of the arms for transradial access.

Figure 2: Preoperative supine transfemoral subtracted (A) and unsubtracted (B) frontal views of right T4 injection showing right T4 dAVF (black arrow to fistula point on A). The fistula was identified surgically just inferior to the T4 nerve root. Intraoperative transradial prone angiography with selective right T4 injection (C, subtracted and D, unsubtracted) obtained with Simmons 1 (white arrows) confirmed closure of the dAVF.
Figure 3: Preoperative supine transfemoral subtracted (A) and unsubtracted (B) frontal views of right T10-Adamkiewicz injection demonstrating a filum terminale AVM (double white arrows in B). After AVM microsurgical resection, intraoperative transradial prone angiography (C, subtracted and D, unsubtracted) was performed with right T10 injection with a 125 cm 5F vertebral catheter (thick white arrow in C) showing complete AVM resection with normal antegrade filling of the ASA (black arrow in D).
Figure 4: Preoperative supine transfemoral subtracted (A) and unsubtracted (B) frontal views of T8 injection showing a dAVF with significant venous congestion. After surgical disconnection, intraoperative transradial prone angiography (C, subtracted and D, unsubtracted) was performed with 4F vertebral catheter (white arrow on C) was used to catheterize the T8 branch, which confirmed the fistula occlusion.
Discussion

Intraoperative angiography can facilitate efficient confirmation of complete resection of vascular lesions with minimal risk of patient morbidity thus reducing unnecessary surgical exploration.

Spinal intraoperative angiography is less popular than its cerebral counterpart, especially when patients are in the prone position. Transradial access avoids the challenges in access and navigation associated with femoral access in this position. Radial artery access has been described in many reports of intraoperative angiography but reports of its use in thoracolumbar spinal procedures are few.

While the technique addresses challenges in access and navigation, limitations include catheter length, particularly in lower thoracic catheterizations as well as potential angiographic challenges when catheterizing from above the right branch.
Summary points

Intraoperative angiography is a useful tool in confirming complete resection of vascular lesions.

In spinal surgical operations where the patient is in the prone position, transradial artery access for intraoperative angiography for thoracic spinal vascular lesions is feasible and safe.