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No disclosures

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- Risk factors and Prevention strategies
- Pitfalls and safeguards
  - LSA revascularization
  - CSF drainage
  - Temporary sac perfusion
- Summary

Risk factors for Spinal Cord Ischemia

- Long coverage
- Acute scenario
- Long procedure duration
- Perioperative hypotension
- Large blood loss
- Renal insufficiency
- Coverage of LSA
- Previous abdominal aortic repair

Preoperative work up

- Assessment of collateralization
- Main medullar artery localization (?)
- Optimize Renal function

Perioperative / Open repair

- CSF drainage and IP pressure monitoring
- LSA revascularization
- Temporary sac perfusion
- Sequential aortic clamping
- Truncal or exparochial
- Visceral perfusion
- Hgb levels >10mg/dl
- Mean Systemic pressure >90mmHg

Perioperative / TEVAR

- CSF drainage and IP pressure monitoring
- LSA revascularization
- Temporary sac perfusion
- High blood flow
- Mean Systemic pressure >90mmHg

Prevention strategies in Thoracic Aorta Repair

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RECOMMENDATION 11: In patients who need thoracic endovascular aortic repair (TEVAR) after achievement of patency and revascularisation of the LSA, or in patients with an left subclavian artery injury, the subclavian artery should be revascularised to avoid neurological complications.

- Cerebral ischaemia
- Nerve injuries
- Lymphatic injuries
- Bleeding accident
- Infection
- Thrombosis...

Potential Morbidity

- Cerebral ischaemia
- Nerve injuries
- Lymphatic injuries
- Bleeding accident
- Infection
- Thrombosis...


LSA revascularization

Safeguards

• Good patient selection
• Accurate surgical technique
• High volume experience

Recommendaion 2: It may be considered to perform LSA revascularisation in patients with a patent left subclavian artery injury, or in patients with a dominant or unique left vertebral artery.

EJVES 2015 (editing process)
CSF Drainage Recommendations

Recommendation for (thoracic) endovascular aortic repair (TF-EVAR)

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Class</th>
<th>Level of evi- dence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent a cerebrospinal fluid (CSF) drainage</td>
<td>IIIa</td>
<td>C</td>
</tr>
</tbody>
</table>

CSF Drainage Pitfalls

- Cumbersome and unfriendly system
- Safety issues:
  - CSF drain is not entirely benign

Table 1: Potential complications related to CSF drainage

<table>
<thead>
<tr>
<th>Intracerebral bleeding</th>
<th>Spinal bleeding</th>
<th>Hemorrhagic spinal fluid</th>
<th>Headache</th>
</tr>
</thead>
</table>


CSF Drainage Guidelines for the Management of Descending Thoracic Aorta Diseases

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Class</th>
<th>Level of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Spinal Fluid drainage should be considered in TF-EVAR.</td>
<td>IIa</td>
<td>C</td>
</tr>
</tbody>
</table>

Cumbersome and unfriendly system

Safety issues:
- CSF drain is not entirely benign

Morbidity (Brain Bleeding) 4.3 %
Mortality 0.6 %
Increased risk:
- Previous head trauma
- Chronic subdural hematoma
- Presence of central aneurysm
- Cranial arteriovenous malformations
- Cranial lead abnormalities
- Coagulation disorders

J Vasc Surg 2009

LSA revascularization Safeguards

CSF drainage technique

Lumbar drainage system with epidural filter, pressure line, graduated flow regulator (mL/h) and graduated burets.

Becker EDMS II (Medtronic)

Pressure in the flushing system?

LiquiGuard

Pump rotor

Tube set for LiquiGuard

CSF (intrathecal or drainage) in correct position?
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CSF drainage

Safeguards

- Appropriate patient selection Identifying risk factors
- Use specific dedicated system (Liquoguard®) for a continuous monitoring
- Train your personnel (Recovery and Critical care Units)
- High volume experience

Editor’s Choice — Temporary Aneurysm Sac Perfusion as an Adjunct for Prevention of Spinal Cord Ischemia After Branched Endovascular Repair of Thoracoabdominal Aneurysms

Table 4. Perioperative results.

<table>
<thead>
<tr>
<th></th>
<th>Non-TASP (n = 43)</th>
<th>TASP (n = 40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General complication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New developed renal failure/dialysis</td>
<td>2 (5)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Acute mesenteric ischemia</td>
<td>2 (5)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Perioperative mortality</td>
<td>3 (7)</td>
<td>3 (8)</td>
</tr>
<tr>
<td>Mortality during TASP interval</td>
<td></td>
<td>1 (3)</td>
</tr>
<tr>
<td>Side branch complication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early reinterventions</td>
<td>3 (7)</td>
<td>5 (13)</td>
</tr>
</tbody>
</table>

Note. Values are n (%). TASP = temporary aneurysm sac perfusion.

Temporary sac perfusion

Pitfalls

- Does not substitute any other strategy
- % Aneurysm Rupture waiting for the secondary procedure?
- % Failure to complete the secondary branch stenting?
**Temporary sac perfusion Safeguards**

- High volume experience
- More studies are needed for an extensive validation

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**Summary**

- CSF drainage and SF pressure monitoring, LSA revascularization and Temporary sac perfusion are effective adjuvants to prevent spinal cord ischemia in high risk patients during TEVAR
- High volume experience minimizes all the pitfalls related with these adjuvants