False lumen embolization in chronic aortic dissection

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Georgia Vascular Society
2018 Annual Meeting
Lake Oconee, Georgia
Disclosures

• Some off-label use of devices
• Use of non-FDA approved devices
Problem

- Aneurysmal degeneration of chronic aortic dissection can be a challenging problem.

- Common practice is management with stent graft coverage of the proximal entry tear to redirect flow into the true lumen and promote false lumen thrombosis.

- This strategy often results in false lumen thrombosis and remodeling in cases of acute aortic dissection.

- Response is limited in patients with chronic dissection.
  - High rate of aneurysm formation (35%)³
  - Mortality as high as 36% at 3 year followup⁴

Chronic dissection: Why does flow in the false lumen persist?

- Persistent retrograde perfusion and unchanged pressure in the false lumen
  - This can be present despite sufficient seal of proximal entry tear and cause aneurysm formation

1. Figure from Kolbel et al. The Candy-plug technique Jour Endovasc Therapy 2017
Chronic dissection with aneurysm treatment

- Open repair – high rates mortality and paraplegia, 20-40% mortality \(^1,2\)

- Hybrid approach with resection of the dissection membrane in the intended distal landing zone also described with success \(^3\)

- Endovascular false lumen occlusion
  - Previously described methods to occlude the distal false lumen are use of fenestrated stent grafts\(^1\) or the use of large diameter plugs\(^2\)

- Compared to other approaches, false lumen embolization is a relatively straightforward method of achieving aneurysm thrombosis without aortic cross-clamping

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3. Roselli EE et al Distal landing zone open fenestration facilitates endovascular elephant trunk completion and false lumen thrombosis
Case

• 78 yo male with history of HTN presents with acute onset upper abdominal and low chest pain pain and dysphagia
• CT scan with aortic dissection
• Labwork unremarkable
• Concern that symptoms were related to compression of the esophagus by a pulsatile false lumen

• OR for TEVAR and false lumen embolization with amplatzer plug
IVUS is key to technique
• Dysphagia and pain resolved post-op
• d/c home on POD #2
• f/u CTA with thrombosis of false lumen, decreased size
Chronic aortic dissection with aneurysm

• What about cases with a larger false lumen? How can we embolize this?

• What if there are more than 2 lumens?
Case

• 63 yo male with history of chronic TBAD (10 years prior, managed medically) presents with acute onset of chest pain
• OR for L C-SCA bypass, L SCA embolization and TEVAR
• D/C on POD #2
CTA post-op

- Doing well at post op visit
- BP controlled (130s/70s)
- No symptoms

- TAAA 6.5cm =>7cm => 9cm
- True lumen remains very compressed
• OR for FL embolization x 2 using “candy-plug” physician modified devices

• Balloon of true lumen (stented portion)
• J Endovasc Ther 2013

• Initial report of using a modified TEVAR as a large diameter embolization plug to facilitate false lumen occlusion
Case

- Use of IVUS to enter each lumen and leave a wire
- Balloon of the descending thoracic aorta to rupture the dissection flap
Creation of the candy plug

• Cook aortic cuff with the middle stent constrained to allow for retrieval of the dilator tip after deployment

• Ethibond purse-string placed around the middle stent to constrain it to approx. 1 cm in diameter
  • This allows for dilator retrieval**
  • Center is subsequently embolized with Amplatzer plug
• Amplatzer plug placed into the center of the candy wrapper
One month, still a small leak

Six month, no leak, positive remodeling
Piedmont experience

• Since October 2015 5 cases of false lumen embolization for patients with chronic dissection performed
  • Embolization performed with coils, plugs, physician modified device or combination

• All patients underwent CTA before, between 30-60 days, and between 6-8 months after intervention
Technique

• Extend true lumen TEVAR to celiac
  • Balloon if there is severe compression
• Access false lumen using IVUS
• Place plug approximately 1cm proximal to celiac trunk
  • Oversize 10-30% of FL diameter
Results

• There were no peri-op mortalities (0/5)
• 100% technical Success (5/5)
• No intraprocedural complications
• 3/5 patients (60%) had complete thrombosis of treated false lumen on followup
• Two had persistent leak, minor enhancement, one of these had aneurysm expansion and underwent open repair (hybrid)
  • Clinical success 4/5 80%
• There have been no deaths in the followup period
## Piedmont experience

<table>
<thead>
<tr>
<th>Patient</th>
<th>Indication</th>
<th>Treatment</th>
<th>Followup Mo</th>
<th>Post op mm</th>
<th>Last mm</th>
<th>aneurysm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chronic dissection with aneurysm</td>
<td>FL embo with PMEG, subsequent open repair</td>
<td>24</td>
<td>100</td>
<td>78</td>
<td>remodeling</td>
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<td>Chronic dissection, aneurysm, dysphagia</td>
<td>FL embo, Amplatzer plug</td>
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<td>49</td>
<td>47</td>
<td>remodeling</td>
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<tr>
<td>3</td>
<td>Chronic infrarenal dissection with severe pain</td>
<td>FL embo, amplatzer plug</td>
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<td>21</td>
<td>20</td>
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<tr>
<td>4</td>
<td>Chronic dissection with aneurysm</td>
<td>FL embo, large coils</td>
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<tr>
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<td>Chronic dissection with aneurysm</td>
<td>FL embo with PMEG x 2</td>
<td>6</td>
<td>90</td>
<td>79</td>
<td>remodeling</td>
</tr>
</tbody>
</table>
Limitations

• Small patient number and followup
• Adequate embolization may require physician modification of devices
Conclusion

- False lumen embolization is a useful adjunct in management of complicated chronic aortic dissection that can be used to facilitate false lumen thrombosis

- It is minimally invasive with low rates of morbidity and mortality