Complications of endovascular treatment of May-Thurner syndrome

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• I have no conflict of interests
• Endovenous treatment of May-Thurner syndrome is effective, safe and durable.
• The purpose of this review is to highlight the small number of complications that may occur with this procedure and suggest treatment options.
Definitions

• It is not known at what degree, venous stenosis is haemodynamically significant
• Morphological obstruction causing >50% area stenosis as measured by IVUS has arbitrarily been chosen for stenting.
Effect of stent sizing

• Stent sizing and apposition has been shown to be an important determinant of clinical outcome.

• Since sizing is typically approximated, large oversizing (20%) can significantly increase the vessel wall stress and this contributes to neointimal hyperplasia.
Fig. 7. A: a positive correlation between CWS/WSS and IH is shown in the +10% sizing case ($R^2 = 0.68$, $P < 0.005$). B: a positive correlation between CWS/WSS and IH is shown in the +20% sizing case ($R^2 = 0.64$, $P < 0.005$). C: effect of stent sizing on the extent of IH quantified as the maximum percent area stenosis in the stented region for all the data.

Published in: Henry Y. Chen; Anjan K. Sinha; Jenny S. Choy; Hai Zheng; Michael Sturek; Brian Bigelow; Deepak L. Bhatt; Ghassan S. Kassab; American Journal of Physiology-Heart and Circulatory Physiology 2011, 301, H2254-H2263.
DOI: 10.1152/ajpheart.00240.2011
Comparison of angiographic/histological examinations in the low, medium and high oversized nitinol stents at 180 days in pigs. Zhao et al; Cardiovasc Intervent Radiol 2009
Distal stent migration

• It occurs because of inadequate coverage of the original stenosis at the junction of the left common iliac vein and the IVC.
• The Wallstent is gradually squeezed caudad by the constricting lesion and symptoms recur.
• The stent should be extended in the inferior vena cava for 3-5cm

Raju et al; J Vasc Surg 2009
Collapse and coning

• Collapse and coning of the proximal end of the Wallstent occurs when the end of it is deployed right across the stenosis with no extension in the IVC.

• This complication is specific of the Wallstent and is the result of lack of radial force at the stent ends.
Proximal stent migration

• Causes of proximal migration:
  1. Miscalculation of the recipient vein size
  2. Balloon failure
  3. Poor insertion technique
### Migration of venous stents into the heart

<table>
<thead>
<tr>
<th>n</th>
<th>Location</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mullens, 2006</td>
<td>1 Right ventricle</td>
<td>Open heart surgical removal, Tricuspid valvuloplasty</td>
<td>good</td>
</tr>
<tr>
<td>Steinberg, 2017</td>
<td>1 Right atrium</td>
<td>Perforation intraatrial septum, sudden death</td>
<td></td>
</tr>
<tr>
<td>Holst, 2018</td>
<td>1 Right ventricle</td>
<td>Open heart surgical removal</td>
<td>good</td>
</tr>
</tbody>
</table>
Acute Stent Migration into the Right Ventricle in a Patient with Iliac Vein Stenting
Recommended stent diameter and post-stent IVUS area for different vein segments.

- Vessel segment Diameter Area
- CIV 16–18mm 200–254mm²
- EIV 14mm 150mm²
- CFV 12mm 110mm²

The ideal diameter/area of 18mm/254mm² may not be achievable in postthrombotic limbs

Raju et al; Phlebology 2017
Diameter vs area measurements

In theory:

Diameter stenosis: 25%
Area stenosis: 44%

In practice:

Diameter stenosis: 41%
Area stenosis: 0%

Compression is not always associated with area stenosis
CT measurement technique

B. Diameter Measurement in multi-planar reconstructions

- Measurements are performed in reconstructions orthogonal to the line of blood flow

- When the iliac vein is fusiform/oval in shape, the minor diameter is measured.

- When the iliac vein is an irregular shape, the diameter crossing the midpoint of the maximum diameter was measured.
CT measurement technique

Manual measurement of cross-sectional area

• Measurements are performed in reconstructions orthogonal to the line of blood flow

• Distal measurements are performed above the confluence of the external and internal iliac veins, with preference at the site where the common iliac vein has the most circular shape.
Contralateral DVT

- Extension of the stent to the vena cava to avoid migration/compression contributes to partial jailing of the contralateral flow and is associated with 2.4% DVT (Caliste et al, Ann Vasc Surg 2014).
- We present a bail out for this complication.
Final position of the pigtail catheter for thrombolysis
Raju’s Z stent modification for the reduction of contralateral DVT

- Overlapping Wallstents end at the iliac confluence and a 2cm caval extension is performed with Gianturco Z-stents placed inside and on the top of the Wallstents.
- There is a 10-20% oversizing compared to the diameter of the Wall stents to prevent migration.
Stent Patency

- 70 patients with May-Thurner syndrome underwent 77 lower extremity interventions.
- Post thrombotic (group 1) n=56
- De novo presentation of swelling/pain ulceration (group 2) n=21

• In group 1, five patients (8.9%) developed in stent thrombosis 3 within 48 hours all with subtherapeutic IV anticoagulation, one at 1 week and one at 6 months
• In group 2, two had stent thrombosis at 12 months (9.4%)

Outcomes of endovascular intervention for May-Thurner syndrome
Conclusions

• Complications in endovenous management of May Thurner syndrome are rare and reinterventions are infrequent.
• Attention to detail and in particular insertion technique, deployment of the stent to cover the full length of the stenosis and appropriate stent sizing may contribute to a reduction of complications.