Present Status of Endotension: What mimics it, when is it real, what causes it and what to do about it

Luis A. Sanchez MD
Gregorio A. Sicard Distinguished Professor of Surgery & Radiology
Chief, Section of Vascular Surgery

Endovascular AAA Repair

- EVAR is currently the most common technique used for the treatment of AAAs
- Continued aneurysm enlargement after EVAR is a concern and a failure of the treatment modality that occurs in 0.2 to 41% of patients
- Aortic growth after EVAR is often a result of an endoleak but these are not always readily detectable


EVAR: Endotension

- Definition: continued sac pressurization (and enlargement) without evidence of sac perfusion or endoleak
- Prevalence:
  - Is very low and poorly defined
  - Depends on index of suspicion, device specifics, and imaging modalities

Endotension is an undetected endoleak??

EVAR: Endoleaks

<table>
<thead>
<tr>
<th>Type of endoleak</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I endoleak</td>
<td>Failure to create an adequate circumferential seal</td>
</tr>
<tr>
<td>Type II endoleak</td>
<td>Sac perfusion</td>
</tr>
<tr>
<td>Type III endoleak</td>
<td>Internal flow from an open tear</td>
</tr>
<tr>
<td>Type IV endoleak</td>
<td>Intimal hyperplasia</td>
</tr>
<tr>
<td>Type V endoleak</td>
<td>Continued high sac pressure following EVAR</td>
</tr>
</tbody>
</table>

EVAR: Endotension

- Cases initially suspected as endotension have been found to have a clear etiology subsequently
- Example: First generation Excluder graft
  - Aneurysm growth without evidence of endoleak occurred in up to 37% of the initial trial patients
  - Further evaluations noted that the porous material was the etiology

Disclosure Statement

- Consultant
  - Cook
  - Endologix
  - Bolton Medical
  - W. L. Gore
EVAR: Endotension

- Endotension is a diagnosis of exclusion and its prevalence will depend on how good we are at detecting other etiologies of aneurysm growth.

- Etiologies include:
  - Undiagnosed endoleak
  - Anticoagulation
  - Infection
  - Thrombus sealed endoleak
  - Graft ultrafiltration
  - Aneurysm sac hygroma

EVAR: Endotension

- Imaging modalities for endoleaks include:
  - CTA – has been considered the “gold standard”
  - US – with or without contrast enhancement
  - MRA
  - Angiography

EVAR: Endoleaks and Endotension

- CTA – excellent modality IF utilized appropriately
  - A 3-phase study is essential for the diagnosis of endoleaks and device evaluation
  - Limitations: radiation dose and contrast use

- MRA – good modality evaluate for endoleaks
  - Expensive
  - Not readily available in some centers
  - Not useful in patients with stainless steel devices

- Ultrasound – increased experience & use
  - Cost effective
  - Readily available
  - Contrast enhanced option may improve evaluation
  - Limitations: operator dependent, affected by body habitus and fasting status

EVAR: Endoleaks and Endotension

- Systematic review of US and MR imaging vs CTA for endoleak detection
  - 31 studies, 3853 EVAR pts w/ paired studies w/in 1 month of EVAR
  - Results:
    - Endoleaks – 15.6% of patients
    - 15 studies DUS vs CTA – CTA noted a significantly higher rate of endoleaks
      - 74 endoleaks noted by CTA and not noted by DUS
      - 57 endoleaks noted by DUS and not noted by CTA
    - 10 studies CEUS vs CTA – CEUS was more sensitive
      - 98 endoleaks noted by CEUS and not noted by CTA
      - 54 endoleaks noted by CTA and not noted by CEUS
    - 6 studies MRI vs CTA – MRI was more sensitive
      - 43 endoleaks noted by MRI and not noted by CTA
      - 4 endoleaks noted by CTA and not noted by MRI
  - NO difference for Type I & III endoleaks

Guo Q et al., J Endovasc Ther 2016
EVAR: Endoleaks and Endotension

- Evaluation of 3D CEUS for detection of endoleaks
  - 100 paired CTA/3D CEUS

<table>
<thead>
<tr>
<th>Sens</th>
<th>Spec</th>
<th>+PV</th>
<th>-PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D CEUS vs CTA</td>
<td>99%</td>
<td>91%</td>
<td>90%</td>
</tr>
<tr>
<td>3D CEUS vs MDT*</td>
<td>96%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*MDT = Multidisciplinary Team w/ access to all imaging

3D CEUS can be very helpful in patients with sac expansion and diagnostic uncertainty on US or CTA


EVAR: Endotension

MANAGEMENT:

- Remains controversial
- Non-operative treatment if asymptomatic
- Management considered if continued growth >10mm in diameter.
- Endovascular relining if appropriate
- Conversion to open surgery has been increasingly used for good risk patients.

EVAR: Endotension

CONCLUSION

- Does it really exist or is it just a missed endoleak?
- Increasing device complexity and potential failure modes will increase the need for good imaging (like CEUS) to better understand endoleaks and etiologies of endotension.