Contrast Enhanced Ultrasound Eliminates The Need For CT Scans After EVAR

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Disclosures
• Philips Ultrasound: Research support
• Novartis: Consulting and research support

EVAR: Type II endoleak remains an issue

Long-Term Outcomes of Abdominal Aortic Aneurysm in the Medicare Population
Marc L. Schermerhorn, M.D., Dominique B. Buck, M.D., A. James O'Malley, Ph.D., Thomas Currer, M.D., John C. McCallum, M.D., Jerome Delfine, R.A., and Bruce E. Landen, M.D., M.B.A.

Table 3: Eight-Year Outcomes after Endovascular and Open Repair of Abdominal Aortic Aneurysm

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Endovascular Repair (N = 39,506)</th>
<th>Open Repair (N = 39,506)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>14,548 (54.6)</td>
<td>14,681 (45.7)</td>
<td>0.76</td>
</tr>
<tr>
<td>Rupture of aneurysm</td>
<td>962 (5.4)</td>
<td>353 (1.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Any aneurysm-related intervention</td>
<td>8,312 (4.6)</td>
<td>754 (2.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Major reintervention</td>
<td>582 (2.5)</td>
<td>216 (0.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Minor reintervention</td>
<td>3,624 (1.7)</td>
<td>557 (1.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Minor reintervention for embolization</td>
<td>1,857 (0.9)</td>
<td>161 (0.5)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Ultrasound for EVAR surveillance

• SIZE

• LEAKS
Maximum diameter measured according to center line

3D US better than 2D US for assessment of EVAR sac diameter as compared to 3D CT

Eur. J Vasc Endovasc Surg 2013

Comparison of Residual sac volume estimation of 3-D CT and 3-D US

Mean (ml)

Difference 3-D CT - 3-D US (ml)

Upper LoA = 13 ml
Lower LoA = -9 ml
Mean diff = 2 ml

Endoleak detection

• Type I: Attachment
• Type II: Sidebranches
• Type III: Structural
• Type IV: Structural

Minor Type II leak

Summary - size

• Ultrasound can assess size of EVAR sacs
• 3D determined diameter more accurate than 2D
• Volume reproducibility and accuracy by 3D ultrasound seems very accurate for sac size surveillance

Department of Vascular Surgery, Rigshospitalet

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Detection of endoleak by CEUS

- All patients 281 scheduled for EVAR-surveillance including a CTA scan were intended to be enrolled.
- Patients excluded (N=45):
  - Impaired renal function 12
  - Unwilling to participate 15
  - Complete sac shrinkage 6
  - Followed elsewhere 5
  - Pseudoaneurysm 4
  - Mesh-inlay 2
  - Respiration and bowel gas 1

Study V: Results of 236 patients included

<table>
<thead>
<tr>
<th>Ultrasound versus CTA</th>
<th>Contrast-enhanced US versus CTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>CT (+)</td>
</tr>
<tr>
<td>US (+)</td>
<td>29</td>
</tr>
<tr>
<td>US (-)</td>
<td>34</td>
</tr>
</tbody>
</table>

Sensitivity 45.3 (33.1 - 57.3) %
Sensitivity 84.1 (72.7 - 92.1) %
NPV* 82.0 (75.8 - 87.1) %
NPV 94.3 (89.7 - 97.2) %

*NPV: Negative predictive value

Missed Endoleak on US and CEUS

No re-intervention

Contrast-enhanced ultrasound (CEUS) versus computed tomography angiography (CTA) in detection of endoleaks in post-EVAR patients. Are delayed type II endoleaks being missed? A systematic review and meta-analysis.

Chung J(1), Kordzadeh A(1), Prionidis I(1), Panayiotopoulos Y(1), Browne T(1).

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(1)Department of Vascular and Endovascular Surgery, Mid Essex Hospital Services NHS Trust, Broomfield Hospital, Chelmsford, Essex CM1 7ET UK.

PURPOSE: The purpose of this systematic review is to assess the accuracy of contrast-enhanced ultrasound (CEUS) co-computed tomography angiography (CTA) for the detection of endoleaks within EVAR surveillance program.

MATERIAL AND METHODS: A systematic review in Pubmed, EMBASE and Cochrane database was performed. Articles assessing diagnostic accuracy and comparative modality (CTA + CEUS) for endoleak in adult patients within surveillance programs were retrieved. Methodological assessment was performed, using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool. The sensitivity and specificity of data were extracted and statistical analysis was performed using MetaDisc version 1.4.

RESULTS: Eight articles were found eligible (N=454 patients). The pooled sensitivity of CEUS at detecting endoleak is 0.914 (CI 0.866-0.949) and the pooled specificity is 0.782 (CI 0.741-0.820).

CONCLUSION: The CEUS with its dynamic nature and longer scanning window demonstrated to be a highly sensitive modality for endoleak detection in comparison to CTA in delayed endoleaks type II.
Endoleak detection by CEUS

Status

• It works - “No Brainer”
• Sensitivity good
  – Missed ones are generally minor and probably without clinical importance
• Specificity high! Endoleak seen is there and probably CT is wrong if not shown
• We have stopped CT after 3 months if fine, and continue surveillance with CEUS only.

Ultrasound for EVAR surveillance

• 3D superior to 2D for AAA diameter
• 3D US volume assessment works
• CEUS as good as or better than CTA
• NOT time consuming – few minutes
• Easy to learn
• “On cart” soon

Thank you for your attention