How TEVAR And EVAR Can Have A Detrimental Effect On The Heart: What Can Be Done About It

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NO DISCLOSURES RELATED TO THE TOPIC

EVAR and cardiovascular Outcome

• A non-significant tendency toward cardiovascular deaths was apparent in the EVAR trials in the endovascular group during the 24-month interval.

• Cardiovascular mortality was primarily due to the required secondary interventions.

ACE Study 2007
Survival free of reinterventions

French Endurant Registry (REF) 2017
Survival free of reinterventions

ACE Study 2007: Survival at 4 years


11/16/2018
French Endurant Registry (REF) 2017
Survival at 4 years

Survival rate at 4 years:

80% at 4 years

Courtesy J.P Becquemin, IMAO Sept. 2018

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Short-term vs. long-term MI following EVAR and Open AAA Repair

Stather et al British Journal of Surgery 2013; 100: 863–872

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Arterial Stiffness

Elastic arteries

Stiff arteries

Arterial stiffening results in increased pulse pressure, left ventricular hypertrophy, subendocardial ischemia, endothelial dysfunction and cardiac fibrosis

Liao J et al Curr Ather Reports 2014

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Pulse wave velocity (PWV) and arterial stiffness

Pulse wave velocity (PWV): the gold standard method of arterial stiffness measurement and a strong independent predictor of cardiovascular morbidity and mortality.

Cavalcante JL et al JACC 2011; Ben-Shlomo Y et al JACC 2013

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Changes in arterial stiffness in patients undergoing EVAR and TEVAR

Computational Fluid Dynamics

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Cardiovascular magnetic resonance elastography

Magnetic resonance elastography (MRE) is a phase-contrast magnetic resonance imaging technique that measures tissue stiffness non-invasively.

Khan S. et al NNR in Biomedicine. 2017

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Differential effects of stent-graft fabrics on arterial stiffness in patients undergoing EVAR

N=118 pts

Values of PWV and novel biomarkers at baseline and after 12 months

<table>
<thead>
<tr>
<th>Stent-graft fabric</th>
<th>PWV baseline (m/s)</th>
<th>PWV 12 months (m/s)</th>
<th>OPG baseline (ng/mL)</th>
<th>OPG 12 months (ng/mL)</th>
<th>IL-8 baseline (pg/mL)</th>
<th>IL-8 12 months (pg/mL)</th>
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<tbody>
<tr>
<td>PTFE</td>
<td>13.39 ± 3.25</td>
<td>15.91 ± 4.89</td>
<td>29.51 ± 13.22</td>
<td>27.71 ± 11.32</td>
<td>9.61 ± 1.98</td>
<td>11.65 ± 3.65</td>
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</tbody>
</table>

PWV, OPG and IL-8 increase was more pronounced in Polyester Woven group compared to PTFE group (p=0.033, p=0.048, p<0.001 respectively)


EVAR alters cardiac structure and function

<table>
<thead>
<tr>
<th>Cardiac parameter</th>
<th>Pre-op (n=39)</th>
<th>Post-op (n=39)</th>
<th>P value</th>
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<tbody>
<tr>
<td>Exercise tolerance</td>
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<tr>
<td>Increased baPWV</td>
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<tr>
<td>Induced left ventricular hypertrophy</td>
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<tr>
<td>Left atrial enlargement</td>
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<td>Impaired diastolic function</td>
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</table>

Takeda Y et al. Circ J 2014

Arterial stiffness and thoracic endografts

M, 79y; Symptomatic 8cm TAA; Medtronic VALIANT Thoracic 40240, 40246
PWV and NT-proBNP changes in pts following TEVAR

Endovascular treatment of descending thoracic aortic aneurysms was associated with significantly increased NT-proBNP levels and arterial stiffness.

An increased cardiac risk for patients with already impaired cardiac compensatory mechanism?

Conclusions (I)

- TEVAR and EVAR are associated with lower perioperative mortality and morbidity rates compared to open surgical repair BUT this advantage is blunted at long term, mainly due to an increase in cardiovascular complications.

- Arterial stiffening together with adverse cardiac function after stent graft implantation may explain this change in the long-term outcome.

Conclusions (II)

- There is evidence of increased arterial stiffness after EVAR related to graft type (polyester more than PTFE).

- Arterial stiffness should be taken into consideration by the industry when designing new endografts. In the meantime patients after endovascular treatment of aneurysms are in need of intensive cardiac follow up.

Thank you for your attention