The Underlying Mechanism of Type II Endoleaks Associated with Sac Enlargement: What is the Impact on How They should be diagnosed and Treated

Type II Endoleaks Can be dangerous

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WHEN TO TREAT Type II Endoleaks?
The answer has changed steadily over the years gradually favoring a more conservative approach

The current recommendation:

- **Rx confirmed Type II Endoleaks ONLY when associated with AAA sac Enlargement!**

Eliminates many unnecessary re-interventions

The Care of Patients with an Abdominal Aortic Aneurysm: The Society for Vascular Surgery Practice Guidelines

We suggest treatment of Type II endoleaks associated with aneurysm expansion.

- Level of recommendation: Weak
- Quality of Evidence: Low

We recommend surveillance of Type II endoleaks not associated with aneurysm expansion.

- Level of recommendation: Strong
- Quality of Evidence: Moderate

Intra Sac Pressure Measurements

**Before Implantation**

- Type I Endoleak: High
- Type II Endoleak: Low
- No Endoleaks: Very Low

Why the distinction between Type II Endoleaks WITH or WITHOUT SAC EXPANSION?

*Because it is most likely related to Sac Pressure*
Resolution of Endoleak Reduces the Intra Sac Pressure

WN EVAR 2008. Type II Lumbar Endoleak

- 2010 Type II Lumbar
  - Mean 56
  - Pulse 13

- 2011-2015 resolved @3 yrs
  - No more leaks by duplex
  - Mean 22
  - Pulse 9

Treatment Reduces the Intra Sac Pressure

WC. EVAR 2008. Type II IMA Endoleak

- 2012 Type II IMA
  - Mean 61
  - Pulse 21

- 2013 IMA Coiled
  - Mean 21
  - Pulse 6

Evidence suggests that Type II Endoleaks have a relatively benign Natural History

- 2/3 resolve spontaneously by 6 months

2004: We had Type II Endoleaks All figured out

Effectiveness of coiling in the treatment of endoleaks after endovascular repair

- Houlon 2001: 18 Persistent > 6M, 89% Resolution
- Lieuwald 2001: 13 Persistent >6M, 69% Resolution
- Baum 2002: 13 Presence of T2, 92% with translumbar
- Faries 2003: 16 Presence of T2, 88% Resolution
- Sheehan 2004: 19 Persistence >6 M, 79% Resolution/no growth

2017: Many Things have changed

Conservative management of Type II endoleaks has become the norm unless AAA sac enlarging.

but more interestingly

The effectiveness of any Type II endoleak treatment has come into serious question
**Type II Endoleaks with Sac Expansion are Different**

Outcomes of percutaneous endovascular intervention for type II endoleak with sac expansion

Abdulhammed Ateh, MD; Chistina O. Monac, MD; Luis A. Sanchez, MD; Daniel Fieno, MD; Nad Saud, MD; Brian G. Robins, MD; John A. Cupul, MD; and Patrick J. Gragnani, MD. *Vasc. Med.* 2014; 19: 1-7

- 42 patients with type II and Sac Expansion Rx.
- Success Rate: 28%
- Occult Type I or III endoleaks in 21%

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**Type II Endoleaks with Sac expansion are different**

Type II endoleak with or without intervention after endovascular aortic aneurysm repair does not change aneurysm-related outcomes despite sac growth

Joy Walker, MD; Lee Yen Thatcher, BA; Philip Goodney, MD; Todd Campbell, MD; Hong Hua, MD; Steven Okhat, MD; Bradley Hill, MD; and Robert W. Chang, MD. *J Vasc Surg.* 2014; 59: 930-7

- 1412 patients
- Type II endoleaks have more growth and lead to many interventions that seem ineffective in stopping the expansion and eliminating the endoleaks compared to those left alone.

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**2016: Results of Rx of type II Rx**

We noticed that our success rate in coiling Type II endoleaks started falling and is now around 40%

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<tbody>
<tr>
<td>Sarac 2012</td>
<td>95</td>
<td>&gt; 5mm sac growth</td>
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<tr>
<td>Abularrage 2012</td>
<td>51</td>
<td>80% with sac growth</td>
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<tr>
<td>Aziz 2012</td>
<td>42</td>
<td>Sac growth</td>
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<tr>
<td>Walker 2015</td>
<td>111</td>
<td>74% with sac growth</td>
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**The Explanation probably lies in either**

- Type II Endoleaks form a heterogeneous group: Anatomic origin and number of branches
  Intra sac pressure
  or
- Type II Endoleaks with Sac enlargement may be different than the usual type II's and may be associated with occult Type I or III endoleaks
Can Occult Endoleaks account for sac expansion?

Illustrative case. EVAR Zenith Dec 2005

2 Month Feb 2006. Lumbar Type II endoleak 65 x 71 mm

8 Month Aug 2006. Lumbar Type II endoleak. 61 x 66 mm (shrinking)

31 Months Nov 2008
75 x 72 mm Expansion

Jan 2009
No clear endoleak
75 x 72 mm

Dec 2009
76 x 77 mm enlarging
Type III endoleak????

Jun 2011 (18 months)
No endoleak. 76 x 77 mm

Stable for 5 years since

Can Occult Endoleaks account for sac expansion?

Illustrative case. EVAR Zenith Dec 2005

Jan 2010
Type III endoleak covered

Jun 2011 (18 months)
No endoleak. 76 x 77 mm

Stable for 5 years since

New UPMC Review

- 2000-2014
- All Patients who were TREATED for endoleaks
- 329 procedures in 178 patients
- 86% Male
- All available CT scans reviewed
- Mean FU: 7.1 ± 4.4 years

New UPMC Review

Selected Results

- Of 107 patients with initial diagnosis of Type II
  28 (26%) ultimately treated for type I or III
  19 after initial Type II treatment
  9 only Rx for Type I or III
- In 98 patients treated first for a Type II
  Rate of growth until type II treatment significantly
  associated with occult Type I or III endoleak (p=.028)
  ≥ 5mm/year 36.8%
  < 5mm/year 13.8%
Summary

- Type II endoleaks with sac expansion have a different natural history.
- Occult Type I or III endoleaks must be ruled out when sac expansion exists with a Type II endoleak especially:
  - If rate of growth is fast
  - If initial Rx fails to eliminate expansion

A high index of suspicion is necessary.