

What are the best means to detect them: CT scan, Duplex or MRI

FRANS MOLL

Joost van Herwaarden

Faculty Disclosure

Frans Moll

I disclose the following financial relationships:

Consultant for “Best Doctors”

Je déclare les informations suivantes : je suis consultant pour la société XYZ, employé de la Société ABC, je reçois des fonds/support pour mes recherches de la société ACME, fais partie du comité de direction de la société ACE, je parle pour la société DRUG, je suis actionnaire majoritaire de la société ABC OU je n'ai **aucune relation financière** à déclarer.

Still some concerns about EVAR



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Predictors of Abdominal Aortic Aneurysm Sac Enlargement After Endovascular Repair

Andres Schanzer, Roy K. Greenberg, Nathanael Hevelone, William P. Robinson,
Mohammad H. Eslami, Robert J. Goldberg and Louis Messina

(Circulation. 2011;123:2848-2855.)

- Reported 5-year rate of sac enlargement is 41% (M2S imaging database, 10 228 pts)

Causes of Sac Enlargement



- Type I Endoleak
- Type II Endoleak
- Type III Endoleak
- Type IV Endoleak
- Endotension

Causes of Sac Enlargement



- Type I Endoleak → Treatment
- Type II Endoleak → ?
- Type III Endoleak → Treatment
- Type IV Endoleak → Treatment
- Endotension → Debate

Causes of Sac Enlargement



- Type I Endoleak → Treatment
- Type II Endoleak → ?
- Type III Endoleak → Treatment
- Type IV Endoleak → Treatment
- Endotension → Conservative

Persistent type 2 endoleak after endovascular repair of abdominal aortic aneurysm is associated with adverse late outcomes

John E. Jones, MD, Marvin D. Atkins, MD, David C. Brewster, MD, Thomas K. Chung, MA, Christopher J. Kwolek, MD, Glenn M. LaMuraglia, MD, Thomas M. Hodgman, BA, and Richard P. Cambria, MD, *Boston, Mass*

(J Vasc Surg 2007;46:9-15.)

- 873 patients:
- Freedom from rupture at 5 years: 91.1% with type 2 endoleak vs 97.4% without type 2 endoleak.
- Multivariate analysis demonstrated persistent type 2 endoleak to be a significant predictor of aneurysm rupture (P = .03)

Aneurysm Rupture after EVAR: Can the Ultimate Failure be Predicted?

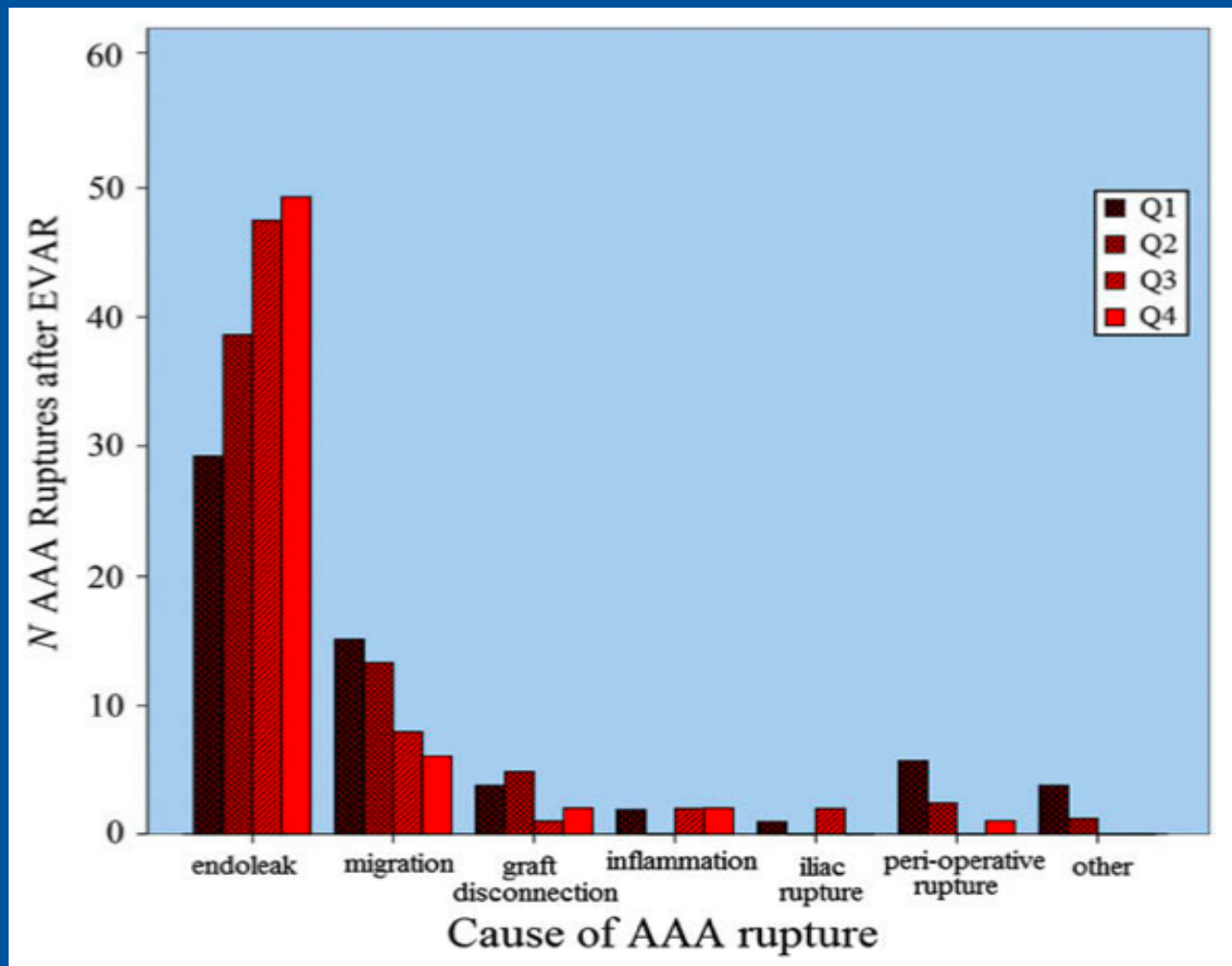
F.J.V. Schlösser^a, R.J. Gusberg^a, A. Dardik^a, P.H. Lin^b, H.J.M. Verhagen^c,
F.L. Moll^d, B.E. Muhs^{a,*}

Eur J Vasc Endovasc Surg (2009) 37, 15–22

- Review of Literature
- 270 patients with RAAA after EVAR Identified
- Endoleak is the main cause of post EVAR rupture

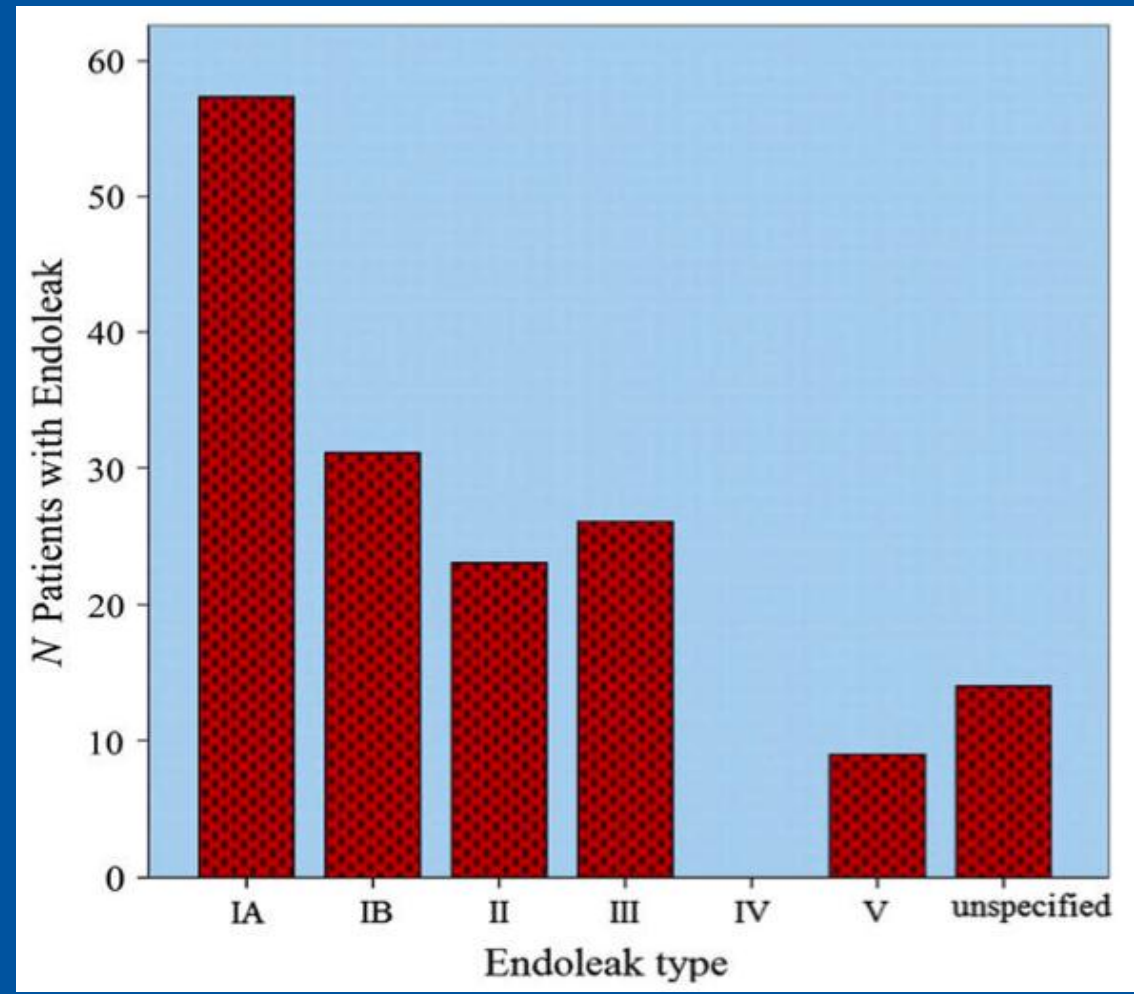
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Rate and Predictability of Graft Rupture After Endovascular and Open Abdominal Aortic Aneurysm Repair

Data From the EVAR Trials

Thomas R. Wyss, MD, Louise C. Brown, PhD, Janet T. Powell, MD, and Roger M. Greenhalgh, MA, MD, MChir, FRCS

(Ann Surg 2010;252:805–812)

- **Annual Rupture risk**
 - **0.4% without endoleak/ migration**
 - **2.4% when Type I Endoleak / migration / Type II with sac growth**

So,.....



- **Better imaging is needed**
 - **to detect more Type II endoleaks in patients with AAA sac enlargement**
 - **To identify the multiple sources of flow into the AAA sac (to improve embolization therapy)**



Type II endoleak detection

- Duplex Ultrasound (DU)
- Contrast Enhanced Ultrasound (CEUS)
- CT Angiography
- MR / MRA
- DSA

Duplex with Levovist



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- . late nineties
- . compared with CTA as goldstandaard'
- . too sensitive, too many patients 'accused' of having an Endoleak
- . too much scattering

communication Tutein Nolthenius & Moll 1999

MRI



<i>Author, journal, year</i>	Number of scan pairs	Total nr of endoleaks on MRI / CTA	Nr of Type II on MRI / CTA	Sens. MRI	Spec. MRI
<i>Haulon, Eur. J. Vasc. Endovasc. Surg., 2001</i>	31	18 / 10	17 / 9	94%	83%
<i>Cejna, Eur. Radiol., 2002</i>	18	9 / 8	6 / 5	NR	NR
<i>Van der Laan, Eur. J. Vasc. Endovasc. Surg., 2006</i>	35	23 / 11	6 / 3	NR	NR
<i>Alerci, Eur. Radiol., 2008</i>	43	22 / 11 24 / 12	19 / 10 13 / 7	100% 95%	92% 81%
<i>Cornelissen, Invest. Radiol., 2010</i>	11	6 / 0	1 / 0	NR	NR
<i>Cantisani, Eur. J. Vasc. Endovasc. Surg., 2011</i>	108	24 / 20	21 / 18	96%	100%

- Might even be better with a blood pool contrast agent.
- Blood pool contrast agents bind to Albumin: which provide longer serum half-life
- Possibility of “very late phase”

Detection of Occult Endoleaks After Endovascular Treatment of Abdominal Aortic Aneurysm Using Magnetic Resonance Imaging With a Blood Pool Contrast Agent

Preliminary Observations

Sandra A. P. Cornelissen, MD, MSc, Mathias Prokop, MD, PhD,* Hence J. Verhagen, MD, PhD,†
Miraude E. Adriaensen, MD, MSc,‡ Frans L. Moll, MD, PhD,§ and Lambertus W. Bartels, PhD**

(Invest Radiol 2010;45: 548–553)

- **12 pts with stable/ growing Sac w/o EL on CTA**
- **Gadofosveset trisodium (Vasovist[®], Bayer Schering Pharma, Berlin)**
- **T1-weighted images acquired before / 3 min / 30 min**
- **After 3 min: 2 EL, 2 possible EL**
- **After 30 min: 6 EL, 1 possible EL**

Detection of occult endoleaks

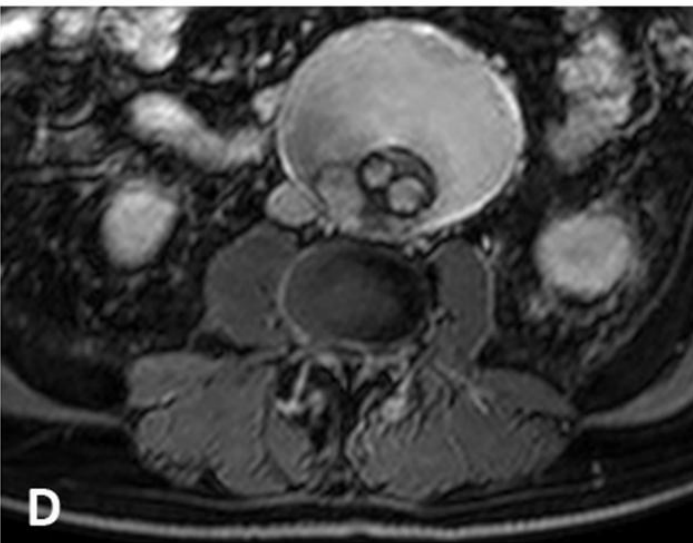
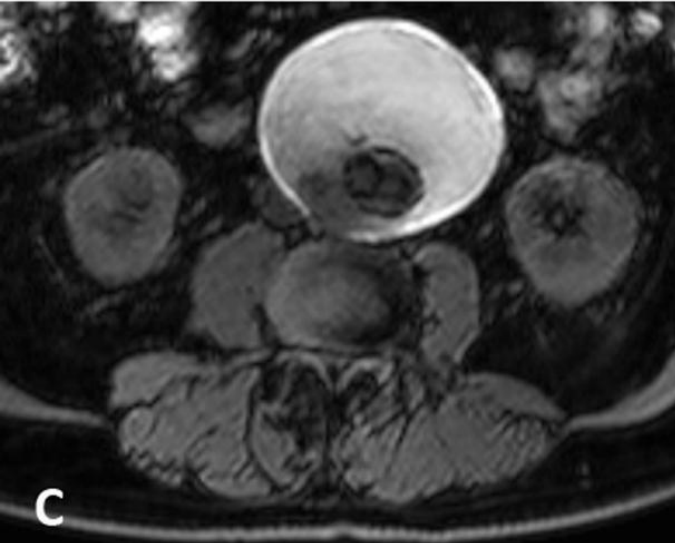
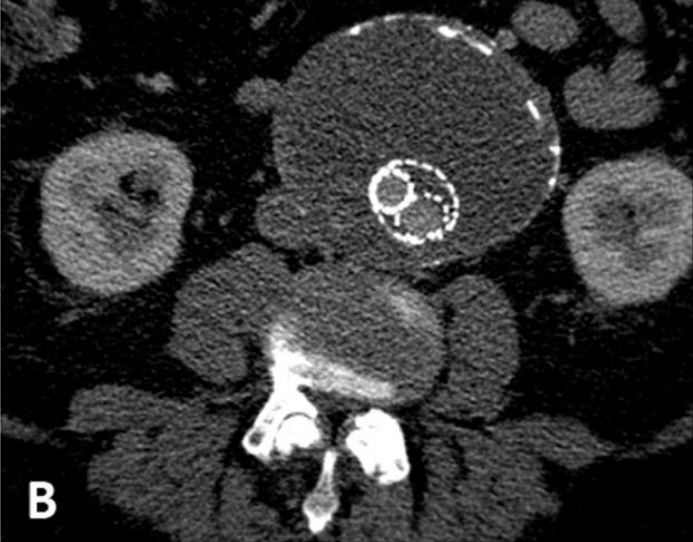
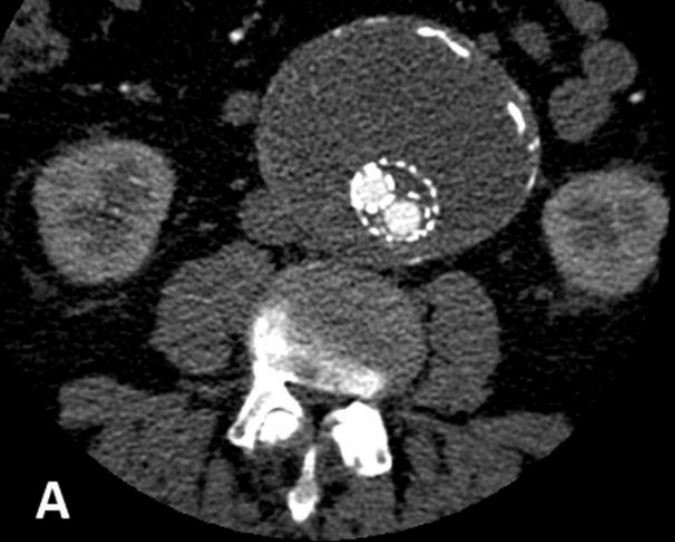


- However, since Vasovist was no longer available, another contrast agent was needed to continue this promising research

- **Multihance[®] (gadobenate dimeglumine, Bracco, Italy)**
weak albumin-binding contrast agent
- **Patients after EVAR with continued AAA growth and no or uncertain endoleak at CTA**

- **1.5-T clinical scanner (Ingenua (R4.2), Philips Healthcare, Best, The Netherlands)**
- **Presence of endoleaks is assessed by comparing pre-and post-contrast T1-weighted images**
- **Post-contrast images 5 and 15 minutes after contrast administration**

Examples



Examples



Contrast: APPLIED

Gantry#: 0°

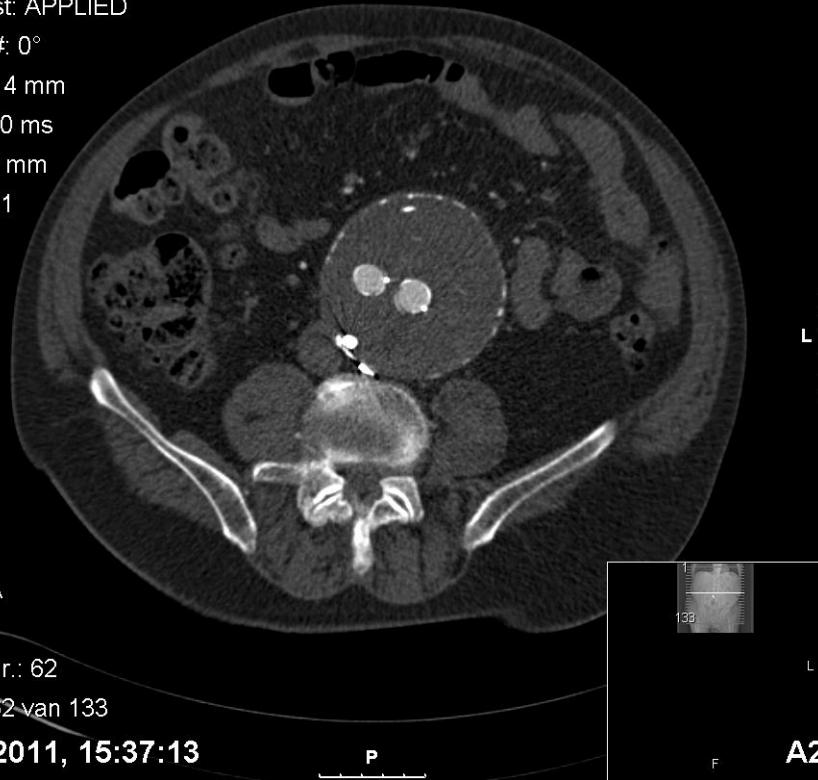
FoV: 414 mm

Tijd: 500 ms

Slice: 3 mm

Pos: 121

FFS



F: B25f

267 mA

100 kV

Beeld nr.: 62

Beeld 62 van 133

5-10-2011, 15:37:13

A2

Seq: RM

Slice: 4 mm

Pos: 82

TR: 0

TE: 0

AC: 1

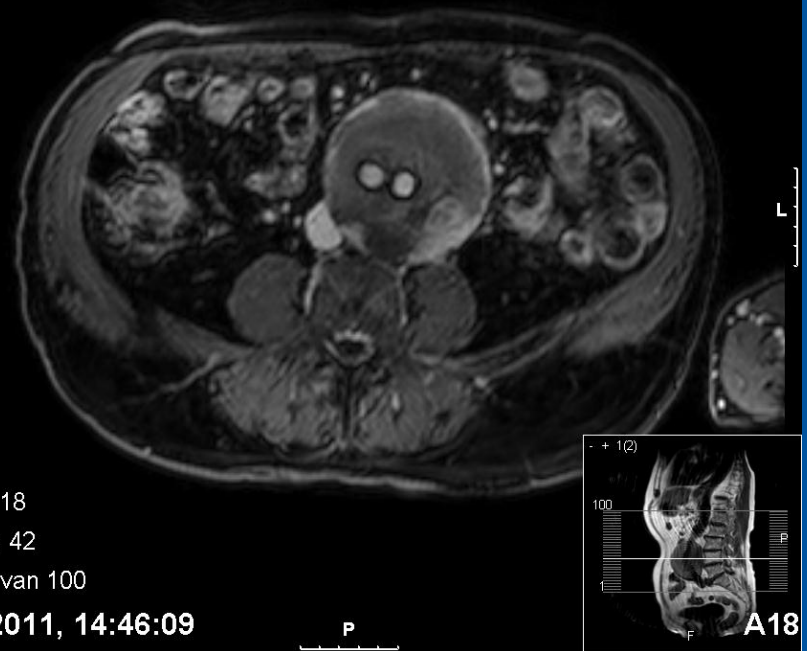
HFS

Scan no: 18

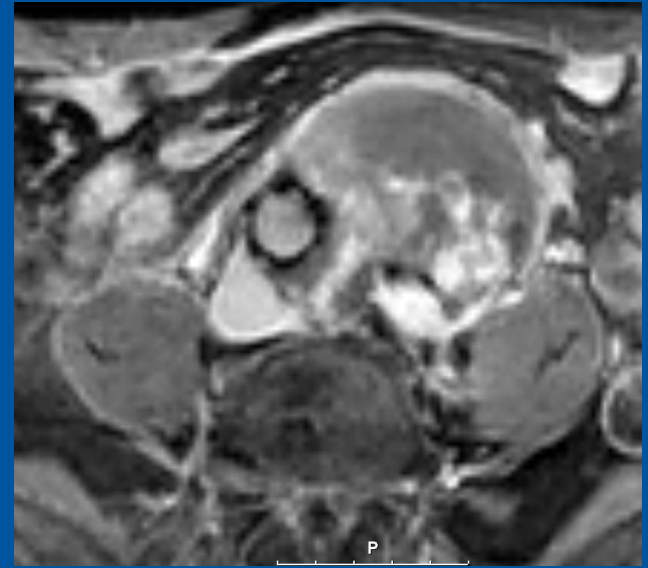
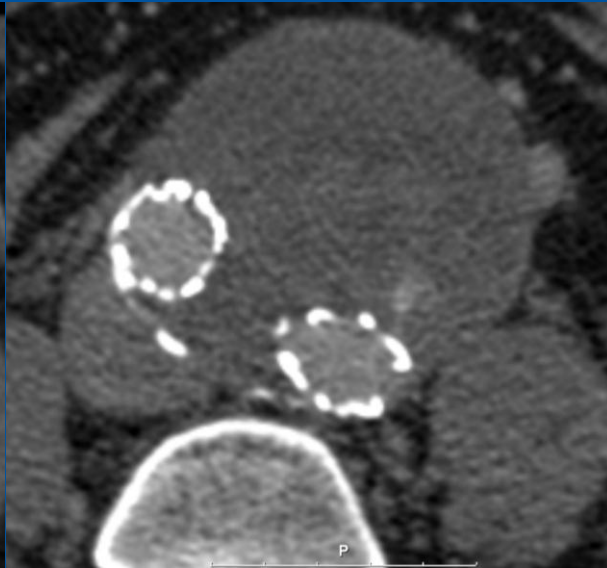
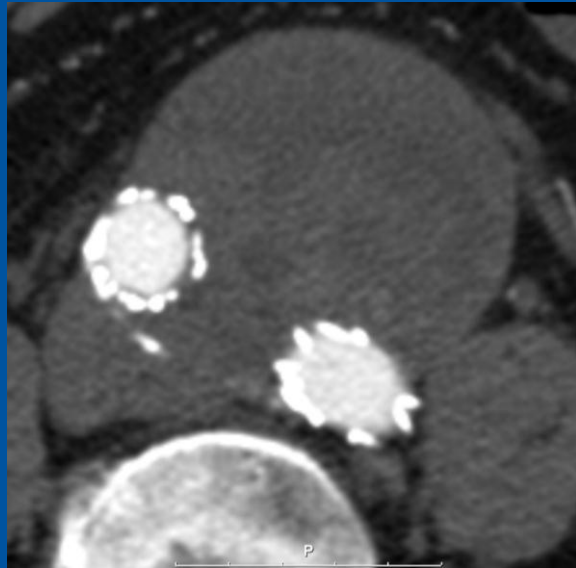
Beeld nr.: 42

Beeld 42 van 100

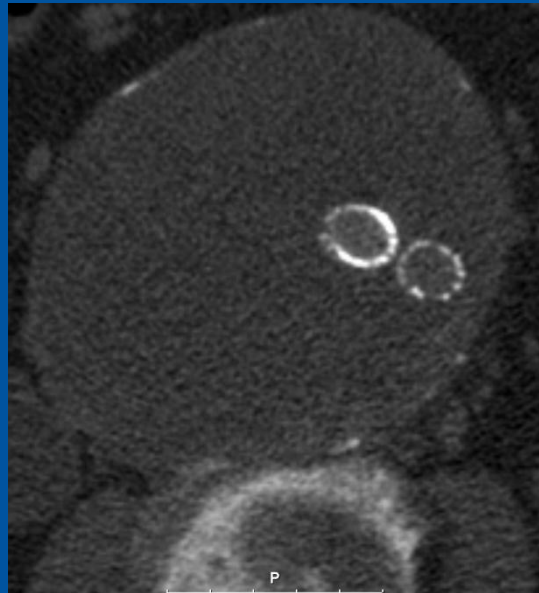
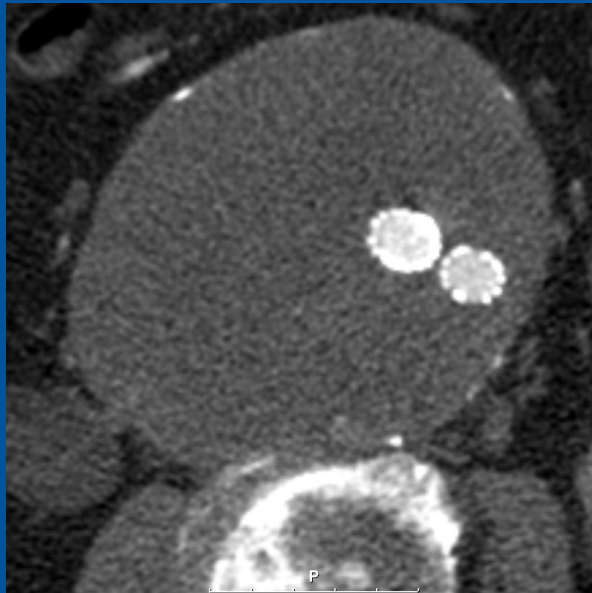
18-11-2011, 14:46:09



Examples



Examples



Conclusions



- In patients with Aneurysm Sac enlargement after EVAR & Type II endoleak the annual rupture risk is significant
- Treatment of those type II endoleaks is indicated for most patients
- However, longterm results from transarterial and translumbar embolization are poor

Conclusions



- Imaging should be improved to detect more type II endoleaks and to detect more feeding vessels for better embolization
- MRI with blood pool contrast agent might give the needed improvement.
- But, not all patients and stentgrafts are MRI compatible & nothing of the effect of this better imaging on the outcome of EVAR is proven yet...

