

UNITED STATES
DEPARTMENT OF VETERANS AFFAIRS



Late Complications of EVAR and Management

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Case Presentation

- 74 year old male presents with intermittent abdominal pain x 4 month duration on 7/21/2011
- Abdominal pain-dull and distention
- PMH: HTN, hyperlipidemia, GERD
- PSH: Open AAA repair -1999
- SH: 6 cigars per week; denies ETOH or IVDA

Case Presentation

VS: T 98.8 HR 67 RR 16

BP 148/68

CV: RRR, S1S2 normal

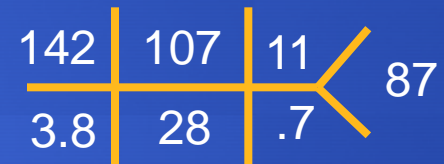
Pulm: Clear to auscultation b/l

GI: soft nontender,
nondistended

Vascular: -pulses

- 2+ femoral bilaterally
- 2+ popliteal bilaterally
- 2+ left DP and PT
- 1+ right DP and PT

- CTA (7/21) : 4.3cm infrarenal abdominal aortic aneurysm and a 7.5cm x 3 cm right common iliac artery aneurysm





A

R



500 Exposure Time

KVP 120
303 mAs
CE

Protocol:AAA DISSECTION PRE/POST

RY

A

R



R



500 EXPOSURE TIME
266
SERIES #4
2.00 MM
IMAGE #134/213
630072111-15924

KVP 120
341 MAS
CE

Protocol:AAA DISSECTION PRE/POST

R



500 EXPOSURE TIME
302
SERIES #4
2.00 MM
IMAGE #152/213
630072111-15924

KVP 120
341 MAS
CE

Protocol:AAA DISSECTION PRE/POST

7/21/2011 16:21:44

A

R

500 EXPOSURE TIME
4
SERIES #8
2.00 MM
IMAGE #50/125
630072111-15924

KVP 120
235 MAS
CE

Protocol:AAA DISSECTION PRE/POST



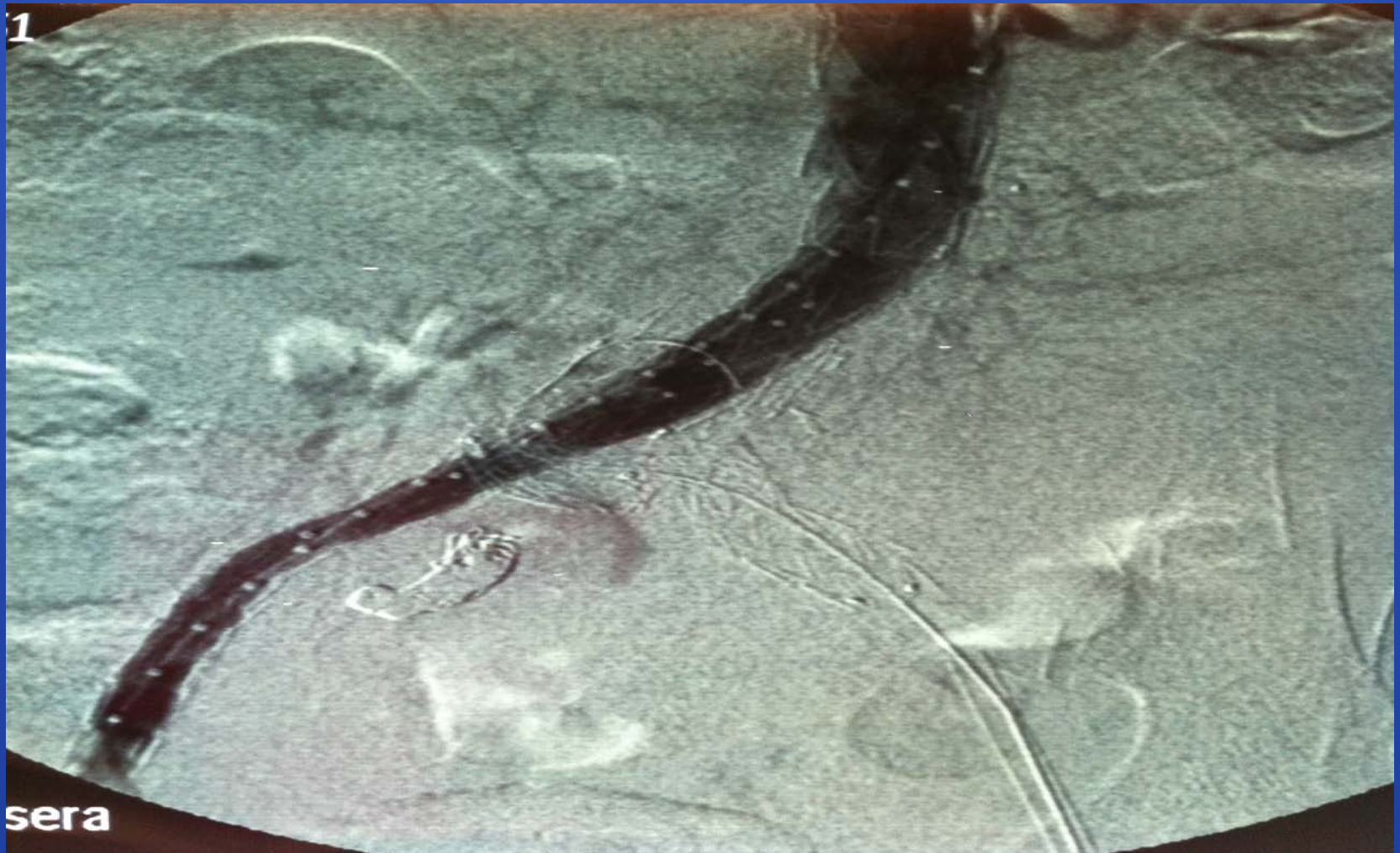
Case Presentation

- 7/29/2011- Coil embolization of right internal iliac artery and aortogram



Case Presentation

- 8/12- Endovascular repair of abdominal aortic aneurysm with femoral-femoral bypass



Postoperative Course

- POD #0- BP 220/90
 - Nitroglycerin drip initiated
 - Labetalol drip
- POD#1-2: Remained hypertensive and abdominal distention with pain
- POD#2- CTA Lactate: 0.6
 - Stent migration with occlusion of the left renal artery and partial obstruction of the SMA



500 EXPOSURE TIME
104
SERIES #6
1.00 MM
IMAGE #131/496
630081411-896

KVP 120
389 MAS
CE

Protocol: AAA ENDOGRAFT/STENT PLACEMENT



A

R

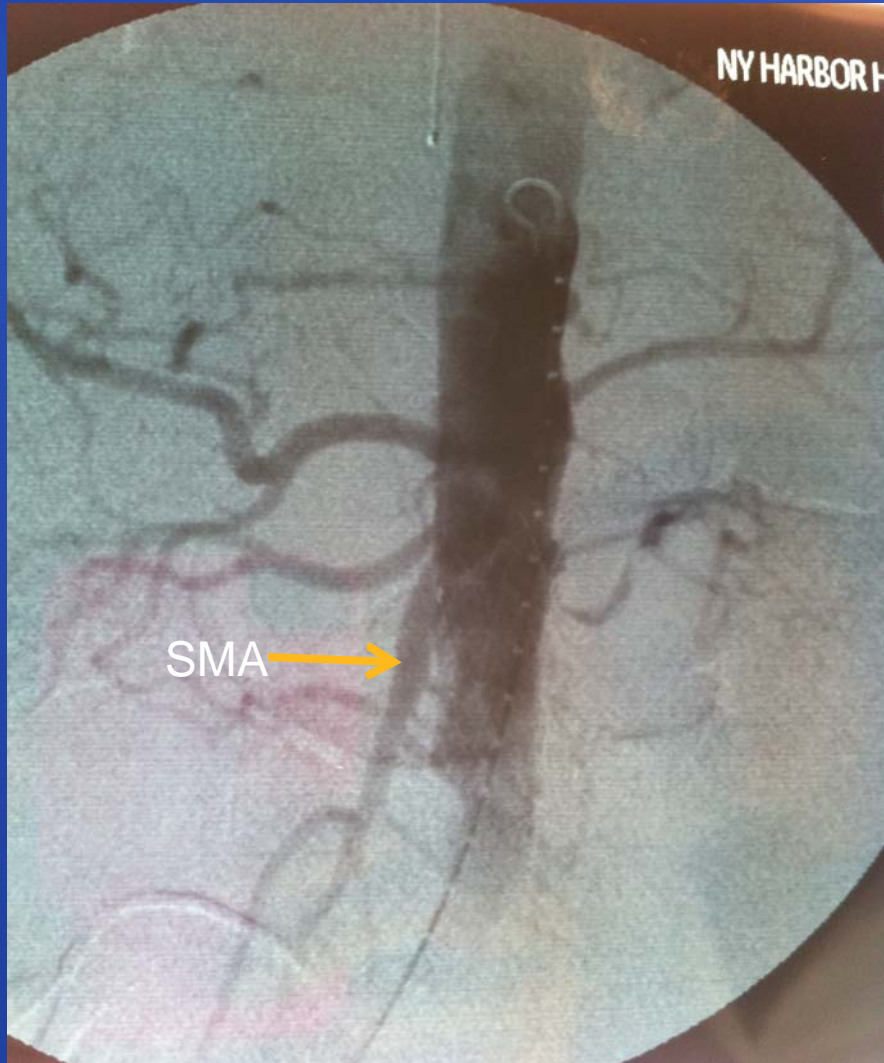


500 EXPOSURE TIME
115.2
SERIES #6
1.00 MM
IMAGE #145/496
630081411-896

KVP 120
387 MAS
CE

Protocol:AAA ENDOGRAFT/STENT PLACEMENT

Postoperative Course



- 8/14- Aortogram
- The fabric of the stent graft was covering the left renal artery
- Strut was at the level of the superior mesentery artery.
- The superior mesentery artery was cannulated
- NO flow compromised to SMA or right renal artery

Postoperative Course

- POD#5- abdominal distention decreased and clear liquid diet begun and advanced as tolerated
- Blood pressure controlled on oral labetalol
- Discharged on POD#10
- POD#25- Doing just fine...

We will discuss...

- Post operative surveillance
- Endoleaks
- Device Migration
- The future
- What is the best test?



Postoperative Complications

- Follow:
 - Size changes in aneurysm sac
 - Device migration and endoleak
- Changes in the aneurysm may lead to:
 - Angulation
 - Kinking
 - Thrombosis
 - Migration of endograft

Postoperative Surveillance

- Radiographic follow up:
- CTA at 1, 6, 12 months
 - ↓ **Normal**
- Then every year
- Evidence- based protocols for long term surveillance are lacking
- MRA
- Abdominal duplex ultrasonography
 - Limited data
- Angiography
 - Limb – flow abnormality
 - Documented endoleak

Endoleaks

- Persistent flow of blood into an aneurysm sac after endograft placement
- Most common cause of secondary interventions and aneurysm-related morbidity

| Type | Description |
|------|---|
| I | Inadequate seal at proximal (Ia) or distal (Ib) attachment site |
| II | Flow into the aneurysm sac from an aortic branch vessel |
| III | Endograft fabric tear or failure of seal between graft components |
| IV | Endograft fabric porosity |



Type I Endoleak

- Factors contributing:
 - Undersizing or oversizing the endograft
 - Severe aortic neck angulation
 - Deploying a device to seal a heavily calcified aortic wall or lined with circumferential thrombus
- Due to changes in the configuration of the aorta as the sac diameter decreases over time

Type Ia Endoleak



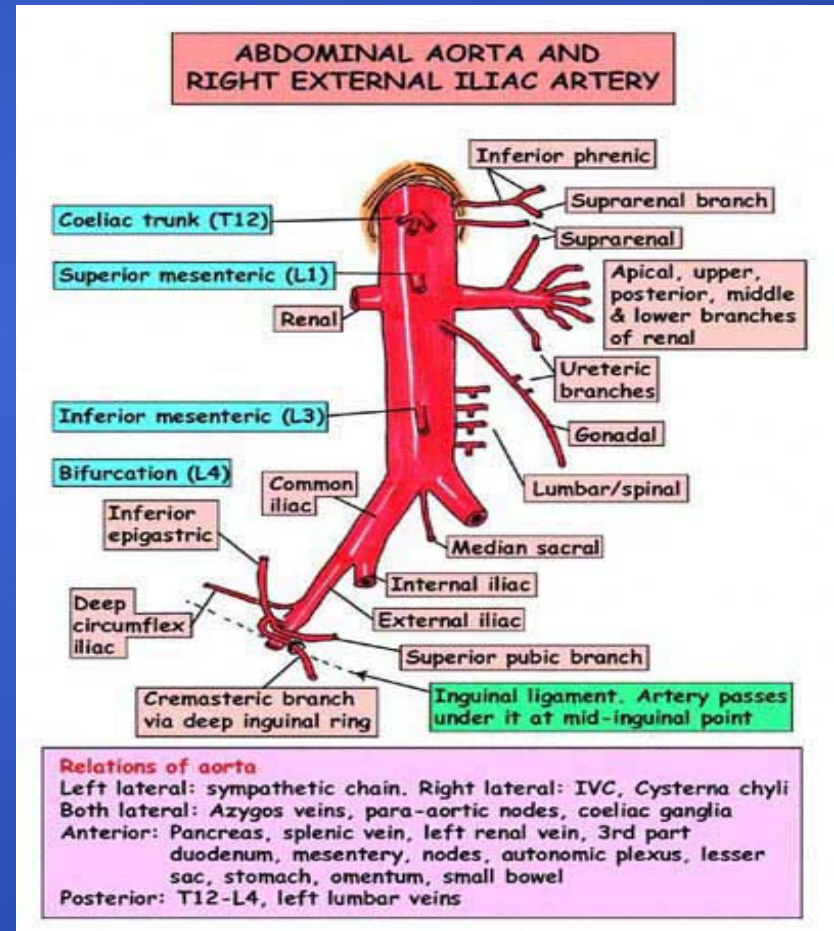


Type I Endoleak Management

- Repaired immediately
 - Obliterated by use of proximal or distal extension grafts
- Rarely close spontaneously
- Conversion to an open surgical repair and explantation of endograft
 - Mortality – 30%

Type II Endoleak

- **MOST COMMON** – 25%
- Cause:
 - Retrograde flow into the aneurysm sac from a patent aortic branch vessel – IMA or a lumbar artery
- Imaging:
 - Collections of contrast within the aneurysm sac but outside the endograft wall





(a)



(b)



Type II Endoleak Management

- Controversial
- Spontaneous resolution in 30-90% cases
- Operate if increasing size of aneurysm sac
- Treatment:
 - Percutaneous translumbar or transarterial coil embolization
 - Laparoscopic clipping of the feeding vessel



Type III and Type IV

- **Type III**

- Separation between modular endograft components or because of erosion/tears in the endograft fabric
- Treatment:
 - Stents

- **Type IV**

- Egress of blood through the pores in the fabric
- Treatment:
 - Resolve spontaneously with reversal of anticoagulation



Endotension

- Type V endoleak
- Elevated aneurysm sac pressure leading to sac expansion in the absence of a radiographically documented endoleak
- Mechanism- multifactorial
 - Low-flow endoleak → thrombus accumulation
 - Accumulation of protein-rich fluid in aneurysm sac after exclusion
 - Transmission of systemic pressure through the endograft wall to thrombus lining the sac

Management of Endotension

- Largely undefined
- Fenestration of the aneurysm sac
- Conversion to an open repair
 - 20-30% mortality



Device Migration

- Leads to endoleak, stent fracture, aneurysm expansion, and rupture
- Device specific and related to mechanism of fixation
- Risk factors:
 - Short proximal aortic neck length
 - Dilation of aortic neck over time
 - Severe proximal neck angulation
 - Endograft oversizing (>30%)
 - Presence of thrombus at the proximal aortic neck



Non-Contrast CT is comparable to Contrast-enhanced CT for aortic volume analysis after EVAR *Eur J Vasc Endovasc Surg* (2011) 41, 460-466

- Retrospective analysis; 316 patients (2005-2006)

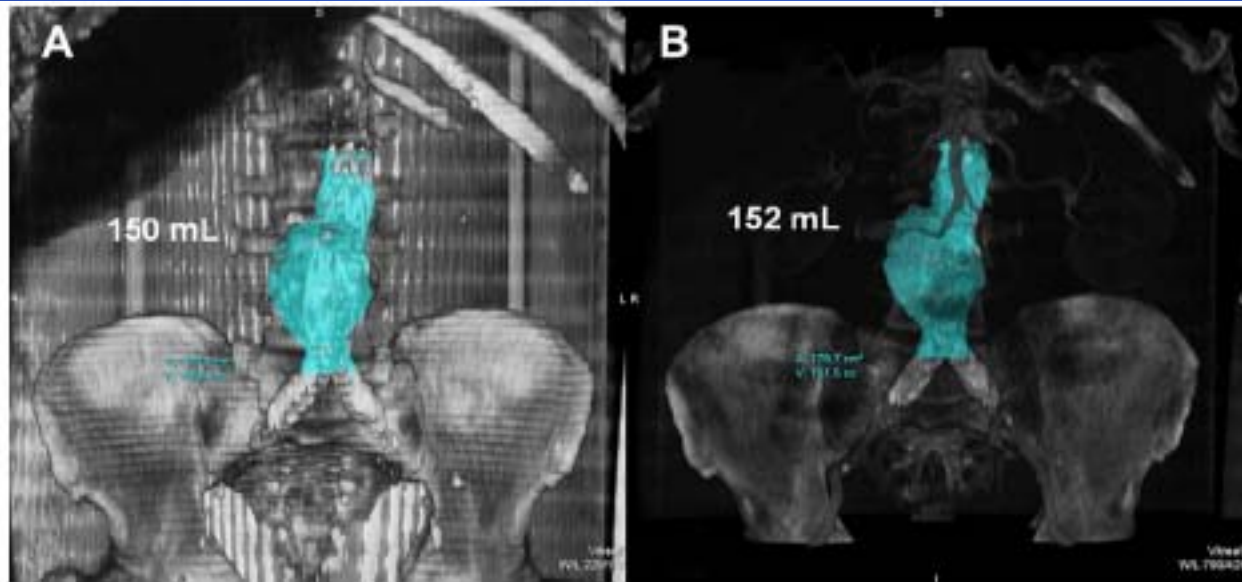


Figure 1 Aortic volumes obtained with noncontrast computed tomography (A) and contrast-enhanced computed tomography (B).



Correlation between aortic volumes

Table 1 Intraclass correlation coefficient for intra-observer and inter-observer reproducibility of aortic volume measurements obtained with noncontrast and contrast-enhanced computed tomography.

| Type of reproducibility | ICC (95% CI) | |
|-------------------------|-----------------------|-----------------------|
| | Noncontrast CT | Contrast-enhanced CT |
| Intra-observer | 0.998* (0.994, 0.999) | 0.996* (0.988, 0.998) |
| Inter-observer | 0.998* (0.991, 0.999) | 0.998* (0.994, 0.999) |

ICC, Intraclass correlation coefficient; CI, confidence interval; CT, computed tomography.

* $P < 0.0001$ for all ICCs.



Study Conclusion

- AV obtained from NCCT is accurate and comparable to the obtained CECT
- No consensus on what constitutes a significant change in AV
- Promising for patients with CKD

In the Future...

- Improvement in endograft technology
 - Anaconda device
 - Aptus endograft



In Summary...

- CTA is currently the gold standard radiographic modality
- Type II Endoleaks are the most common
- Type I and III endoleaks needs operative intervention
- CTA is currently the gold standard radiographic modality

References

- Rutherford's Vascular Surgery, 7th edition
- Schwartz's Principles of Surgery
- The influence of thrombus, calcification, angulation and tortuosity of attachment sites on the time to the first graft-related complication after endovascular aneurysm repair. Wyss TR, Dick F, Brown LC, Greenhalgh RM. J Vasc Surg. 2011 Jun 29.
- Non-Contrast CT is comparable to Contrast-enhanced CT for aortic volume analysis after EVAR *Eur J Vasc Endovasc Surg* (2011) 41, 460-466
- Sheehan MK, Ouriel K, Greenberg R, McCann R, Murphy M, Fillinger M, et al. Are type II endoleaks after endovascular aneurysm repair endograft dependent? J Vasc Surg 2006;43(4):
- Veith FJ, Baum RA, Ohki T, Amor M, Adiseshiah M, Blankensteijn JD, et al. Nature and significance of endoleaks and endotension: summary of opinions expressed at an international conference. J Vasc Surg 2002;35(5):1029e35.