Type 2 Endoleak after EVAR
How to decide Intervention and How?

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EVAR
To Prevent Rupture

Preferred Approach for anatomically suitable AAA

Minimally invasive : mortality and morbidity and LOS

Initial benefits appear to reduce with time

Increase in reintervention rates Commonest endoleak

Convergence of mortality after 4 yrs

One reason Increase is late aneurysm rupture

	Trial/Author	Year	N	Follow-Up Years (Mean or Median)	Secondary Procedures (% of Patients)
RCTs	EVAR-1	2010	626	6	23
	EVAR-2	2010	197	3.1	28
	DREAM	2010	173	6.4	28
	OVER	2009	444	1.8	10
Case Control Studies	Carpenter	2010	157	1.8	8.9
	Conrad	2010	832	2.9	11
	Mehta	2010	1,768	2.8	18
	AbuRahma	2009	238	2	26
	Dias	2009	279	4.5	20
	Abbruzzese	2009	565	2.5	11
	Pitoulias	2009	617	3.8	23
	Kim	2008	310	3.3	19
	Schermerhorn	2008	22,830	4.0	9.0
			Total	**3.5 Years**	**18%**

Type II Endoleak

Type II endoleak Backflow from aortic collaterals into the aneurysmal sac

Most common : 50% of all Endoleaks

10-50% of patient

Vessels: Lumbar, IMA, Median Sacral, Accessory Renal arteries

Simple : inflow and outflow single vessel Type IIa

Complex: Nidus of involved vessels Mimic AV malformation Type IIb

Types : Transient <6m 60% resolve in 1m

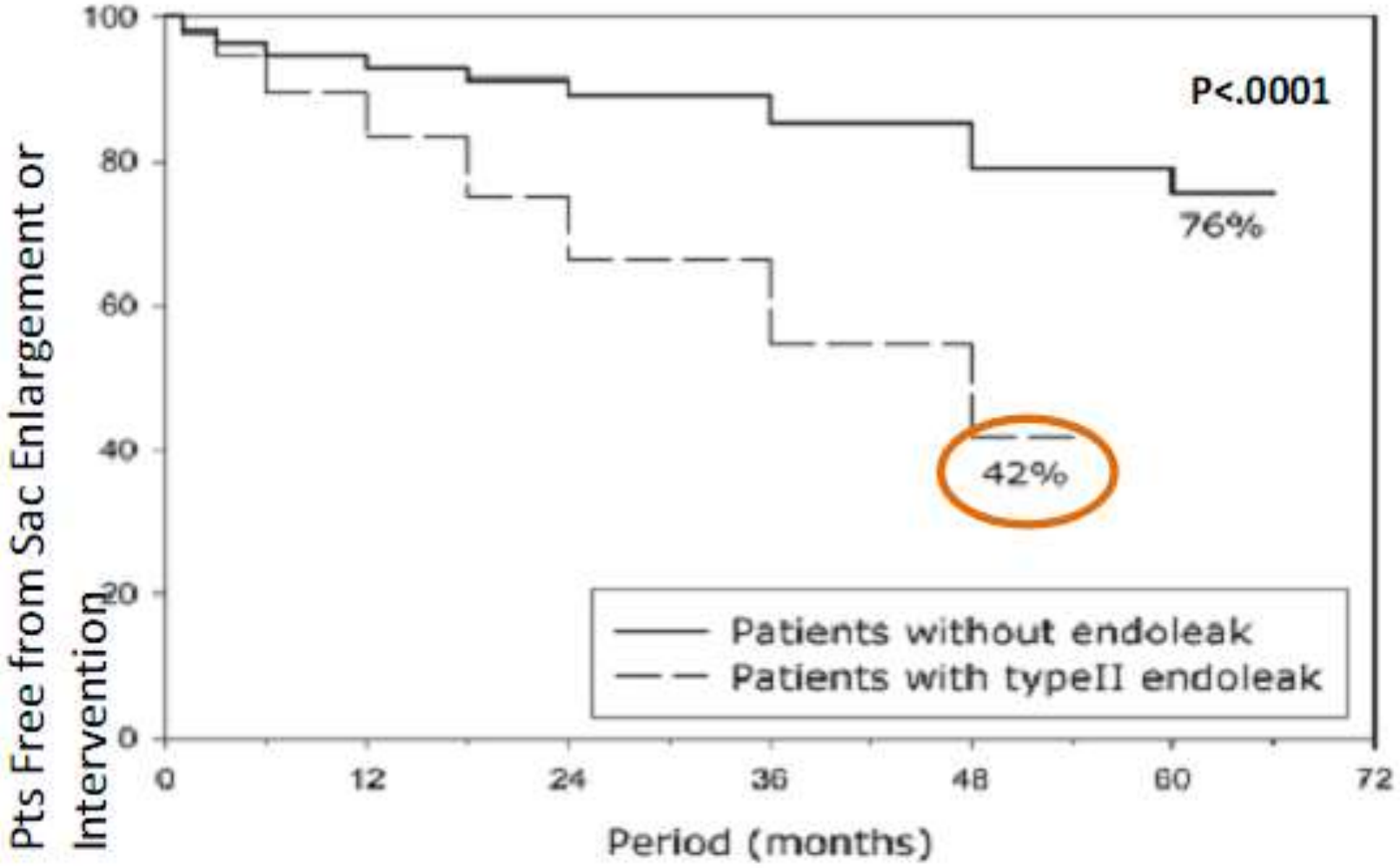
Persistent >6m Little chance of resolution

Early, Persistent, Late

Problem of Type II Endoleak

Most common endovascular complication of EVAR

Impact of type II endoleaks on Rates of secondary interventions



Mehta M, et al JVS 2010

Impact of Endoleak on Cost

Event	No	Yes
Endoleak	$5,706	$26,739
Secondary Intervention	$3,668	$31,696

Noll RE, et al. JVS 2007

Diagnosis of Endoleak

All patients with EVAR need FUP with Imaging

Detection of Type II Challenging

Low flow can be missed

Overlap with different endoleaks classification difficult

Need to identify the correct endoleak

Options

Ultrasound DUS, CEUS

CTA

MRA

Angiogram SMA/Bil IIA used with intervention, classification

Imaging

US Lower sensitivity and specificity than CT

Body habitus and gas also a problem

DUS Still considered satisfactory technique

DUS with Contrast may be equivalent to CTA and MRA

Allow dynamic Real time visualisation detect and classify type
Feasible long term surveillance

CTA

CTA Gold standard timely images in number of different phases Tri phase
Non contrast
Arterial
Delayed Phase more radiation

Dual Energy CT
Good Accuracy
Reduced radiation exposure

Detect Most Cases of Type II Endoleak

MRA

MRA Superior resolution and soft tissue differentiation

Highly accurate in diagnosing and classifying endoleaks

Not widely available

Costly

Time Consuming

Stent Graft must be compatible

DUSS with AXR, CTA, MRA

Management

Prevention

Conservative Asymptomatic, clear evidence off sac expansion,

Early intervention to prevent adverse late outcomes eg rupture EVAR

Selectively (10 mm sac expansion and/or persistent endoleak after 6 months)

Aggressively (any type II endoleak or those persisting for .3 months)

Prevention

Best Management **Proper Patient Selection**

Preop CT assessment Risk Factors

Recognizing **R**isk factors and protective factors for type II endoleak

Protective factors	**Risk factors**
Smoking	Number of Patent lumbar arteries
Peripheral vascular disease	Diameter of lumbar arteries <2mm transient
Occluded/Embolized IMA	Patent inferior mesenteric artery >2.5mm
	Proportion of aneurysm sac lined with clot
	Maximum thrombus thickness

Plan surveillance or preop/intra op embolization

Pre/Intraoperative embolization

Coils alone IMA and lumbar, IMA alone Need RCT

Coils and Thrombin Coil in Ima and/sac, Thrombin in sac

Thrombin injection +/-coils 2.4 vs15%

Autologous thrombin/platelet gel during procedure ENDGELLA study

Feasible, Variable success with conflicting results

Longer duration, Radiation, Coil dislocation, Cost

Many spontaneously thrombose

Outcome not clear

Risk May outweigh benefit

Larger long-term studies preoperative embolization effect on imaging and repeat intervention, aneurysm rupture, and mortality

Ronsivalle et al. JEVT 2010 :Muthu et al. JEVT 2007 :Pilon et al. ICTS 2009:Nevala et al. JVIR 2010: Parry et .al JVS 2002

Prevention

Device Selection

Endovascular Aneurysm Sealing (EVAS)

Nellix promising early series EU, NZ

Clinical Outcome Goals

- Eliminate secondary Interventions
- Reduce required patient surveillance

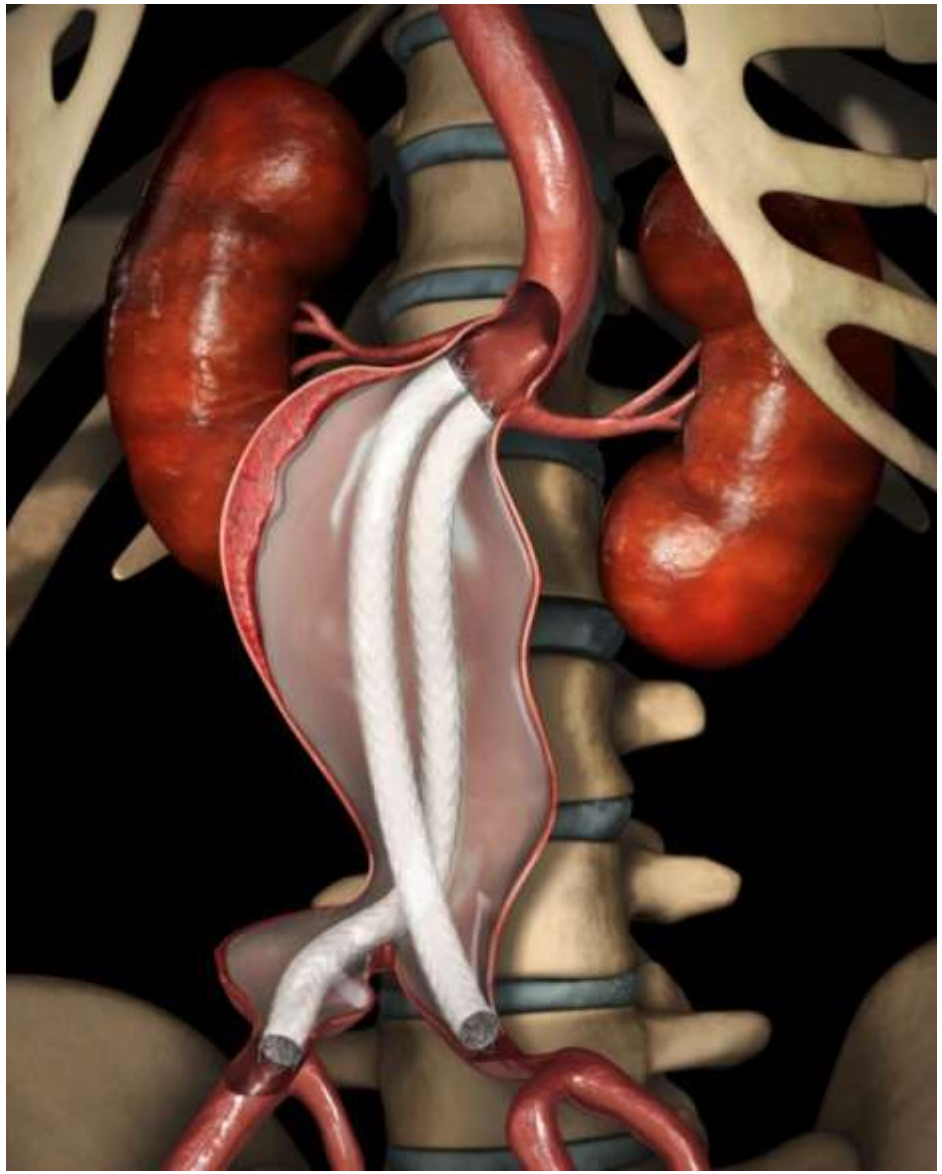
<0.5% Overall reinterventions for endoleaks

2% for limb occlusion

Short Followup

EVAS FORWARD investigational device

Awaiting Nellix EVAS Forward Global Registry



Conservative

Benign

Spontaneous resolution occurs 35-80% Over 1-5yrs

Type II not associated with rupture Eurostar registry 2000 pts

Poor success rate of interventions

No difference in mortality and AAA mortality between intervention and non intervention.

Does Require strict and frequent Surveillance Program

Preferred approach

van Marrewijk et al *Eur J Vasc Endovasc Surg*. 2004;27(2):128–137.

Intervention Embolization

Embolize
- Endovascular
- Percutaneous
- Both

Endovascular
- Collaterals SMA, Iliolumbar
- Transluminal outside graft
- Transcaval Promising

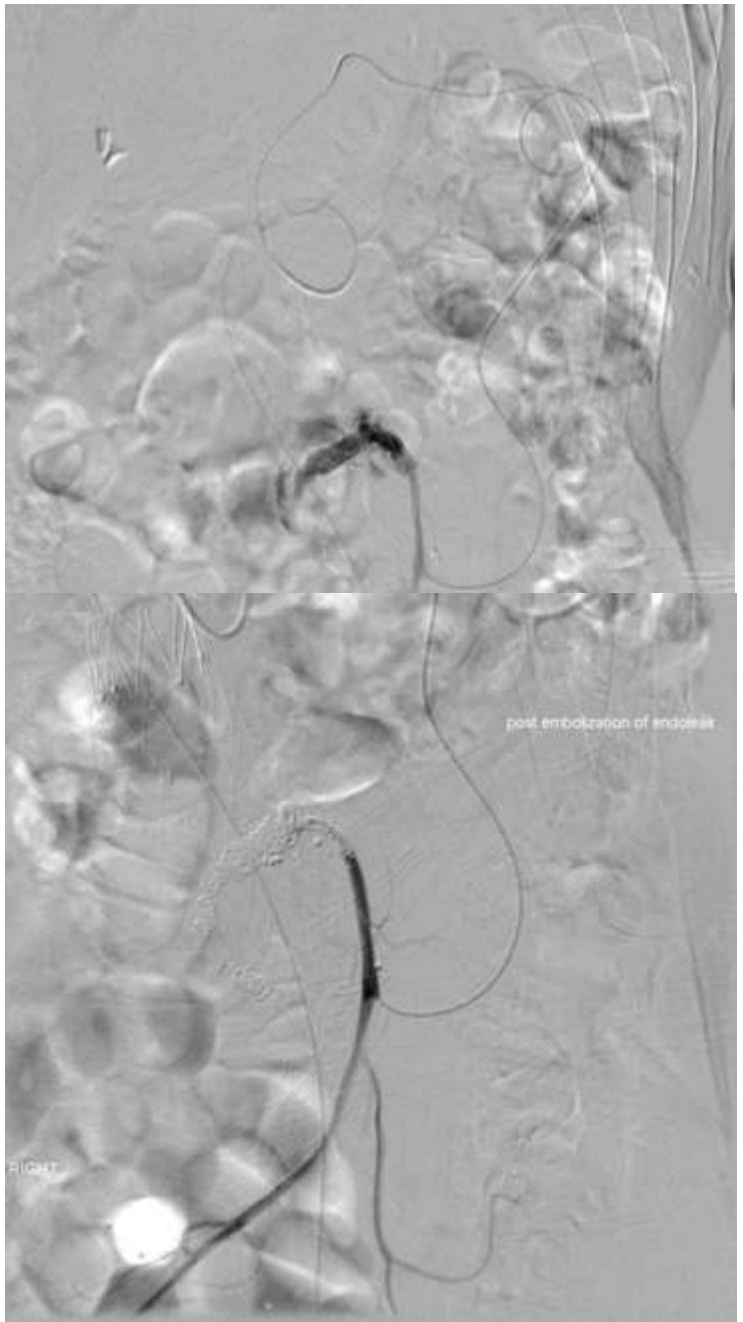
Translumbar

Direct Sac Puncture

Risk PE, Stent puncture then type III

Need to get the nidus both in and out

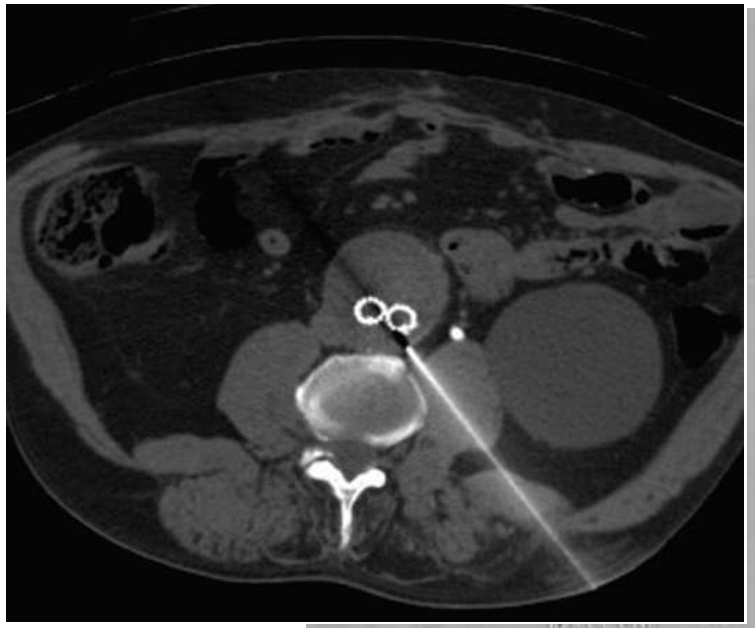
Need more Studies compare agents, techniques to clarify gold standard



Embolizing Agents

Embolent	Mechanism of action
Coils	Reduce blood flow inducing thrombosis
	Cause vessel wall damage
Amplatzer Vascular Plug	Plug the vessel wall, damaging the wall and promoting thrombogenesis
Particulate agents	Reduce blood flow, initiating thrombosis and promoting angionecrosis of the vessel wall
Gelatin foam/powder	Forms a cast of the vessel forming a surface for thrombogenesis and occlusion
Tissue adhesives (glue)	Forms a cast of the vessel and incites an inflammatory response
Sclerosing agents	Directly toxic to the tissues, inducing tissue necrosis

Lumbar Access
Combination of agents often used



Surgery

Rare

Balance Perceived risk of aneurysm rupture

Expected perioperative morbidity/mortality

Laparoscopic	Well described
	Not readily available
	IMA, Lumbar, Sac
Open Sactotomy	Proximal Balloon Control

Failed Endovascular approach

Source cannot be found but sac increasing

Management Plan for Endoleak

Assess Before and plan device and or embolization prior to procedure

Surveillance
SVS CT cont 1m and one year and then yearly fup
ESVS Xray CT 1m and 1yr if ok then yearly fup

Type II endoeak Contrast enhanced CT 6m, US and Non ct CT 6m

Diagnose accurately
Multidisciplinary: Conservative first then fail intervention with plan for surveillance

Conclusion

Achilles heel of EVAR
Management is still a dilemma
Conservative is currently favoured

Need trials of Large numbers
Longterm outcomes and complications
Assessment of Different approaches
Different embolents

Multicentre registry alternative