



i-MEET
NEXT GENERATION
Multidisciplinary European Endovascular Therapy

Threshold of 5.0/5.5 cm diameter to treat an infrarenal AAA still stands, but how to measure it (US, CT, MRA)

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Disclosure of Interest

Disclosure

Speaker name:

Kevin Mani

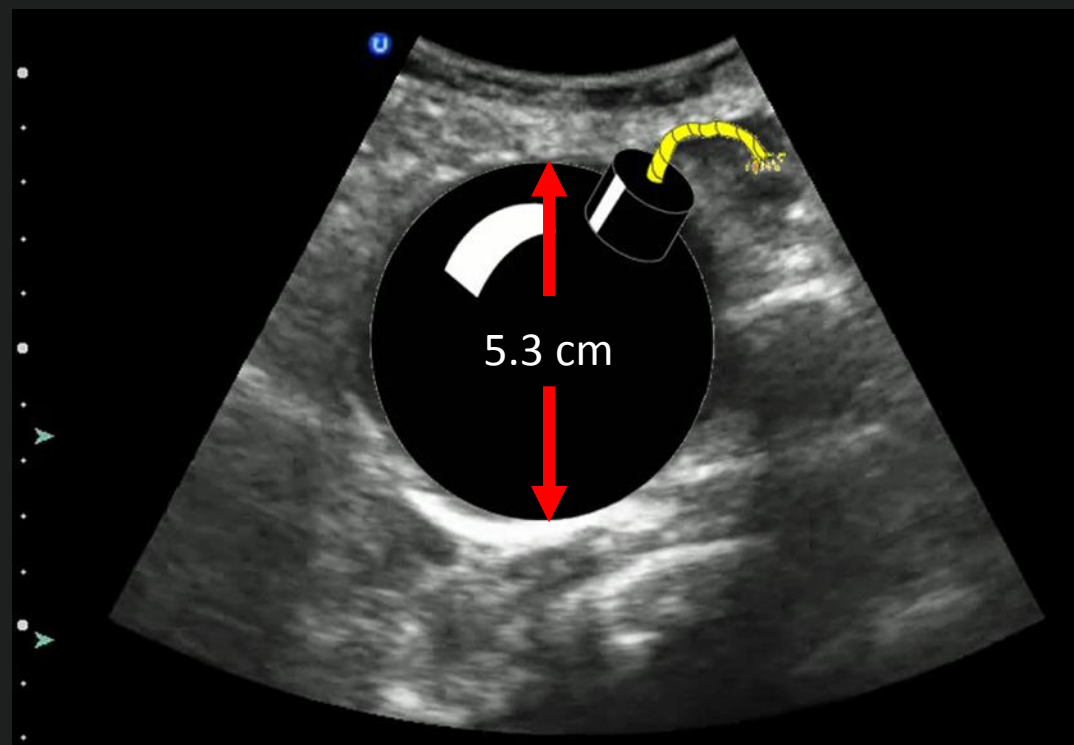
- I have no conflict of interest related to this talk

74 years old male with AAA

- Previous smoker
- Otherwise healthy
- Accidental finding of AAA on abdominal US scan, 5.3 cm

Options?

- A. Surveillance
- B. Plan to operate
- C. CT scan, re-measure, operate



CT – report 53mm AAA

What to do?

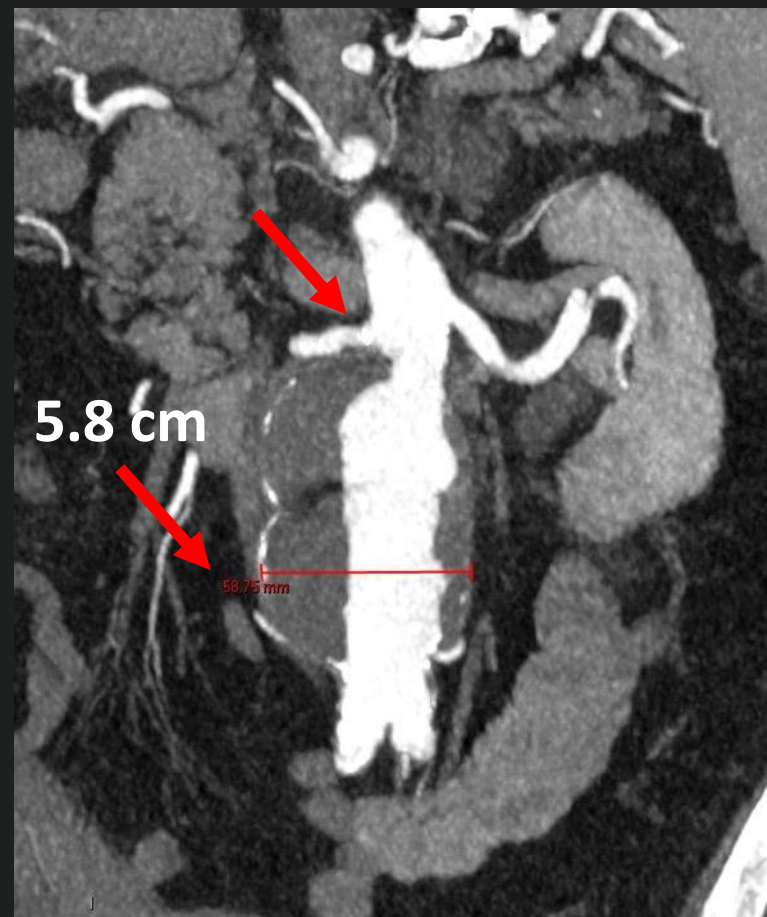
- A Operate**
- B Remeasure, I can make this 5.5!**
- C Continue surveillance**



Continued surveillance, US 55mm, new CT

Juxtarenal AAA

- A Plan for FEVAR
- B Open repair
- C Continued surveillance



European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Infrarenal

Recommendation 22

In men, the threshold for considering elective abdominal aortic aneurysm repair is recommended to be ≥ 5.5 cm diameter

Class	Level	References
I	A	[189]

Recommendation 23

In women with acceptable surgical risk the threshold for considering elective abdominal aortic aneurysm repair may be considered to be ≥ 5.0 cm diameter

Class	Level	References
IIb	C	[199,171,91,198,200]

Juxtarenal

Recommendation 93

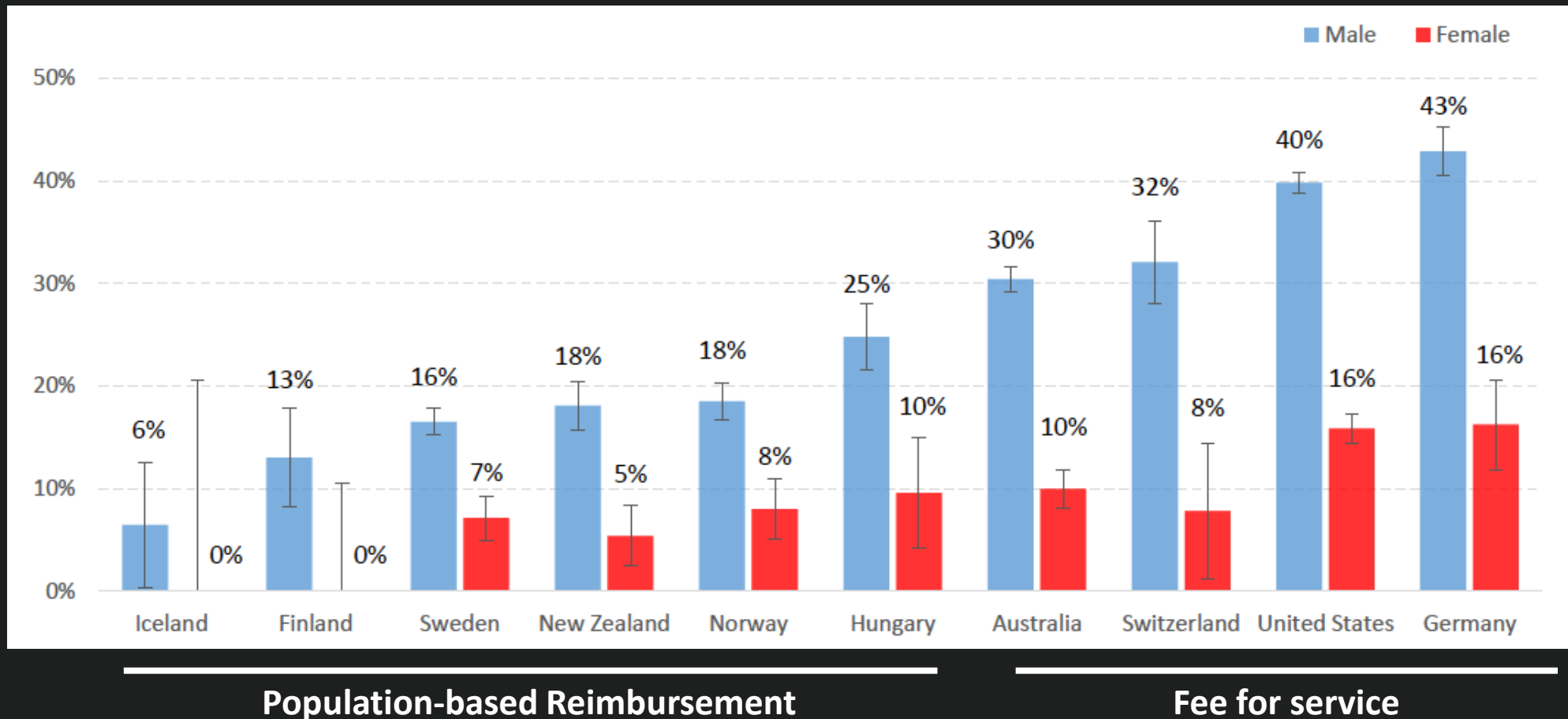
In patients with juxtarenal abdominal aortic aneurysm and acceptable surgical risk, the minimum threshold for elective repair may be considered to be 5.5 cm diameter

Class	Level	References
IIb	C	[189]

”An individualised approach regarding threshold for repair is appropriate... **in practice a larger threshold may be more appropriate** in patients with increased comorbidities”

Practice varies between countries

Proportion of elective AAA repairs performed below threshold



Imaging techniques for AAA

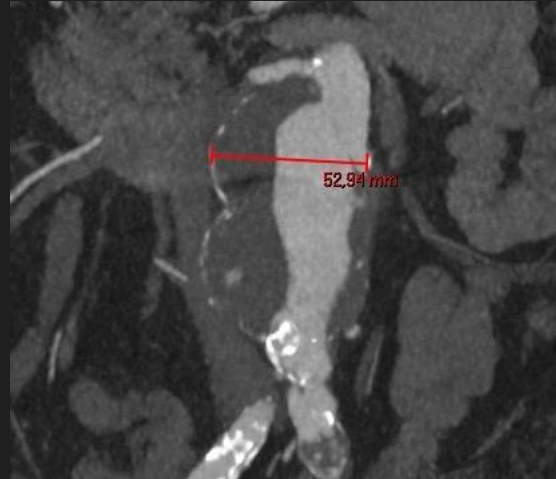
- **Ultrasound**

- Surveillance



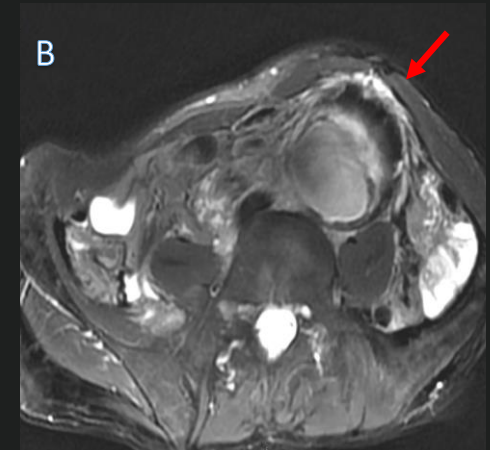
- **Computed tomography**

- Surgical decisionmaking



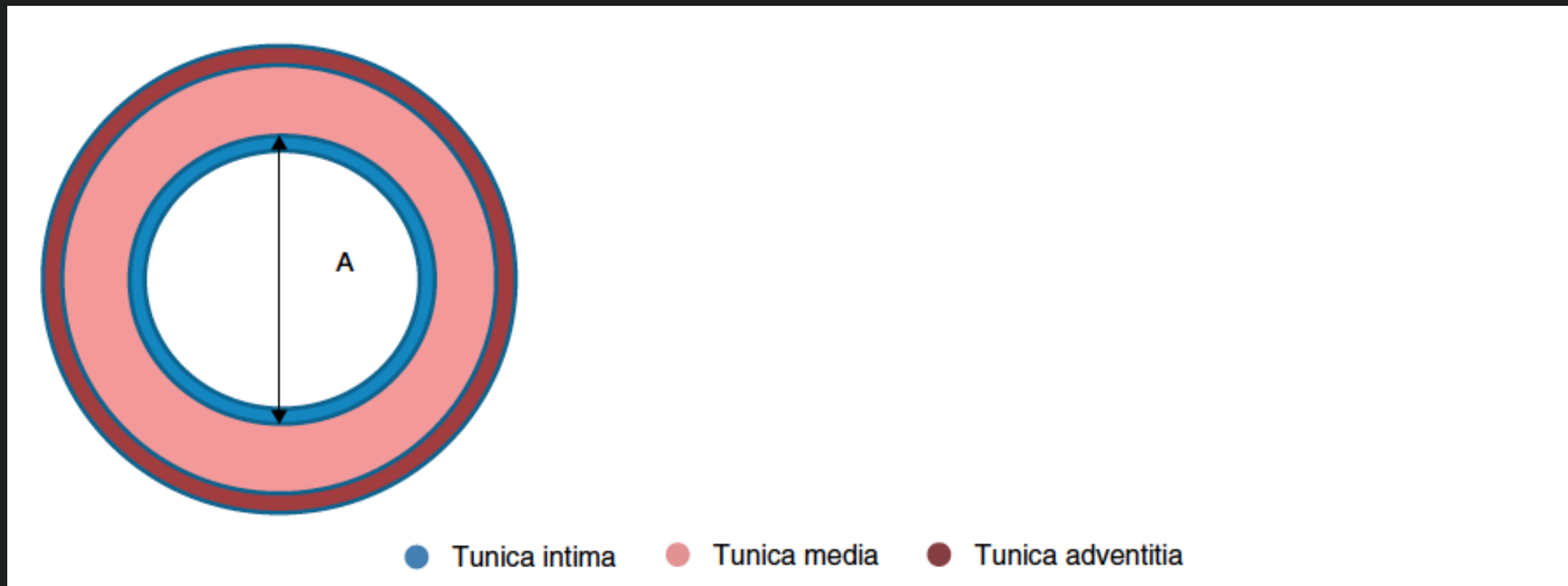
- **Magnetic resonance imaging**

- Research?



Ultrasound measurement of the aortic diameter can be performed in three ways

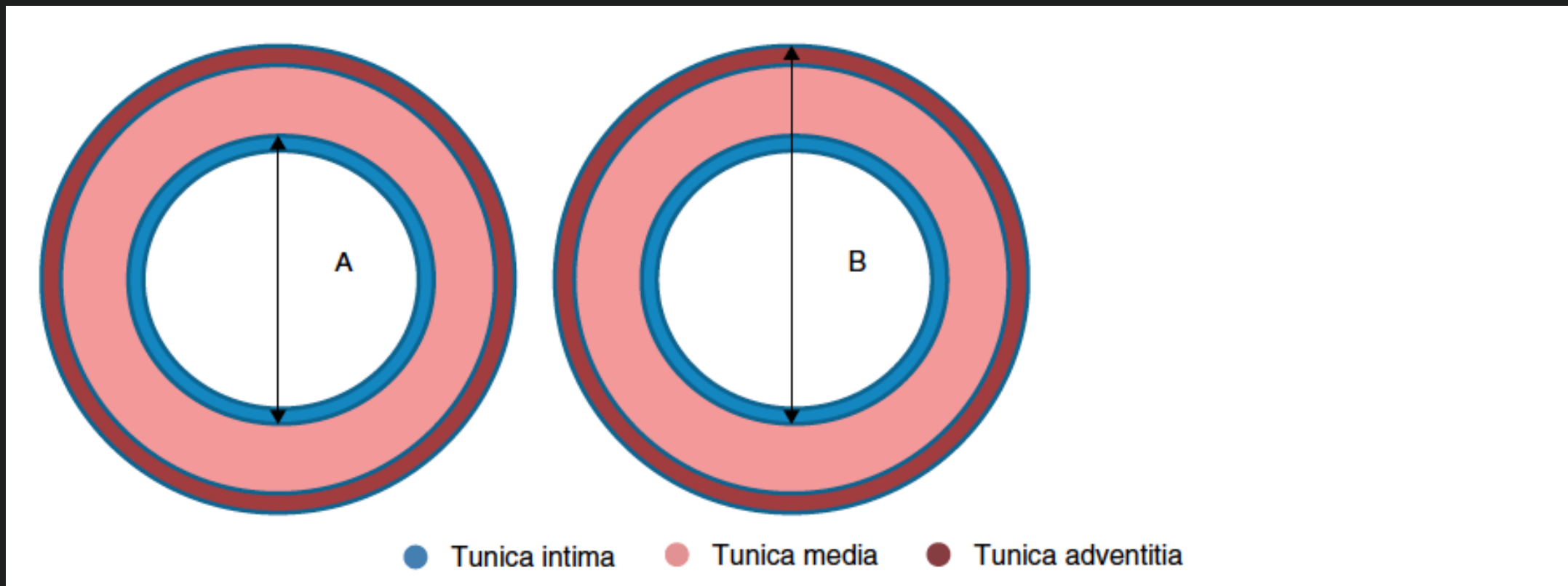
Inner To Inner (ITI) UK screening



Ultrasound measurement of the aortic diameter can be performed in three ways

Inner To Inner (ITI)
UK screening

Leading Edge (LELE)
Swedish screening

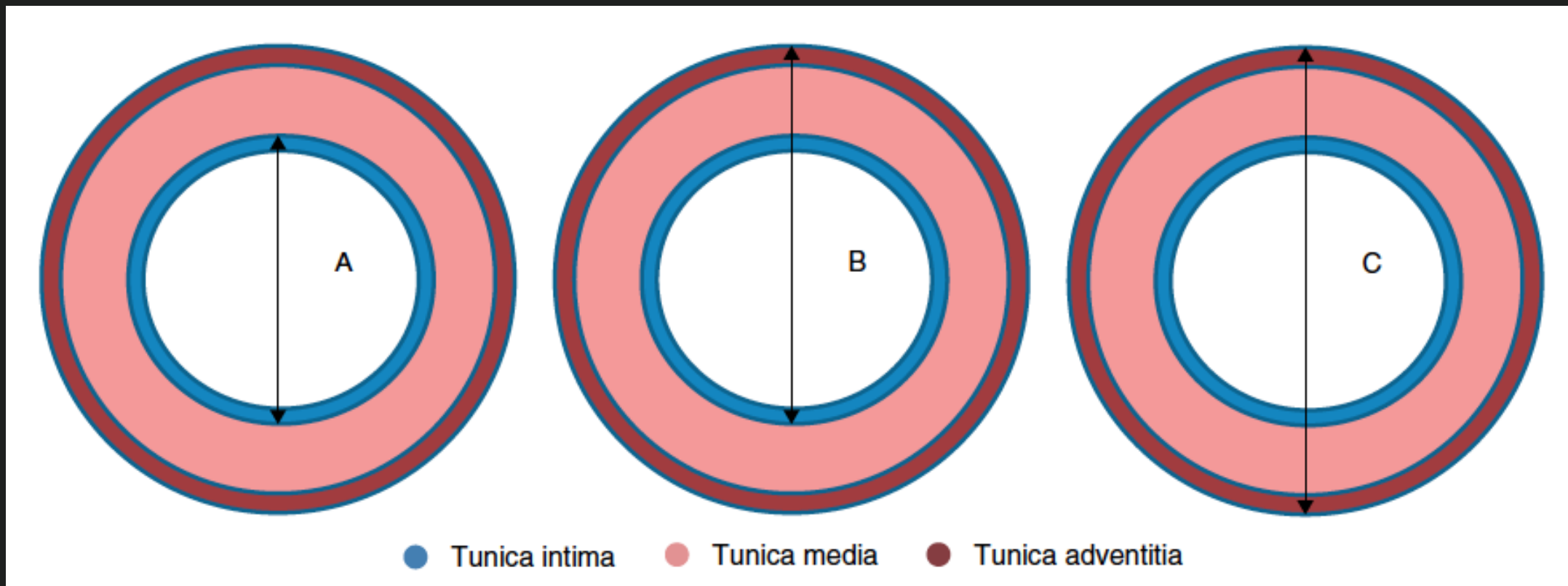


Ultrasound measurement of the aortic diameter can be performed in three ways

Inner To Inner (ITI)
UK screening

Leading Edge (LELE)
Swedish screening

Outer To Outer
UKSAT



Comparison of three ultrasound methods of measuring the diameter of the abdominal aorta

M. Gürtelschmid^{1,2}, M. Björck¹ and A. Wanhainen¹

¹Department of Surgical Sciences, Section of Vascular Surgery, Uppsala University Hospital, Uppsala, and ²Department of Surgery, Mälarsjukhuset, Eskilstuna, Sweden

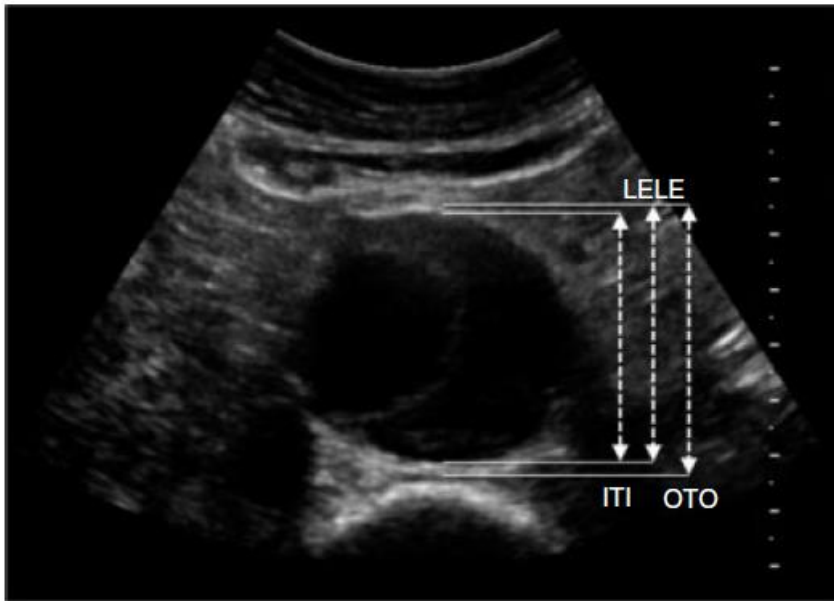


Fig. 1 Ultrasound methods to measure the diameter of the abdominal aorta: outer-to-outer (OTO) method, inner-to-inner (ITI) method and leading edge-to-leading edge (LELE) method

- LELE most reproducible
- ITI as good
- Difference between methods:
 - ITI to OTO: 4-5 mm difference
 - LELE to OTO: 2 mm difference

ESVS recommendations - Ultrasound

Recommendation 7

Ultrasonography is recommended for the first line diagnosis and surveillance of small abdominal aortic aneurysms

Class	Level	References
I	B	[111,71,103,112]

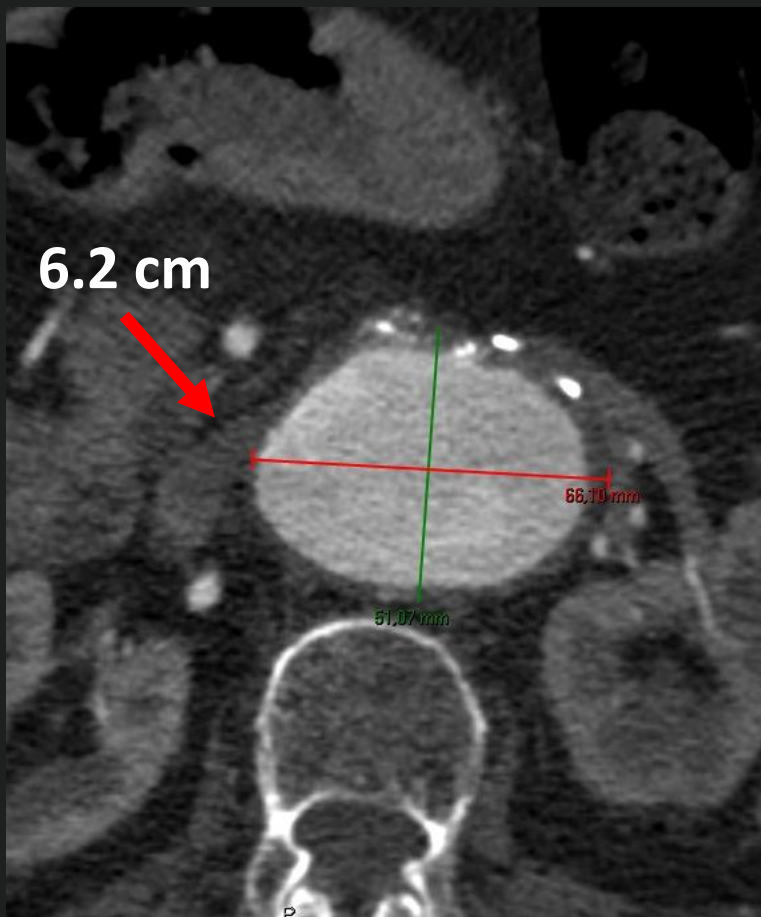
Recommendation 8

The antero-posterior measuring plane with a consistent calliper placement should be considered the preferred method for ultrasound abdominal aortic diameter measurement

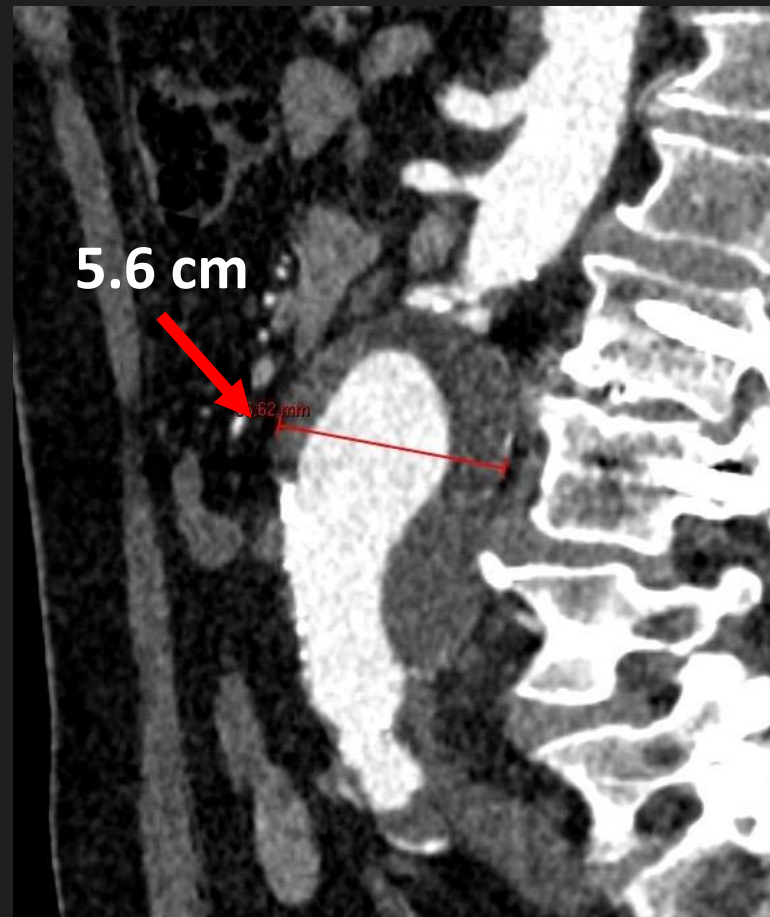
Class	Level	References
IIa	B	[108,106,75,76,103,77]

What is a correct CT measurement?

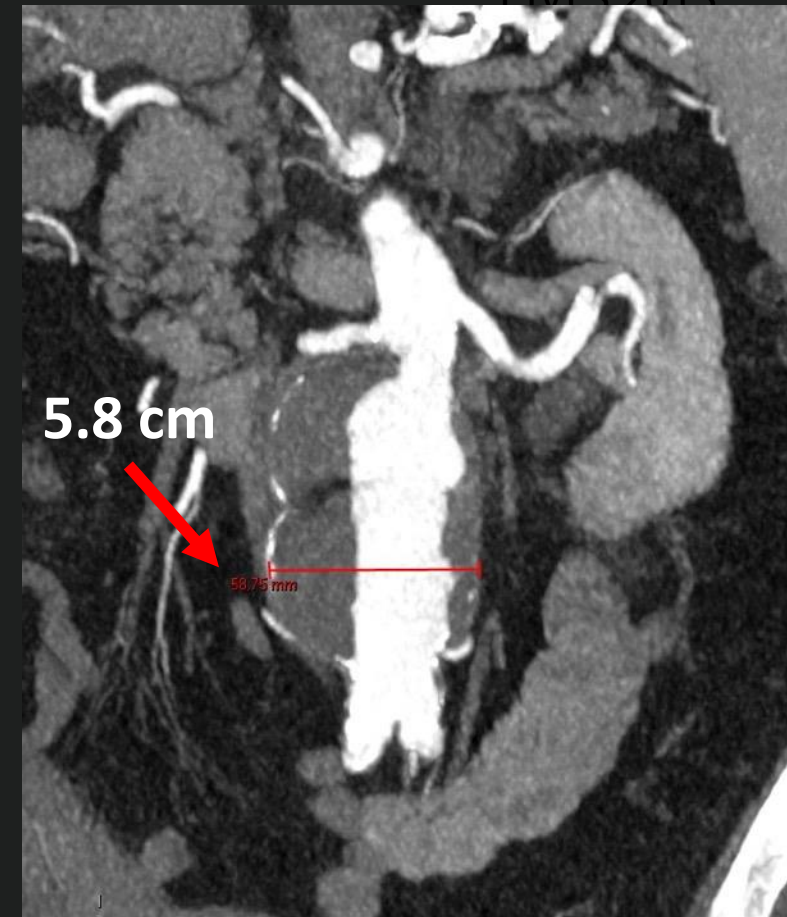
A



B



C



No consensus on how aortic diameter was measured for intervention studies

Table 4
Measurement protocols of maximum AAA diameter in decision-making for intervention (8 studies, 11 articles). The mean score is 1.625.

Authors	Study/Country	Imaging modality	Plane for acquisition	Axis for measurement	Position for callipers	Selected diameter	Score
Lederle ^{45,46}	Aneurysm Detection and management Study, USA	CT	Cross-sectional perpendicular to the direction of the AAA tortuosity when appropriate	Any direction	External	Maximum external cross-sectional diameter in any direction	4
UK Small Aneurysm Trial participants ^{60,61} Ellis ⁴²	UK Small Aneurysm Trial	US	Not specified	Anteroposterior	External	Maximum external anteroposterior diameter	3
Becquemin ⁶²	ACE, France	CT	Not specified	Not specified	Not specified	Not specified	0
Ouriel ⁶³	PIVOTAL, USA	CT	No specified	No specified	No specified	No specified	0
Lederle ⁶⁴	OVER	Not specified	Not specified	Not specified	External	Maximum external diameter	2
Cao ⁶⁵	CEASAR, Italy	CT	cross-sectional perpendicular to the vessel axis	Any direction	External	Maximum external cross-sectional diameter	4
Brown ⁶⁶	EVAR, UK	CT	Not specified	Not specified	Not specified	Not specified	0
Prinssen ⁶⁷	DREAM, The Netherlands	Not specified	Not specified	Not specified	Not specified	Not specified	0

Abbreviations as in Table 2.

No consensus on how aortic diameter was measured for intervention studies



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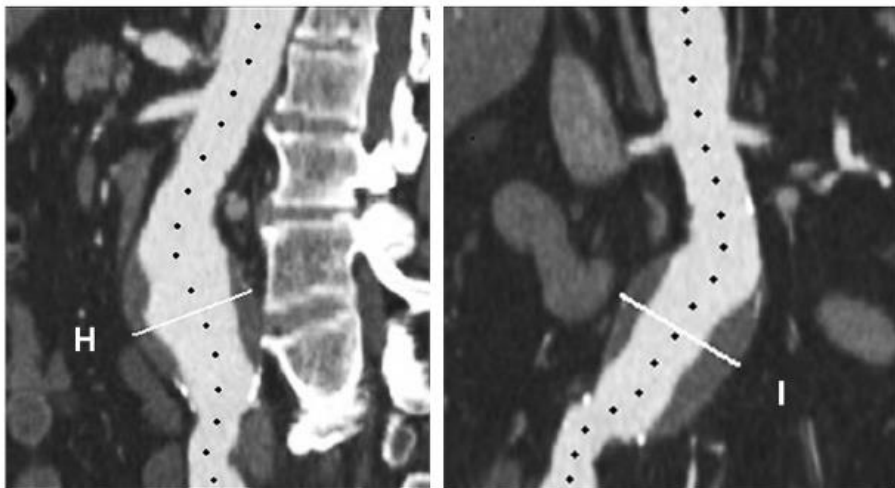
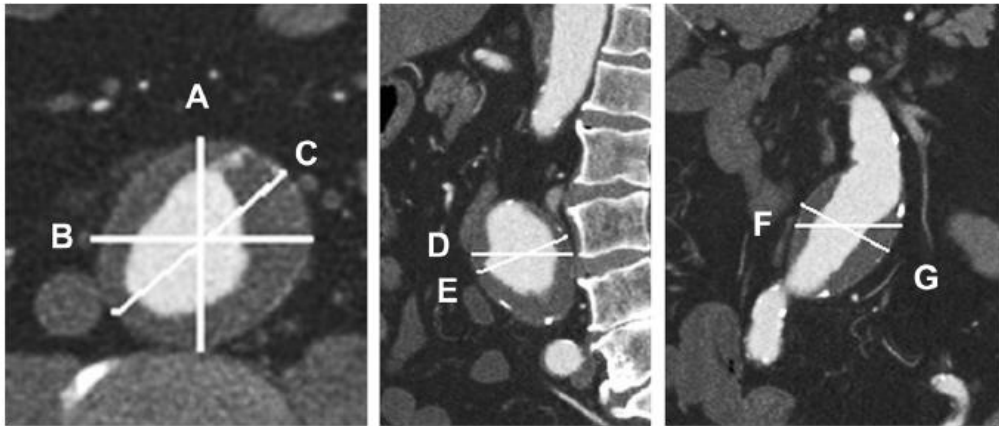
Abbreviations as in Table 2.

Measurement of Maximum Diameter of Native Abdominal Aortic Aneurysm by Angio-CT: Reproducibility is Better with the Semi-automated Method

C. Mora ^{a,b}, C. Marcus ^b, C. Barbe ^c, F. Ecartot ^d, A. Long ^{a,e,f,*}

EJVES 2013

^aVascular Medicine, University Hospital Reims, Hôpital Robert Debré, Reims, France



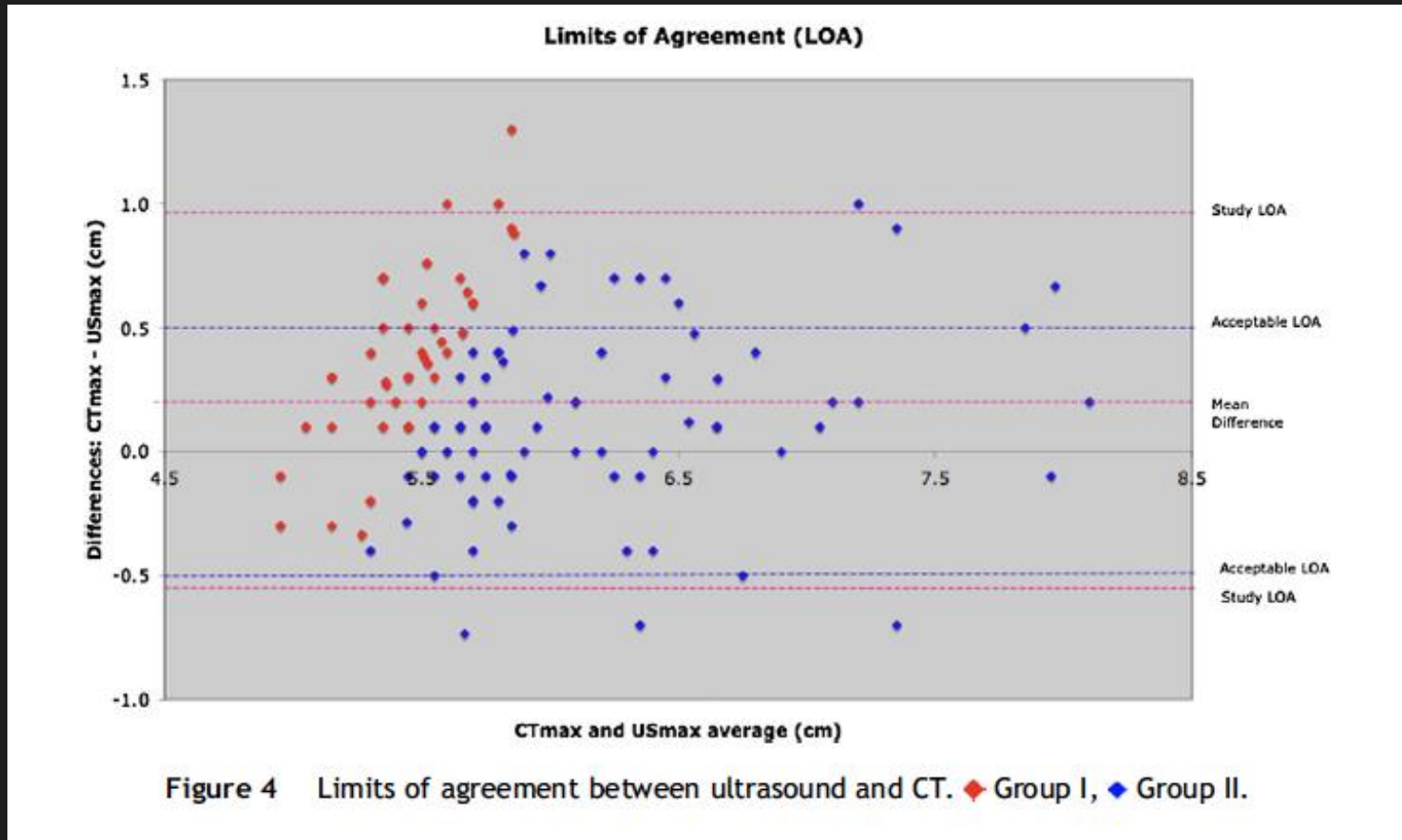
CT

Intra-observer reproducibility – High
Inter-observer reproducibility - Poor

Rapid growth?

Semi-automated method (centerline)
reduces intra- and inter-observer
discordance

CT measurement is in general 4 mm larger than US for AAA 5-5.5 cm



- AAA 5-5.5cm
- AAA >5.5cm

70% of AAA 5-5.5 cm on US were >5.5 cm when measured on CT

6% of US >5.5cm had CT <5.5cm

ESVS recommendations - CT

Recommendation 9

In patients with abdominal aortic aneurysms computed tomography angiography is recommended for therapeutic decision making and treatment planning, and for the diagnosis of rupture

Class	Level	References
I	C	[120,103,113]

Recommendation 10

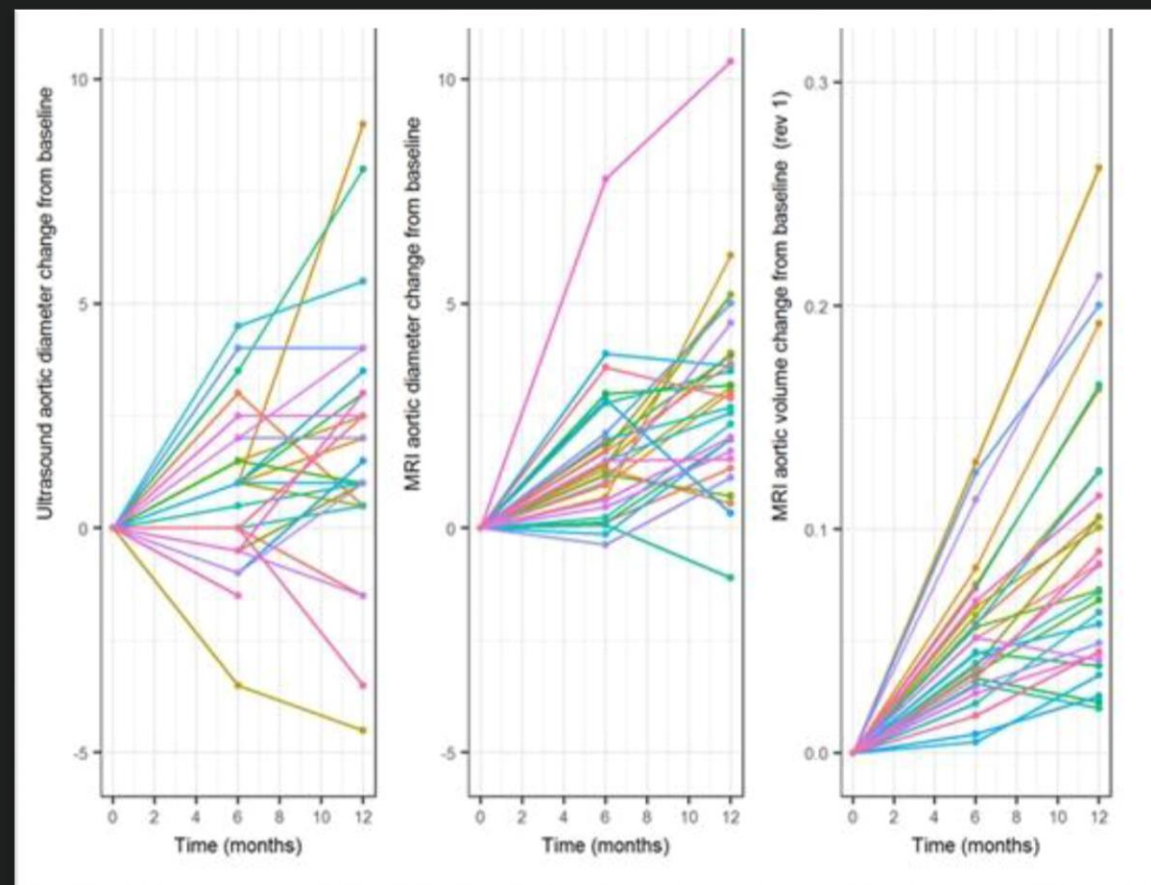
Aortic diameter measurement with computed tomography angiography should be considered using dedicated post-processing software analysis in three perpendicular planes with a consistent calliper placement

Class	Level	References
IIa	C	[114]

How about MR and aorta?

- No clinical role
- MR volume – a potential research tool for evaluation of AAA growth
- Relative agreement (corresponding consistency)
 - US 87.2%
 - MRI diameter 94.7%
 - MRI volume 99.6%

Evaluation of small AAA growth, 12 months

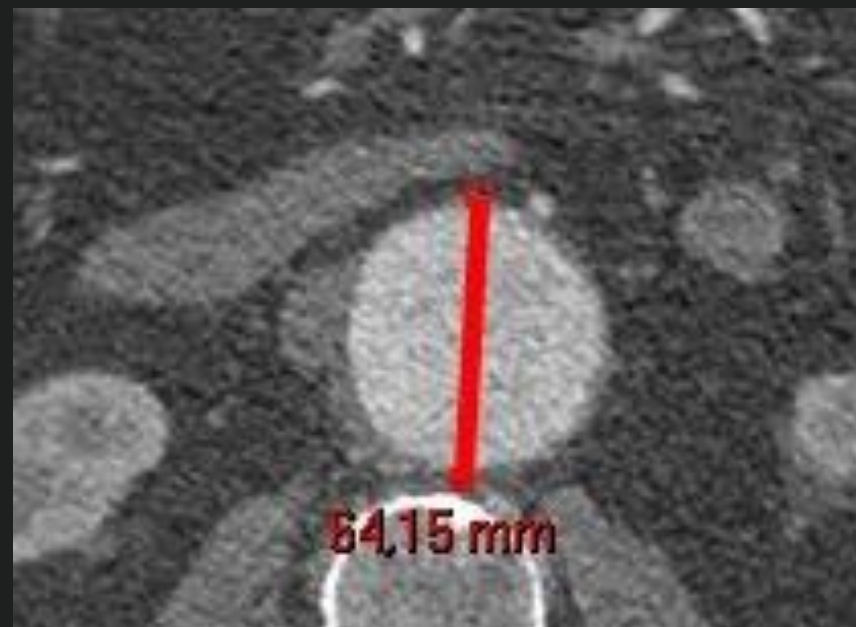
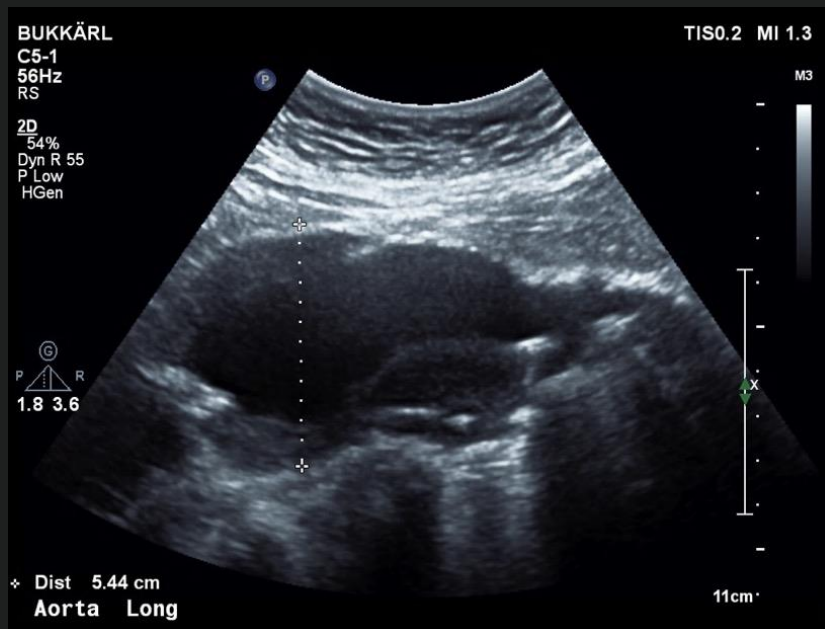


US Diameter

MR Diameter

MR Volume

Conclusions – not only the images are grey...



Grey zone of uncertainty

Conclusions

- Ultrasound for surveillance, CT for surgery
- Variation in measurement with different techniques and between observers
- Post-processing software and consistent plane and caliper placement of value



