Peripheral arterial aneurysms associated with AAA

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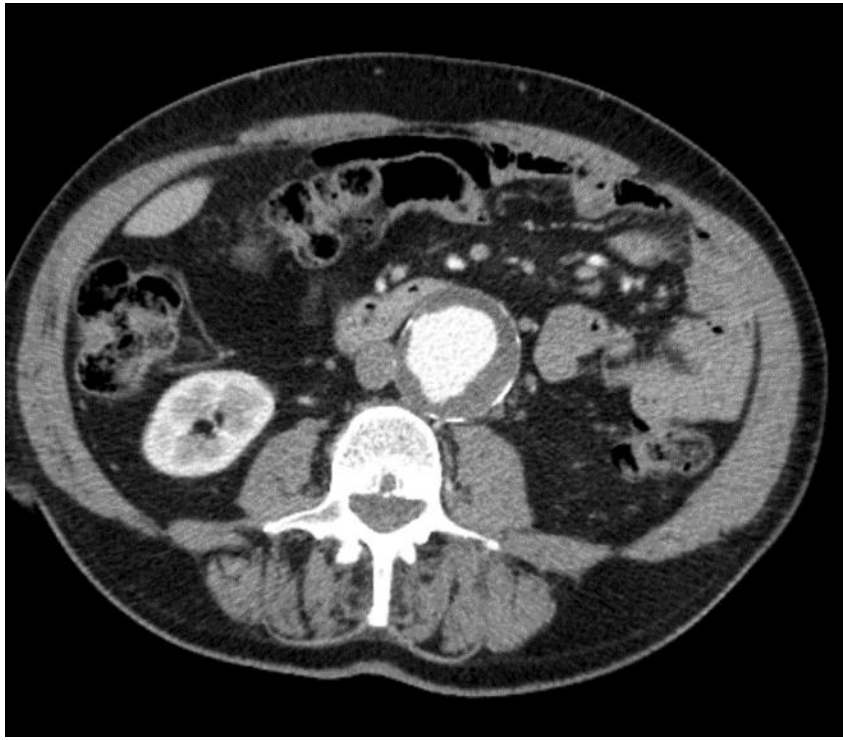
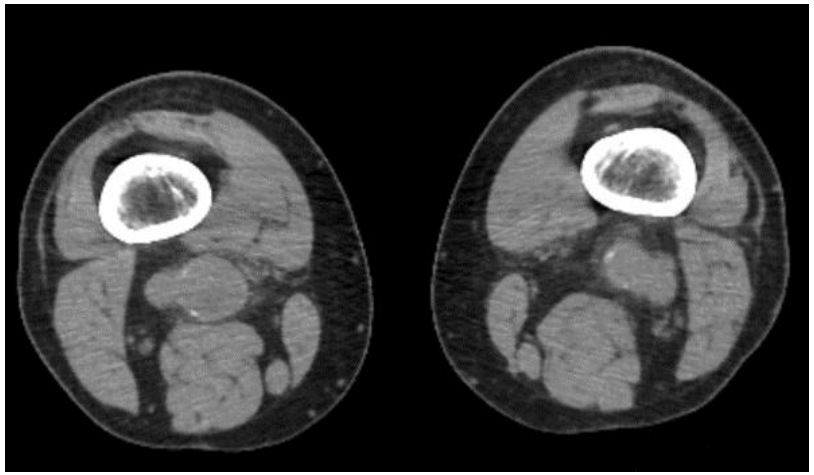
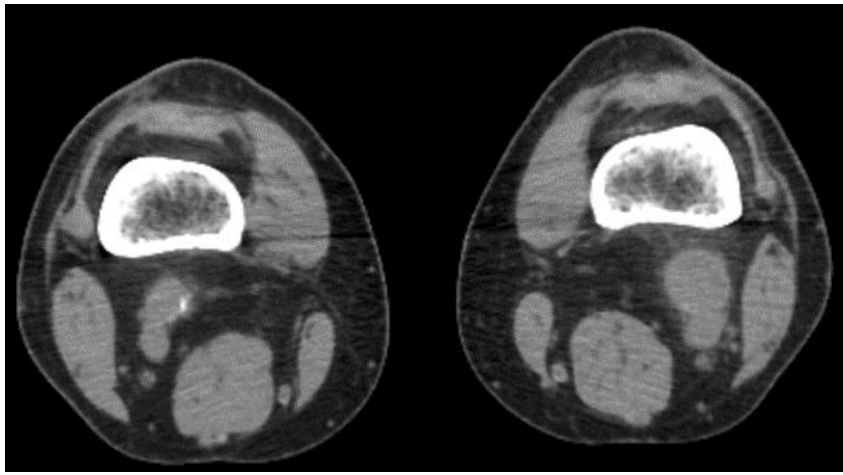






Prevalence of peripheral aneurysms in patients with AAA

Common iliac
Internal iliac
Common femoral
Deep femoral
Femoral
Popliteal
Combinations

External iliac artery has been mentioned in two reports.
However, no such aneurysm has been demonstrated.

Current issues

- No prospective studies
- No precise definitions for aneurysms
- Inconsistent data on prevalence
- Lack of screening, follow-up and cost-effectiveness data

Male 77 years old

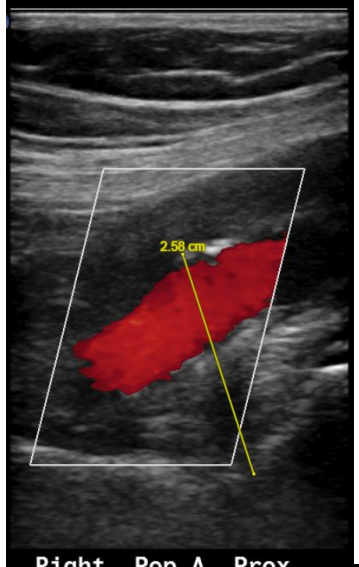
Bilateral popliteal artery aneurysms

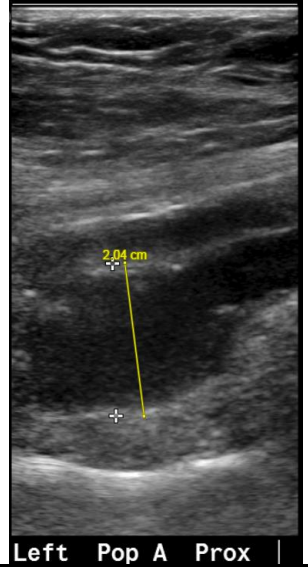
RT 2.6cm LT 2.0cm

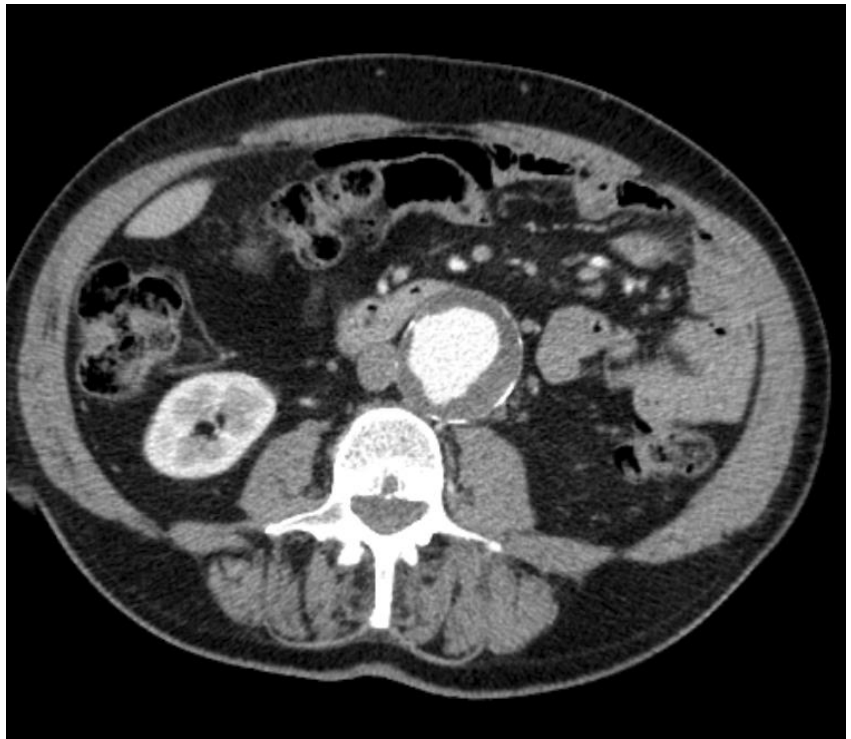
AAA

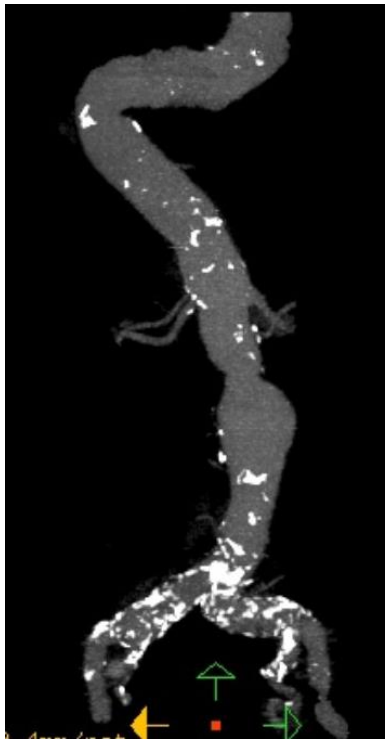
5.4cm

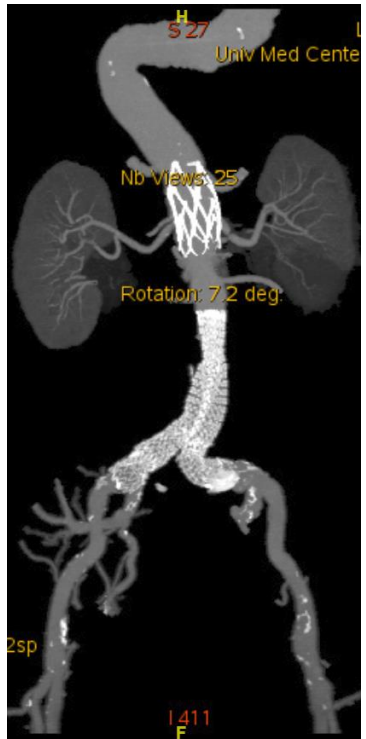
RCIA 2.4cm LCIA 1.8cm

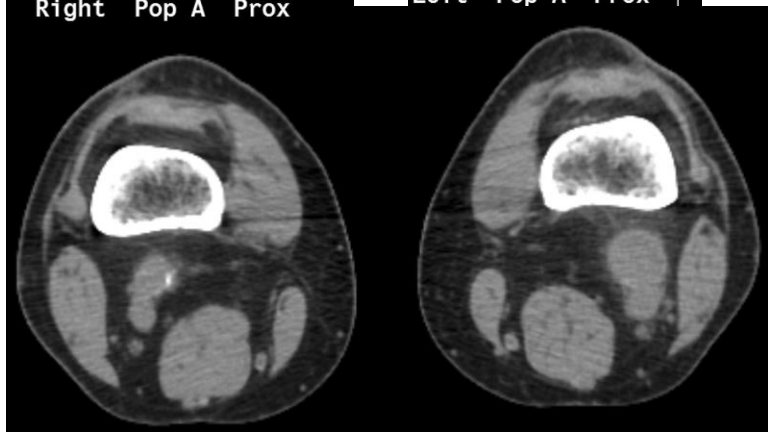


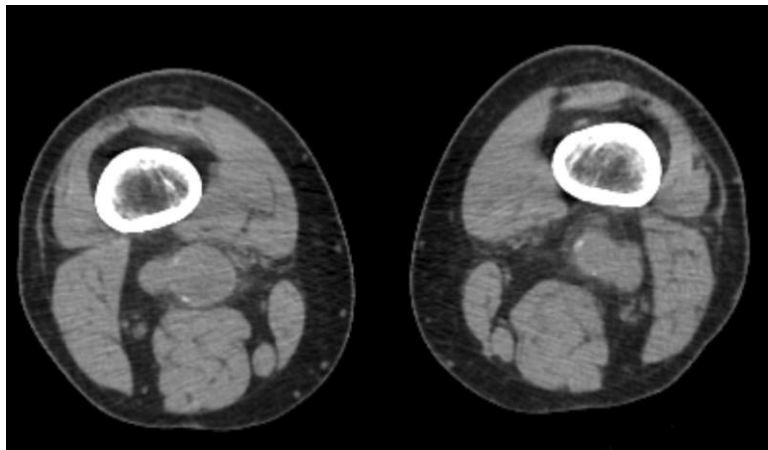








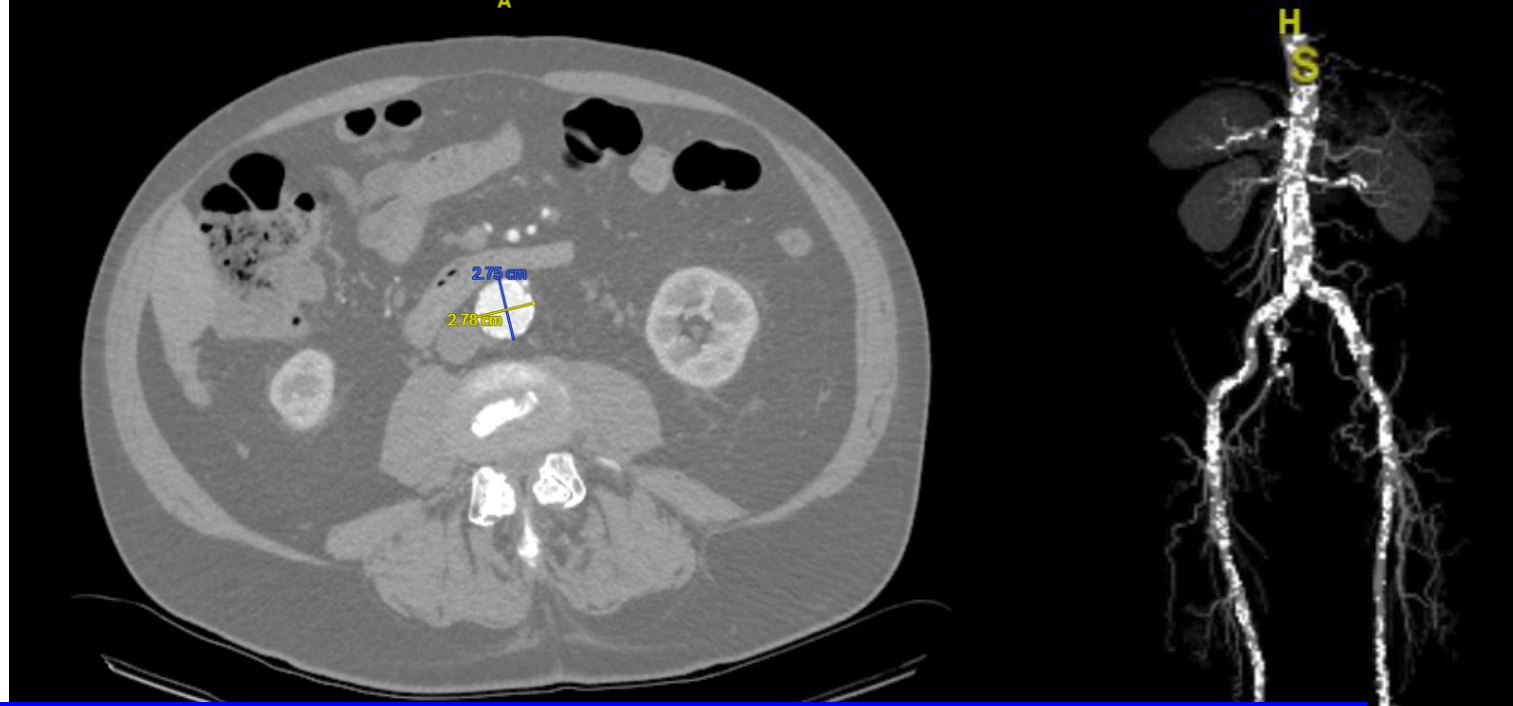




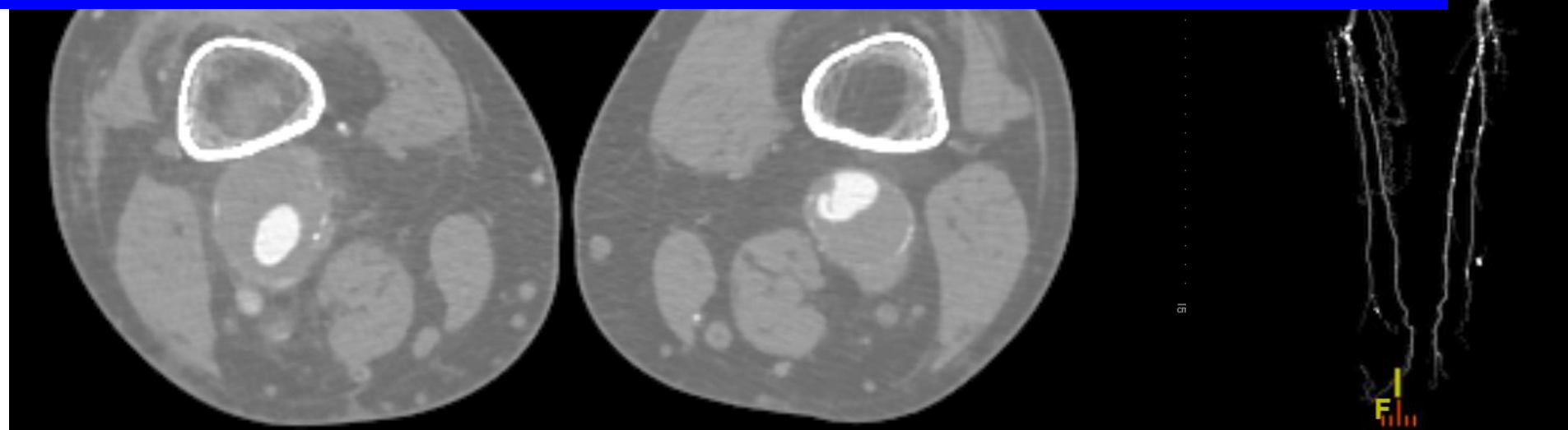
Male 75 years old
Bilateral popliteal artery aneurysms
RT 3.5cm LT 2.8cm

Aortic focal ectasia
2.8cm

All other arteries were normal



If PAA are found then check Aorta and other arteries
But if Aorta is found with 2.8cm do you check the other arteries?



Malmo autopsy study

26251 autopsies

1267 aneurysms in aortoiliac system

825 men and **442** women, 78y 36y to 99y

Prevalence **4.8%**

Brunkwall J, et al. J Vasc Surg. 1989 Oct;10(4):381-4

Malmo autopsy study

	Patients	% with aneurysms	% All autopsies
Thoracic aneurysm	237	18.7	0.9
Thoracoabdominal aneurysm with iliac	19	1.5	0.07
Thoracic plus iliac aneurysm	6	0.5	0.02
Abdominal aortic aneurysm	828	65.3	3.2
Combined AAA and iliac aneurysm	170	13.4	0.6
Iliac arteries	7	0.6	0.03
Total # of patients with aneurysms	1267	100	4.8

IAA/AAA, 202/1030 = 19.7%

Brunkwall J, et al. J Vasc Surg. 1989 Oct;10(4):381-4

313 consecutive patients with AAA

Lower limb ultrasound for femoral and PAA

251 men and 62 women, 74y ±7, 50y-90y

Femoral and PAA >1.5 the normal adjacent diameter

	Patients
Aortic aneurysms	313
Femoral or popliteal artery aneurysms	36
Unilateral femoral artery aneurysms	11
Bilateral femoral artery aneurysm	1
Unilateral popliteal artery aneurysms	15
Bilateral popliteal artery aneurysms	4
Unilateral femoral + unilateral popliteal artery aneurysm	1
Unilateral femoral + bilateral popliteal artery aneurysms	2
Bilateral femoral + unilateral popliteal artery aneurysm	1
Bilateral femoral + bilateral popliteal artery aneurysms	1

Overall	**11.5%**
Men	**14%**
Fem	**7%**
Pop	**10%**

No femoral or PAA was found in 62 females

Diwan A, et al. J Vasc Surg. 2000;31:863-9

AAA size was similar for both groups

Lower extremity aneurysms

5.7 ± 1.7cm (range, 3.1-7.3 cm)

No lower extremity aneurysms

5.8 ± 1.4cm (range, 3.0-11.2 cm)

Iliac artery aneurysms

6 (17%) of the 36 patients with lower extremity aneurysms

11 (4%) of the 277 patients with aortic aneurysms alone

Diwan A, et al. J Vasc Surg. 2000;31:863-9

183 consecutive patients with AAA

Right lower limb ultrasound for CFA and POPA

158 men and 25 women, 57y-78y

CFA and PAA >1.5 the normal adjacent diameter

	Overall		Men
CFA	8	4.3%	5%
POPA	4	2.2%	2.5%
Both	12	6.5%	7.5%

No CFA or PAA was found in 25 females

Lower prevalence due to unilateral exam

Sandgren T, et al. J Vasc Surg. 2001;34:1079-84

Definitions

3 alternative definitions of PAA were used:

10.5mm – ⩾50% of the average popliteal artery diameter (about 7mm)

Diwan A, Sarkar R, Stanley JC, et al. J Vasc Surg 2000;31:863–869
Wolf YG, Kobzantsev Z, Zelmanovich L. J Vasc Surg 2006;43:488–492
Vrijenhoek JE, Mackaay AJ, Moll FL. Ann Vasc Surg 2013;27:454–458
Sandgren T, Sonesson B, Ryden-Ahlgren, et al. *J Vasc Surg* 2001;34:1079–1084

⩾ 12mm

Ascher E, Markevich N, Schutzer RW, et al. J Vasc Surg 2003;37:755–760

⩾ 15

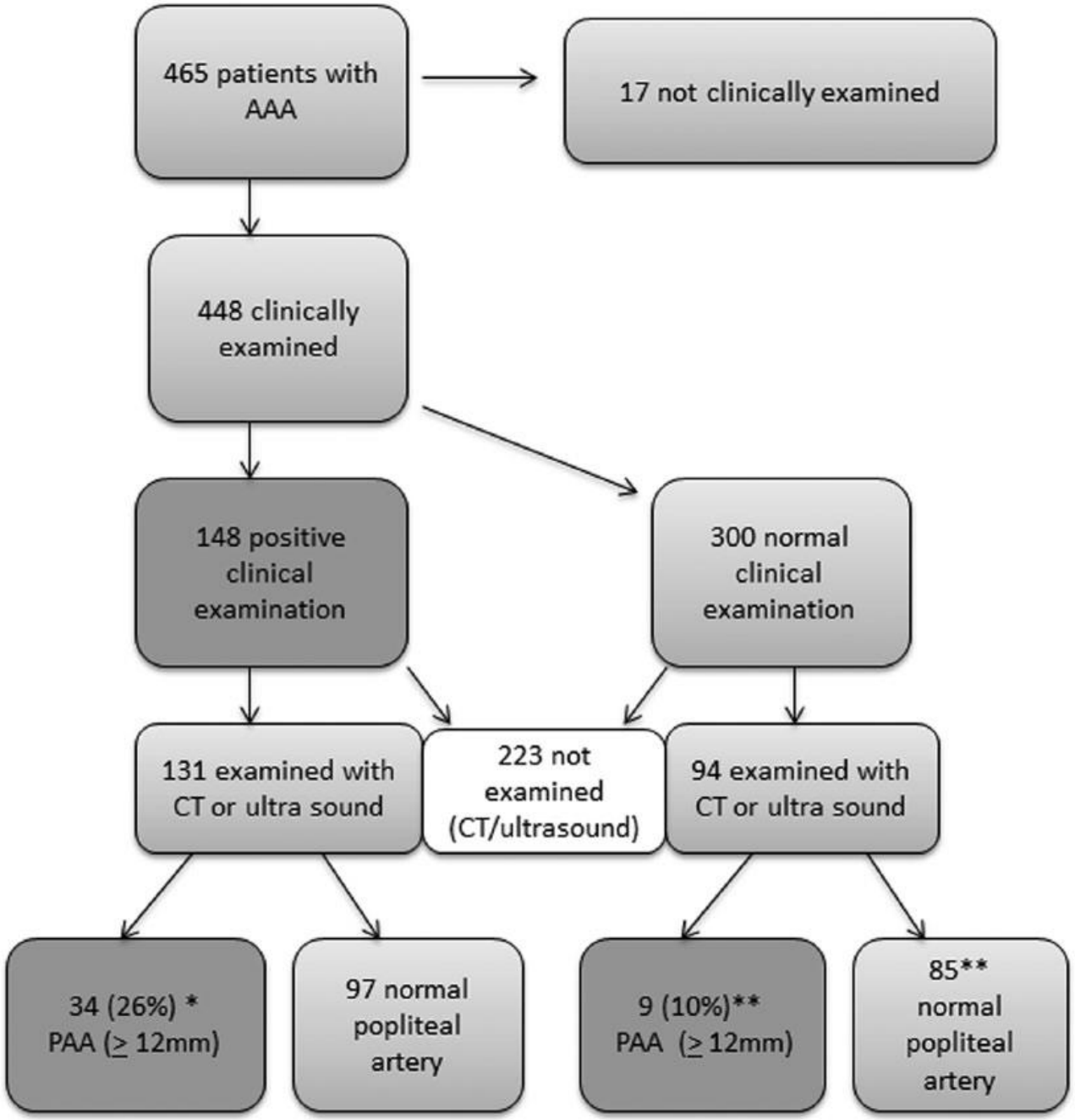
Claridge M, Hobbs S, Quick C, et al. Vasc Health Risk Manag 2006;2:189–191
Trickett JP, Scott RA, Tilney HS. J Med Screen 2002;9:92–93
Galland RB. Am J Surg 2005;190:314–318
Tielliu IF, Verhoeven EL, Zeebregts CJ, et al. J Vasc Surg 2005; 41: 561–567

AAA was defined as an infrarenal diameter ⩾ 30mm

TAA diameter exceeding 37mm

Wanhainen A, Themudo R, Ahlstrom H, et al. J Vasc Surg 2008;47:504–512

Tuveson V et al. Vasc Med. 2016 Aug;21(4):369-75



Clinical examination

Sensitivity 26% (34/131)

Specificity 90% (85/94)

PAA is defined here as >12mm

Tuveson V et al. Vasc Med. 2016 Aug;21(4):369-75

Prevalence of PAA in women and men with AAA examined radiologically

	All: 225 (100%)	Women: 16 (7%)	Men: 209 (93%)
≥12 mm	43 (19.1)	2 (12)	41 (20)
≥15 mm	25 (11.1)	1 (6)	24 (11)
≥20 mm	17 (7.6)	1 (6)	16 (8)

Tuveson V et al. Vasc Med. 2016 Aug;21(4):369-75

Patient characteristics for all radiologically examined patients with AAA only or AAA and PAA

	PAA and AAA *n*=43	PAA and AAA *n*=43	AAA only *n*=182	*p*-value
Mean age	69.7 (SD 6.6)	69.7 (SD 6.6)	69.71 (SD 6.6)	0.99
Men (%)	41 (95.3)	41 (95.3)	168 (92.3)	0.48
Height, cm	179.0 (SD 7.5)	179.0 (SD 7.5)	177.5 (SD 7.3)	0.23
Weight, kg	90.5 (SD 12.8)	90.5 (SD 12.8)	85.7 (SD 15.6)	0.06
Smoking[a] (%)	29 (67.4)	29 (67.4)	146 (80.2)	0.17
Claudication (%)	11 (25.6)	11 (25.6)	19 (10.4)	0.009
Ankle pressure[b]				
Right	147.7 (SD 39.0)	147.7 (SD 39.0)	161.6 (SD 30.6)	0.023
Left	147.4 (SD 39.0)	147.4 (SD 39.0)	161.0 (SD 31.1)	0.024

Tuveson V et al. Vasc Med. 2016 Aug;21(4):369-75

Patient characteristics for all radiologically examined patients with AAA only or AAA and PAA

AAA <50mm 57% (n=129)
AAA ⩾50mm 43% (n=96)

The distribution of PAA between the groups was similar, regardless of the definition

PAA ⩾ 12 mm: 19% small vs 20% large AAA, p=0.823

PAA ⩾ 15 mm: 8.5% small vs 15% large AAA, p=0.153

Tuveson V et al. Vasc Med. 2016 Aug;21(4):369-75

Prevalence of synchronous and metachronous aneurysms in women with AAA

Table 1. Definitions of aneurysms in the studied arterial segments.

Arterial segment	Definition of an aneurysm
Ascending thoracic aorta	≥42 mm
Descending thoracic aorta	≥33 mm
Infrarenal abdominal aorta	≥30 mm
Common iliac artery	≥20 mm (or >50% contralateral side)
Common femoral artery	≥12 mm
Popliteal artery	≥10 mm

Wallinder J et al. Eur J Vasc Endovasc Surg 2018 In Press

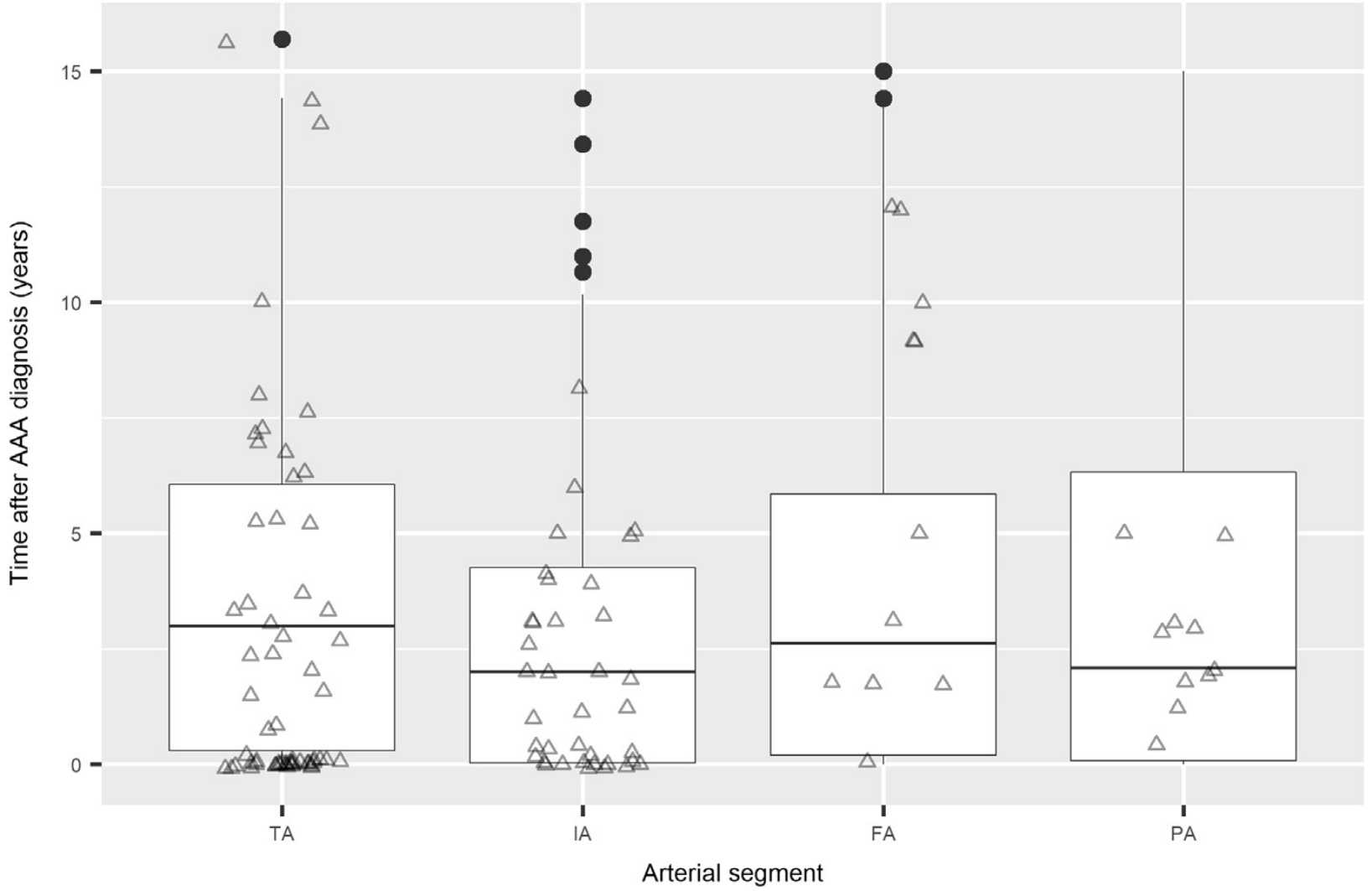
Prevalence of synchronous and metachronous aneurysms in women with AAA

Table 2. Prevalence of concomitant arterial aneurysms among women with abdominal aortic aneurysms.

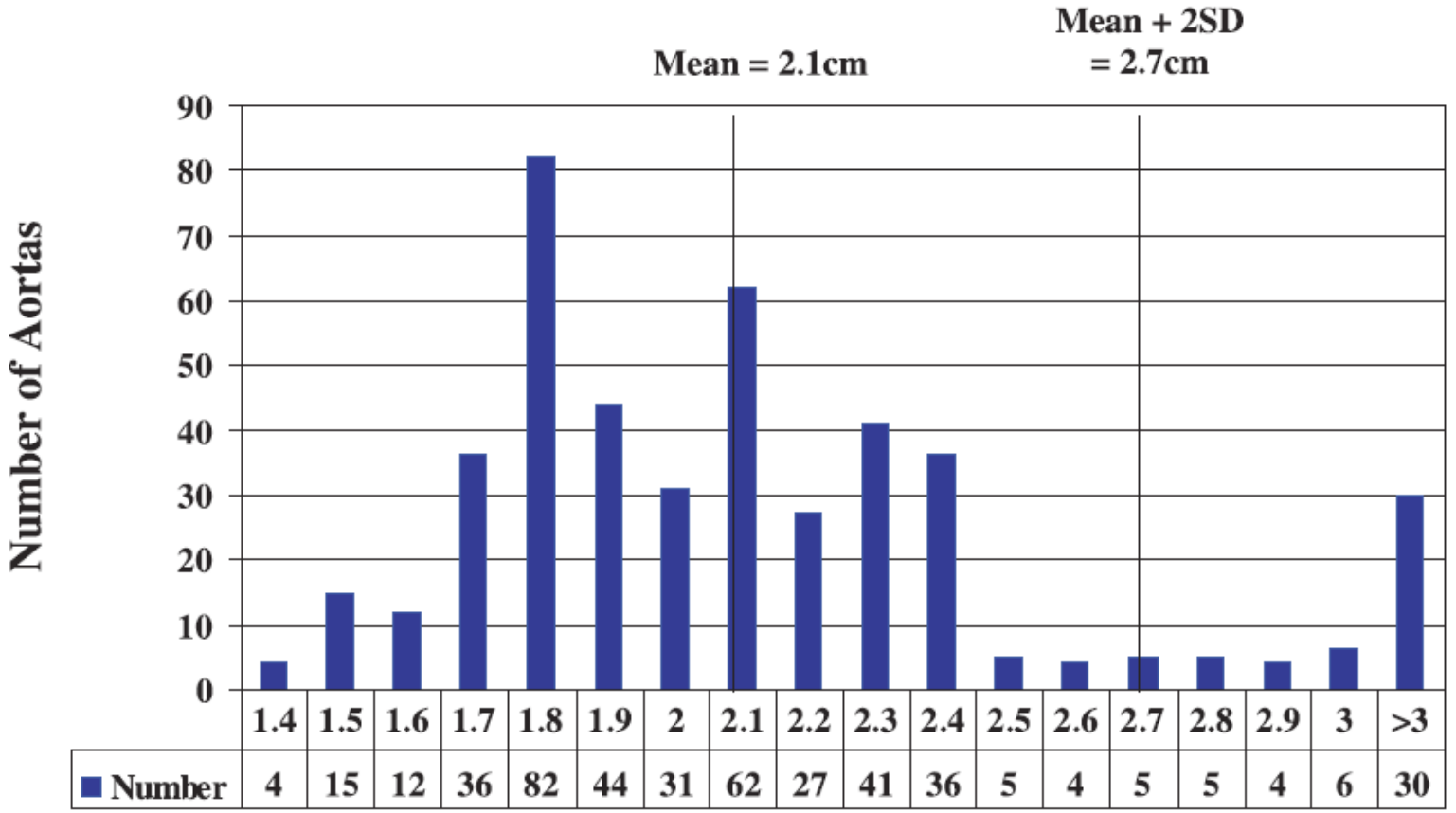
Segment	Number of patients evaluated (%)	Follow up[a] Years, median (range)	Patients with aneurysm Number (%)	Bilateral aneurysms Number (%)
Thoracic aorta	217 (64%)	3.0 (0—15.7)	67 (31%)	n.a.
Common iliac arteries	259 (76%)	2.0 (0—14.4)	24 (9.3%)	11 (4.4%)
All infrainguinal arteries	143 (42%)	—	6 (4.2%)	4 (2.8%)
Common femoral arteries	184 (55%)	2.7 (0—15)	8 (4.3%)	3 (1.6%)
Popliteal arteries	149 (44%)	2.2 (0—15)	6 (4.0%)	4 (2.7%)

Wallinder J et al. Eur J Vasc Endovasc Surg 2018 In Press

Prevalence of synchronous and metachronous aneurysms in women with AAA



Wallinder J et al. Eur J Vasc Endovasc Surg 2018 In Press



Using conventional definitions, the imaging of popliteal arteries during AAA screening does not detect any PAA and is thus of limited value.

However, if a definition of PAA of ⩾1cm (based on mean+2SD) is used then 39/898 (4.3%) of arteries would be regarded as having abnormal diameters and may require surveillance.

Morris-Stiff G, et al. Eur J Vasc Endovasc Surg 2005;30:71–74

Community based AAA screening program

283 subjects

112 with small AAA 3.3cm – 3.5cm

PAA 3 2.7%

171 with normal aorta <29mm

PAA None

Popliteal artery aneurysms are rare in men to be screened for AAA. They are seen in <3% of men with a small AAA and <1% of the total population screened for AAA.

Claridge M, et al. Vasc Health Risk Manag 2006;2:189–191

27 patients with SFA aneurysms
2002-2012 at 2 institutions

Location	*No. (%)*
Proximal third of the SFA	4 (15)
Mid-third	6 (22)
Distal third	16 (59)
Whole SFA	1 (4)
Total	27 (100)

Location	*All (n = 25; 100%),*[a] *No. (%)*	*Patients with aneurysms elsewhere; (n = 21; 84%), No. (%)*
Thoracic aortic aneurysm	3 (12)	3 (14)
Aortoiliac aneurysm	17 (68)	17 (81)
Common femoral aneurysm	6 (24)	6 (29)
Profunda femoris aneurysm	2 (8)	2 (10)
Contralateral SFA aneurysm	8 (32)	8 (38)
Popliteal aneurysm[b]	12 (48)	12 (57)

Perini P, et al. J Vasc Surg 2014;59:152–8

234 open repairs for PAA in 196 patients
1981-2013

Other arterial aneurysms 69 patients (34%)

56 aortoiliac aneurysms
6 isolated iliac artery aneurysm
4 femoral aneurysm
1 small aneurysm of the ascending aorta
1 TAAA type IV
1 renal artery

Most likely the prevalence of other aneurysms was underestimated

Dorigo W, et al. J Vasc Surg 2015;62:1176–82

169 patients with AAA
TAA or enlargement was found in 20%
PAA or enlargement in 33%

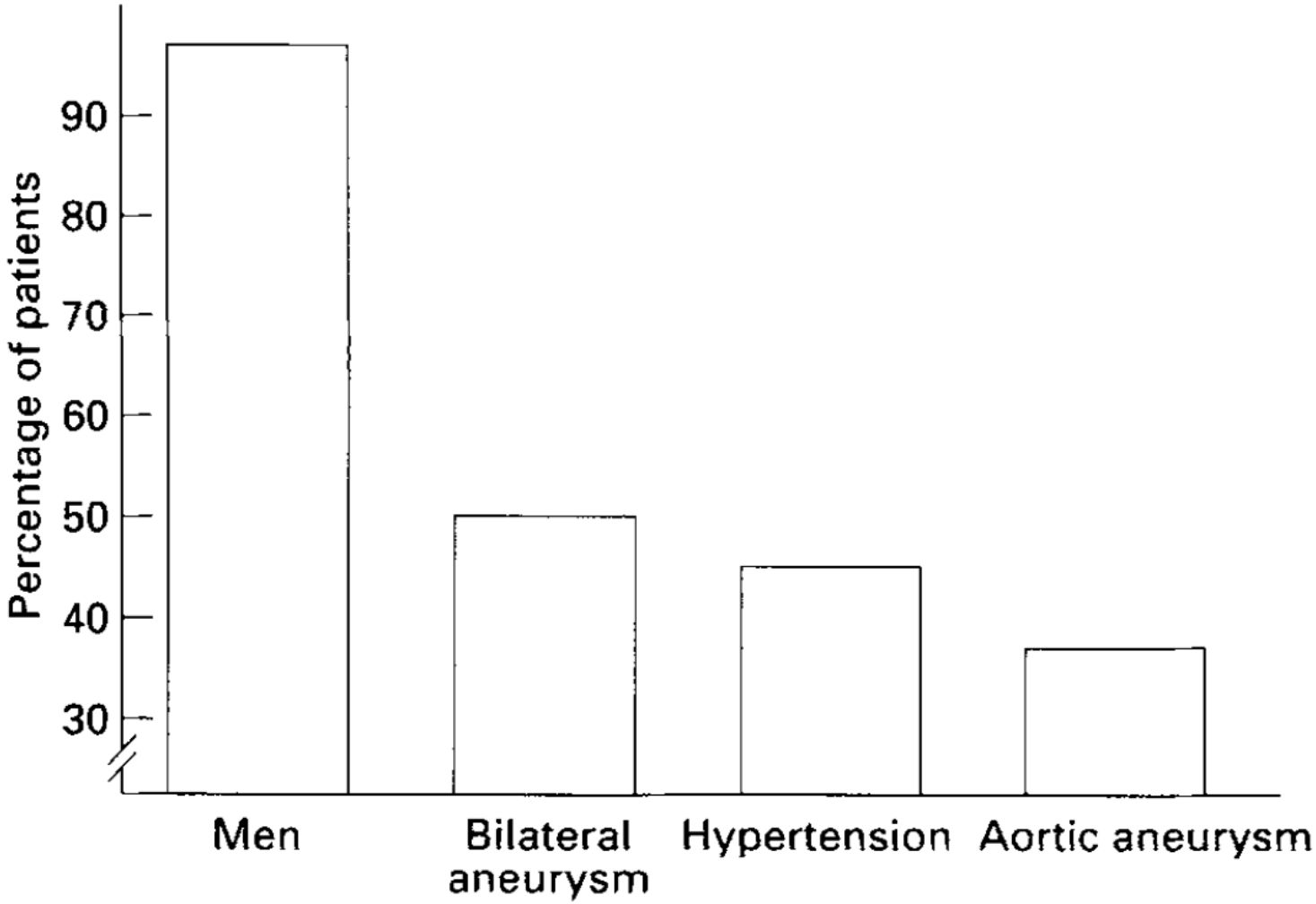
In patients with AAA

MMP9 and MMP12 genetic variants are associated with enlargements or aneurysmal disease outside the abdominal aorta.

AAA >35mm
TAA >45mm, enlargement >35mm to 44mm
Popliteal artery aneurysm >15mm, enlargement 10mm-14mm

Fiotti N, et al. J Vasc Surg 2018;67:1727-35

29 studies containing 1673 patients with 2445 PAAs



Dawson, et al. Br J Surg 1997;84:293-299

Patients with AAA
Association with aneurysms in TA and peripheral arteries

Patients with peripheral artery aneurysms have a stronger association with AAA

Considerable variation on the prevalence based on aneurysm definitions

Some work on peripheral artery development in patients with AAA

Number of peripheral aneurysms is small

Screening for peripheral aneurysms is not cost-effective

Lack of prospective and multicenter data

Guidelines and recommendations for screening and follow-up do not exist