



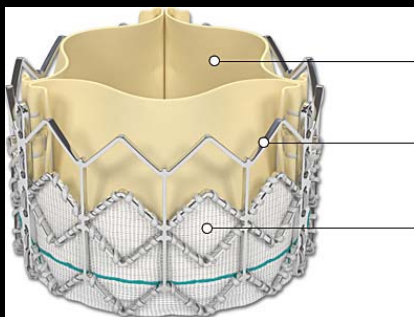
Washington
Hospital Center



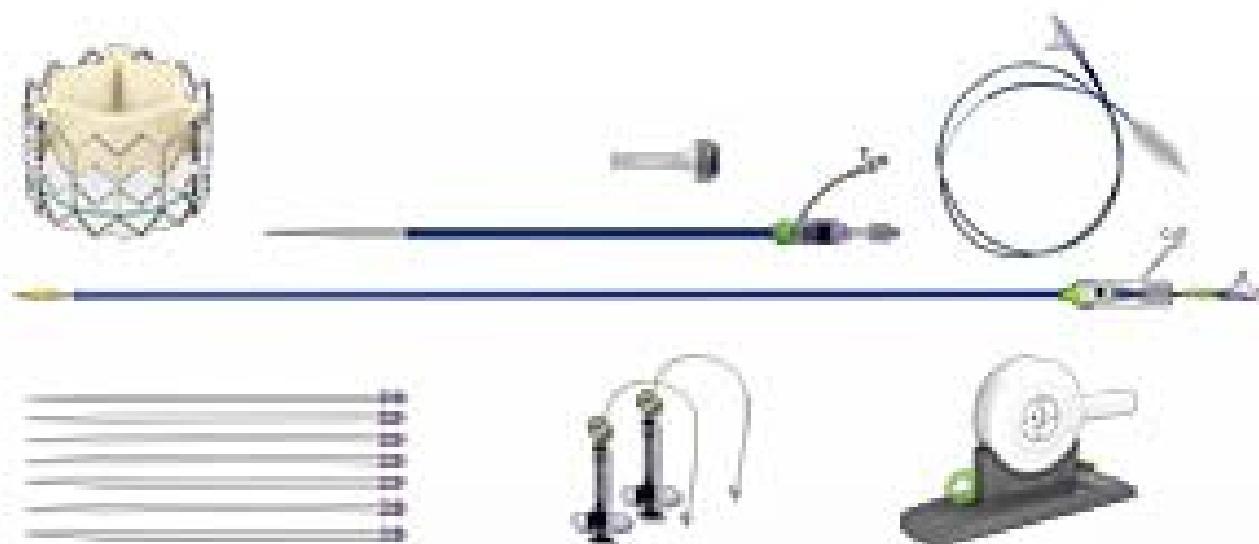
Aorta, Iliac, and Femoral Evaluation by CT for TAVI

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Edwards SAPIEN Valve and RetroFlex 3 Delivery System



Bovine Pericardial Tissue Leaflets
Balloon Expandable Stainless Steel Frame
Polyethylene Terephthalate Skirt



SAPIEN Valve

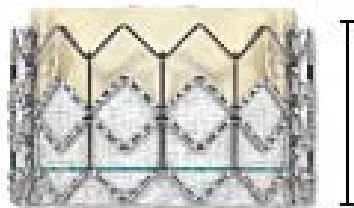
23 mm



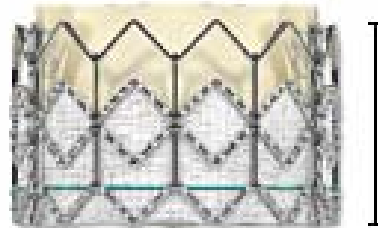
26 mm



14.3 mm



16.1 mm

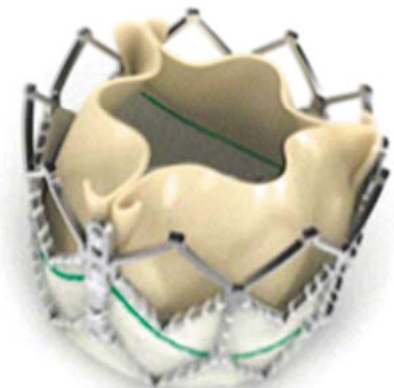


18-22 mm

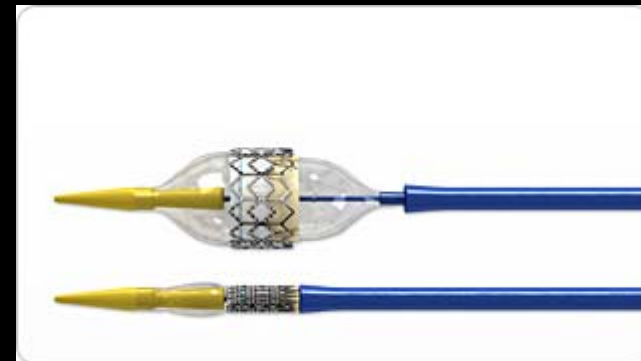
21-25 mm



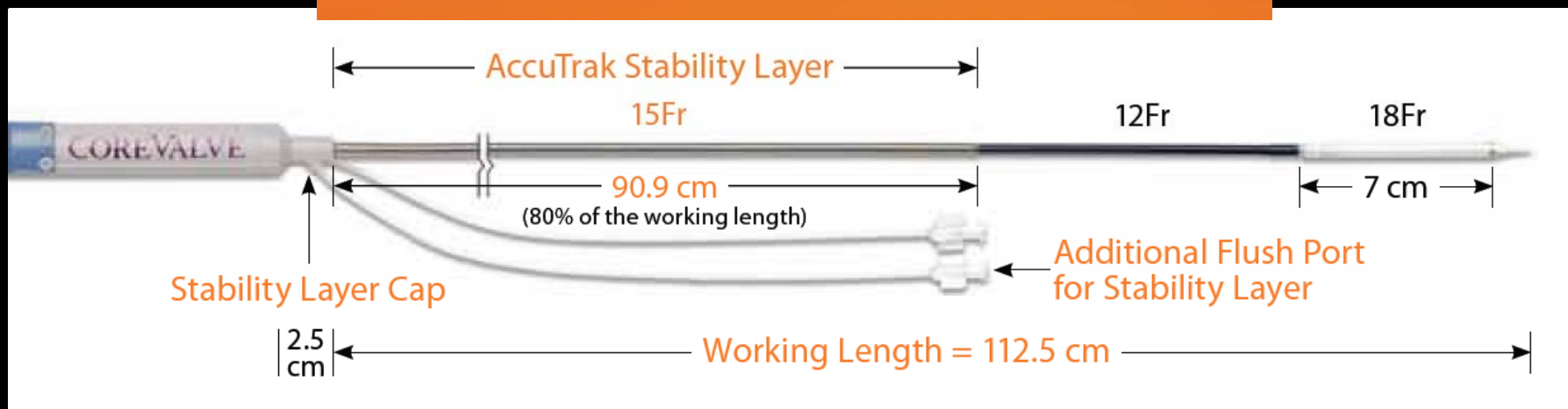
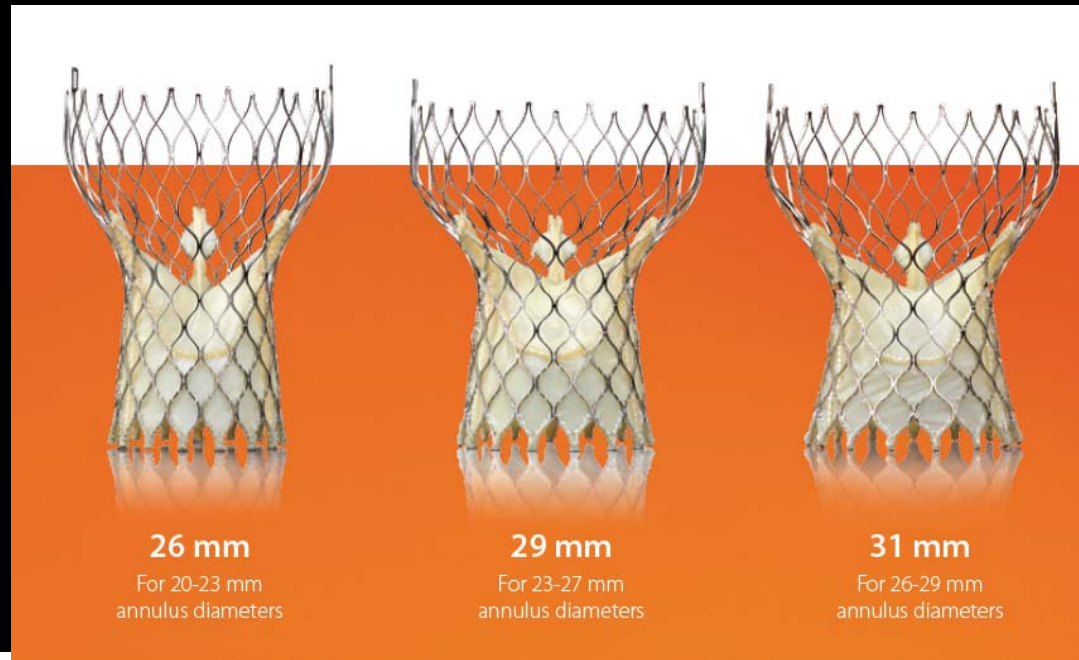
Sapien™



Sapien XT™



CoreValve and Delivery System



Anatomic Study Required

- Suitable anatomy, and free of contraindications, required for safe delivery and deployment
- In particular:
 - Caliber
 - Tortuosity
 - Calcification
 - Plaque/Atheroma

Prevalence of significant peripheral artery disease in patients evaluated for percutaneous aortic valve insertion: Preprocedural assessment with multidetector computed tomography

Vikram Kurra, MD,^{a,b} Paul Schoenhagen, MD,^{a,b} Eric E. Roselli, MD,^a Samir R. Kapadia, MD,^a E. Murat Tuzcu, MD,^a Roy Greenberg, MD,^a Mateen Akhtar, MD,^a Milind Y. Desai, MD,^{a,b} Scott D. Flamm, MD,^{a,b} Sandra S. Halliburton, PhD,^b Lars G. Svensson, MD,^a and Srikanth Sola, MD^{a,b}

TABLE 2. Mean luminal diameter of the infrarenal abdominal aorta and iliofemoral arteries in the overall group and in the groups with (PAD group) and (no-PAD group) criteria of significant PAD

Arterial segment (mm)	Mean luminal diameter (mm ± SD)			P value (PAD vs no-PAD)
	All patients (n = 100)	PAD group (n = 35)	No-PAD group (n = 65)	
Infrarenal abdominal aorta	16.4 ± 2.7	15.2 ± 2.6	17.2 ± 2.9	.02
Right common iliac artery	10.6 ± 1.8	9.4 ± 1.8	11.3 ± 1.5	.01
Right external iliac artery	8.6 ± 1.4	7.1 ± 1.1	9.2 ± 0.9	.01
Right common femoral artery	8.7 ± 1.2	7.3 ± 1.2	9.3 ± 0.9	<.001
Left common iliac artery	10.4 ± 1.6	9.4 ± 1.6	10.9 ± 1.4	.03
Left external iliac artery	8.5 ± 1.3	7.4 ± 0.9	9.2 ± 1.1	.001
Left common femoral artery	8.6 ± 1.2	7.5 ± 1.1	9.2 ± 0.9	.01

PAD, Peripheral arterial disease; SD, standard deviation.

Prevalence of significant peripheral artery disease in patients evaluated for percutaneous aortic valve insertion: Preprocedural assessment with multidetector computed tomography

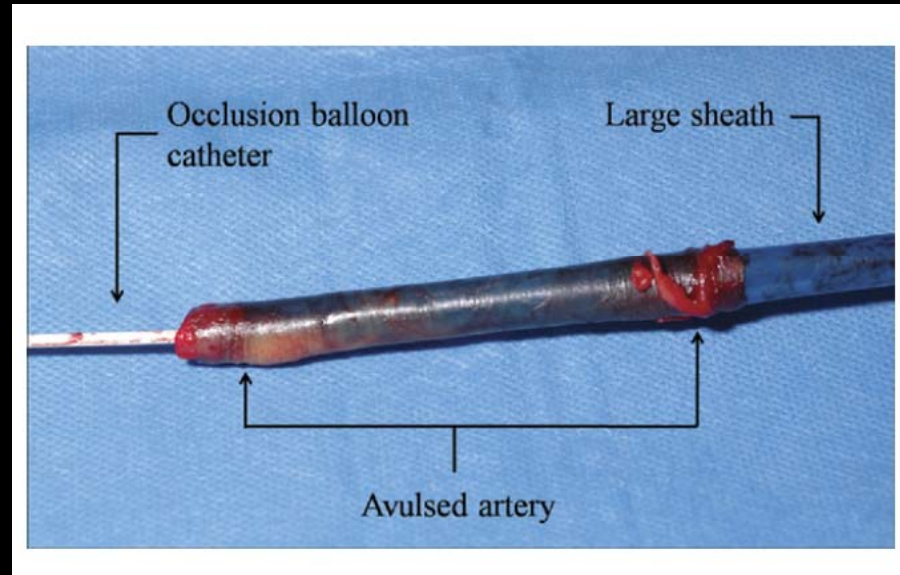
Vikram Kurra, MD,^{a,b} Paul Schoenhagen, MD,^{a,b} Eric E. Roselli, MD,^a Samir R. Kapadia, MD,^a E. Murat Tuzcu, MD,^a Roy Greenberg, MD,^a Mateen Akhtar, MD,^a Milind Y. Desai, MD,^{a,b} Scott D. Flamm, MD,^{a,b} Sandra S. Halliburton, PhD,^b Lars G. Svensson, MD,^a and Srikanth Sola, MD^{a,b}

TABLE 3. Circumferential calcification and abdominal aortic aneurysm in the overall group and in the groups with (PAD group) and (no-PAD group) criteria of significant PAD

Variable	All patients (n = 100)	PAD group (n = 35)	noPAD group (n = 65)	P value (PAD vs no-PAD)
Infrarenal AAA (>3.5 cm)	5 (5%)	2 (6%)	3 (4%)	.8
Infrarenal aorta < 12 mm	6 (6%)	6 (17%)	0 (0%)	.22
Circumferential calcification aortic bifurcation (>60%)	12 (10%)	7 (20%)	5 (8%)	.01
Circumferential calcification iliac bifurcation (>60%)	12 (12%)	12 (34%)*	0 (0%)*	.2

PAD, Peripheral arterial disease; *AAA*, abdominal aortic aneurysm. *By definition

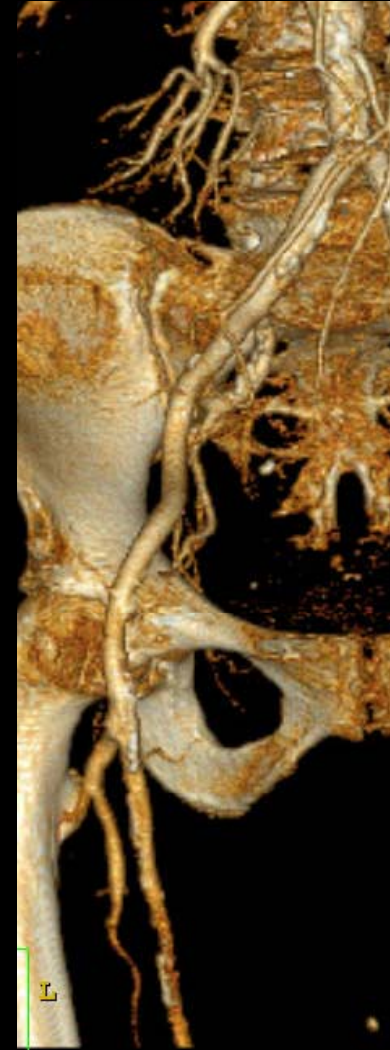
Risks of TAVI Access/Deployment



- Unable to deliver or deploy
- Dissection
- Embolism
- Entrapment/Avulsion

4 Primary Reasons for Failure

- Insufficient caliber
- Calcification
- Tortuosity
- Plaque
- Incidental findings: aneurysms; previous dissections
- CT can play a strong role in identifying potential problems



Standard CTA Aorta Exam

- Arch to mid-thigh (extend to subclavian arteries for TAVI patients)
- Non-con followed by con-enhanced
- Helical, ungated CT
- Pro:
 - Fast, familiar, full coverage of aorta
 - Normal peripheral IV access
- Con:
 - No gating: artifact of root
 - Large contrast volume (100-120 mL)

Alternative Exams

- Dynamic gating: (on) through chest and (off) through abdomen/peripheral
 - Good option if contrast volume not a concern
- Full aorta non-contrast with con-enhanced scan dedicated to iliac/femoral
 - Reduces contrast volume
- Intra-aortic contrast injection and dedicated iliac/femoral scan
 - Lowest possible contrast volume
 - Obtain critical lumen calibers in iliacs/femorals

Ilio-femoral CT Angiography with Ultra-Low Dose Intra-arterial Contrast Injection - A Novel Imaging Protocol

Joshi SB, Mendoza DD, Steinberg DH, Lopez CF,
Raizon A, Hutter AJ, Weissman G, Pichard AD, Satler LF,
Weigold WG

Methods

- Consecutive patients being evaluated for percutaneous valvular intervention requiring large bore arterial access
- Cardiac catheterisation with a 6 Fr femoral sheath
 - DSA of iliac arteries in antero-posterior projection
 - single injection of 30cc contrast into abdominal aorta via pigtail catheter
- Pigtail catheter left in situ in infra-renal abdominal aorta
 - connected to heparinized saline and secured

- Patient transferred to CT suite
- CT next to Cardiac Cath labs



Methods

CT Imaging Protocol (1)

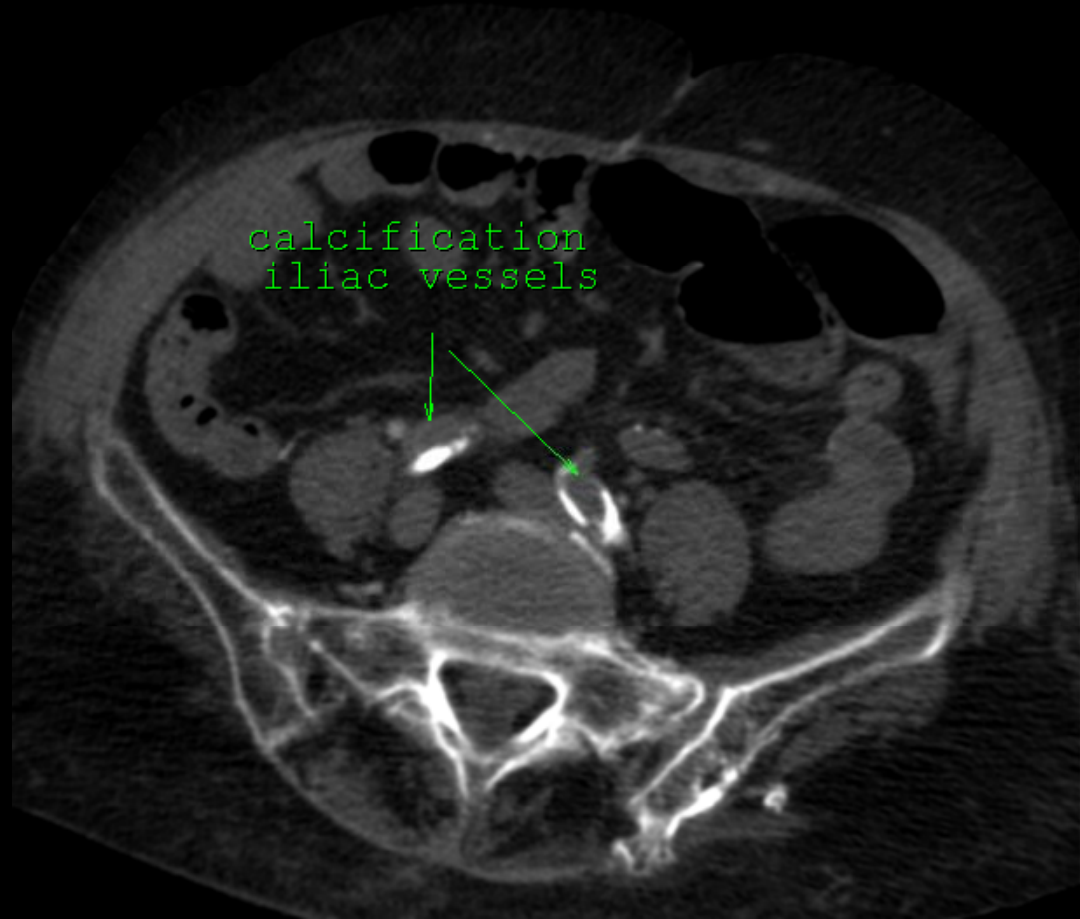
- Philips iCT 256 slice scanner
- Survey



Methods

CT imaging (2)

- non contrast scan of chest abdomen and pelvis
- calcification
- confirmation of catheter position



CT Imaging Protocol (2)

Contrast Enhanced Scan

- 1:3 to 1:4 dilution contrast to saline mixture (Isovue 370)
- 40 cc of total volume (10-12 cc of contrast) injected at 4 cc/second via pigtail catheter
- 6 sec scan delay
- helical ungated CT from mid-abdomen to mid thigh
 - 64 x 0.625 collimation, rotation time 0.75 seconds, pitch 0.64, 120 kV, 154 mAs, thickness 3 mm
- pigtail catheter removed while patient in CT suite
 - arterial sheath left in situ to be removed later

Image Analysis

- Philips Extended Brilliance Workspace
- 2D and 3D tools with multi-planar reconstruction
- non-contrast scan
 - calcification
- contrast-enhanced scan
 - tortuosity
 - stenosis
 - dissection

Results (1)

- 27 patients, 17 (63%) female
- age 83 (+/- 6.9 years)
- serum creatinine 1.4 mg/dL
- all were being considered for percutaneous aortic valve intervention: valvuloplasty or percutaneous replacement

- contrast dose 12.7 +/- 2.0 cc

Results (2)

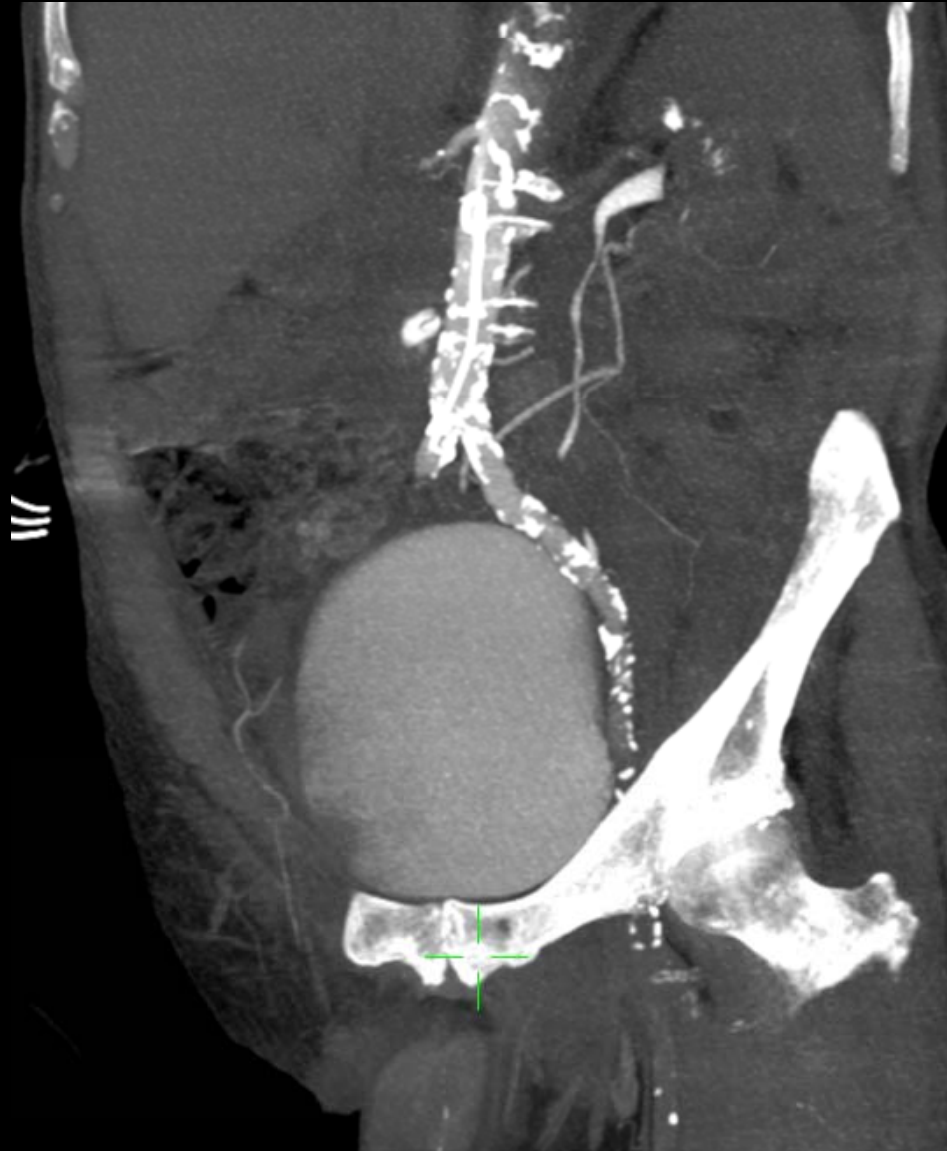
- Excellent image quality in 25 of 27 patients (93%)
- visualisation of entire ilio-femoral arterial tree



Results (3)

Warnings

- 1 patient
 - discordant timing of contrast injection and acquisition
 - scan "outran" contrast
- scan delay increased to 9 seconds

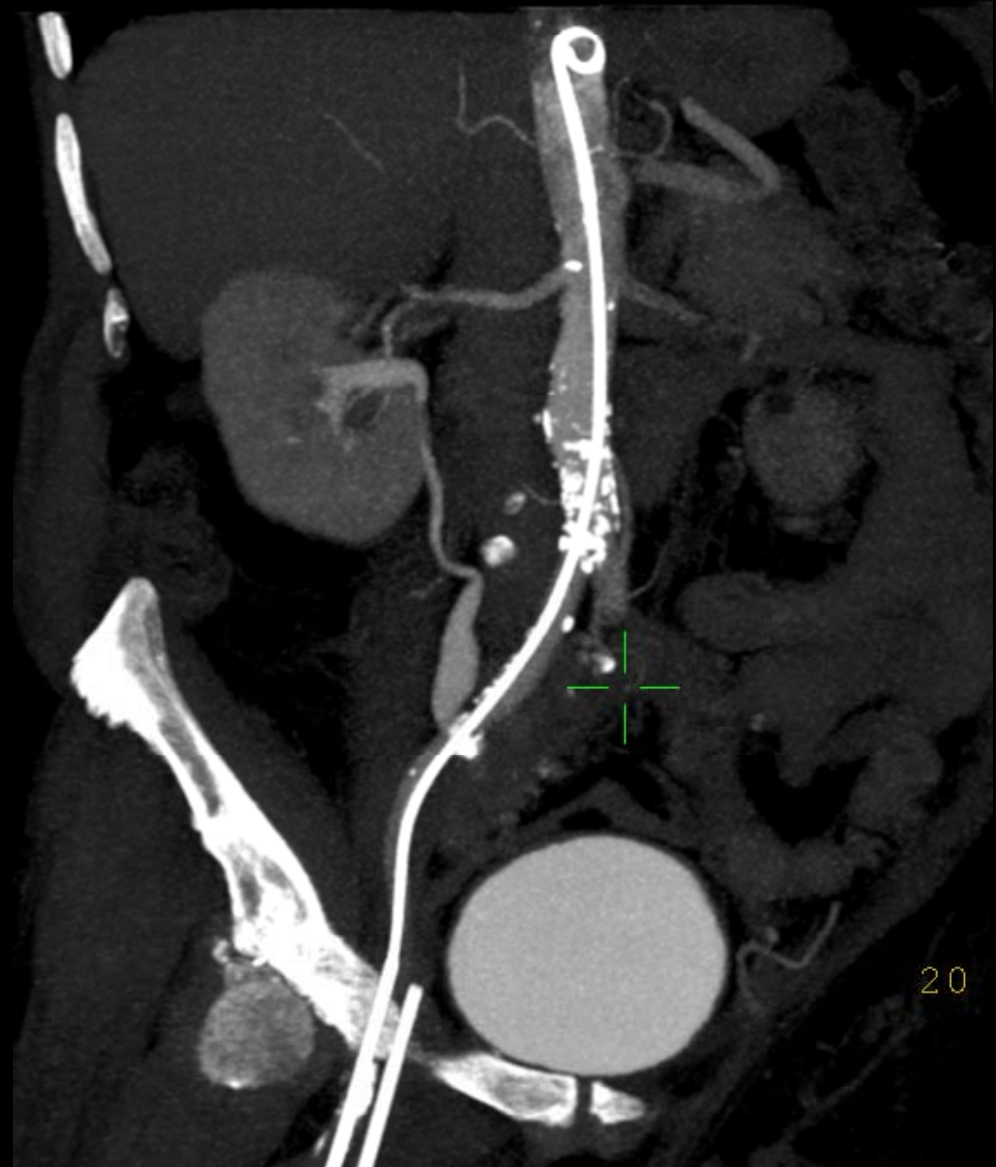


Results (4)

Warnings

1 patient

- catheter above renal arteries
- dilution of contrast
- catheter re-positioned if necessary with subsequent scans



Results (5)

Complications

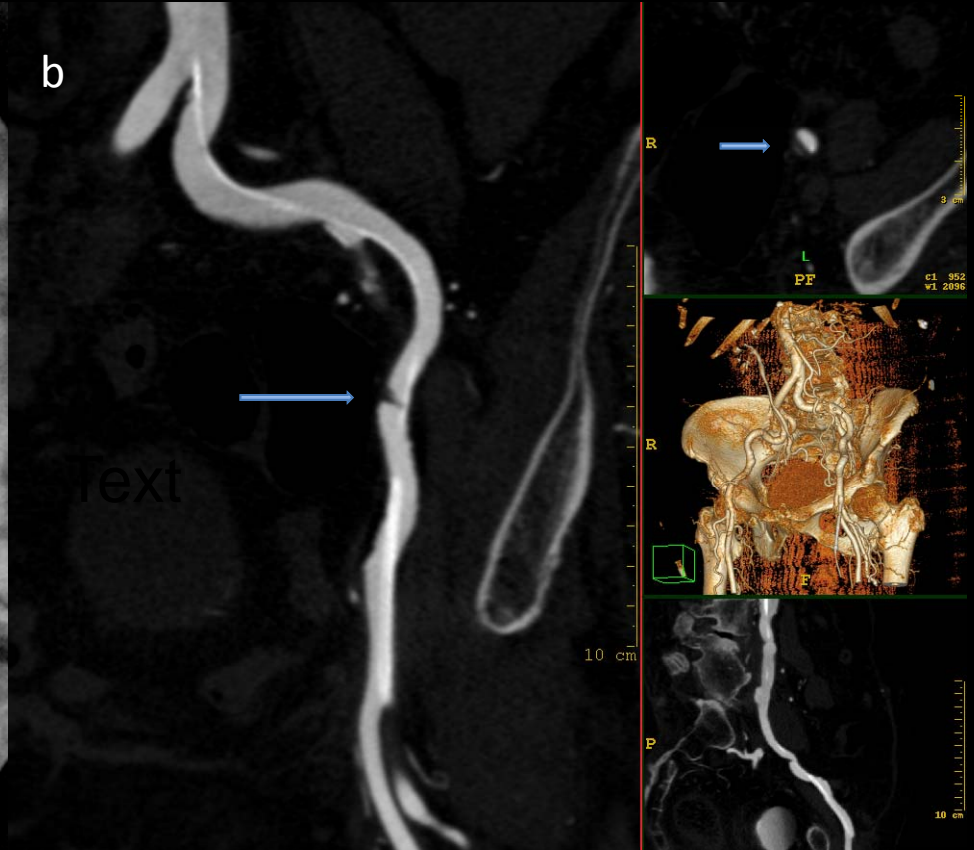
- Thrombosis of pigtail catheter - 1 patient
 - unable to aspirate from catheter
 - catheter replaced in CT suite prior to scan
 - successful completion of scan
 - no clinical sequelae
- No other complications

Example 1

Focal Arterial Stenosis

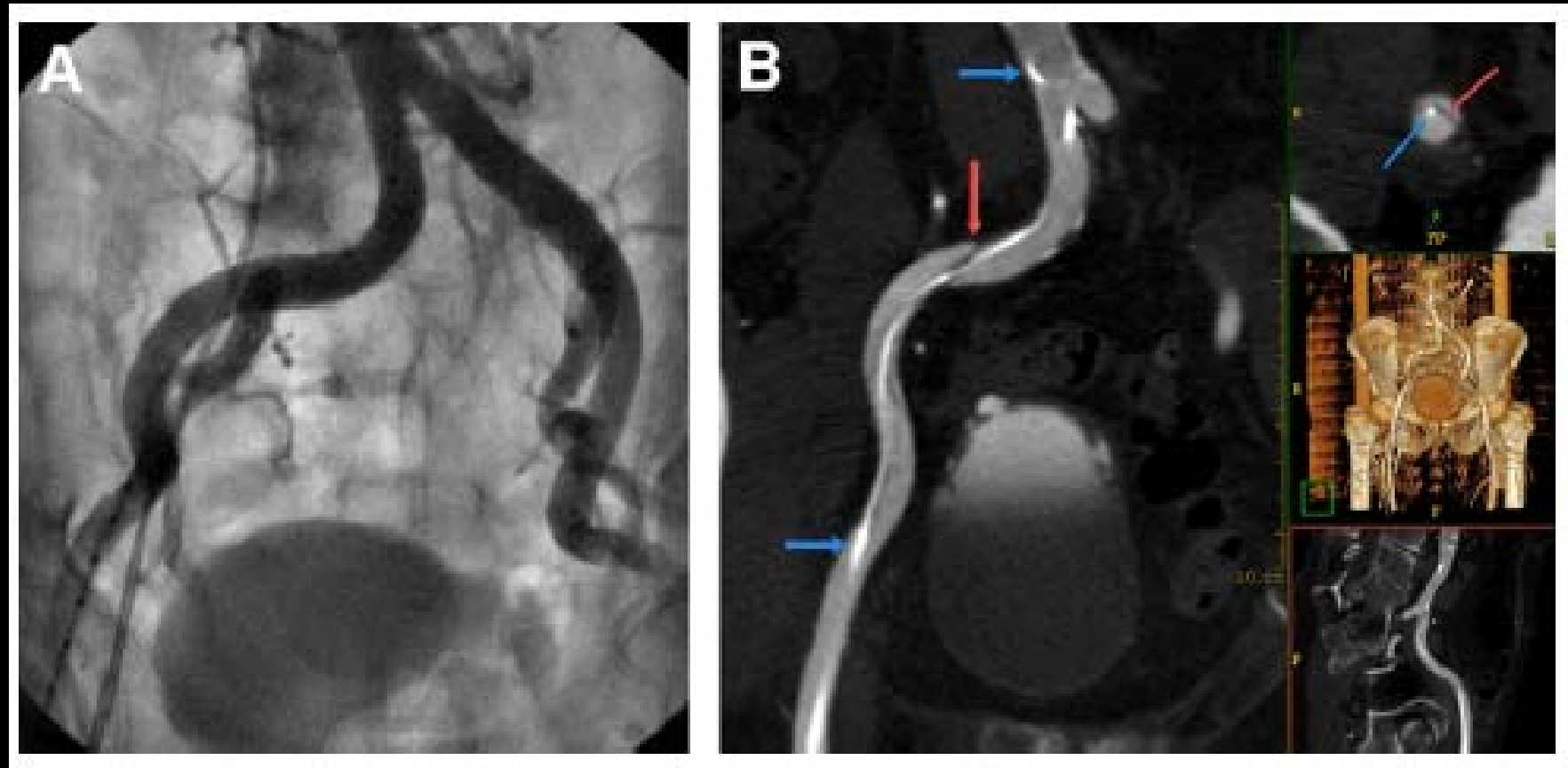


DSA
(30 cc contrast)



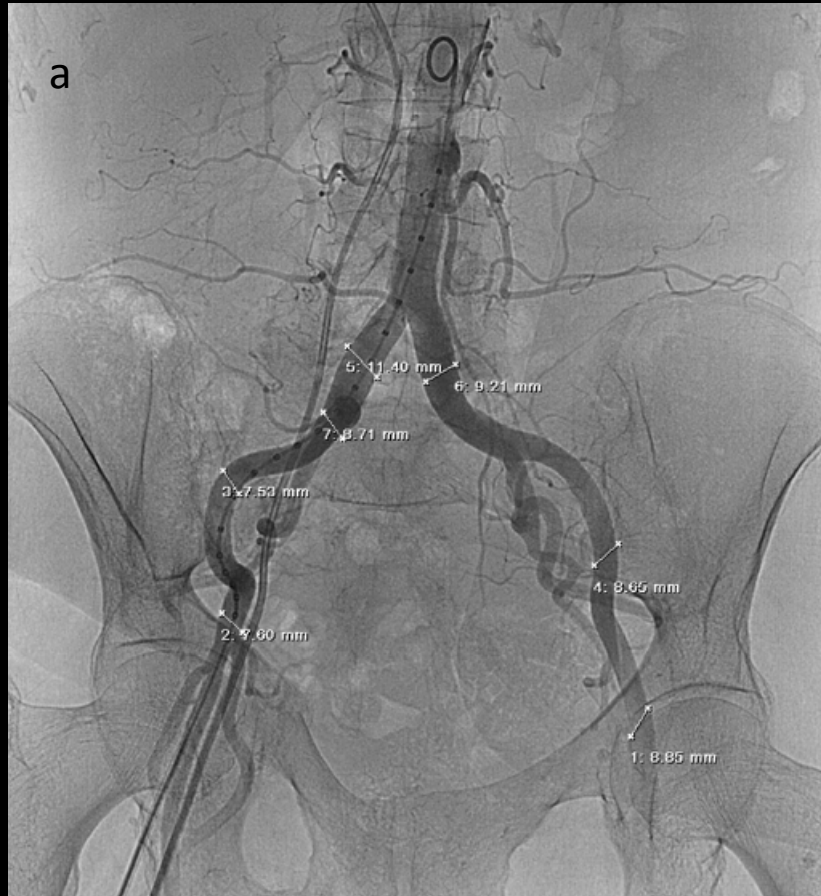
CT angiogram
(10 cc contrast)

Arterial Dissection

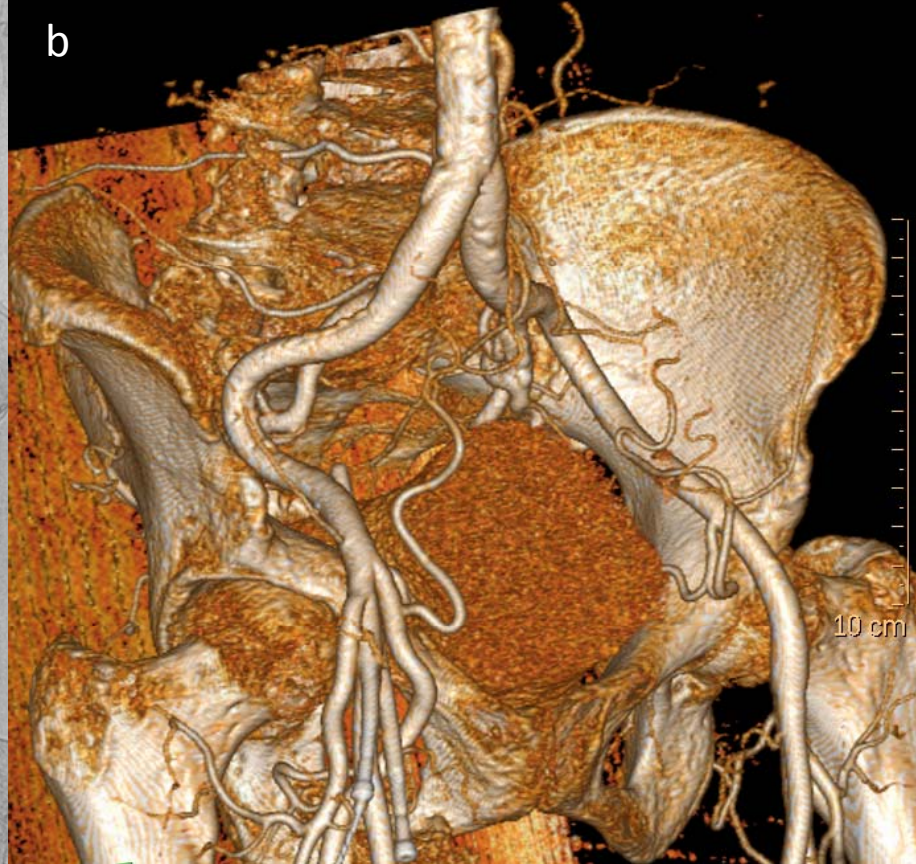


Example 2

Tortuous Iliac Arteries

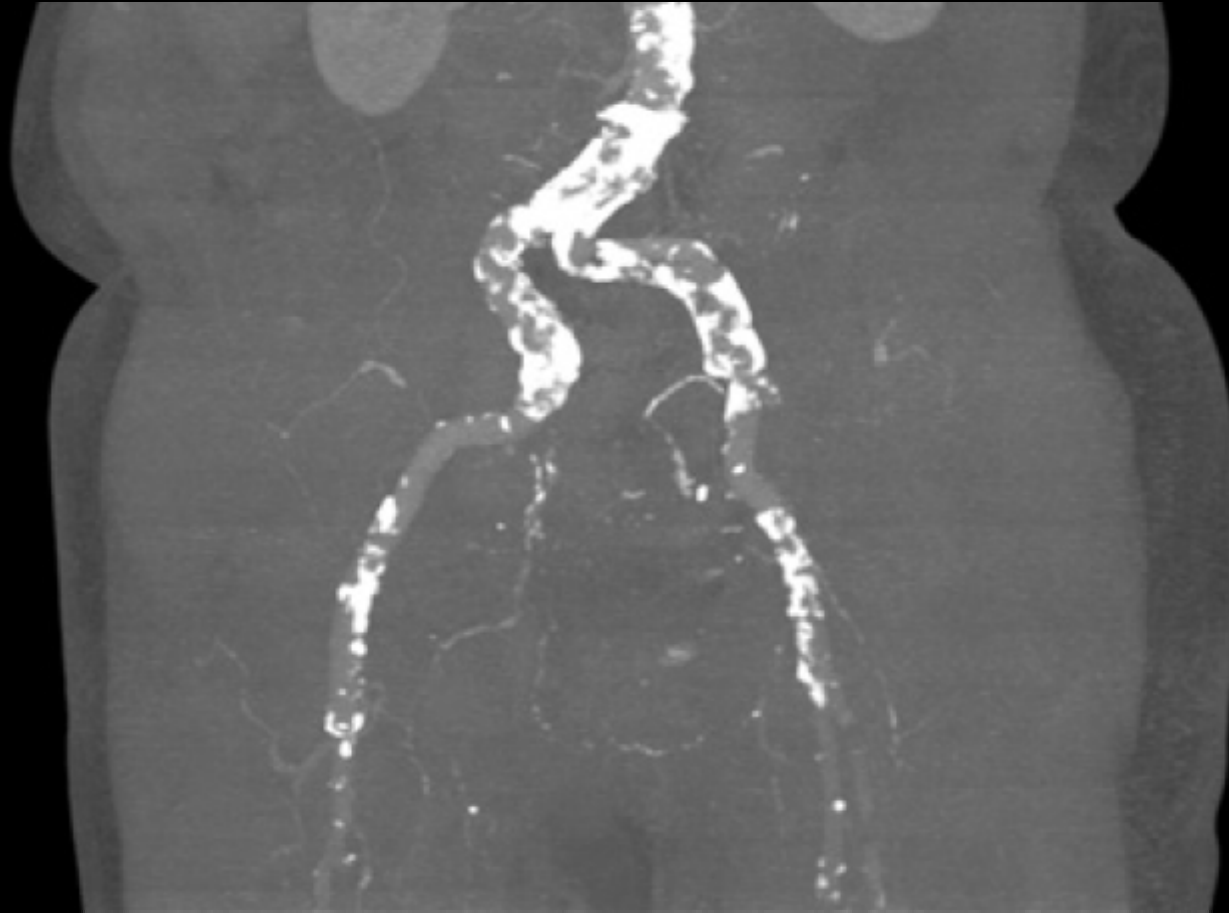


DSA



CT angiogram

Calcification + Tortuosity = No Go



Results (6)

Clinical Impact

- In 7 patients (26 %) CT angiography lead to cancellation of percutaneous intervention due either to confirmation or discovery of contra-indication
 - severe vessel tortuosity
 - stenosis
 - severe calcification

CTA and PTAVR Contraindications

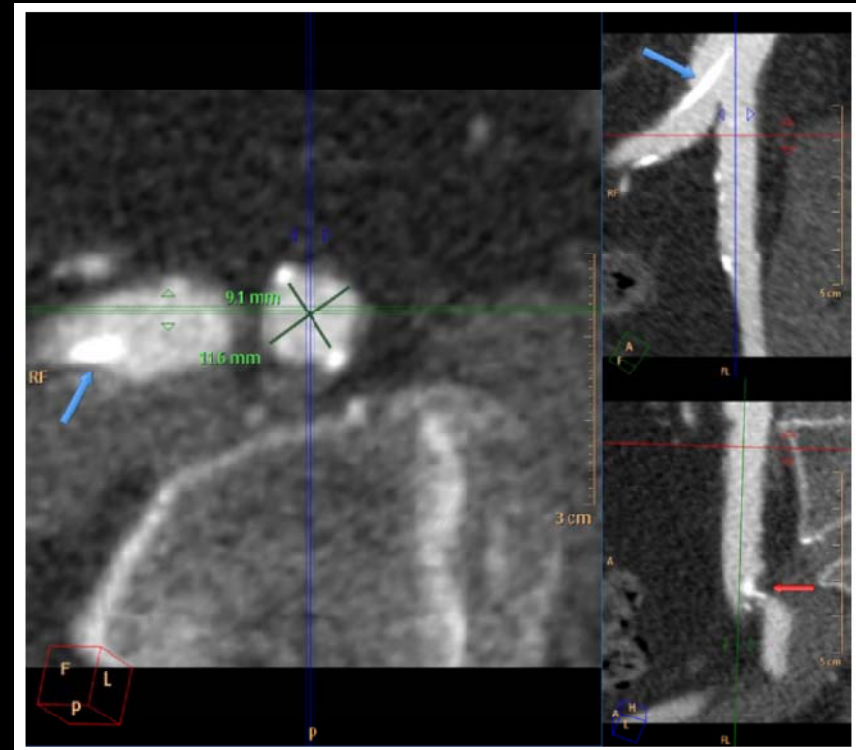
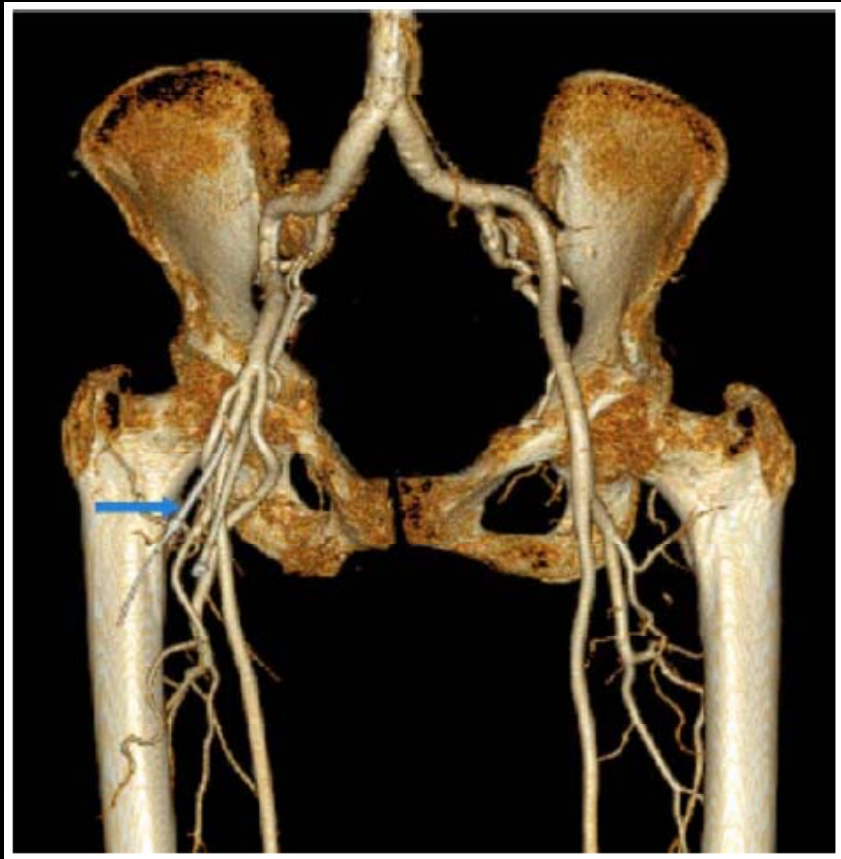
Table 1. Contraindications to Large-Bore Femoral Arterial Access As Assessed on Conventional and Computed Tomographic Angiography

	Severe Tortuosity	Circumferential Calcification	Diameter <7 mm	Arterial Dissection
CA	11	0	20	0
IA-CTA	13	3	28	1

CA – conventional angiography; IA-CTA – intra-arterial computed tomographic angiography.

- Compared to conventional angio, CTA reveals more of the factors that are associated with poor outcomes
- More sensitive tool

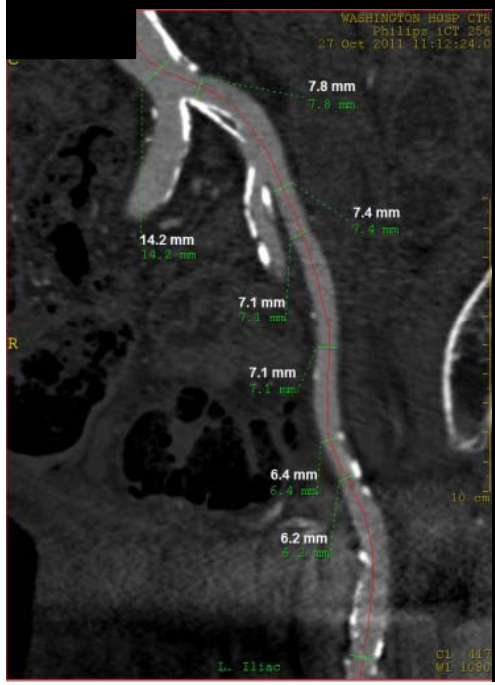
Intra-aortic CTA: Standard Practice Before TAVI



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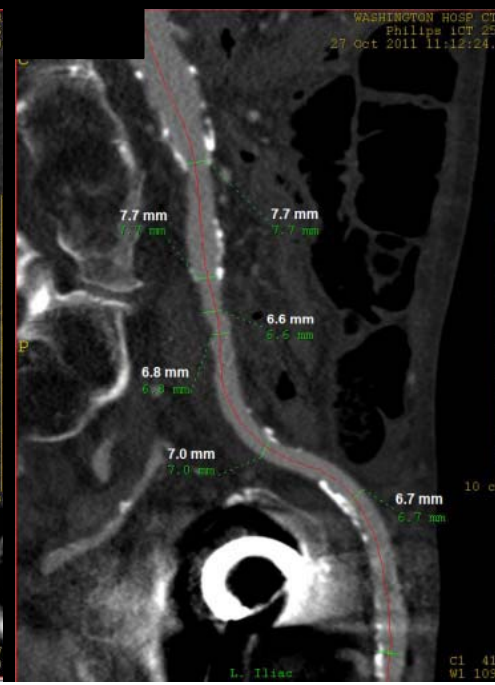
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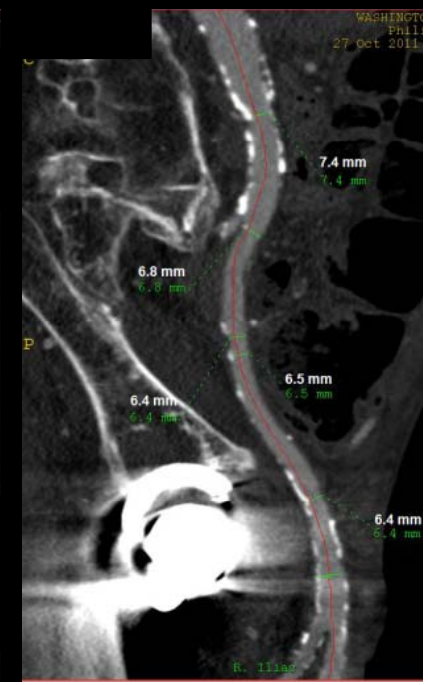
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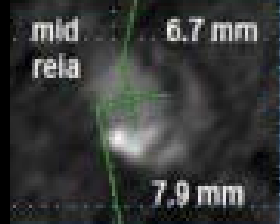
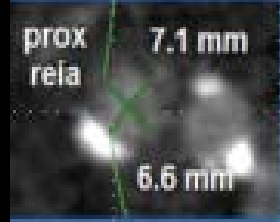
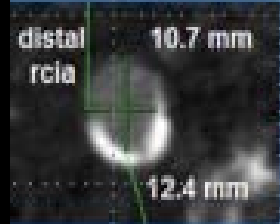


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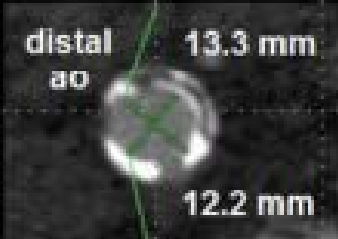
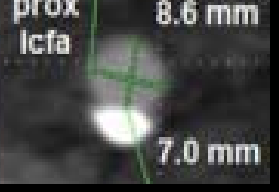
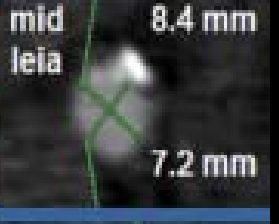
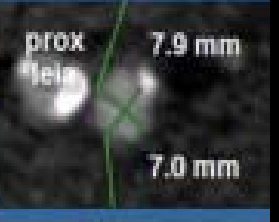
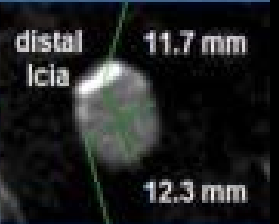




mid

whc
m/88y

RP



Conclusions

- CTA should be standard before TAVI
- Variety of scan/acquisition methods depending on the clinical circumstances and intended approach
- Bare minimum in standard CT angio of aorta, or, if contrast sparing: non-con aorta and con(+) iliac/femoral



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