Endovascular management of coral reef aorta involving the visceral vessels

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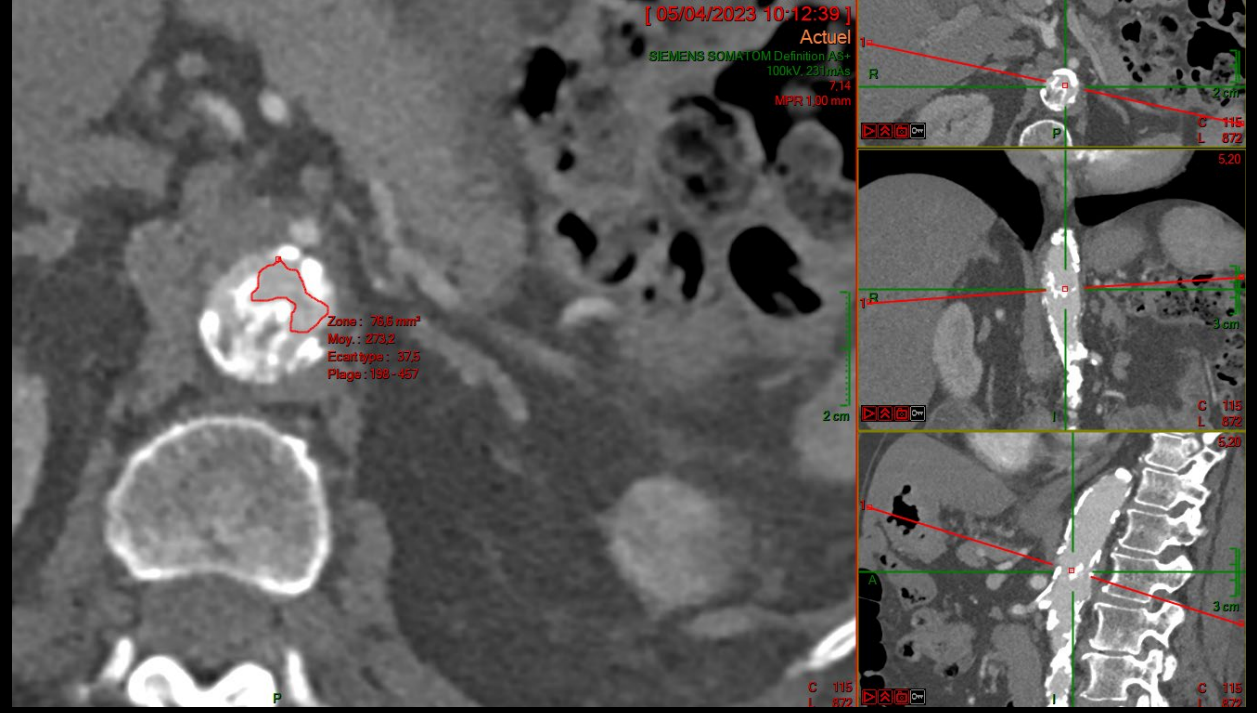
in v)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Moy. : 273,2
Ecart type : 37,5
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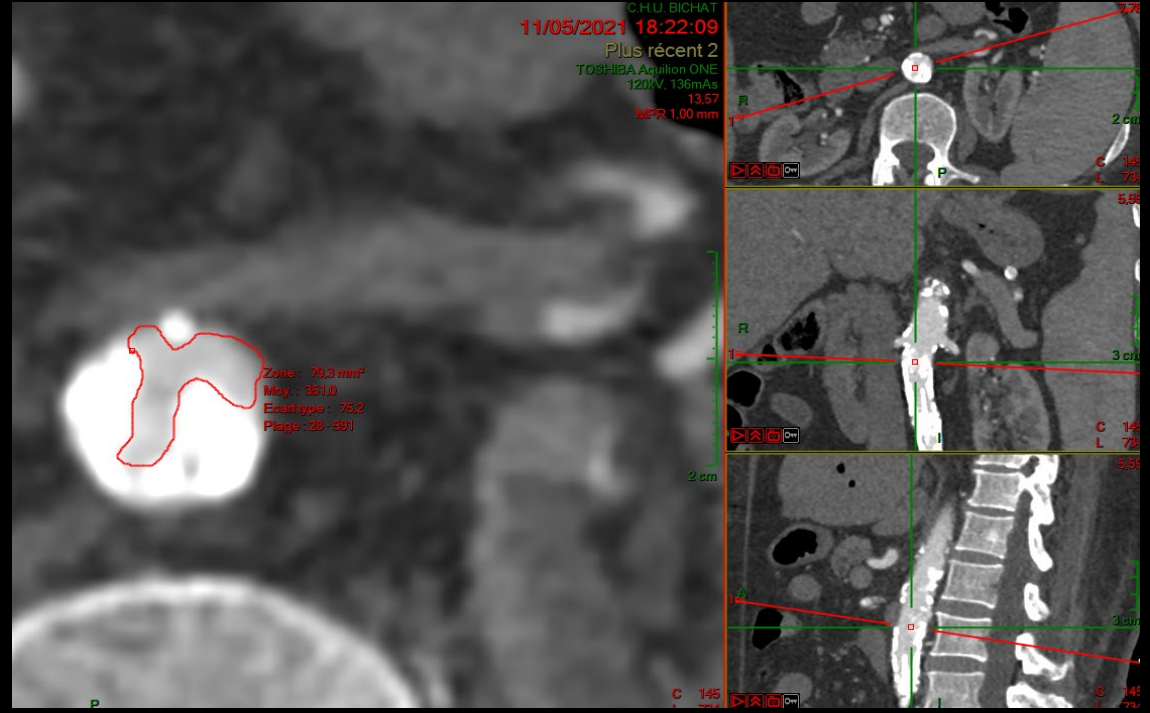
2 cm
3 cm


C.H.U. BICHAT
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Plus récent 2
TOSHIBA Aquilion ONE
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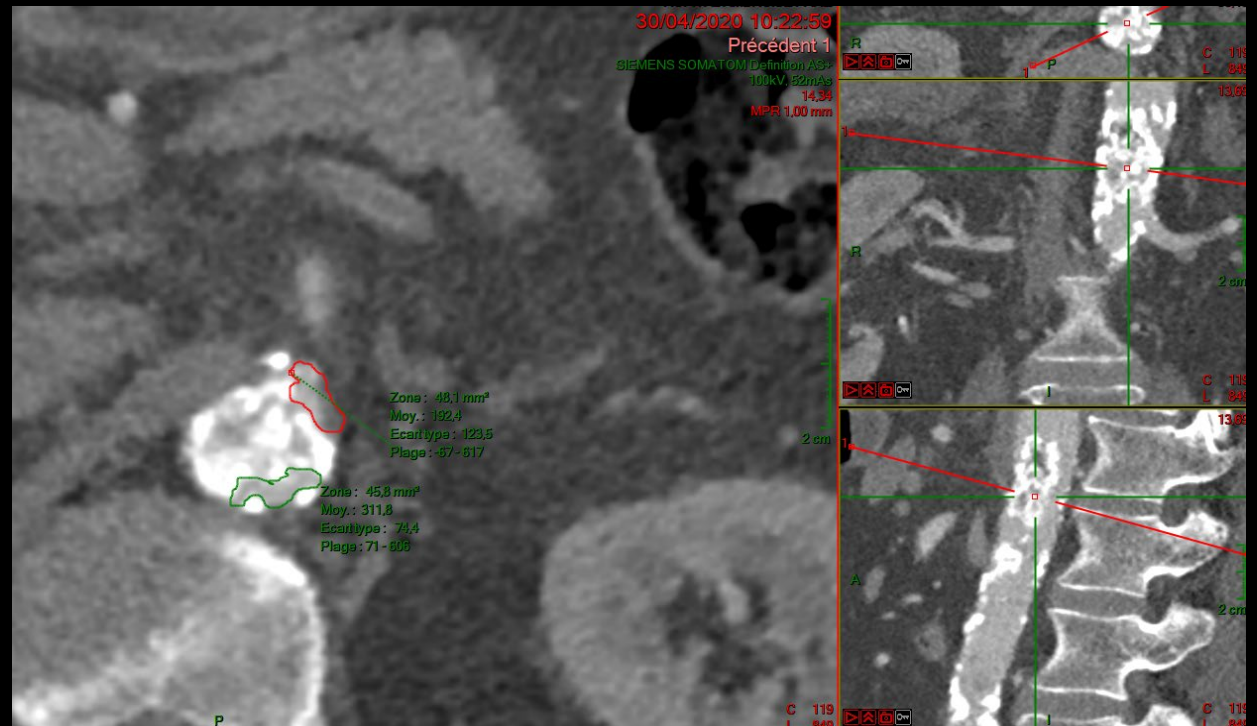
3 cm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Moy. : 192,4
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Moy. : 311,8
Ecart type : 74,4
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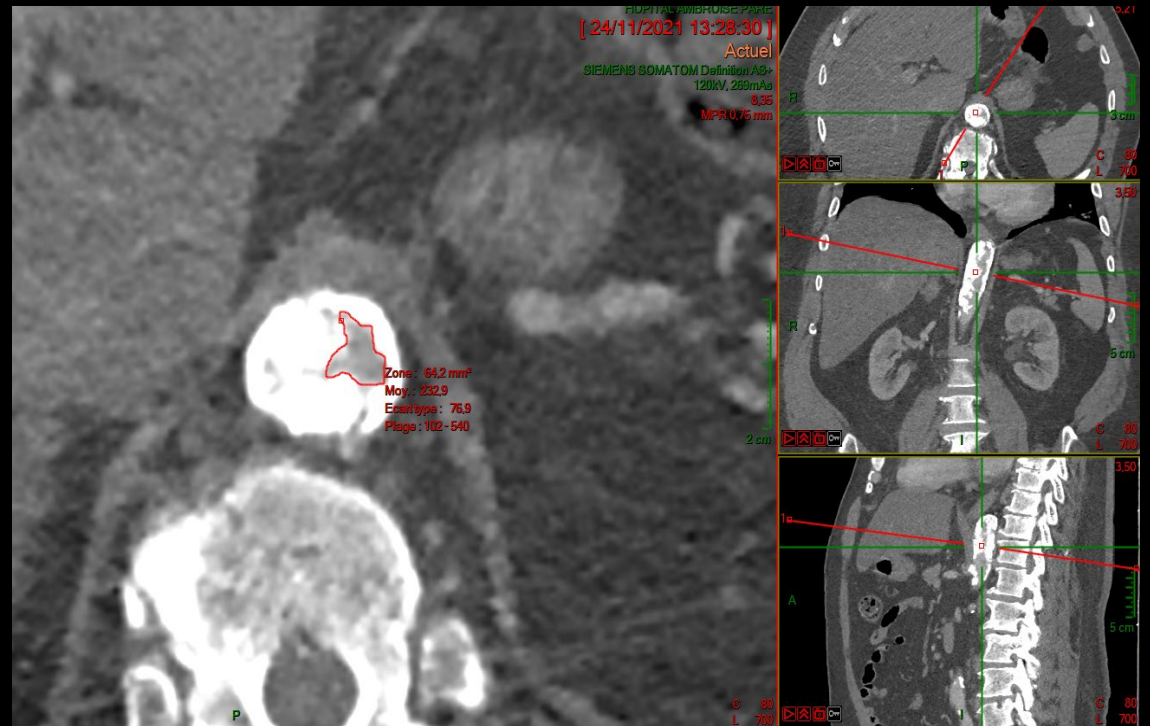
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Moy. : 232,9
Ecart type : 76,9
Plage : 102 - 540
2 cm
5 cm

CRAv: is this the last open surgical domain ?

Transaortic endarterectomy

More complex when ostial disease

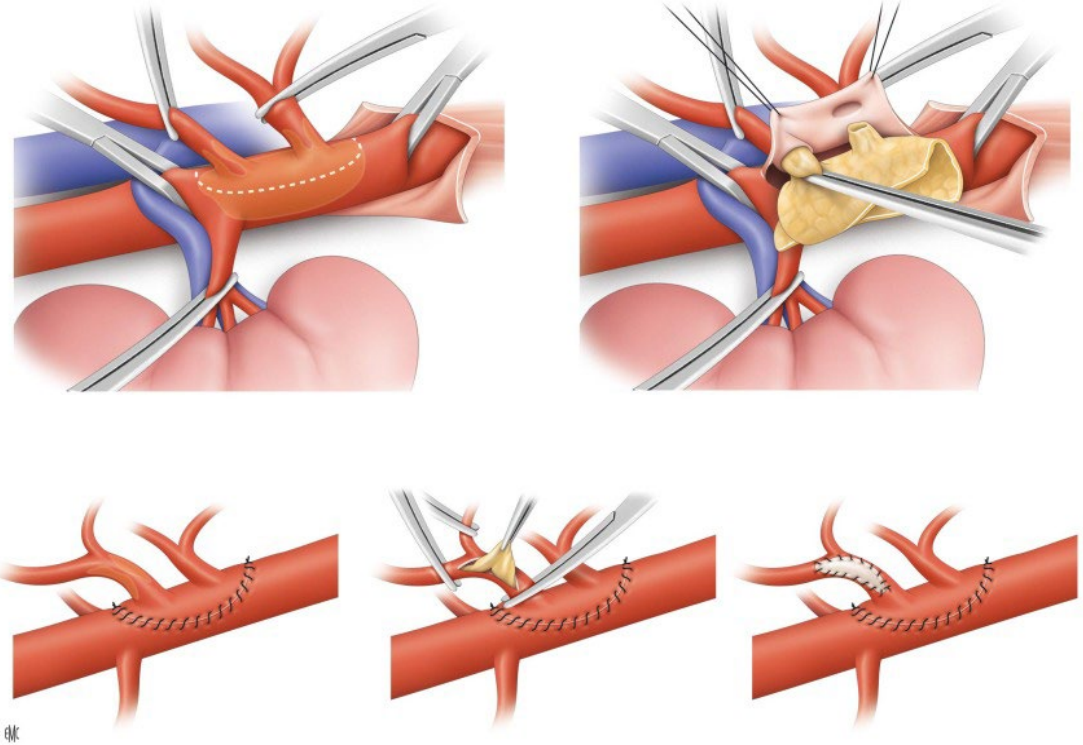
Mortality ≈ 10-15 %

Long incision and its complications

ICU stay and its complications

Unstable comorbidities

Expertise is decreasing



Grotemeyer et al.. Int J Angiol. 2007

Desgranges P et al., EMC Techniques chirurgicales - Chirurgie vasculaire, 2019

Current fears with the endovascular approach

Aortic rupture
Dissection
Plaque shift
Ischemia
Emboli

No dedicated device
But devices that may be useful
Covered stents, venous stents, IVL

Nearly no clinical data

The chimney technique has been described and used for years in juxtarenal AAAs

Preserve the renal perfusion while treating an aortic disease

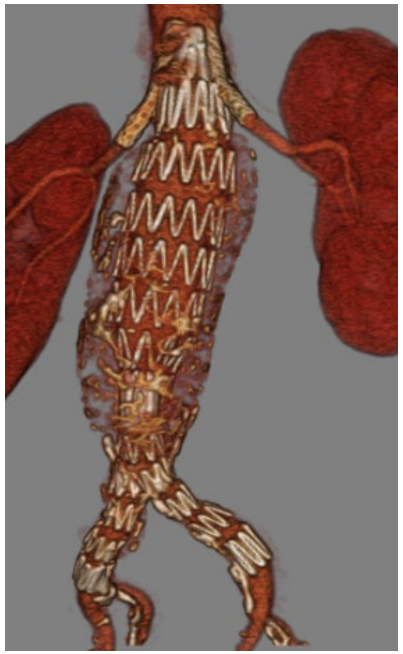
Off-the-shelf

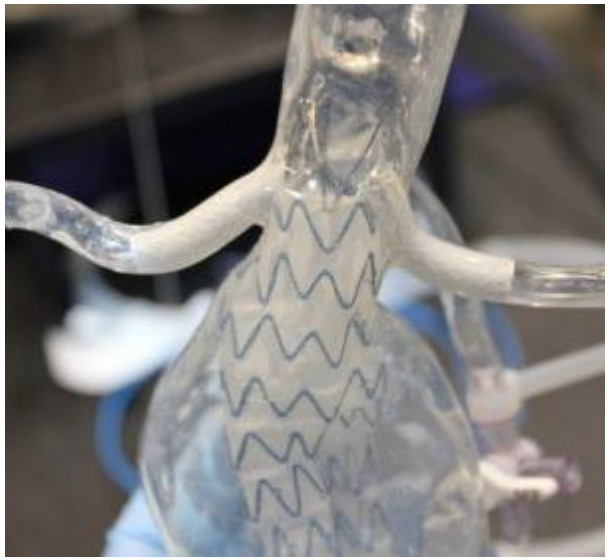
Can be used with ugly accesses

Covered stents and stent-grafts

Patency chimney stents ≈ 95% at 2 yrs

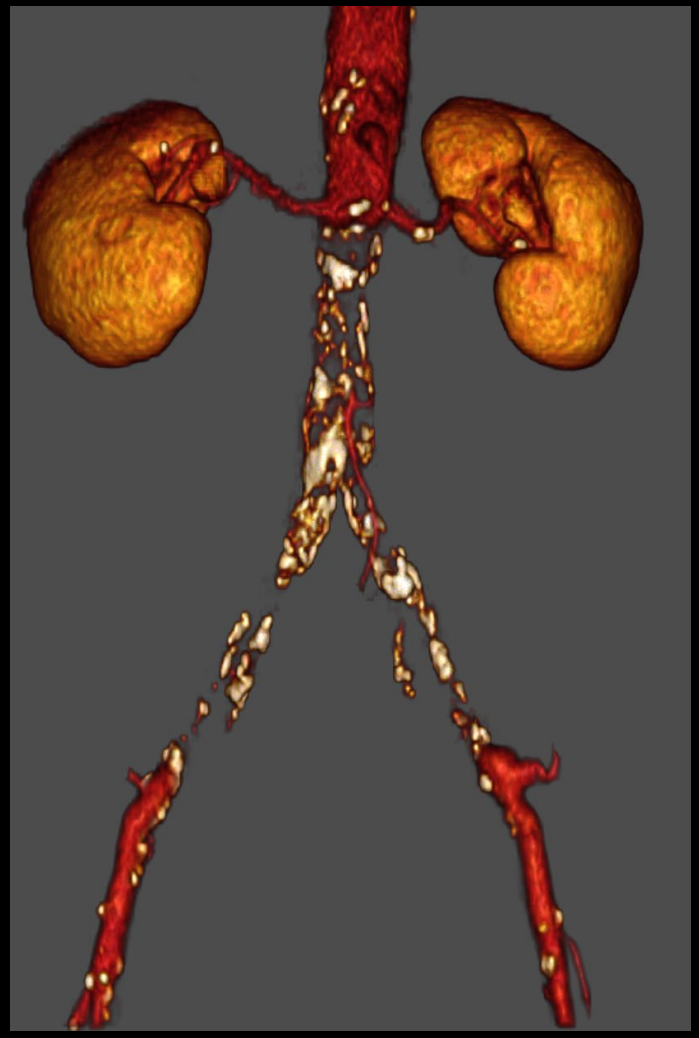
Gutters are not big issues if not used to treat an AAA

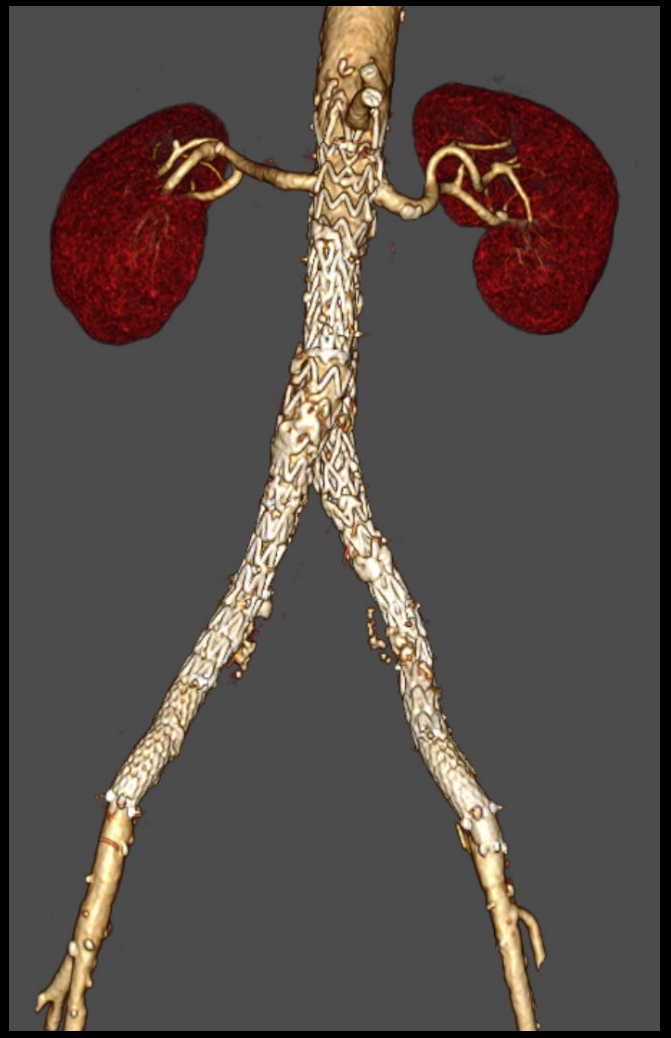


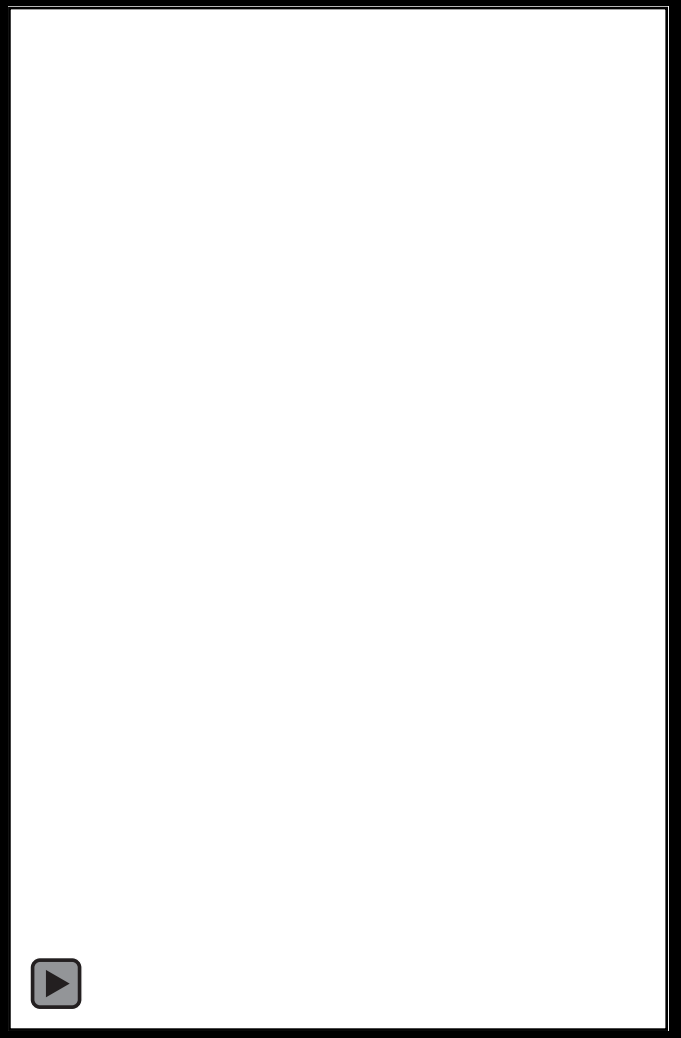


Touma, Coscas et al., Eur J Vasc Endovasc 2020
Coscas et al J Vasc Surg 2011

The concept of Ch-CRAv came after few nice Ch-CERAB







Methods

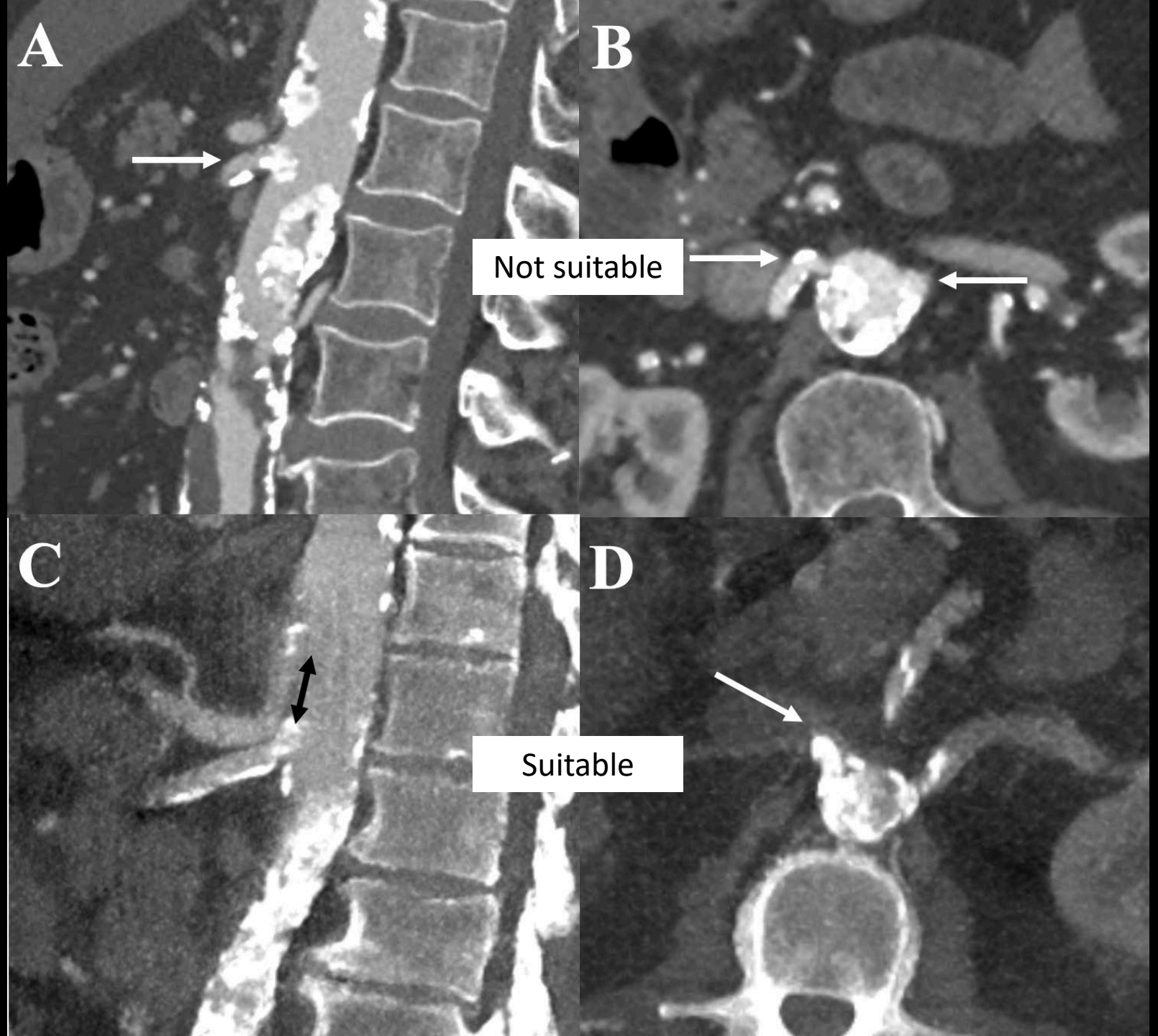
Retrospective monocentric study
Ambroise Paré University Hospital
2020 – 2023: 19 CRAv operated

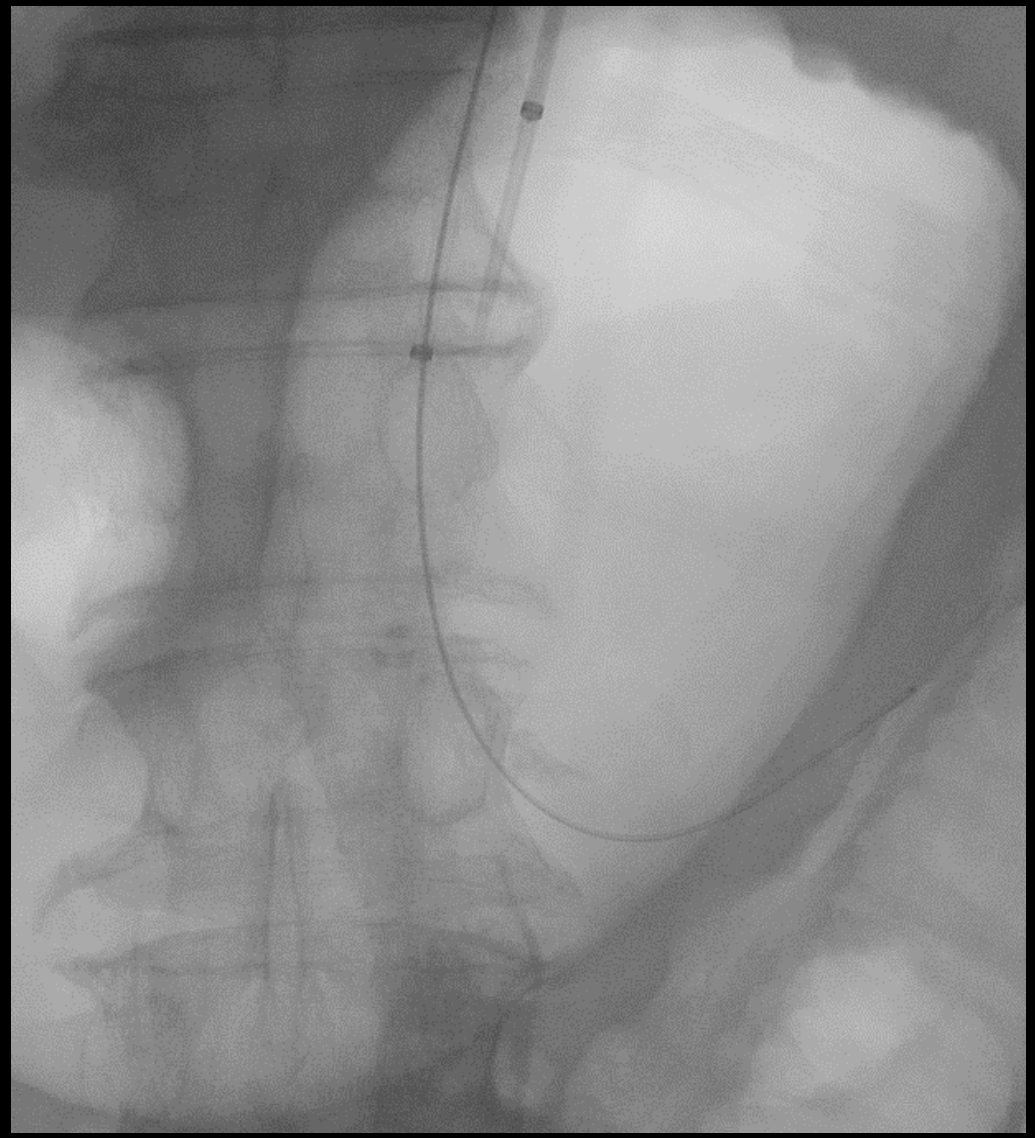
CRAv anatomy was considered suitable if:

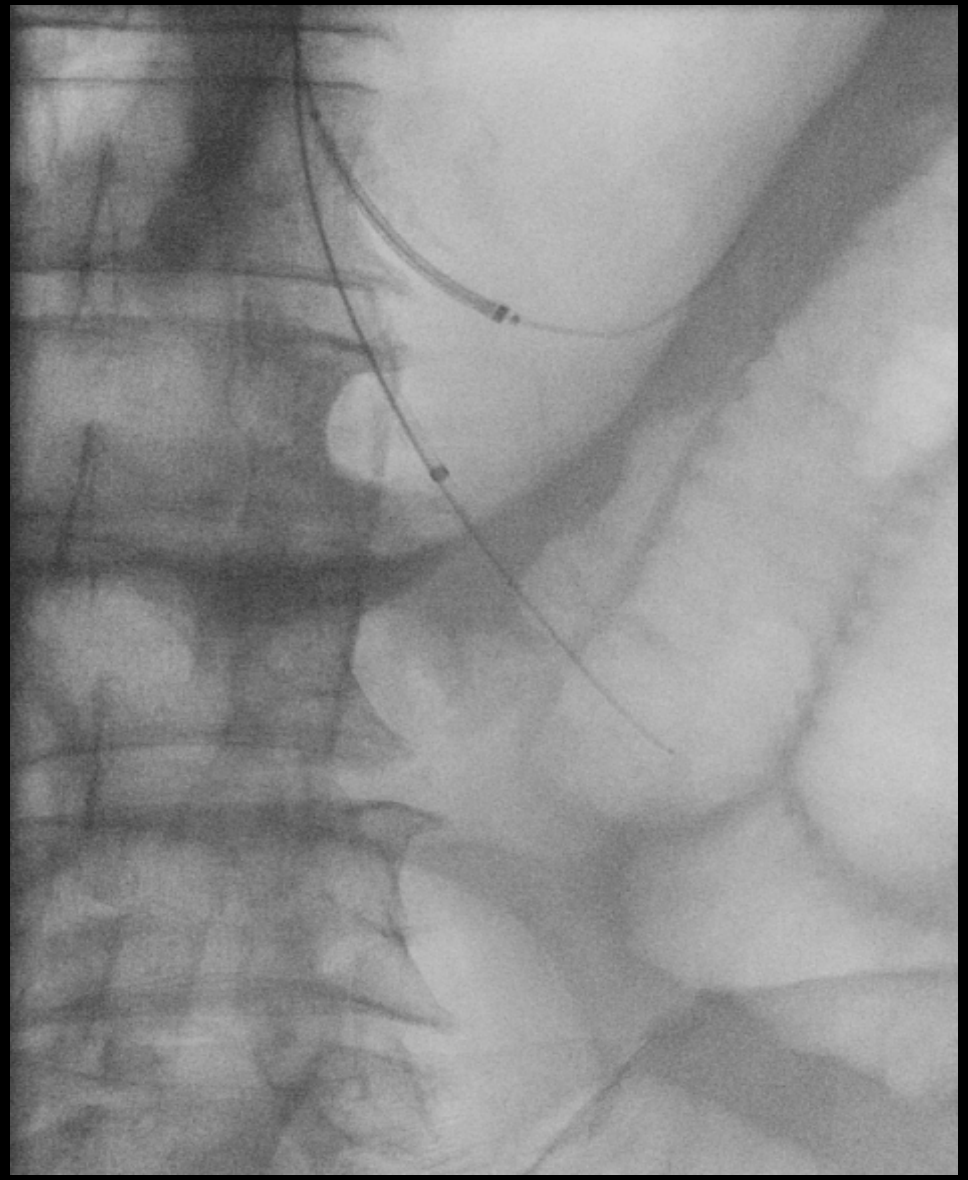
- Symptomatic CRAv
- >50% aortic stenosis
- Aortic diameter <30 mm
- At least one visceral artery involved
- No more than 2 chimneys
- 10 mm sealing in target arteries

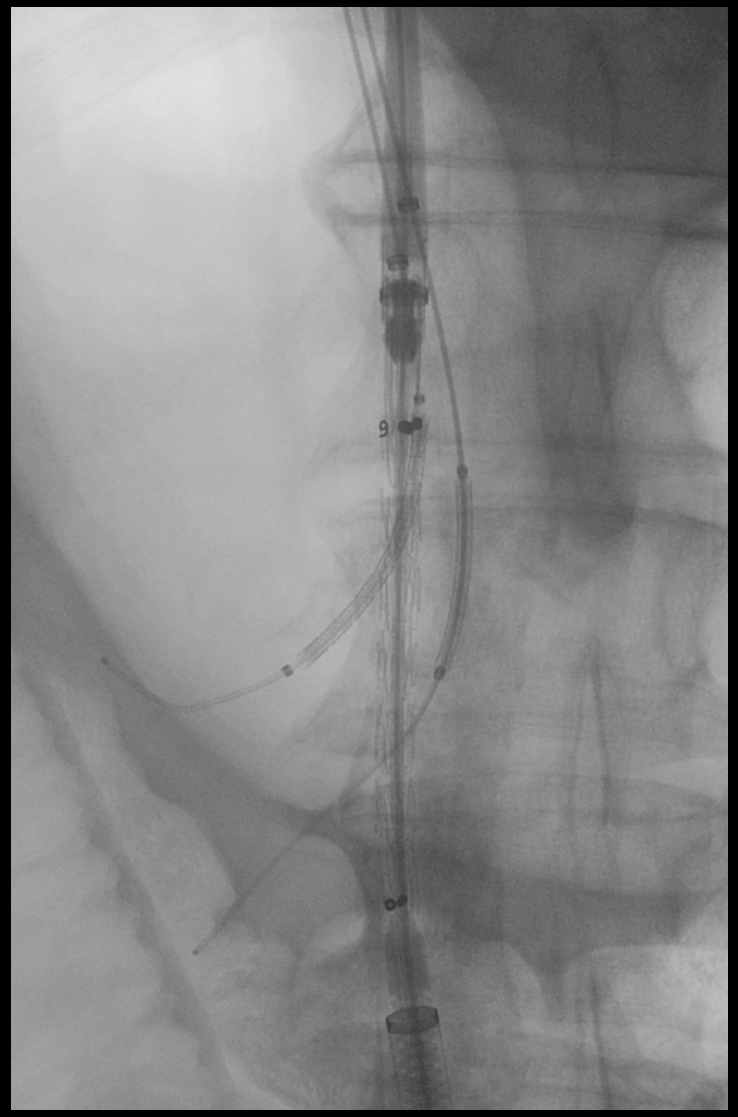
11 CRAv treated by an endovascular approach

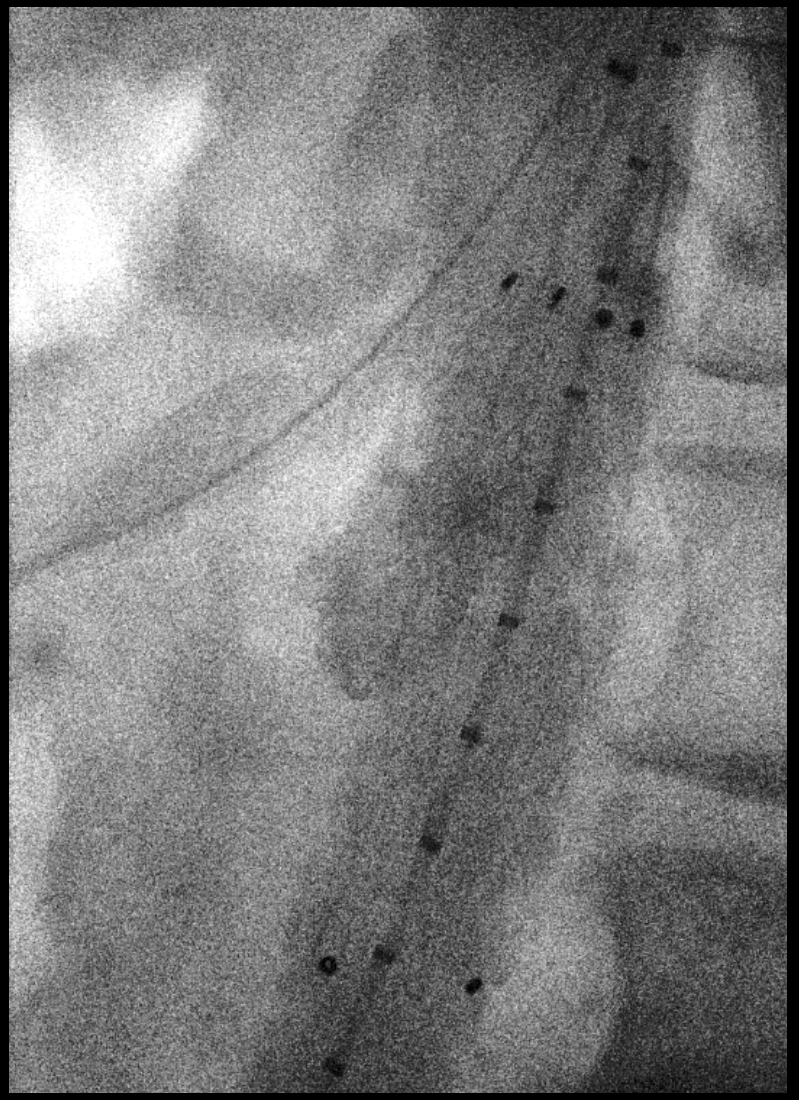
Sarcopenia		4 (36)
Chronic kidney disease		7 (64)
Chronic pulmonary disease		7 (64)
Coronary artery disease		6 (55)
ASA Class	2	1 (9)
	3	8 (73)
	4	2 (18)

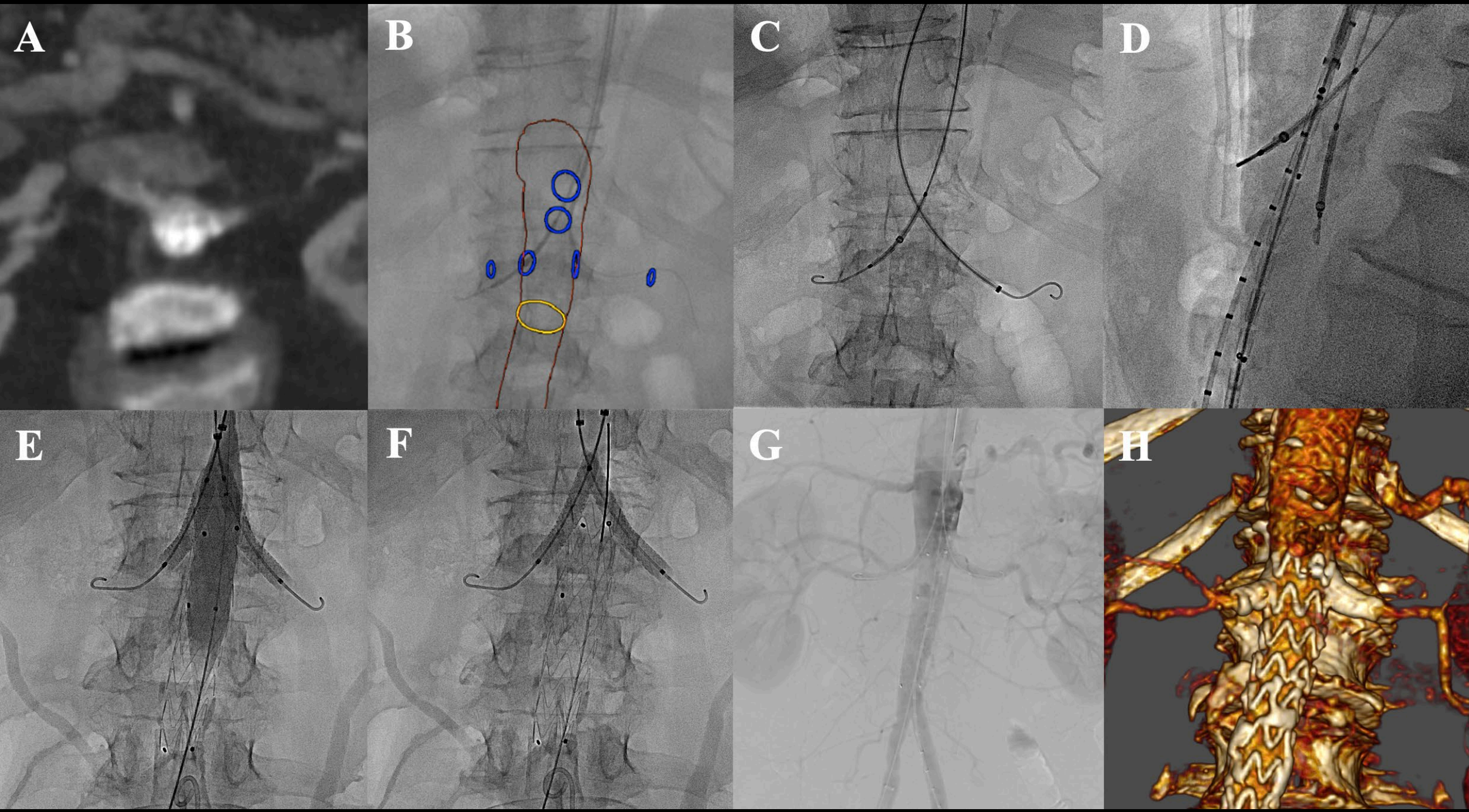

A
B
Not suitable
C
D
Suitable

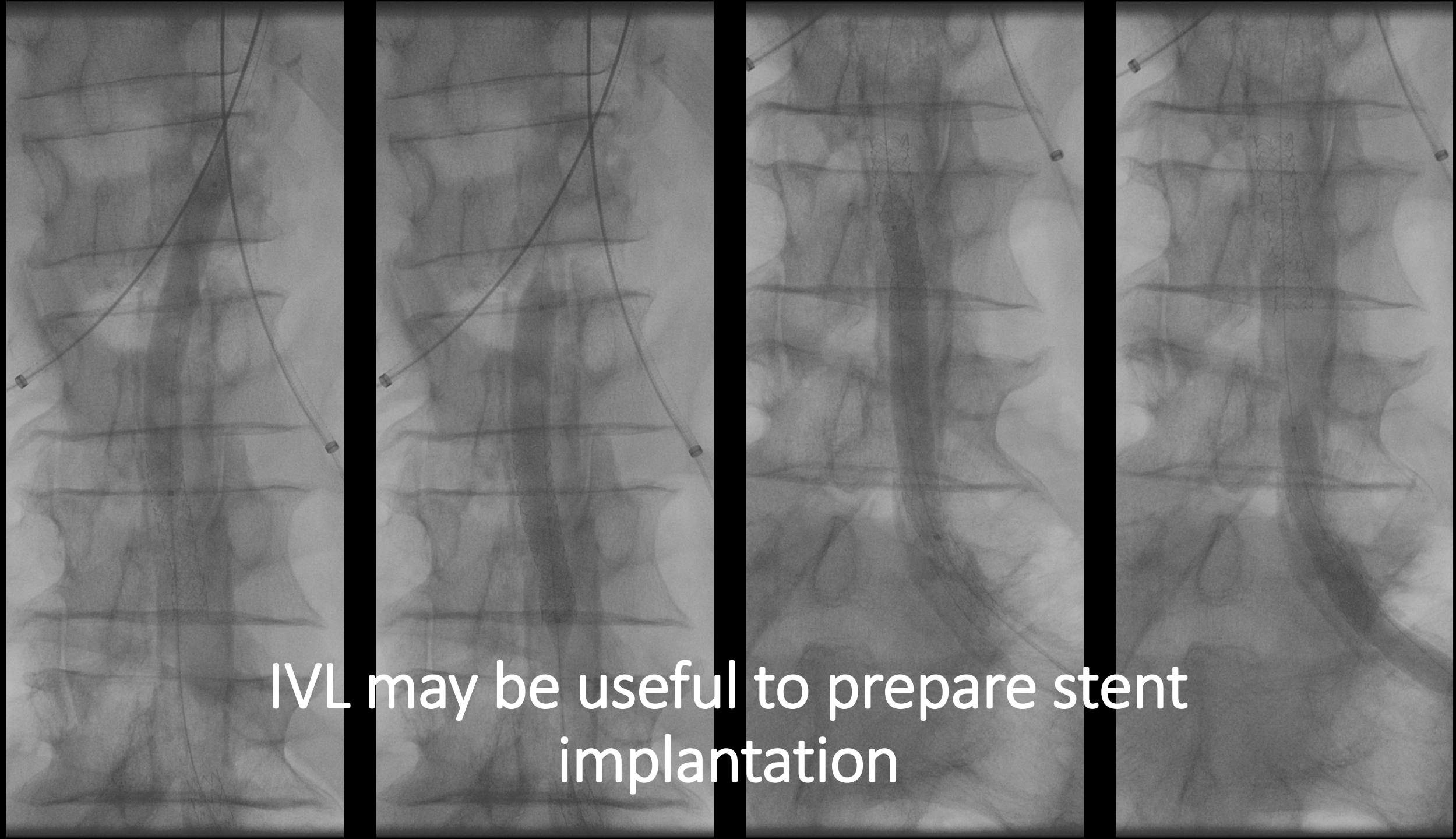




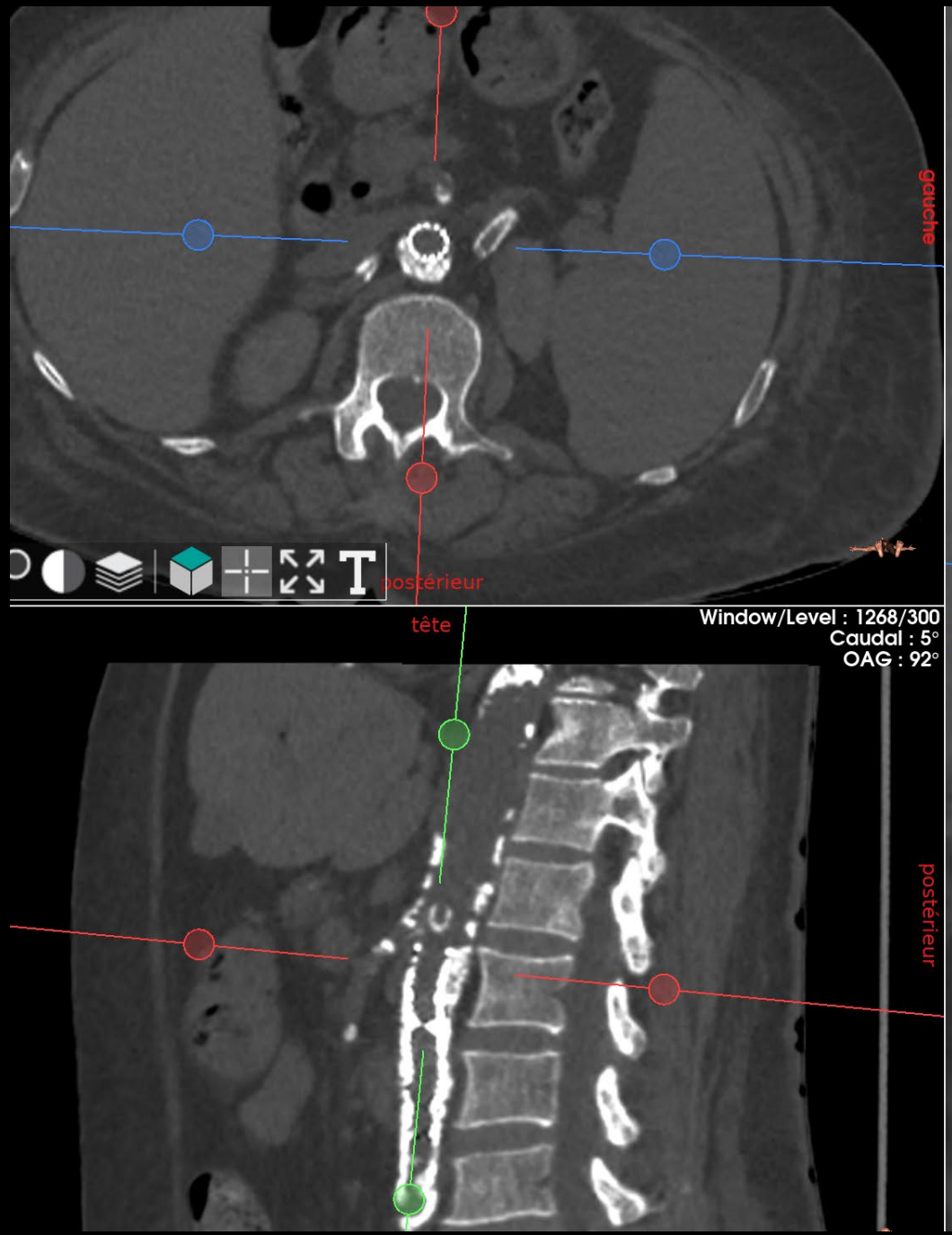


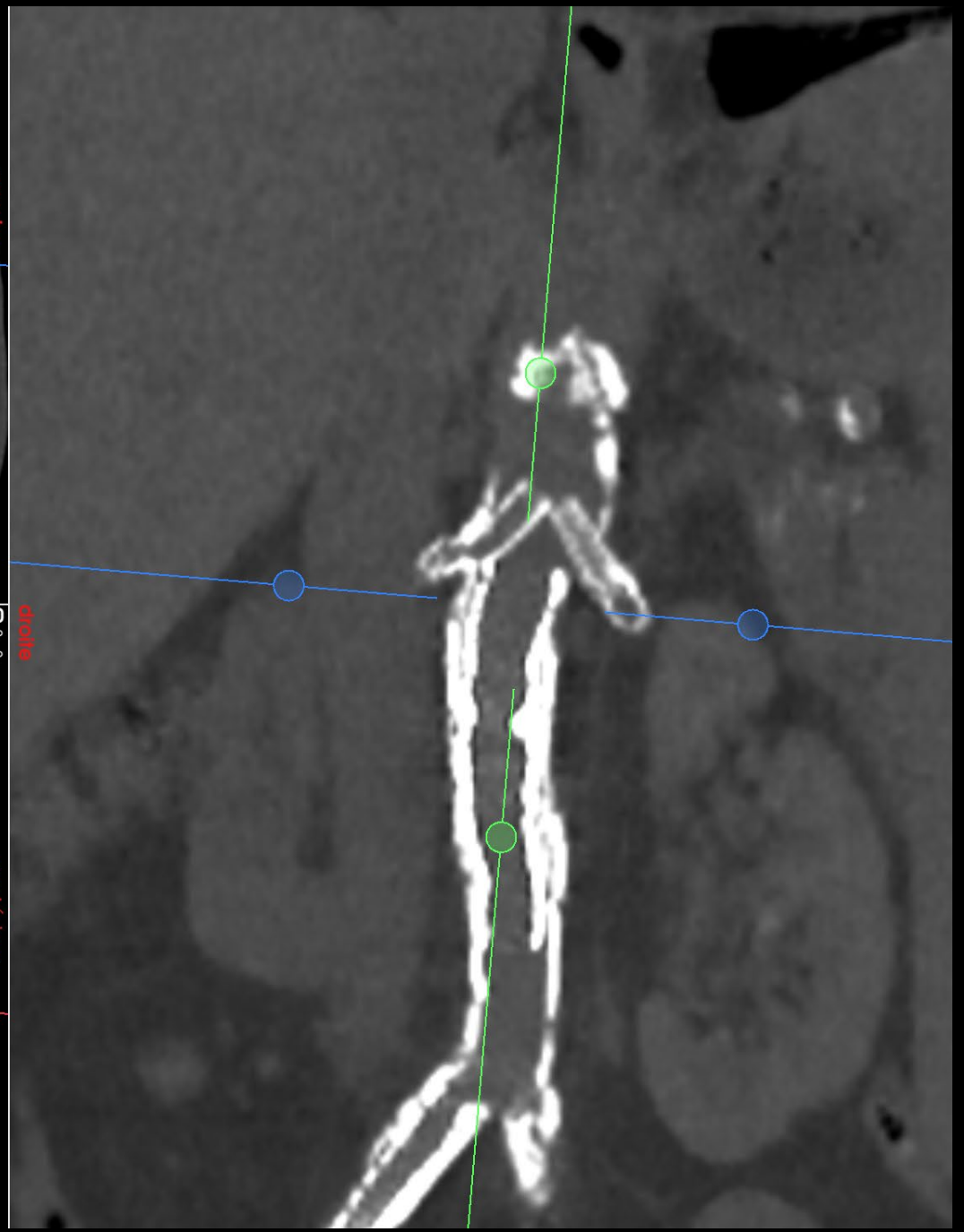



A
B
C
D
E
F
G
H



IVL may be useful to prepare stent implantation


gauche
postérieur
tête
Window/Level : 1268/300
Caudal : 5°
OAG : 92°
postérieur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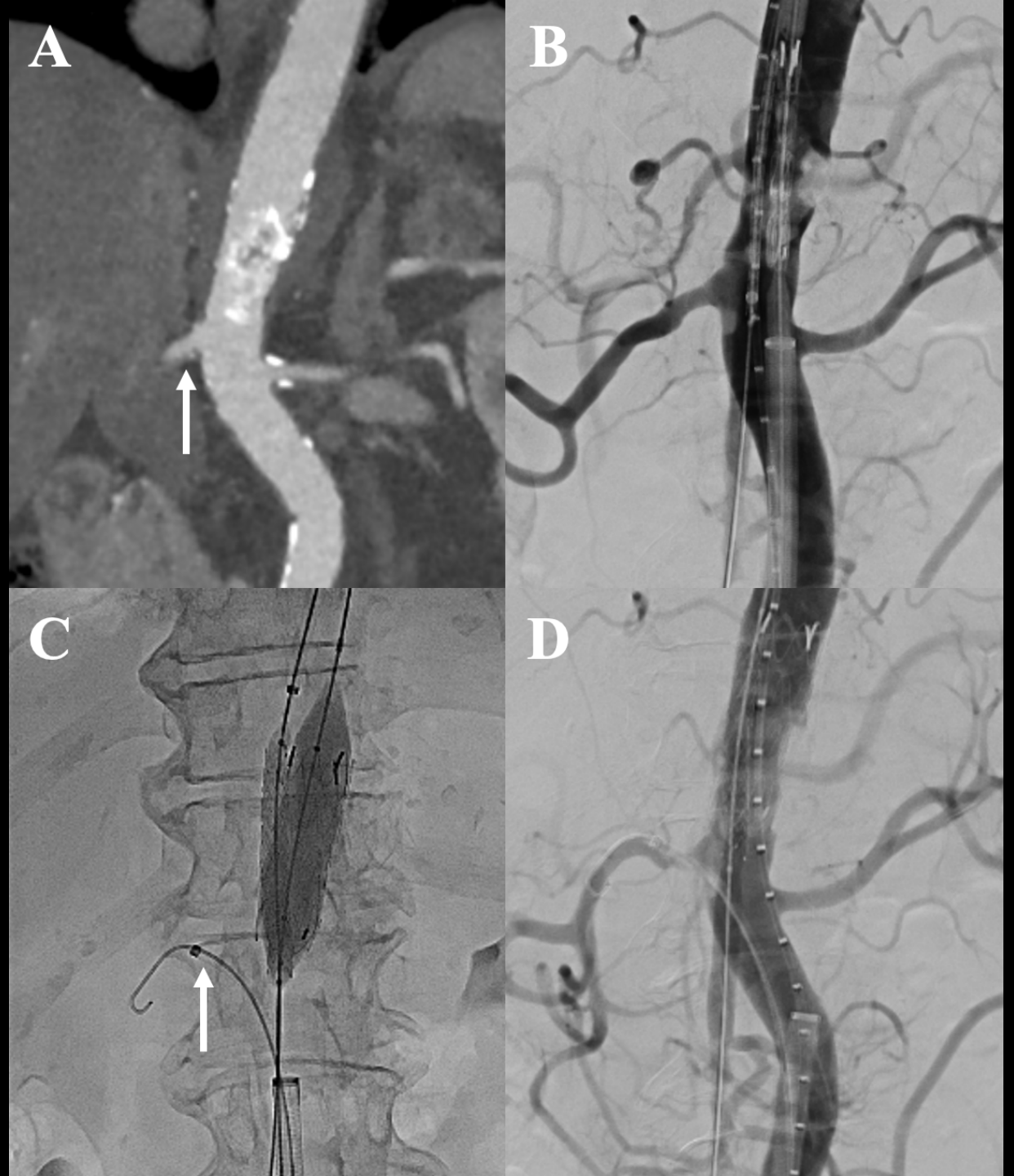
The « security » sheath for arteries located at the border



Demographics

Baseline characteristics	Total 11 patients, n (%)
Male gender	4 (36)
Mean age, years	75 (range, 65 – 89)
Mean BMI (kg/m²)	27 (range, 20.1 – 35.8)
Current tobacco use	6 (55)
Hypertension	11 (100)
Diabetes	2 (18)
Dyslipidemia	4 (36)
Clinical presentation	
Chronic mesenteric insufficiency	2 (20)
Renovascular disease	3 (27)
Congestive heart failure	2 (18)
3 to 4 Rutherford category	7 (64)
5 to 6 Rutherford category	3 (27)

CRAv anatomy

Patient No	CRA location	Target vessels status	Chronically occluded visceral vessels	CRA length (mm)	Proximal aortic diameter (mm)	Distal aortic diameter (mm)	Stenosis percentage (%)
1	Juxtarenal	SMA/LRA stenosis	RRA occlusion	57	23	18	65
2	Celiac	CA/SMA stenosis	None	41	25	20	59
3	Pararenal	SMA/LRA stenosis	RRA occlusion	25	23	21	69
4	Juxtarenal	RRA stenosis LRA healthy (sealing zone)	None	47	17	17	88
5	Thoracic and celiac	SMA healthy (sealing zone)	CA occlusion	80	26	20	80
6	Juxtarenal	RRA healthy (sealing zone) LRA healthy (sealing zone)	CA occlusion	24	20	17	55
7	Celiac	CA stenosis	None	25	26	26	72
8	Juxtarenal	RRA healthy (sealing zone)	LRA occlusion	29	18	17	88
9	Juxtarenal	RRA healthy (sealing zone) LRA healthy (sealing zone)	None	22	20	18	72
10	Juxtarenal	LRA healthy (sealing zone)	None	14	22	18	66
11	Celiac	SMA stenosis	CA occlusion	40	17	15	81

Technical details

Patient No.	Age, y	Symptoms	Type of anesthesia	Access(es) for chimney(s)	Chimney stents	Main aortic device	Associated repairs	Postoperative complications	Follow-up (months)	Vascular follow-up event
1	73	Rutherford 3 Renovascular disease	General	Right axillary	SMA (BMS) LRA (CS)	Endurant (23)	Bilateral iliac CS Right axillary CS	None	43	None
2	65	Rutherford 6 Sarcopenia Renovascular disease	General	Left axillary	CA (CS) SMA (CS)	Fluency (13.5)	Right iliac BMS and iliofemoral bypass	None	2	Died of unrelated cause
3	78	Renovascular disease Congestive Heart failure	General	Left axillary	SMA (CS) LRA (CS)	Endurant (25)	Left subclavian CS	Left axillary hematoma	5	Loss of follow-up
4	67	Rutherford 3	General	Left axillary	RRA (CS) LRA (CS)	Fluency (13.5)	None	None	30	None
5	75	Rutherford 3 Chronic mesenteric ischemia	Local sedation	Left femoral	SMA (CS)	Tag (21)	None	None	28	None
6	74	Rutherford 5	General	Right axillary	RRA (CS) LRA (CS)	BeGraft (14)	Intravascular lithotripsy Bilateral iliac CS	Median nerve palsy	21	SMA CS at 11 months
7	67	Rutherford 5	General	Right common carotid	CA (CS)	Endurant (28)	Left carotid-subclavian bypass Infrarenal CERAB CFA TEA	None	13	None
8	89	Rutherford 4 Renovascular disease	Local sedation	Right brachial	RRA (CS)	Advanta (12)	Bilateral iliac BMS	None	10	None
9	80	Rutherford 4	General	Left axillary	RRA (BMS) LRA (BMS)	Endurant (16)	None	None	7	None
10	76	Rutherford 3	General	Left brachial	LRA (BMS)	Endurant (25)	None	None	6	None
11	77	Congestive Heart Failure Rutherford 3	General	Right brachial	SMA (CS)	Tag (20)	None	None	3	None

Early and mid-term follow-up

At 30 days and in-hospital

No mortality

No major complication

Two complications of the axillary access

- Haematoma
- Median nerve injury (recovered)

Mean FU 13 months (2-43)

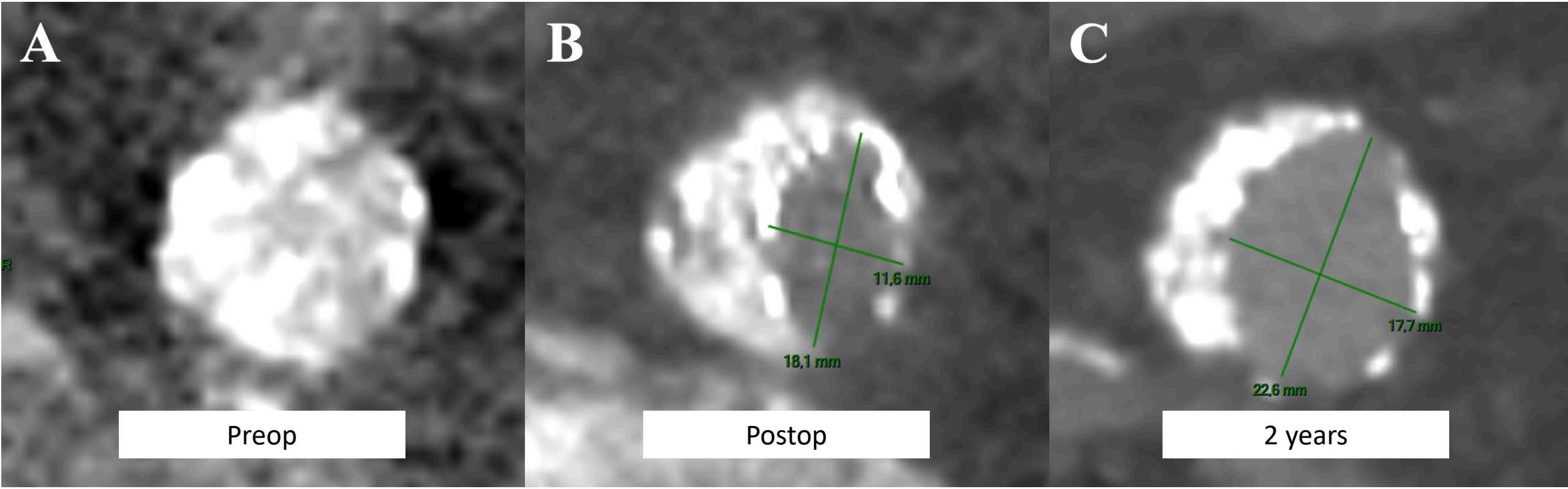
One patient died at 2 months (cardiac)

One patient was lost at 5 months

One patient had plaque shift in front of the SMA, initially asymptomatic but then developped chronic intestinal ischemia and had SMA stenting at 12 months

No other event, trend toward increased eGFR (+10.3 ml/min)

Late expansion with self-expandable aortic stent-grafts



	Present series	Grotemeyer et al.
Anatomic criterias	CRAv limited to 2 target arteries	All CRA
N Patients	11	69
ASA	III (8) or IV (2)	NA
Early mortality	0	11.6%
Mortality during follow-up	1 (9%)	25 (36.2%)
Postoperative complications	Two complications of the axillary access Haematoma (N=1) Median nerve injury (recovered) (N=1)	Acute limb ischemia (N=7) Pleural effusion (N=4) Bleeding (N=3) Stroke (N=2) MI (N=1) Spleen rupture (N=1) CKF (N=1) Severe pancreatitis (N=1) Colonic ischemia (N=1)
Clinique/paraclinique sur le suivi	One patient died at 2 months (cardiac) One patient was lost at 5 months SMA stenting at 12 months No other event	30% patients with follow-up 16/19 (84%) favorable evolution

Grotemeyer et al.. Int J Angiol. 2007

Take Home Messages

Endovascular treament of CRAv is feasible and safe using the chimney technique but larger series with longer follow-up are needed

Self expandable aortic stent-grafts (cuffs) could be more appropriate

This technique may represent an option in high surgical risk patients and perhaps in standard risk patients given the results of open surgery

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