

# EVAR et iliaques tortueuses

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# Iliques tortueuses ?

## Endograft Limb Occlusion in EVAR: Iliac Tortuosity Quantified by Three Different Indices on the Basis of Preoperative CTA

M. Taudorf <sup>a,\*</sup>, L.P. Jensen <sup>b</sup>, K.C. Vogt <sup>b</sup>, J. Grønvall <sup>a</sup>, T.V. Schroeder <sup>b,c</sup>, L. Lönn <sup>a,b</sup>

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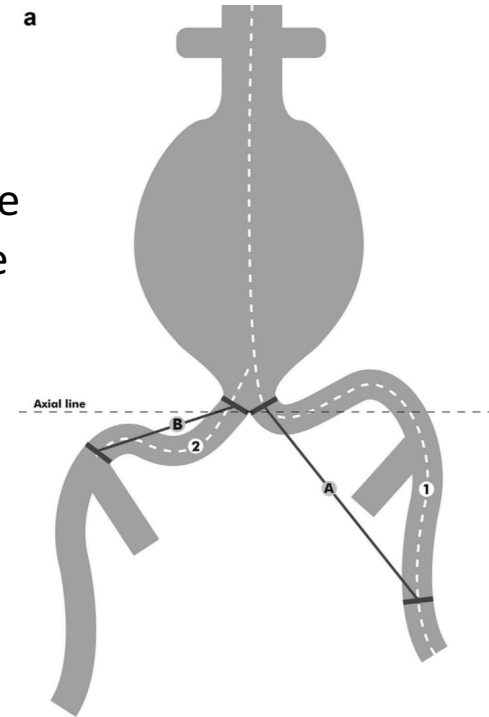
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Index de tortuosité :  
Longueur de la centerline divisée  
Par la longueur de la ligne droite

PAI (Pelvic) :  $A/1$

CAI (Commun Iliac):  $B/1$



Signe de la double iliaque :  
facteur  
aggravant = tortuosité  $>90^\circ$



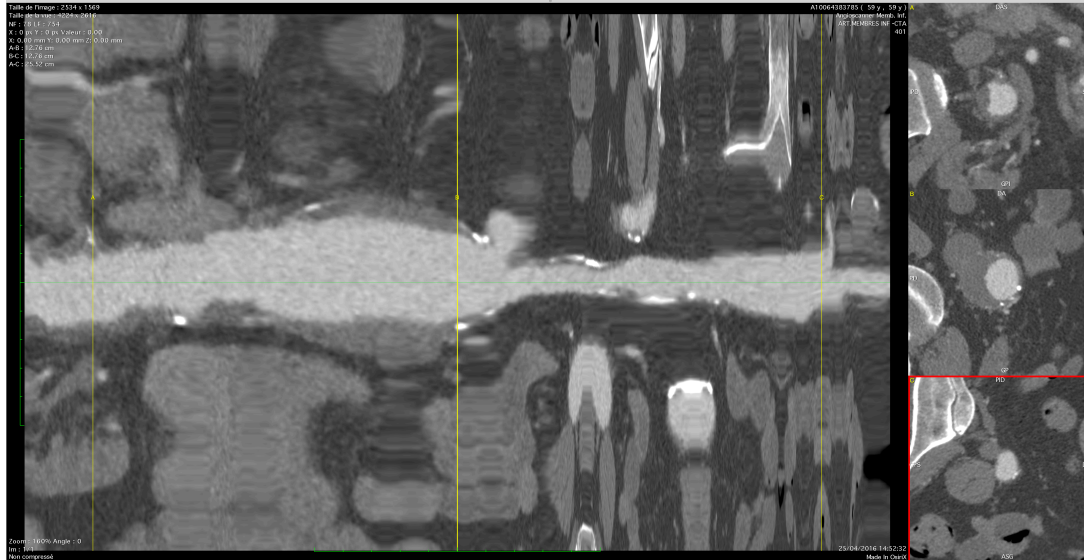
# Facteurs anatomiques associés

- sténoses
- Calcifications++++
- obésité

# Quel(s) risque(s)?

- Erreur de sizing
- Echec de procédure
- Rupture iliaque
- Occlusions de branches

# Erreur de sizing : la centerline n'est pas toujours notre amie

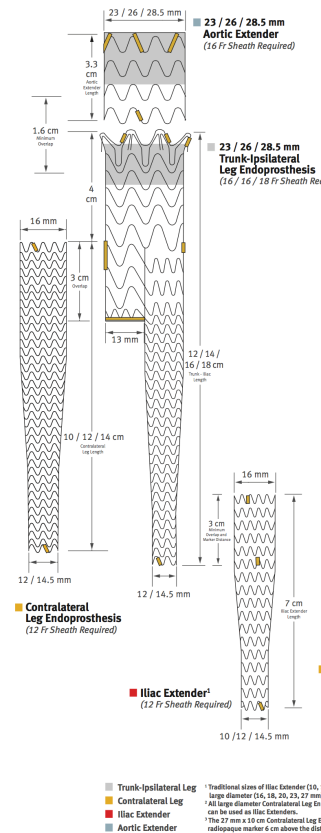


- Distance centerline gauche 252mm
- Matériel posé :
  - Corps longueur : 80mm (Diametre 35)
  - 1ere extension : 100 mm
  - 2eme extension 100 mm
    - Total 280 mm
    - Moins l'overlap 60 mm
    - TTC 220 mm
- La centerline surestime très souvent les longueurs surtout en cas de tortuosité
- Ne prends pas en charge le redressement iliaque

donc

- Prévoir au moins 3 longueurs de jambages différentes

- Préférer un montage en 2 pièces afin d'avoir une variable d'ajustement sur l'overlap plutôt qu'une prothèse trop longue



# Rupture iliaque ?

## Iliac injury during abdominal and thoracic aortic endovascular intervention

Samir K. Shah, MD,<sup>a</sup> Federico E. Parodi, MD,<sup>b</sup> Matthew J. Eagleton, MD,<sup>b</sup> James F. Bena, MS,<sup>c</sup> and Daniel G. Clair, MD,<sup>b</sup> *Boston, Mass; and Cleveland, Ohio*

Injured patients had larger sheath sizes ( $P < .001$ ), with a mean size of 22.4F vs 20.7F in the uninjured group.

Eight of 42 patients in the injury group died on the index admission

**Table II.** Anatomic characteristics of the comparison and injury groups

Factor	Control (n = 400 limbs)		Injury (n = 42)		Logistic model	
	No.	Estimate (95% CI)	No.	Estimate (95% CI)	P value	OR (95% CI)
Centerline Bif to CFA (L1)	395	170.0 (167.1-172.9)	41	164.0 (157.2-170.7)	.11	0.99 (0.97-1.00)
Midpoint diameter	395	8.76 (8.48-9.04)	40	7.38 (6.71-8.05)	<b>&lt;.001</b>	0.68 (0.56-0.82)
CIA/EIA narrowest diameter	395	7.35 (7.14-7.57)	41	6.00 (5.49-6.51)	<b>&lt;.001</b>	0.60 (0.48-0.75)
Straight-line Bif to CFA (L2)	395	130.0 (127.4-132.5)	41	129.6 (123.6-135.5)	.92	1.00 (0.98-1.01)
Maximum acute angle Bif to CFA	395	131.1 (129.5-132.8)	40	132.3 (127.5-137.1)	.64	1.00 (0.99-1.02)
Tortuosity index (L1/L2)	395	1.32 (1.30-1.34)	41	1.28 (1.23-1.33)	.084	0.83 (0.67-1.03)
Ratio: sheath to midpoint	393	2.51 (2.45-2.58)	41	3.10 (2.89-3.30)	<b>&lt;.001</b>	1.12 (1.07-1.17)

*Bif*, Aortic bifurcation; *CFA*, common femoral artery; *CI*, confidence interval; *CIA*, common iliac artery; *EIA*, external iliac artery. Boldface *P* values indicate statistically significant values.

La tortuosité n'augmente pas le risque de rupture  
Risque lié au diamètre iliaque et matériel

# Impact de la tortuosité

## The impact of endovascular aneurysm repair on aortoiliac tortuosity and its use as a predictor of iliac limb complications

James Coulston, MSc, FRCS,<sup>a</sup> Amy Baigent, MBBS,<sup>a</sup> Haran Selvachandran,<sup>b</sup> Steven Jones, MRCS,<sup>a,b</sup> Francesco Torella, MD, FRCS,<sup>a</sup> and Robert Fisher, MD, FRCS,<sup>a</sup> *Liverpool, United Kingdom*

**Table IV.** The influence of tortuosity index (TI) on iliac limb complications

	<i>Control</i> ( <i>n</i> = 240 limbs)	<i>Iliac complication group</i> ( <i>n</i> = 33 limbs)	<i>P value<sup>a</sup></i>
Preoperative			
Aortic	1.10 (1.01-1.54)	1.16 (1.02-1.54)	.0001
Right iliac	1.11 (1.01-1.51)	1.18 (1.03-1.41)	.002
Left iliac	1.14 (1.05-1.62)	1.23 (1.05-1.62)	.002
Postoperative			
Aortic	1.07 (1.00-1.48)	1.14 (1.00-1.48)	.0001
Right iliac	1.08 (1.01-1.48)	1.15 (1.01-1.54)	.043
Left iliac	1.12 (1.01-1.58)	1.18 (1.02-1.55)	.001

Data are presented as median (range).

<sup>a</sup>Mann-Whitney *U* test (unpaired comparison).

The greatest reduction in tortuosity was seen after implantation of the Zenith stent graft, followed by the Endurant stent graft. The lowest reduction in tortuosity after EVAR was seen with the implantation of the Excluder stent graft (median [range] change in TI: Zenith, 0.04 [0.01-0.3]; Endurant, 0.02 [0-0.25]; Excluder, 0.02 [0.02-0.09];  $P < .001$ ).

The median time to iliac complication was 14 months



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504 patients traités par Zenith (Cook)

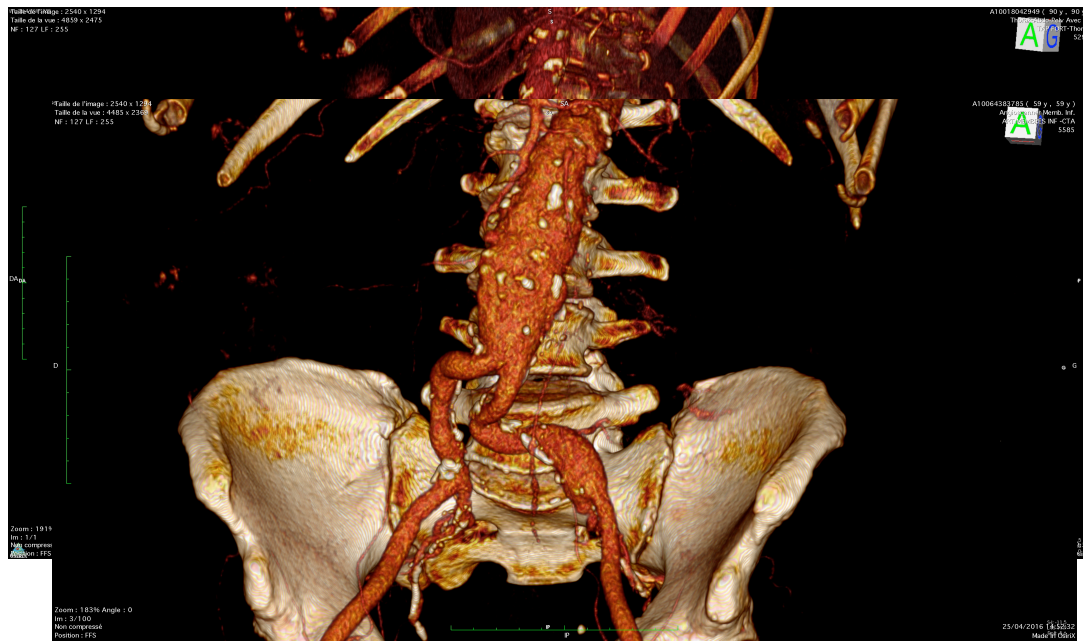
**Table 2.** Risk factor analysis of factors associated with graft limb occlusion.

		Patients with limb graft occlusion (n = 17)	Control patients (n = 34)	p
Pelvic artery index of tortuosity <sup>a</sup> (PAI)	Mean (SD)	1.61 (0.3)	1.48 (0.25)	NS
Common iliac artery index of tortuosity (CAI)	Mean (SD)	1.31 (0.2)	1.16 (0.13)	.009
Double iliac sign (DIS)	Yes	9 (53%)	4 (12%)	.003
Landing zone	EIA	5 (29%)	2 (6%)	.03
AAA diameter (mm)	Mean (SD)	65.1 (21.5)	63.7 (8.5)	NS
Diameter of iliac artery at landing zone (mm)	Mean (SD)	14.4 (3.2)	14.1 (2.9)	NS
Stent graft limb diameter (mm)	Mean (SD)	16.7 (3.3)	16.8 (3.9)	NS
Distal aortic diameter <sup>b</sup> (mm)	Mean SD	31.1 (16.2)	27.6 (8.1)	NS
SFA occlusion		1 (6%)	2 (6%) <sup>c</sup>	NS

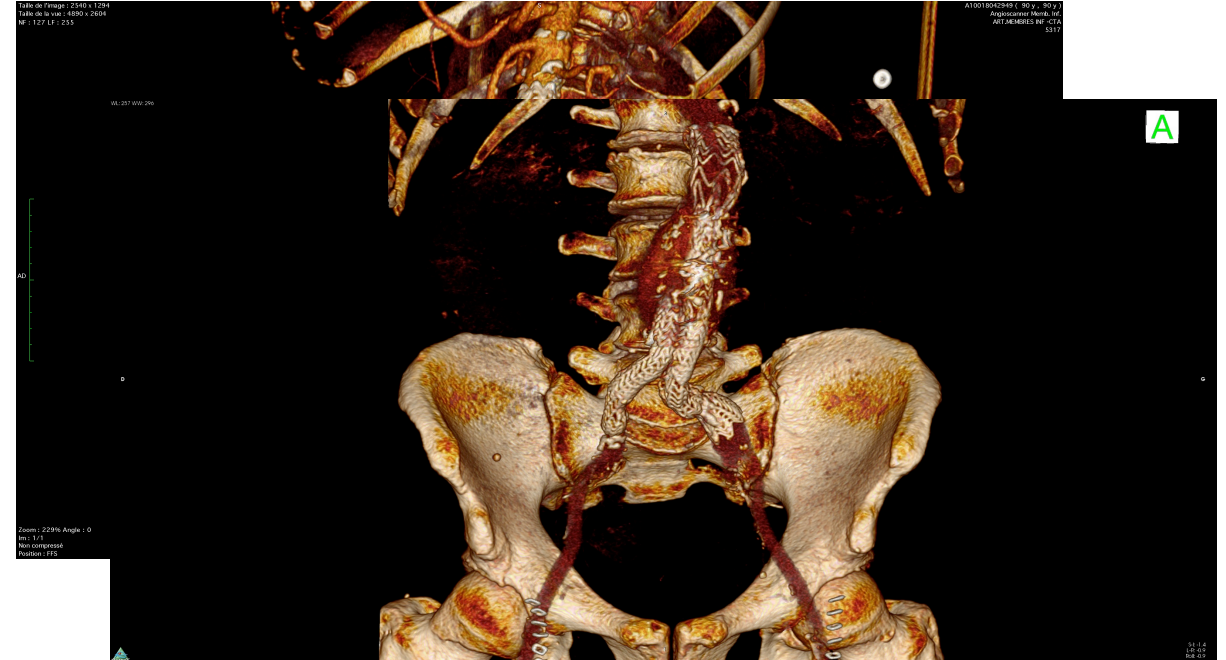
Augmente le risque de thrombose de jambage  
P=0,009 pour CAI

# Adaptabilité Excluder

TDM pre op



TDM 1 mois



# Occlusion de branche : comparatif ?

## Incidence and treatment results of Endurant endograft occlusion

Laura van Zeggeren, MD,<sup>a</sup> Frederico Bastos Gonçalves, MD,<sup>b</sup> Joost A. van Herwaarden, MD, PhD,<sup>c</sup> Herman J. A. Zandvoort, MD,<sup>c</sup> Debora A. B. Werson, MPA,<sup>a</sup> Jan-Albert Vos, MD, PhD,<sup>d</sup> Frans L. Moll, MD, PhD,<sup>c</sup> Hence J. Verhagen, MD, PhD,<sup>b</sup> and Jean-Paul P. M. de Vries, MD, PhD,<sup>a</sup>  
*Nieuwegein, Rotterdam, and Utrecht, The Netherlands*

Excluser à 5 ans : **1,1%**

délai median 20 mois

Zenith à 5 ans : **5,6%**

délai nc

Endurant à 4 ans : **4,0%**

délai median 1 mois

Anaconda à à 3 ans : **2,2 %**

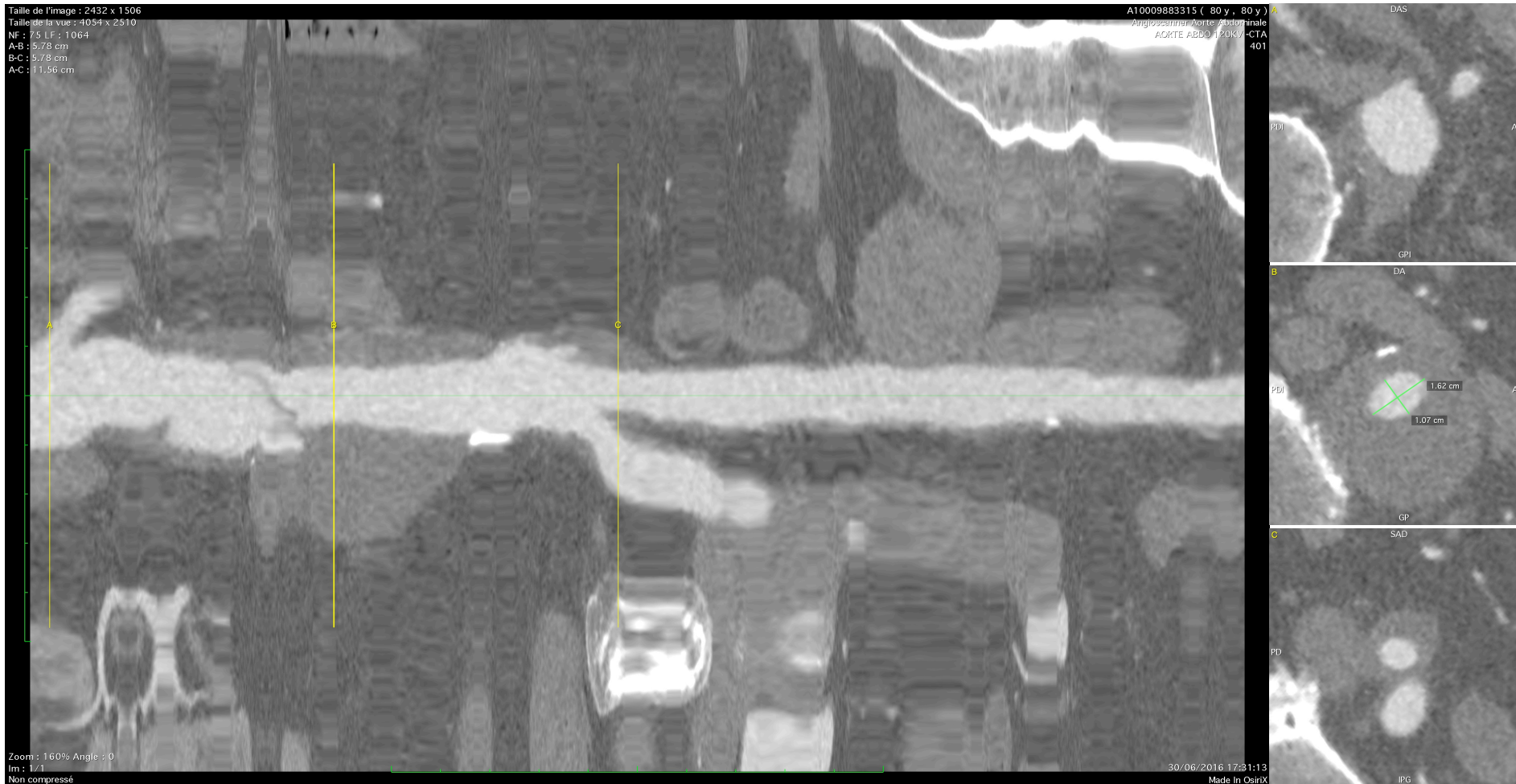
délai nc

Table I. Reported rates of limb thrombosis in literature

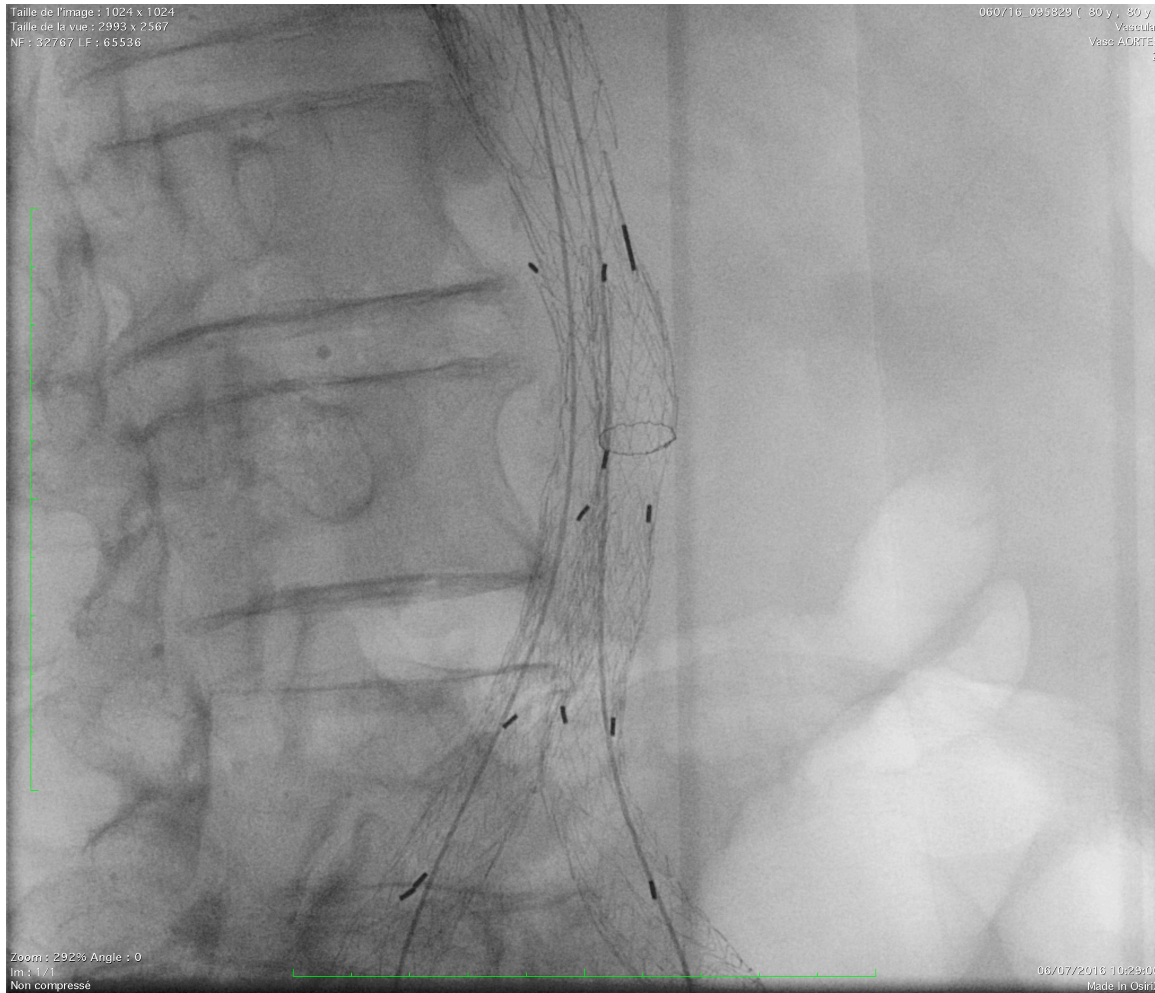
Study (first author)	Year	No.	Endovascular devices used	Follow-up duration	Incidence of occlusion (%)	Occlusion-related mortality (%)
Carroccio <sup>2</sup>	2002	351	Mixed	20 months	3.7	0
Erzurum <sup>4</sup>	2004	823	Mixed	24.2 months	2.7	0.12
Cochennec <sup>5</sup>	2007	460	Mixed	23 months	7.2	3
Maleux <sup>6</sup>	2008	288	Mixed	39 months	3.1	0
EVAR 1 <sup>7</sup>	2010	624	Mixed	6 years	3.2	Not stated
EVAR 2 <sup>8</sup>	2010	229	Mixed	3.1 years	2.2	Not stated
DREAM <sup>9</sup>	2010	178	Mixed	6.4 years	6.7 <sup>a</sup>	Not stated
Van Marrewijk (EUROSTAR) <sup>10</sup>	2005	6787	Mixed	21 months	5	Not stated
Mehta, et al <sup>11</sup>	2010	1768	Mixed	34 months	1.4	0.05

Abbruzzese <sup>12</sup>	2008	565	Mixed	30 months	6	0.35
Bos <sup>15</sup>	2009	92	Excluder <sup>c</sup>	36 months	0	0
Maleux <sup>16</sup>	2012	121	Excluder	4.05 years	1.6	Not stated
Bastos Gonçalves <sup>17</sup>	2012	144	Excluder	5 years	1.4	0
Mertens <sup>18</sup>	2011	143	Zenith <sup>d</sup>	66 months	5.6	Not stated
Sivamurthy <sup>19</sup>	2006	248	Zenith	24 months	5.2	0
Jean-Baptiste <sup>20</sup>	2009	447	Zenith	24 months	1.8	0
Torsello <sup>21</sup>	2010	45	Endurant <sup>e</sup>	30 days	2.2	0
Troisi <sup>22</sup>	2010	156	Endurant	9 months	1.9	0
Van Keulen <sup>23</sup>	2011	100	Endurant	1 year	3.0	1
Rouwet <sup>24</sup>	2011	80	Endurant	1 year	1.3	0
Stokmans <sup>25</sup>	2012	1151	Endurant	30 days	2.0	Not stated
Current study	2012	496	Endurant	1.7 years	4.0	0.6

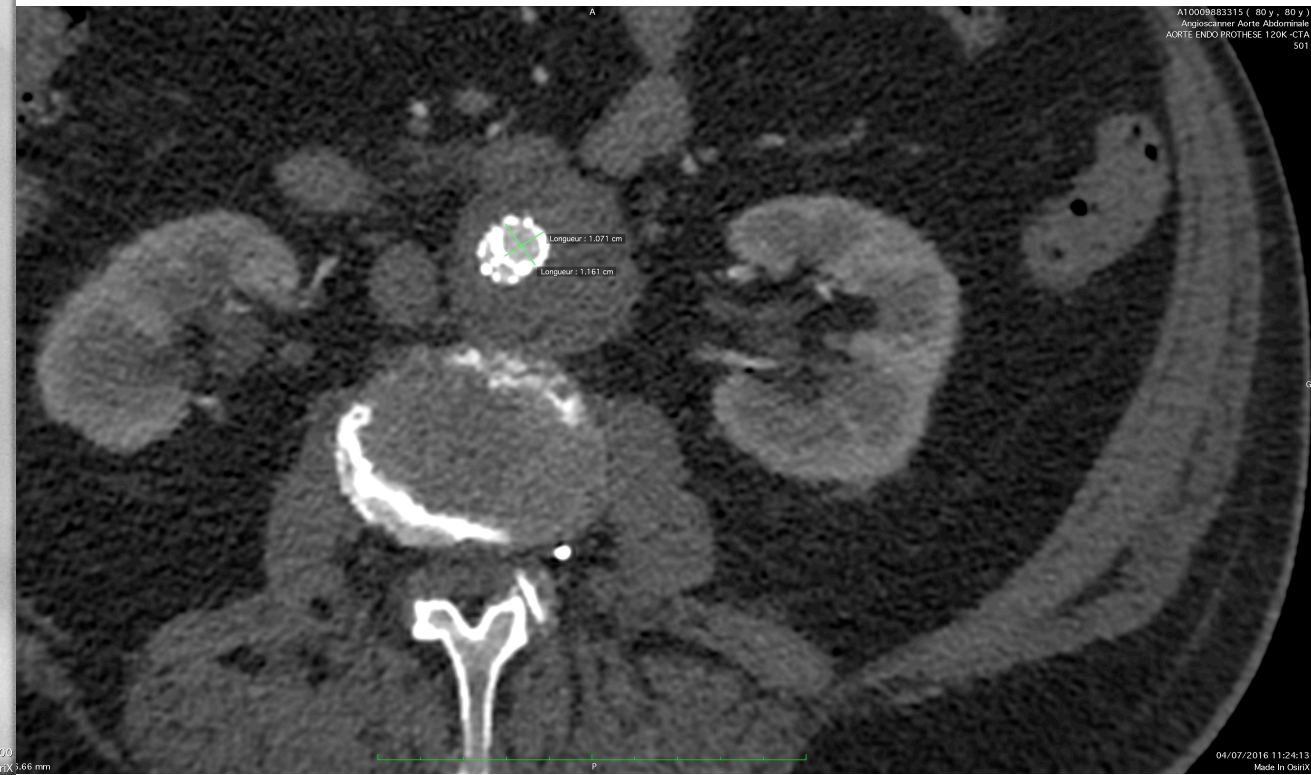
# Mes options : anticiper et faire confiance au TDM



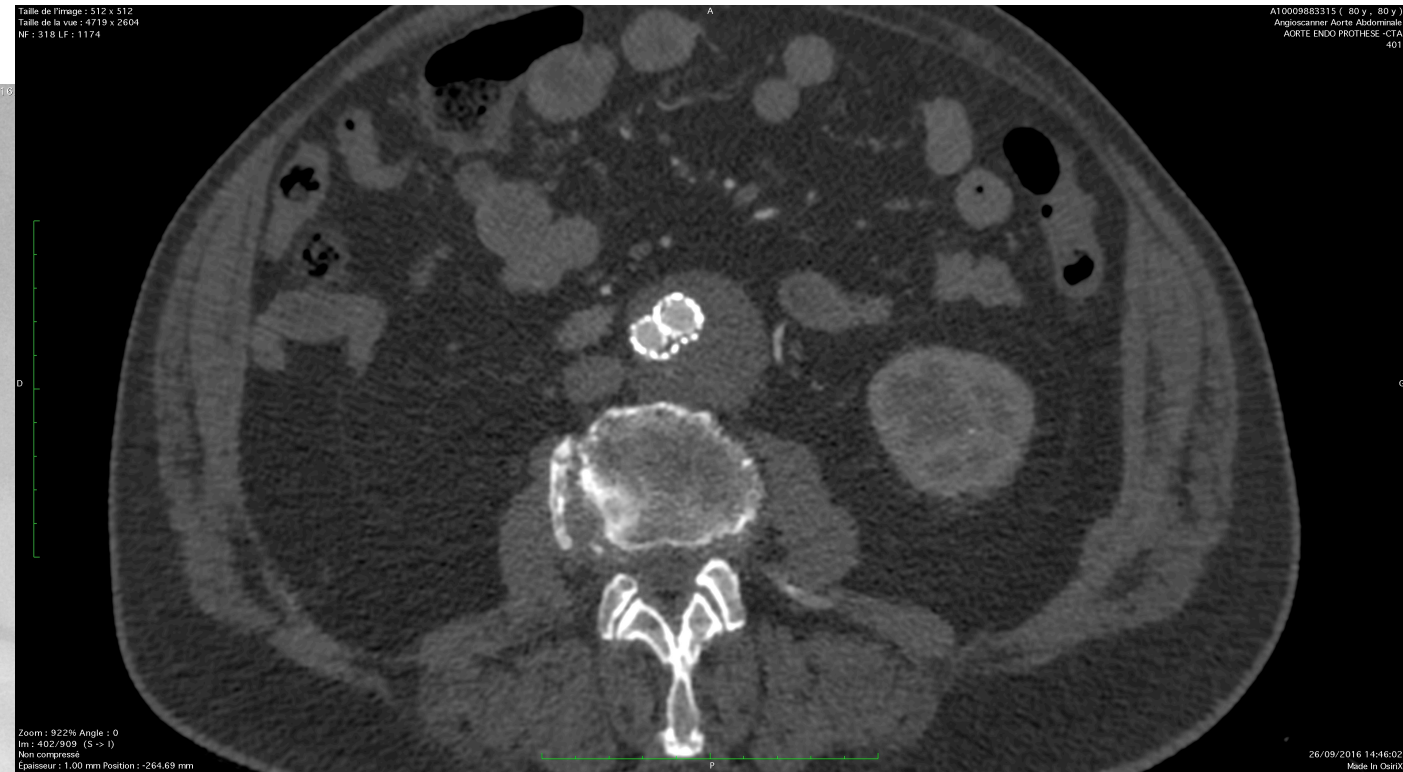
# Pour éviter...



## Angio TDM J3 :



# Et pourtant



Angio Tdm à 3 mois

# Mes options : préparer le passage

- Prédilatation et Stenting préventif :
  - paving and cracking ?
    - 2007 Hinchcliff
  - Internal Endoconduit technique
    - 2008 Matsumura
- Pontage retro péritonéal ?

# Paving & Cracking et Internal endoconduit

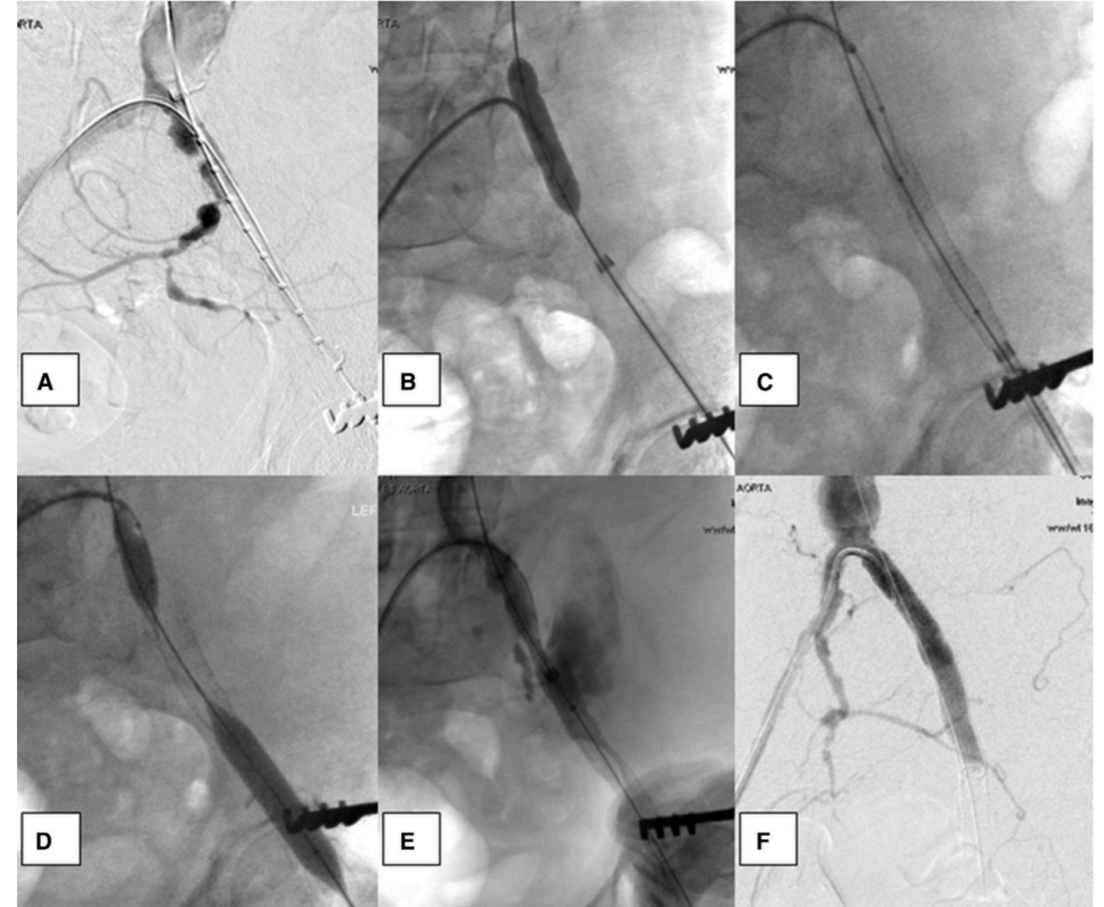
Alternative access techniques with thoracic endovascular aortic repair, open iliac conduit versus endoconduit technique

Guido H. W. van Bogerijen, MD,<sup>a</sup> David M. Williams, MD,<sup>b</sup> Jonathan L. Eliason, MD,<sup>c</sup> Narasimham L. Dasika, MD,<sup>b</sup> G. Michael Deeb, MD,<sup>a</sup> and Himanshu J. Patel, MD,<sup>a</sup> *Ann Arbor, Mich*

Technique séduisante en CHU mais  
Utilisation de Viabahn non remboursés dans cette indication dans cet article

Aucune série significative depuis 2008 ...

Occlusion artère iliaque interne tres fréquente





# Le pontage rétroperitonéal

## Morbidity and mortality after use of iliac conduits for endovascular aortic aneurysm repair

Prateek K. Gupta, MD,<sup>a</sup> Abhishek Sundaram, MD,<sup>b</sup> and K. Craig Kent, MD,<sup>c</sup> *Memphis, Tenn; Omaha, Neb; and Madison, Wisc*

Table II. Postoperative events with univariable analysis

Thirty-day outcomes <sup>a</sup>	Iliac conduit (n = 231)	No iliac conduit (n = 14,108)	P value <sup>b</sup>
Wound infection	9 (3.9)	289 (2.0)	.05
Wound dehiscence	1 (0.4)	37 (0.3)	.46
Urinary tract infection	8 (3.5)	225 (1.6)	.03
Transfusion >4 units PRBC intra/post-op	40 (17.3)	682 (4.8)	<.0001
Peripheral nerve deficiency	3 (1.3)	17 (0.1)	.004
Pneumonia	7 (3.0)	161 (1.1)	.01
Reintubation	6 (2.6)	197 (1.4)	.13
Failure to extubate at 48 hours	11 (4.8)	142 (1.0)	<.0001
Deep venous thrombosis	2 (0.9)	70 (0.5)	.32
Pulmonary embolism	0	21 (0.1)	1.0
Renal insufficiency	3 (1.3)	83 (0.6)	.16
Acute renal failure requiring dialysis	7 (3.0)	98 (0.7)	<.0001
Stroke	2 (0.9)	47 (0.3)	.19
Cardiac arrest or MI	12 (5.2)	155 (1.1)	<.0001
Return to operating room	21 (9.1)	528 (3.7)	<.0001
Hospital length of stay, days	5.1 ± 8.8	2.7 ± 4.3	<.0001
Major morbidity <sup>c</sup>	37 (16.0)	935 (6.6)	<.0001
Death	7 (3.0)	129 (0.9)	.001

Mortalité à 30 jours à 3% identique à l'open...

# Mes options : choisir le matériel

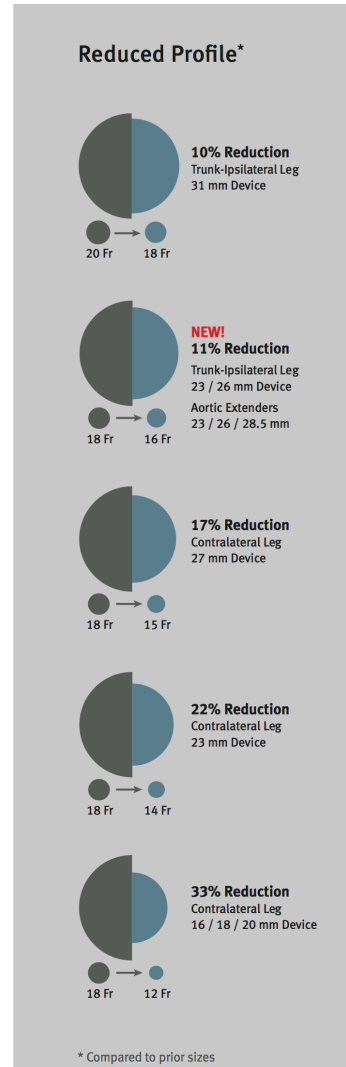
- Low profile :
  - Corps 16 à 18 Fr
  - Jambages 12 à 15 Fr
- Introducteur hydrophile

**Trunk-Ipsilateral Leg Endoprosthesis**

GORE® C3® DELIVERY SYSTEM CATALOGUE NUMBER	INTENDED AORTIC INNER DIAMETER (mm)	AORTIC ENDOPROSTHESIS DIAMETER (mm)	INTENDED ILIAC INNER DIAMETER (mm)	ILIAC ENDOPROSTHESIS DIAMETER (mm)	OVERALL DEVICE LENGTH (cm)	COMMENDED SHEATH SIZE (Fr)
NEW! RLT231212	19-21	23	10-11	12	12	16
NEW! RLT231214	19-21	23	10-11	12	14	16
NEW! RLT231216	19-21	23	10-11	12	16	16
NEW! RLT231218	19-21	23	10-11	12	18	16
NEW! RLT231412	19-21	23	12-13.5	14.5	12	16
NEW! RLT231414	19-21	23	12-13.5	14.5	14	16
NEW! RLT231416	19-21	23	12-13.5	14.5	16	16
NEW! RLT231418	19-21	23	12-13.5	14.5	18	16
NEW! RLT261212	22-23	26	10-11	12	12	16
NEW! RLT261214	22-23	26	10-11	12	14	16
NEW! RLT261216	22-23	26	10-11	12	16	16
NEW! RLT261218	22-23	26	10-11	12	18	16
NEW! RLT261412	22-23	26	12-13.5	14.5	12	16
NEW! RLT261414	22-23	26	12-13.5	14.5	14	16
NEW! RLT261416	22-23	26	12-13.5	14.5	16	16
NEW! RLT261418	22-23	26	12-13.5	14.5	18	16
NEW! RLT281212	24-26	28.5	10-11	12	12	18
NEW! RLT281214	24-26	28.5	10-11	12	14	18
NEW! RLT281216	24-26	28.5	10-11	12	16	18
NEW! RLT281218	24-26	28.5	10-11	12	18	18
NEW! RLT281412	24-26	28.5	12-13.5	14.5	12	18
NEW! RLT281414	24-26	28.5	12-13.5	14.5	14	18
NEW! RLT281416	24-26	28.5	12-13.5	14.5	16	18
NEW! RLT281418	24-26	28.5	12-13.5	14.5	18	18
RLT311413	27-29	31	12-13.5	14.5	13	18
RLT311415	27-29	31	12-13.5	14.5	15	18
RLT311417	27-29	31	12-13.5	14.5	17	18
RLT351414	30-32	35	12-13.5	14.5	14	18
RLT351416	30-32	35	12-13.5	14.5	16	18
RLT351418	30-32	35	12-13.5	14.5	18	18

**Contralateral Leg Endoprosthesis**

CATALOGUE NUMBER	INTENDED ILIAC INNER DIAMETER (mm)	ILIAC ENDOPROSTHESIS DIAMETER (mm)	CONTRALATERAL LEG LENGTH (cm)	COMMENDED SHEATH SIZE (Fr)
PXC121000	10-11	12	10	12
PXC121200	10-11	12	12	12
PXC121400	10-11	12	14	12
PXC141000	12-13.5	14.5	10	12
PXC141200	12-13.5	14.5	12	12
PXC141400	12-13.5	14.5	14	12
PLC161000*	13.5-14.5	16	9.5	12
PLC161200*	13.5-14.5	16	11.5	12
PLC161400*	13.5-14.5	16	13.5	12
PLC181000*	14.5-16.5	18	9.5	12
PLC181200*	14.5-16.5	18	11.5	12
PLC181400*	14.5-16.5	18	13.5	12
PLC201000*	16.5-18.5	20	9.5	12
PLC201200*	16.5-18.5	20	11.5	12
PLC201400*	16.5-18.5	20	13.5	12
PLC231000*	18.5-21.5	23	10	14
PLC231200*	18.5-21.5	23	12	14
PLC231400*	18.5-21.5	23	14	14
PLC271000*	21.5-25.0	27	10	15
PLC271200*	21.5-25.0	27	12	15
PLC271400*	21.5-25.0	27	14	15



# Low Profile : la concurrence

	Gore	Medtronic	Cook	Vascutek	Endologix
Corps	18 à 20 fr	18 à 20 fr	18 à 22 fr	20 à 23 fr	17 fr
Jambage	12 à 15 fr	14 à 16 fr	14 à 16 fr	18 fr	9 fr

# Et après : stratégie endovasculaire

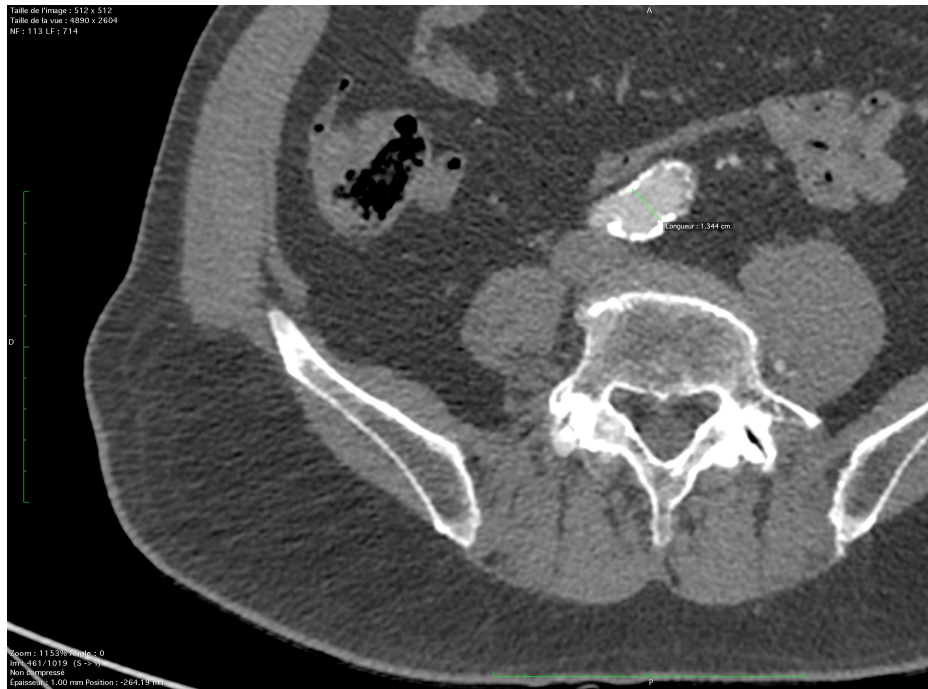
- Prolongement iliaque SES
- 17 patients occlus en FU
- Aucun chez les patients stentés
- 88% passés inaperçus à l'angiographie per op

**Table 3.** Indications for stenting based on the completion angiogram.

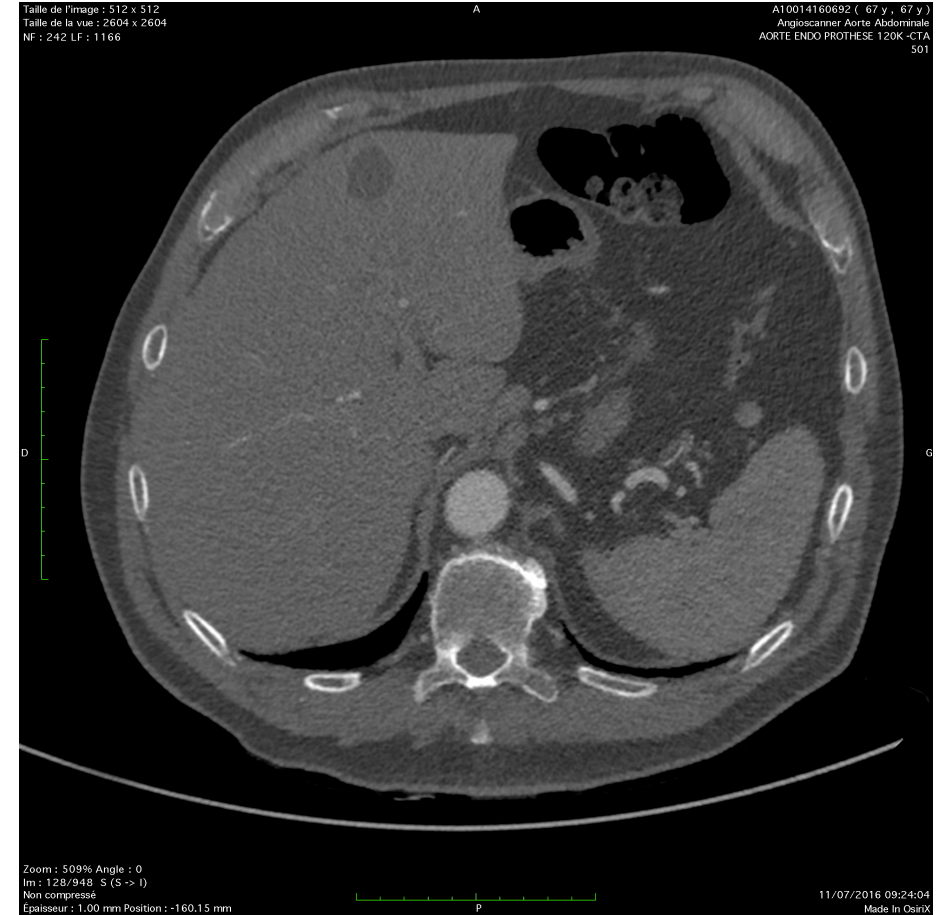
	Stented patients <sup>a</sup> (n = 58)	Patients with limb graft occlusion (n = 17)	Control patients (n = 34)
In graft stenosis/kinking	8 (13%)	2 (12%)	0
Overlap zone stenosis/kinking	48 (79%)	0	3 (9%)
Stenosis/dissection of peripheral vessel	5 (8%)	0	0
None	0	15 (88%)	31 (91%)

<sup>a</sup> Three of the stented patients were bilaterally stented.

# Savoir dire non et s'adapter



- Endologix et Stent acier iliaque gauche



# Conclusion

- Préparer soi meme son intervention
- Ne pas faire confiance à l'angiographie per op et rester sur son idée de départ
- Choisir son matériel en fonction de l'anatomie