THE 24TH INTERNATIONAL EXPERTS SYMPOSIUM
CRITICAL ISSUES
IN AORTIC ENDOGRAFTING

DECEMBER 17 & 18 2021
PULLMAN PARIS BERCY PARIS - FRANCE

The steerable sheath changed my life

G Pratesi, MD

Professor of Vascular Surgery
Clinic of Vascular and Endovascular Surgery
Ospedale Policlinico San Martino - University of Genoa

Disclosures

- Consulting/grants and research support/ honoraria and travel support: Abbott, Cook, Cordis, Medtronic, WL Gore & Associates, Terumo Aortic

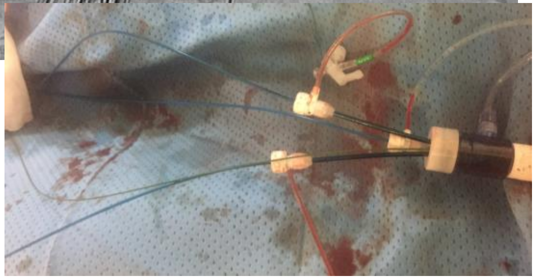
EDITORIAL

Fenestrated and branched endovascular aortic repair has reached a state of maturity

CrossMark

Stéphan Haulon, MD, PhD, *Lille, France*

- Learning curve (patient selection, SCI prevention)
- Endograft design (increase fenestration for a durable fixation)
- Dedicated bridging stents
- Intraoperative imaging (fusion, cone-beam CT scan, IVUS)



J Vasc Surg 2017

Learning curve of fenestrated and branched endovascular aortic repair for pararenal and thoracoabdominal aneurysms

Aleem K Mirza [1], Emanuel R Tenorio [1], Jussi M Kärkkäinen [1], Jan Hofer [1], Thanila Macedo [2], Stephen Cha [3], Pinar Ozbek [1], Gustavo S Oderich [4]

ARTICLE HIGHLIGHTS

- **Type of Research:** Retrospective, single-center cohort study
- **Key Findings:** A review of data of 334 patients with complex aortic aneurysms who underwent fenestrated-branched endovascular aortic repairs found a steady decrease in 30-day mortality over-time (6% to 0%; *P* < .039) and in the rate of major adverse events (60% to 29%; *P* < .0001).

Table III. Major adverse events (*MAEs*) <30 days and secondary intervention in 334 patients treated by fenestrated-branched endovascular aortic repair (F-BEVAR) for pararenal (PRAs) and thoracoabdominal aortic aneurysms (TAAAs) by quartile of the experience

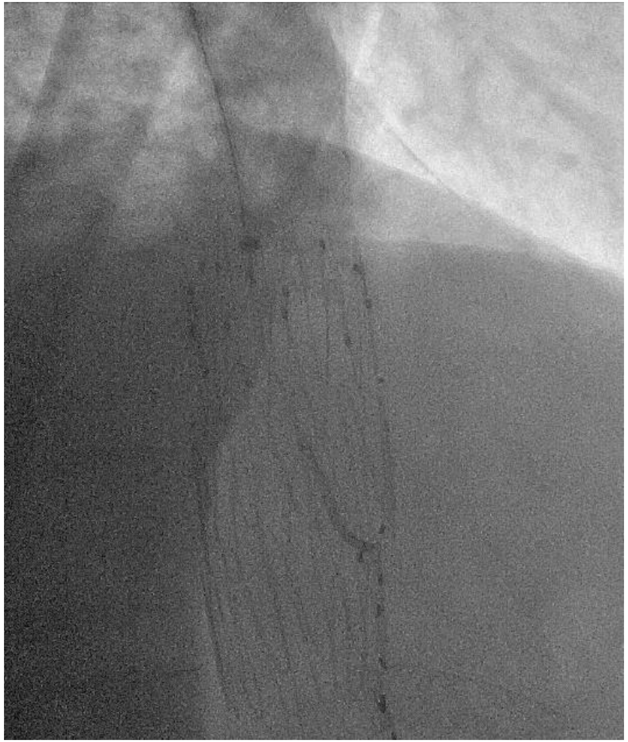
	Overall (N = 334)	Q1 (n = 81)	Q2 (n = 84)	Q3 (n = 84)	Q4 (n = 85)	*P* value
Early death	8 (2)	5 (6)	2 (2)	1 (1)	0	.039
Any MAE	123 (37)	49 (60)	28 (33)	22 (26)	24 (29)	<.001
Estimate blood loss >1000 mL	71 (21)	32 (40)	23 (27)	8 (9)	8 (10)	<.001
Acute kidney injury (>50% decrease in GFR)	42 (13)	16 (20)	9 (11)	8 (9)	9 (11)	.16
Myocardial infarction	17 (5)	5 (6)	2 (2)	5 (6)	5 (6)	.62
Respiratory failure	16 (5)	9 (11)	2 (2)	2 (2)	3 (4)	.049
Paraplegia (SCI Grade 3a to 3c)	7 (2)	2 (2)	2 (2)	3 (4)	0	.44
Stroke	7 (2)	2 (2)	1 (1)	2 (2)	2 (2)	.95
Bowel ischemia	9 (3)	5 (6)	0	3 (4)	1 (1)	.046
Any secondary intervention	96 (29)	34 (42)	25 (30)	19 (22)	18 (21)	.012
Aortic secondary intervention	79 (24)	27 (33)	24 (29)	13 (15)	15 (18)	.017

GFR, Glomerular filtration rate; *Q*, quartile; *SCI*, spinal cordy injury.
Data are presented as number (%).

Conclusions: This study demonstrates significant improvement in perioperative mortality, MAEs, procedural variables, and secondary interventions in patients treated by F-BEVAR, despite the increase in complexity of aneurysm pathology during the study period. Also, better patient selection contributed to improve outcomes.

J Vasc Surg 2020

Critical issues in f/bEVAR

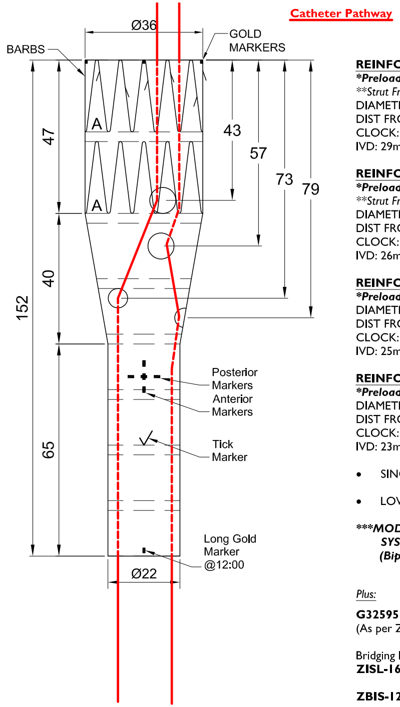


Critical issues target visceral vessels cannulation

- Down-warding/posterior orientation
- Target vessel stenosis/stenting
- Previous EVAR (struts across vessel ostium)
- Median arcuate ligament compression

Technical issues in fEVAR cannulation: how to manage?

- Access from above (preloaded graft)
- Balloon assisted cannulation
- Retrograde cannulation



REINFORCED LARGE FENESTRATION #1
Preloaded Catheter
Strut Free ***Access from above***
DIAMETER: 8mm
DIST FROM PROX EDGE: 43mm
CLOCK: 12:45
IVD: 29mm

REINFORCED LARGE FENESTRATION #2
Preloaded Catheter
Strut Free ***Access from above***
DIAMETER: 8mm
DIST FROM PROX EDGE: 57mm
CLOCK: 12:45
IVD: 26mm

REINFORCED SMALL FENESTRATION #1
Preloaded Catheter
DIAMETER: 6mm ***Access from below***
DIST FROM PROX EDGE: 73mm
CLOCK: 10:45
IVD: 25mm

REINFORCED SMALL FENESTRATION #2
Preloaded Catheter
DIAMETER: 6mm ***Access from below***
DIST FROM PROX EDGE: 79mm
CLOCK: 3:00
IVD: 23mm

- SINGLE DIAMETER REDUCING TIES
- LOW PROFILE FABRIC

*****MODIFIED PRELOADED DELIVERY SYSTEM*****
(Biport handle and preloaded catheters)

Plus:

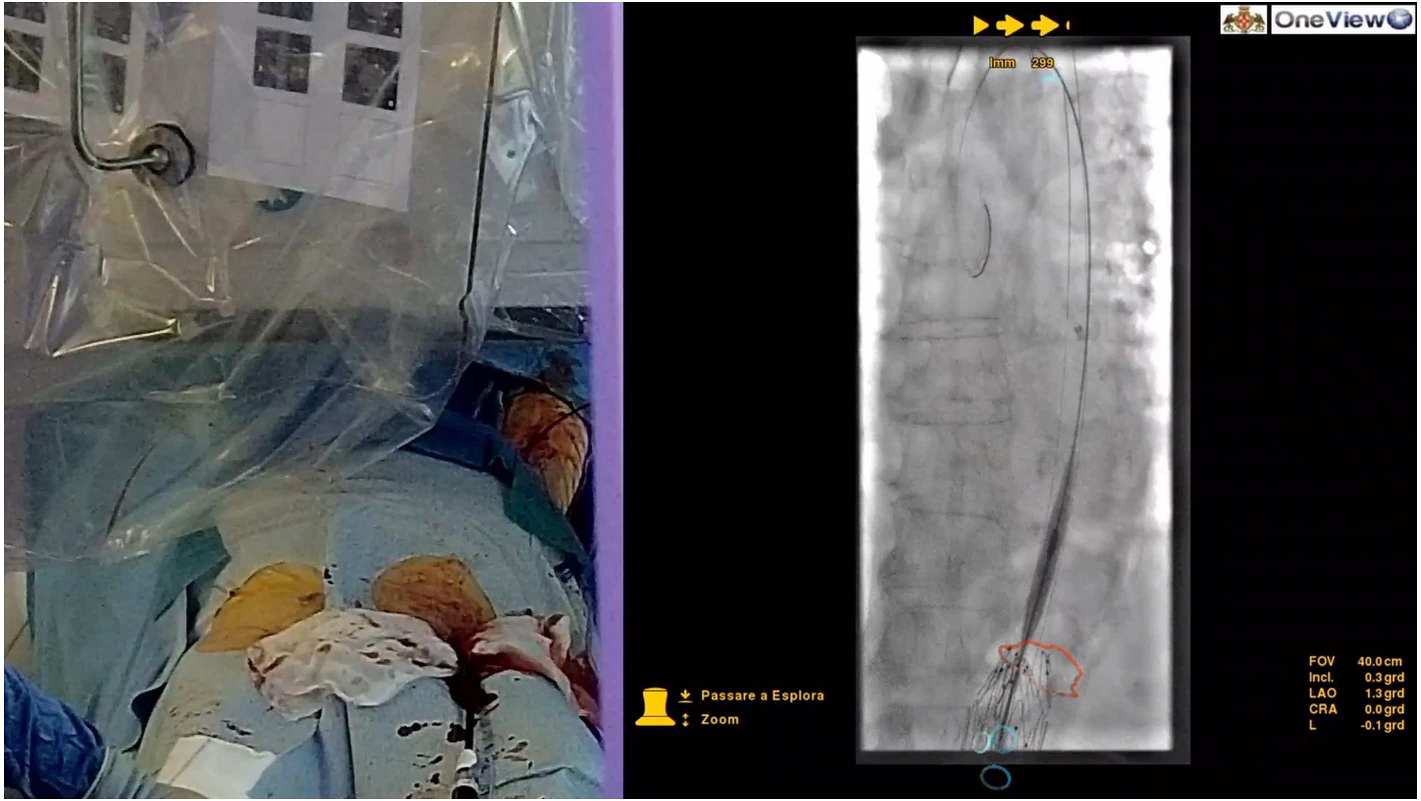
G32595 - AAA-BIFURCATED-GRAFT
(As per ZFEN-D-16-45-76)

Bridging limb
ZISL-16-42

ZBIS-12-45-41

Increased procedural time, radiation exposure and contrast burden

Critical issues in f/bEVAR: Preloaded Endograft



Upper extremity access for fenestrated endovascular aortic aneurysm repair is not associated with increased morbidity

Martyn Knowles, MD, David A. Nation, MD, David E. Timaran, MD, Luis F. Gomez, MD, M. Shadman Baig, MD, R. James Valentine, MD, and Carlos H. Timaran, MD, *Dallas, Tex*

Variables	*Femoral access (n = 50), mean ± SD*	*Upper extremity access (n = 98), mean ± SD*	P
Fenestrations, No.	2.72 ± 0.09	3.25 ± [illegible]	[illegible]
Operative time, min	258.8 ± 14.1	[illegible] ± 10.6	[illegible]
EBL, mL	493.5 ± [illegible]	764.8 ± [illegible]	[illegible]
Transfusion	[illegible]	2.17 ± [illegible]	.1
Length of stay, days			
ICU	3.42 ± [illegible]	4.20 ± 0.38	.27
Total	[illegible]	7.03 ± 0.47	.78

Table IV. Local and cerebrovascular complications by right vs left upper extremity access

Complication	*Right-sided access (n = 6), No. (%)*	*Left-sided access (n = 92), No. (%)*	P
Local complications	[illegible]	4 (4)	.6
CVA	0 (0)	1 (1)	.8

CVA, Cerebrovascular accident.

Table V. Local and cerebrovascular complications by open vs percutaneous upper extremity access

Complication	*Percutaneous access (n = 12), No. (%)*	*Open access (n = 86), No. (%)*	P
Local complications	2 (17)	2 (2)	.02
CVA	0 (0)	1 (1)	.7

CVA, Cerebrovascular accident.

In Literature stroke rates were noted to be between 3% and 10% solution

Conclusions: Upper extremity access appears to be a safe and feasible approach for patients undergoing FEVAR. Open exposure in the upper extremity may be safer than percutaneous access during FEVAR. Unlike chimney and snorkel grafts, upper extremity access during FEVAR is not associated with an increased risk of stroke, despite the need for multiple visceral vessel stenting. (J Vasc Surg 2015;61:80-7.)

J Vasc Surg 2015

A systematic review of outcomes of upper extremity access for fenestrated and branched endovascular aortic repair

J Vasc Surg 2020

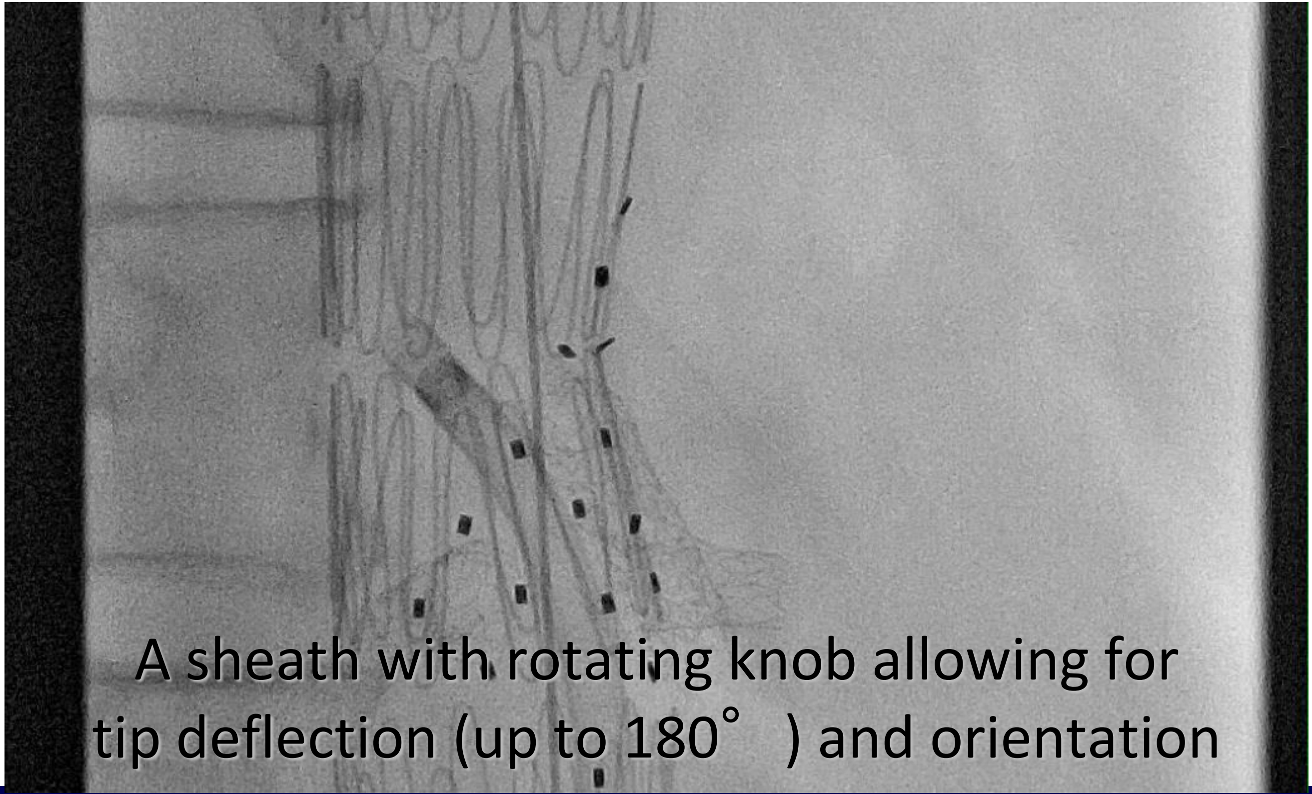
Rafael D Malgor [1], Pablo Marques de Marino [2], Eric Verhoeven [2], Athanasios Katsargyris [2]

	No.	Ischemic stroke	ICH	Spinal cord bleed	SCI	MI	Mortality
Bertoglio et al[66]	34	1 (2.9)	0	0	1 (2.9)	0	2 (6)
Stern et al[67]	29	1 (3.7)	0	0	0	0	0
Knowles et al[68]	98	0	1 (1)	0	0	0	1 (1)
Fiorucci et al[69]	61	2 (3.3)	2 (3.3)	1 (3.3)	0	0	1 (2)
Branzan et al[70]	30	1 (3.3)	0	0	0	0	2 (7)
Mirza et al[71]	243	5 (2.1)	0	0	6 (2.5)	13 (5.3)	6 (2.5)
Total	495	10 (2)	3 (0.6)	1 (3.3)	7 (1.4)	13 (2.6)	12 (2.4)

ICH, Intracerebral hemorrhage; *MI*, myocardial infarction; *SCI*, spinal cord ischemia.
Values are reported as number (%).

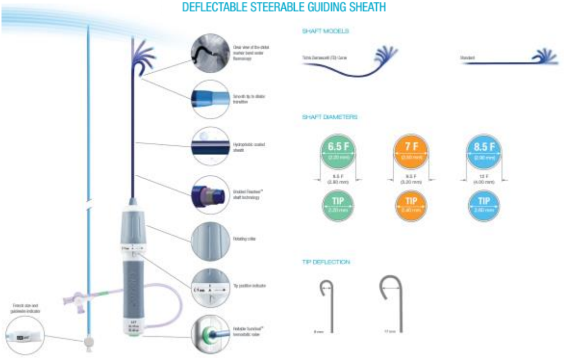
	Percutaneous UEA (n = 56 patients)		Open UEA (n = 495 patients)		
UEA complications	**No.**	**%**	**No.**	**%**	***P* value**
Pseudoaneurysms	1	2	0	0	.1
Wound infection	0	0	1	0.2	.9
Neurologic arm deficit	0	0	4	1	.6
Arterial occlusion	3	5	4	1	.03
Access site bleeding	8	14	9	2	<.01
Stenosis	2	4	0	0	<.01
Total	14	25	18	4	<.01

How to manage? Try a steerable sheath

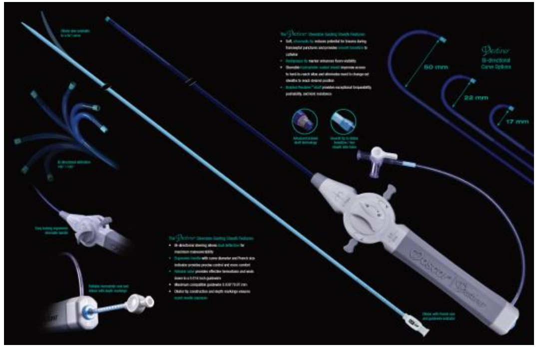


Steerable guiding sheaths: devices current available

Destino™ TWIST
DEFLECTABLE STEERABLE GUIDING SHEATH



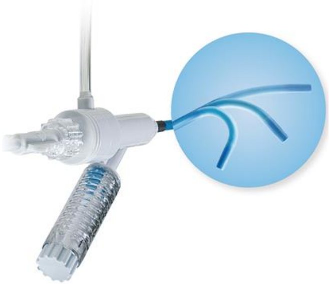
Destino™
STEERABLE GUIDING SHEATH

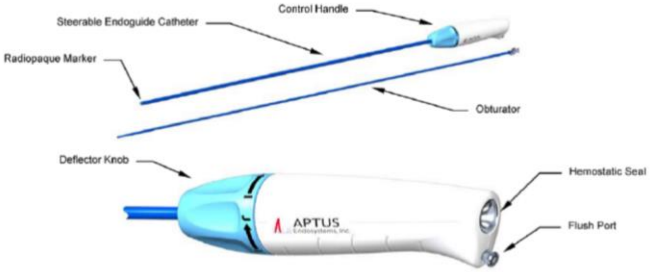


APTUS
ENDOSYSTEMS

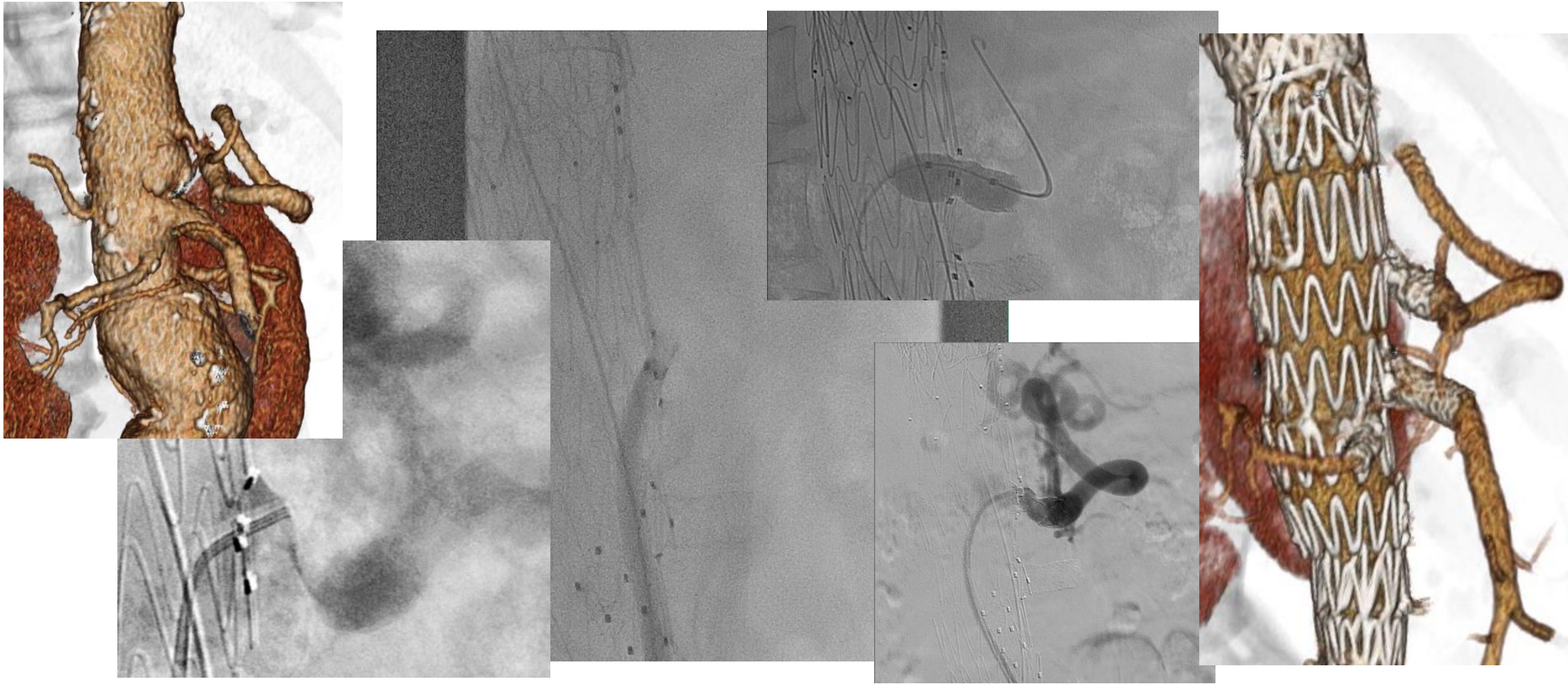
TourGuide™
Steerable Sheath

fustar Steerable Introducer





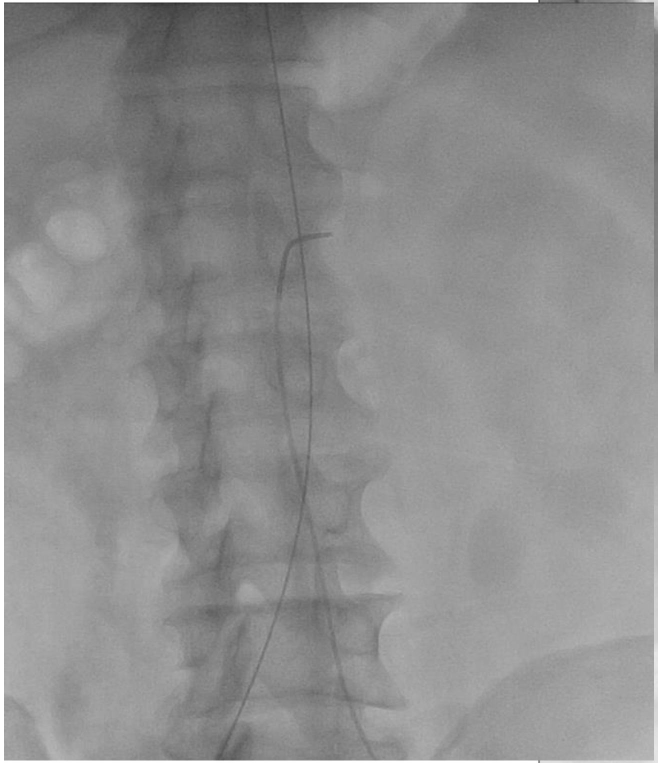
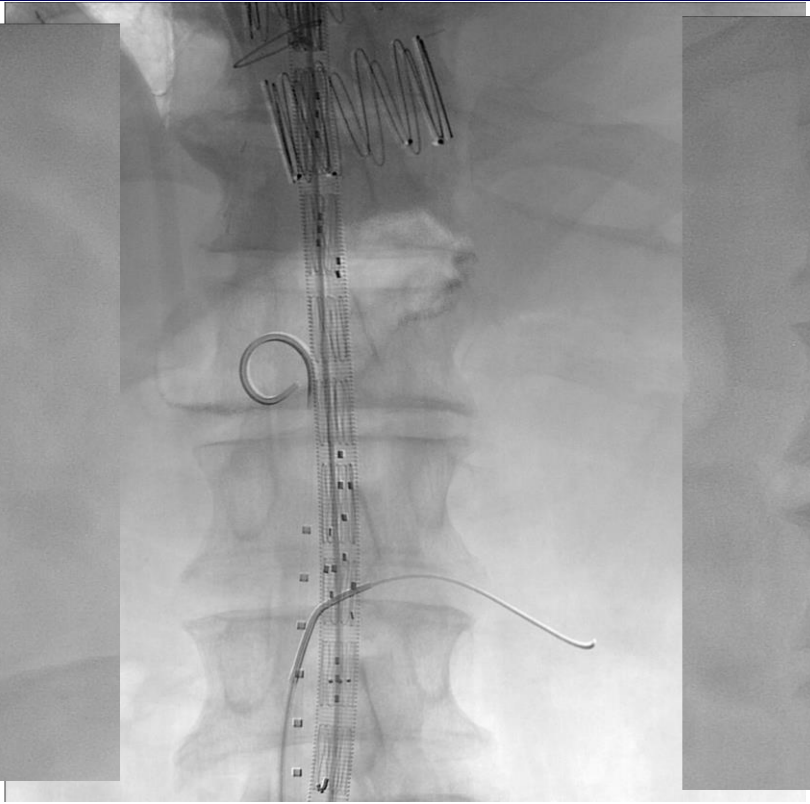
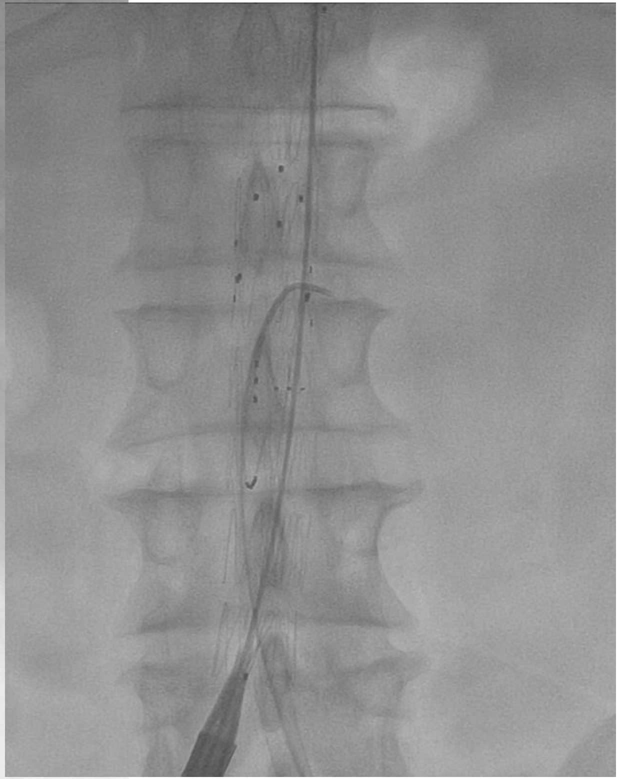
Steerable sheaths: when and how
Challenging CT (MAL compression)



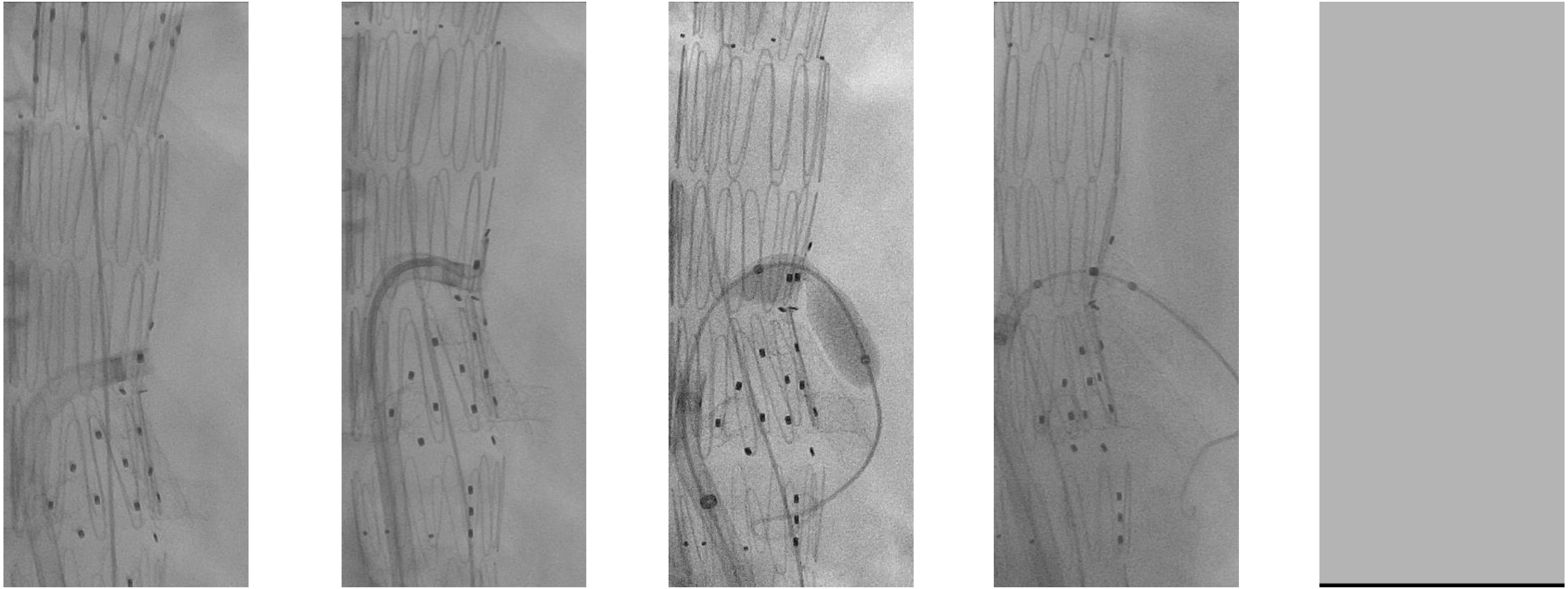
Evolution of endoTx in complex aortic disease

3D fusion guidance
+
Steerable catheter
+
CBCT scan:
a
game
changer

f-EVAR: what we were used to do

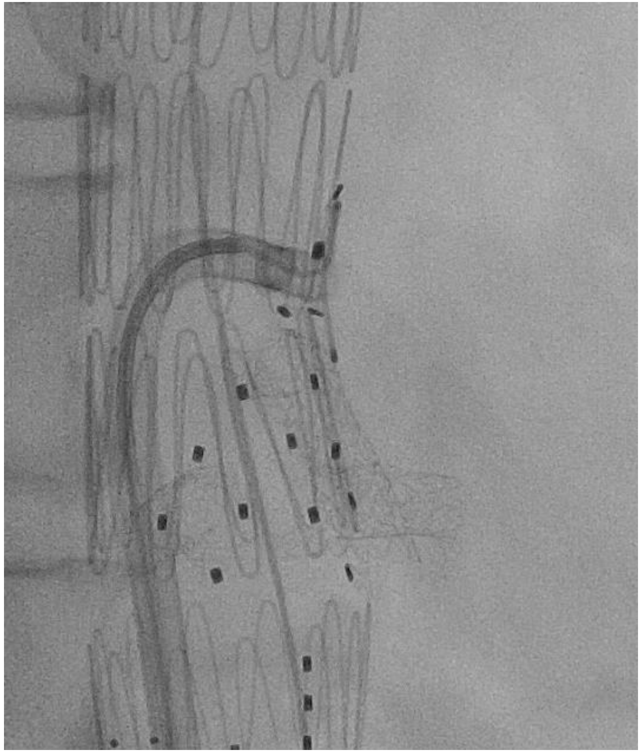




f-EVAR: what we were used to do



f-EVAR: what we were used to do

- 7-8 F for renal arteries
- 10-12 F for SMA and CT
- After failure of standard techniques
- Use as working sheath for all the FEN steps (cannulation, stenting and flaring)



Cone-beam CT scan

CBCT role in complex aortic disease

Prospective nonrandomized study to evaluate cone beam computed tomography for technical assessment of standard and complex endovascular aortic repair

Emanuel R Tenorio [1], Gustavo S Oderich [2], Giuliano A Sandri [1], Pinar Ozbek [1], Jussi M Kärkkäinen [1], Terri Vrtiska [3], Thanila A Macedo [3], Peter Gloviczki [1]

Table III. Positive findings by cone beam computed tomography (CBCT) in 170 endovascular aortic procedures

Variable	Overall (N = 170)	F-BEVAR (n = 85)	IBD (n = 32)	EVAR (n = 24)	TEVAR (n = 18)	Reintervention (n = 11)	*P* value	F-BEVAR (n = 85)	Others (n = 85)	*P* value
Kink, compression, or stent of leaflet	29 (17)	19 (22)	4 (13)	0	2 (11)	4 (36)	.03	19 (22)	10 (12)	.11
Type I-III endoleak	16 (9)	12 (14)	0	2 (8)	1 (6)	1 (9)	.2	12 (14)	4 (5)	.06
Thrombus or dissection	7 (4)	6 (7)	0	0	0	1 (9)	.22	6 (7)	1 (1)	.11
Total positive findings	52 (31)	37 (44)	4 (13)	2 (8)	3 (17)	6 (55)	.0002	37 (44)	15 (18)	.0004

EVAR, Endovascular aneurysm repair; *F-BEVAR*, fenestrated-branched endovascular aneurysm repair; *IBD*, iliac branch device; *TEVAR*, thoracic endovascular aortic repair.
Values are reported as number of procedures (%).

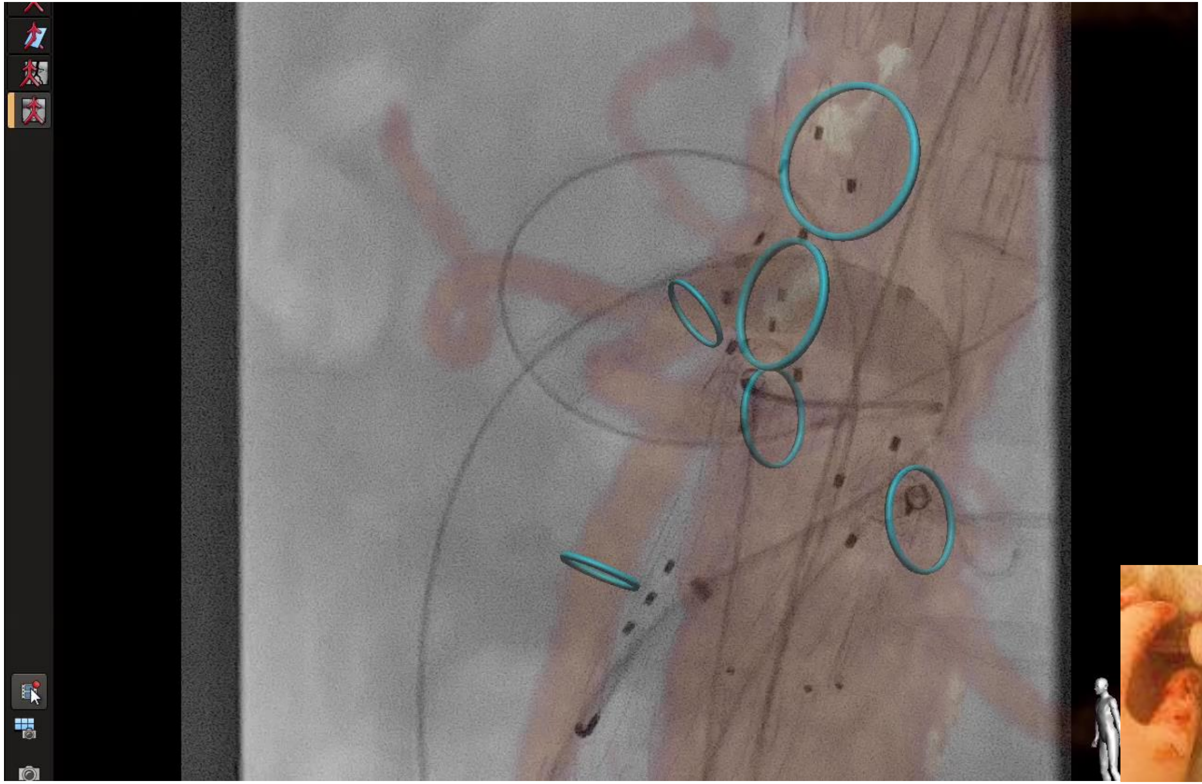
Conclusions: CBCT reliably detected positive findings prompting immediate revisions in nearly one of five patients, with the highest rates among F-BEVAR patients. Detection of any endoleak was higher with CBCT compared with DSA or CTA, but most endoleaks were observed. DSA alone failed to detect positive findings warranting revisions.

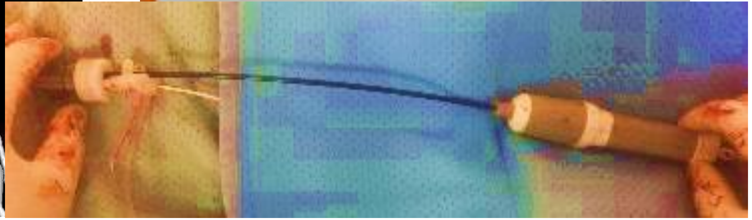
ARTICLE HIGHLIGHTS

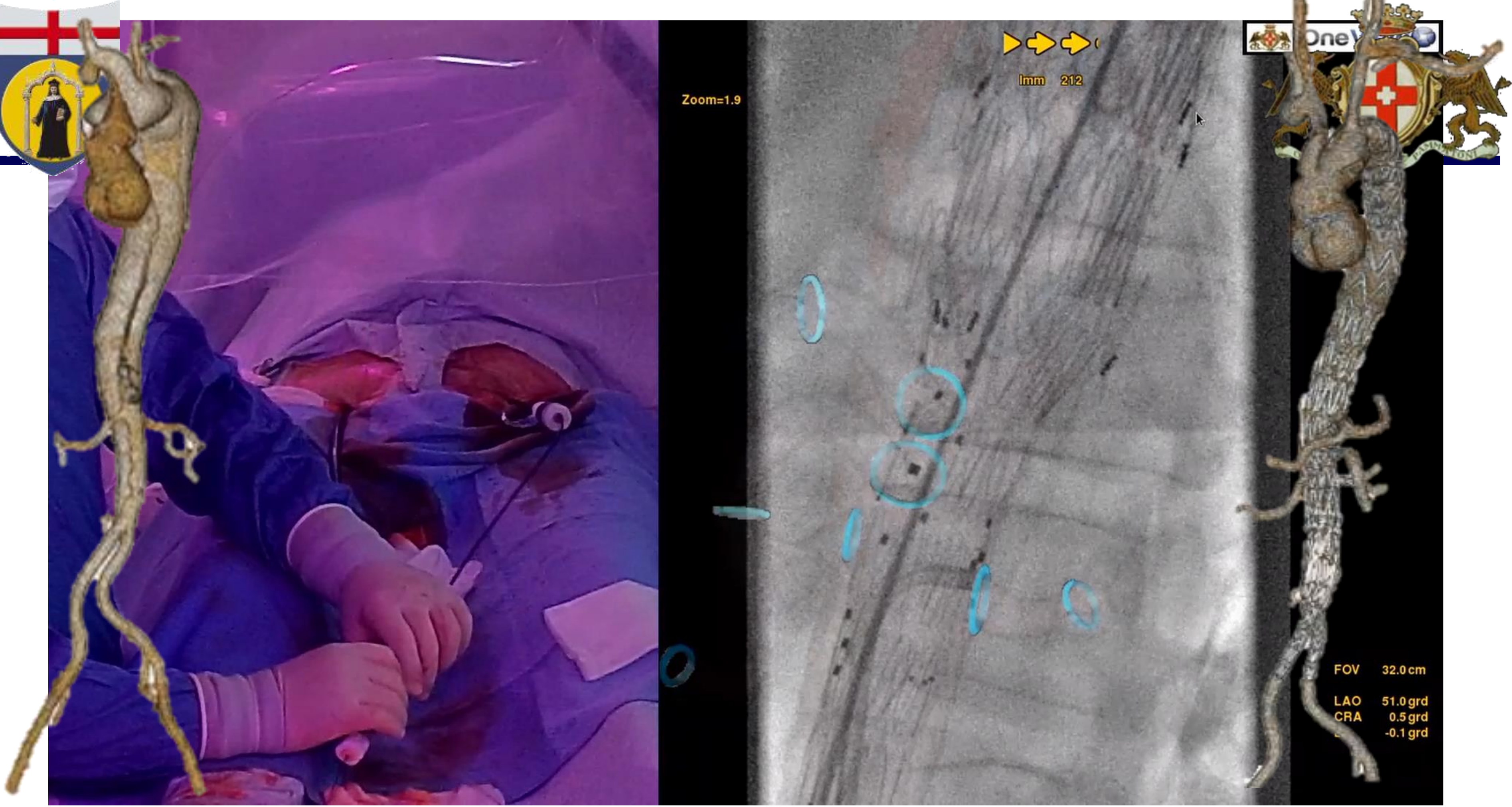
- **Type of Research:** Prospective, single-center cohort study
- **Key Findings:** During 170 aortic interventions, cone beam computed tomography (CBCT) identified 52 positive findings in 43 procedures (25%), higher for fenestrated-branched endovascular aneurysm repair compared with other aortic procedures (35% vs 16%; *P* = .01). Of these, 28 procedures (16%) had positive findings that prompted intervention. Digital subtraction angiography alone would not have detected positive findings in 34 procedures (79%), including 21 procedures (49%) that needed secondary interventions. Computed tomography angiography diagnosed two (1%) additional endoleaks requiring intervention that were not diagnosed by CBCT.
- **Take Home Message:** CBCT reliably detected positive findings prompting immediate revisions in nearly one of five patients, with the highest rates among fenestrated-branched endovascular aneurysm repair patients. Digital subtraction angiography alone failed to detect positive findings warranting secondary interventions.

J Vasc Surg 2020

Fenestrated EVAR: what we do now
Oscor 7F x 65 cm – 4 vessel cannulation

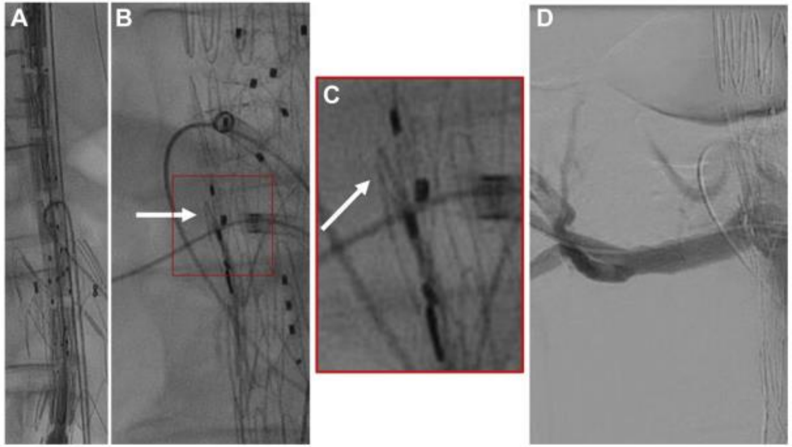


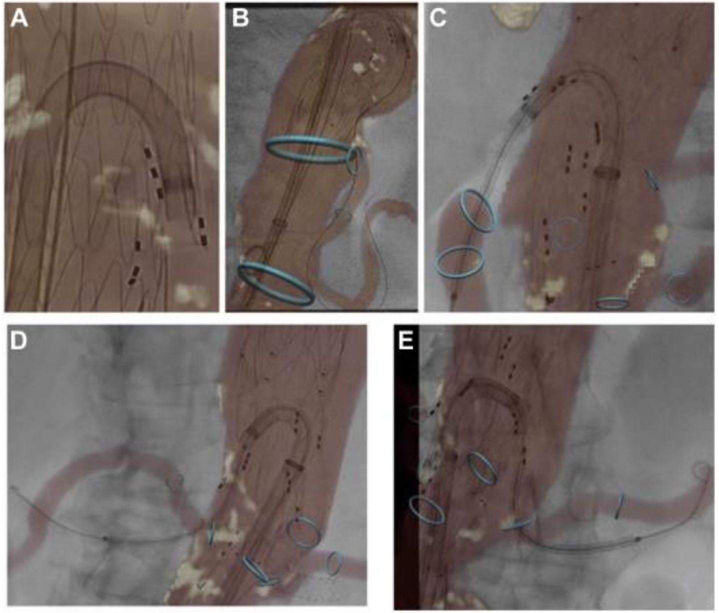



Zoom=1.9
Imm 212
FOV 32.0 cm
LAO 51.0 grd
CRA 0.5 grd
-0.1 grd

Steerable Sheath for Cannulation and Bridging Stenting of Challenging Target Visceral Vessels in Fenestrated and Branched Endografting

Enrico Gallitto [1], Gianluca Faggioli [1], Luca Bertoglio [2], Giovanni Pratesi [3], Giacomo Isernia [4], Martina Goretti [1], Arnaldo Ippoliti [5], Massimo Lenti [4], Roberto Chiesa [2], Mauro Gargiulo [1]



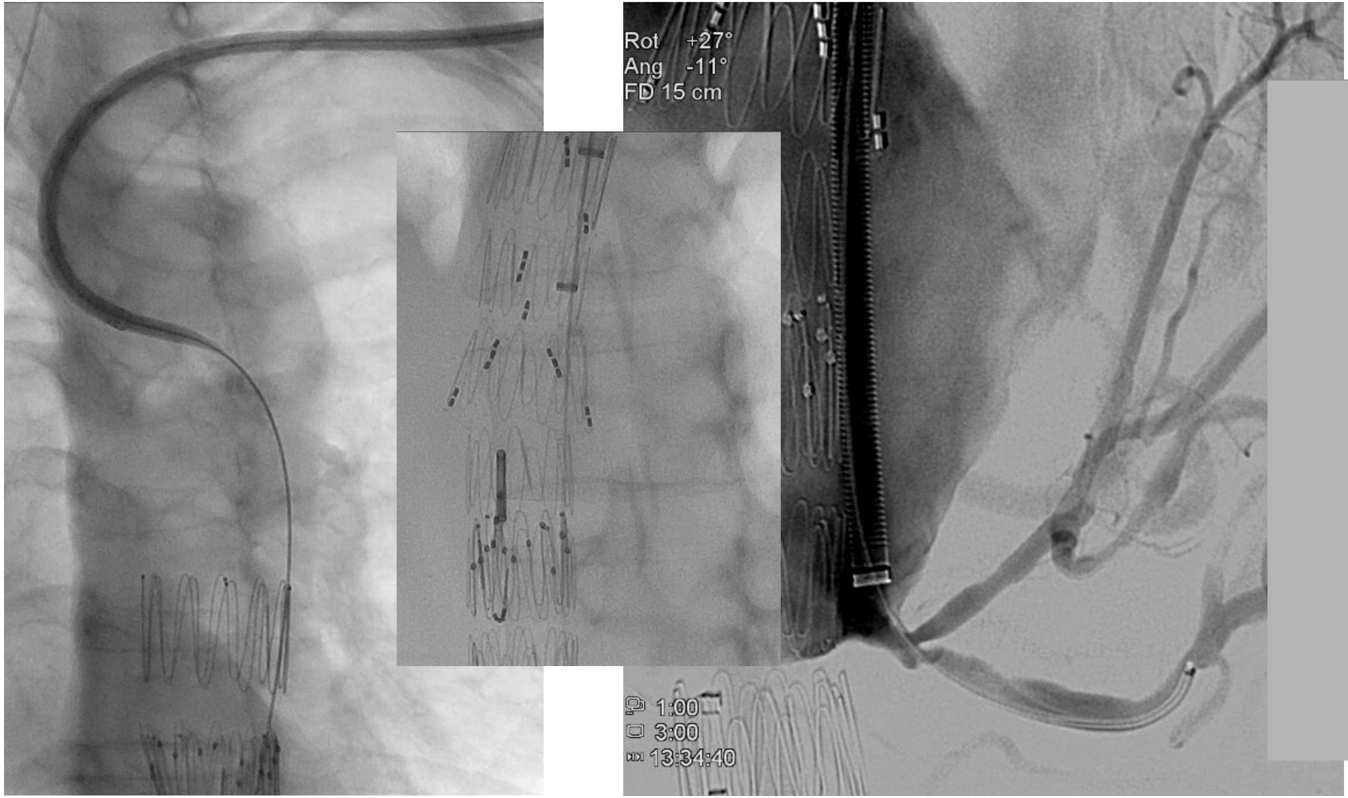


Conclusions

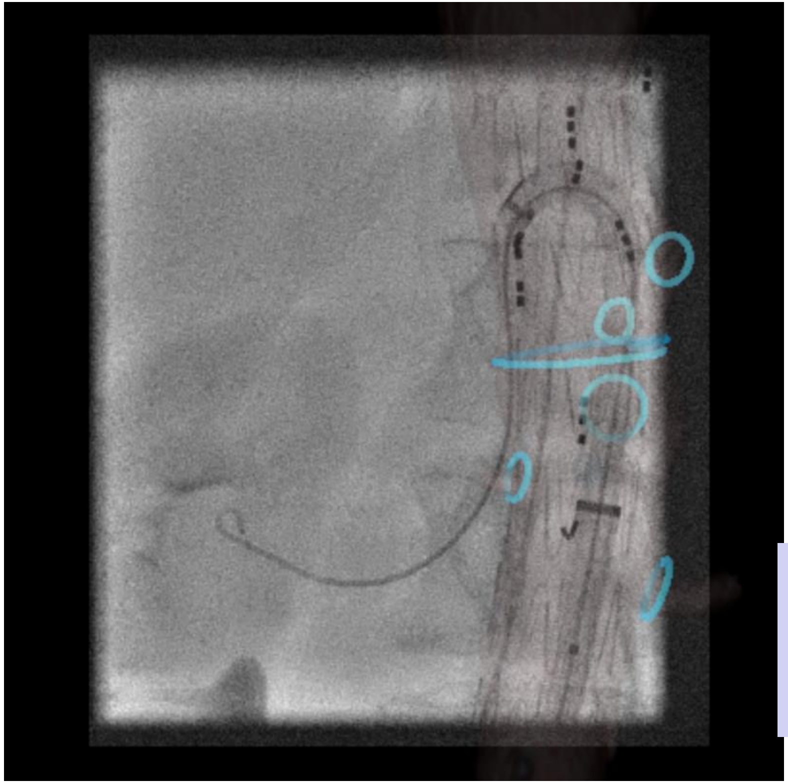
The use of the steerable sheath could be an effective adjunctive tool and can be used primarily as a planned technique or in case of failure of the standard cannulation technique in challenging TVV anatomy during FB-EVAR.

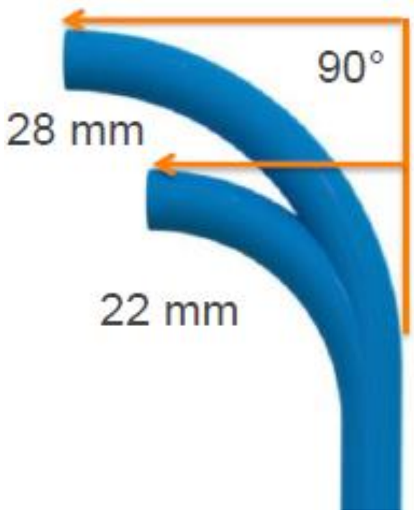
Annals of Vascular Surgery, 2020

b-EVAR: what we were used to do

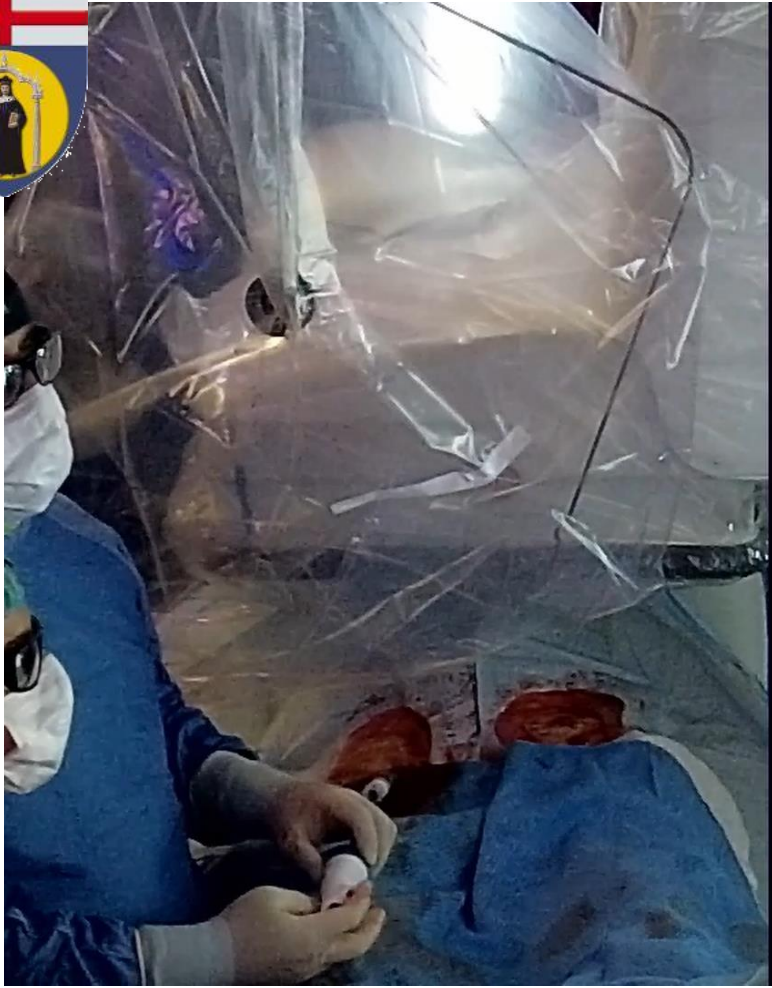


Branched EVAR:
HeliFx Guide x 62 cm – retrograde branch cannulation





16Fr OD,
62cm working length




Imm 27
Zoom=1.9
FOV 40.0 cm
LAO 0.6 grd
CRA 0.0 grd
L -0.1 grd


APTUS

Why we need steerable sheath in fEVAR/bEVAR? Transfemoral vs Upper extremity access

Comparison of transfemoral versus upper extremity access to antegrade branches in branched endovascular aortic repair

Wolf Eilenberg [1], Tilo Kölbel [1], Fiona Rohlffs [1], Gustavo Oderich [2], Ahmed Eleshra [1], Nikolaos Tsilimparis [1], Sebastian Debus [1], Giuseppe Panuccio [3]

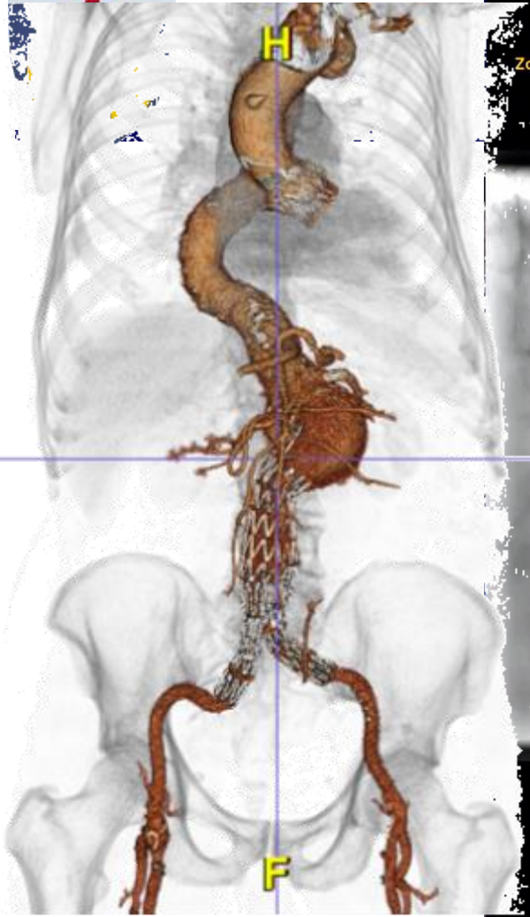
ARTICLE HIGHLIGHTS

- **Type of Research:** A comparative consecutive cohort study of two treatment modalities
- **Key Findings:** The present study shows potential advantages for catheterization of antegrade branches through transfemoral access with reduced radiation exposure, stroke and shorter operation time compared to upper extremity access in branched endovascular aortic repair.

Variable	TFA group (n = 60)	UEA group (n = 92)	
Aortic aneurysm type			
Pararenal	11 (18.3)	28 (30.5)	
TAAA 4	11 (18.3)	13 (14.1)	
TAAA 2 and 3	38 (63.4)	51 (55.4)	
Associated procedure			
ISB	11 (18.3)	16 (17.4)	.88
TEVAR	29 (48.3)	43 (46.7)	.87
Technical success	60/60 (100)	87/92 (95)	<.01
FT, minutes	69 (48-87)	88 (65-104)	.39
DAP, Gy × cm^2	221 (138-405)	255 (148-425)	.05
CA, mL	141 (123-165)	130 (101-157)	.34
Operation time, minutes	300 (240-356)	364 (290-475)	<.01

CA, Contrast agent; *DAP*, dose-area product; *FT*, fluoroscopy time; *ISB*, iliac side branch; *TAAA*, thoracoabdominal aortic aneurysm; *TEVAR*, thoracic endovascular repair; *TFA*, transfemoral access; *UEA*, upper extremity access.
Data presented as number (%) or median (interquartile range).

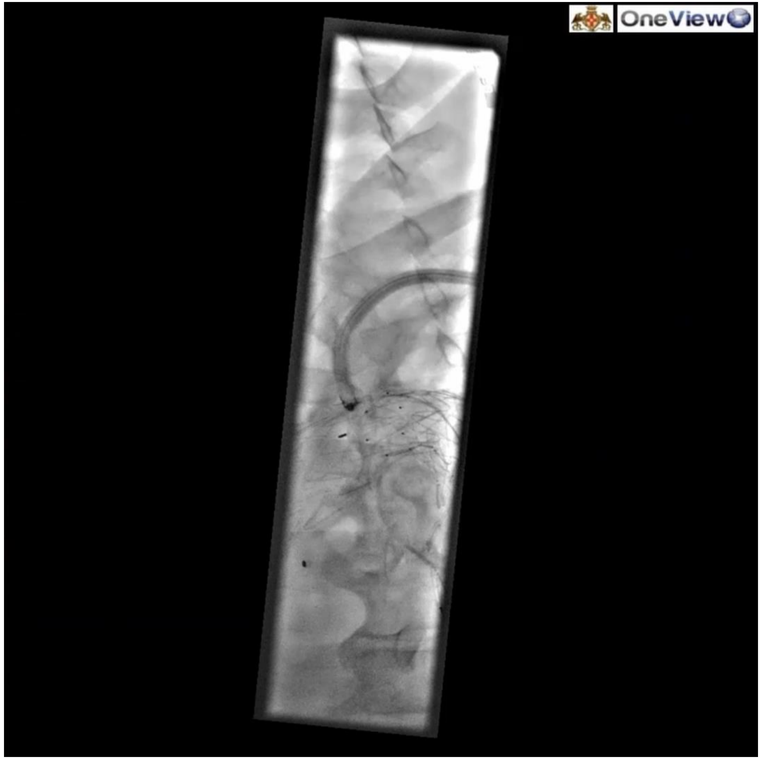
Conclusions: The use of TFA to catheterize antegrade branches was associated with a lower rate of complications in the present study and has become our preferred approach for BEVAR. (J Vasc Surg 2021;73:1498-503.)


H
F


Imm 165
Zoom=1.2
L
FOV
Incl.
RAO
CRA
L

In Situ Laser Fenestration & EVAR

In Situ Laser Fenestration & TEVAR



Conclusions

- By changing tip orientation and angulation, steerable guiding sheaths may overcome technical difficulties related to fenestration cannulation
- They improve support and stability at target areas, for all the FEVAR procedural steps
- Steerable guiding sheaths should be part of the equipment of any centers performing advanced fenestrated and branched endografting

OSPEDALE POLICLINICO SAN MARTINO

Sistema Sanitario Regione Liguria

Istituto di Ricovero e Cura a Carattere Scientifico