FBEVAR for Chronic Dissections

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Disclosures

- Research support, Consulting, IP
  - Cook Medical, GE Healthcare, Bentley

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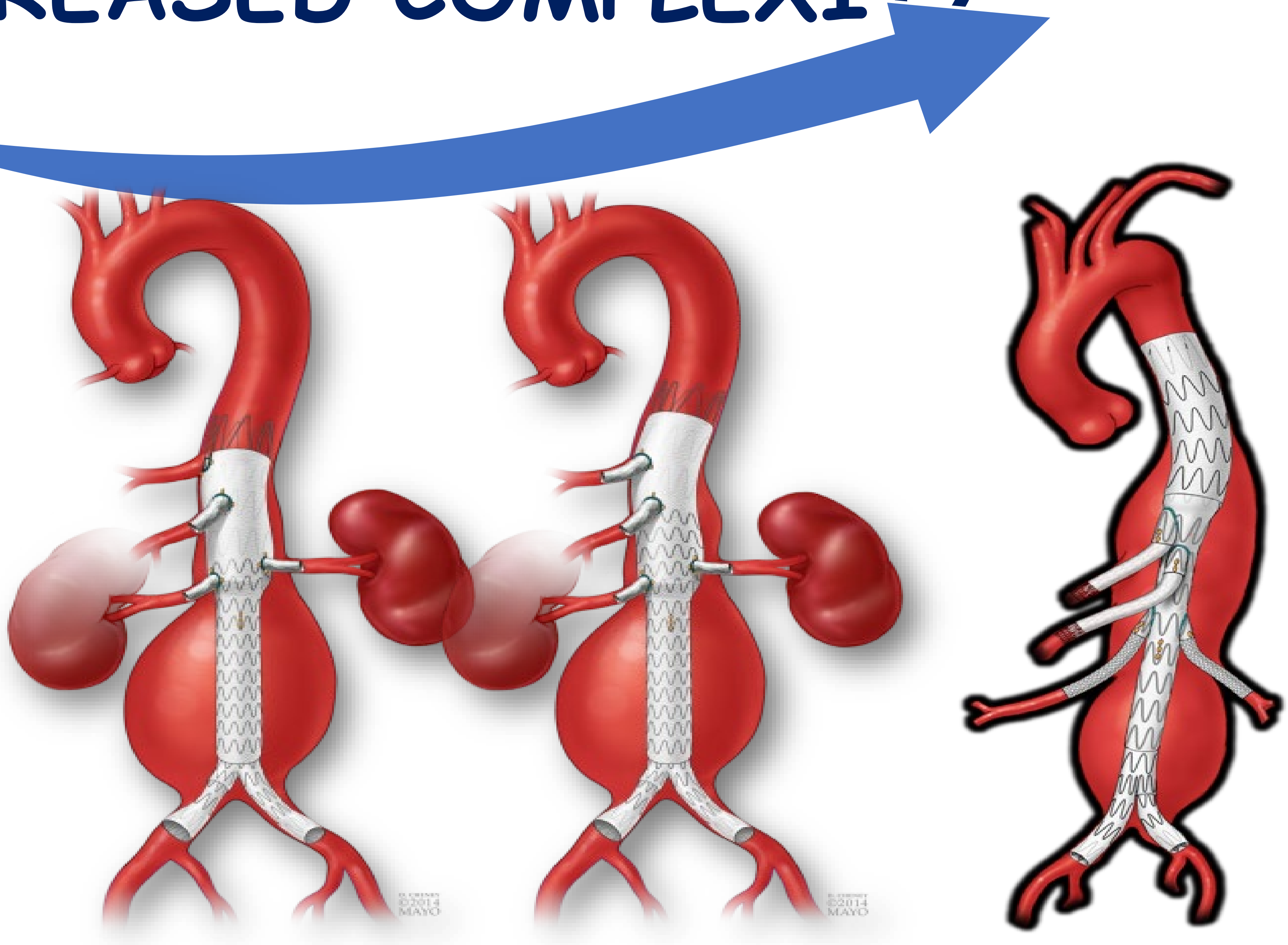
INCREASED COMPLEXITY



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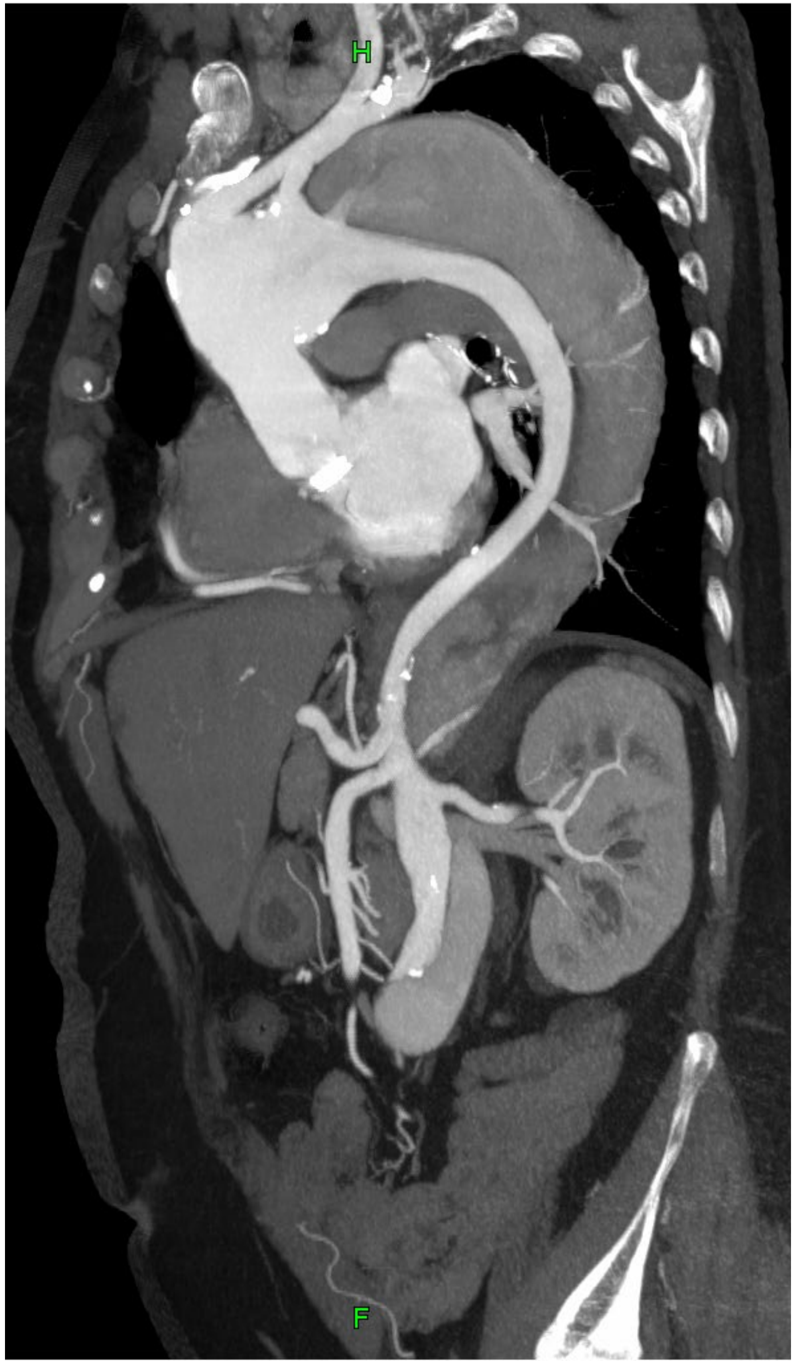
Challenging Procedures

- Proximal and Distal Sealing
- Narrow true lumen
- Target vessels perfused by false lumen
- Dissected target vessels



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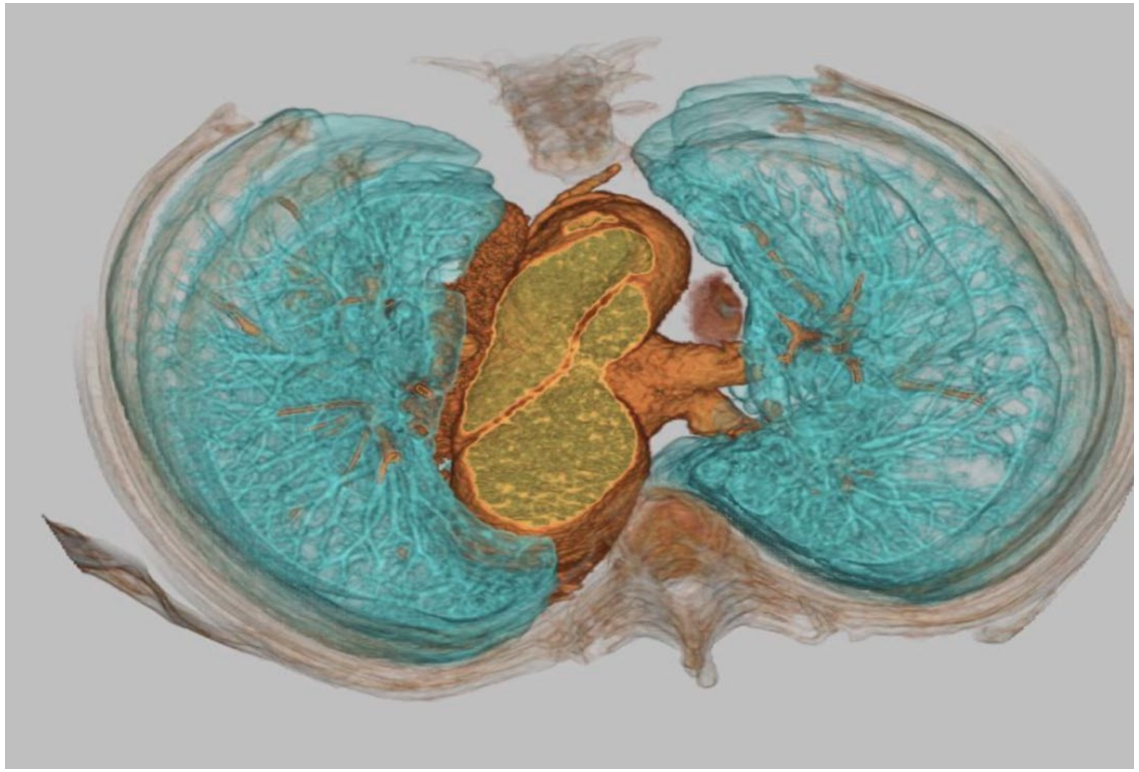

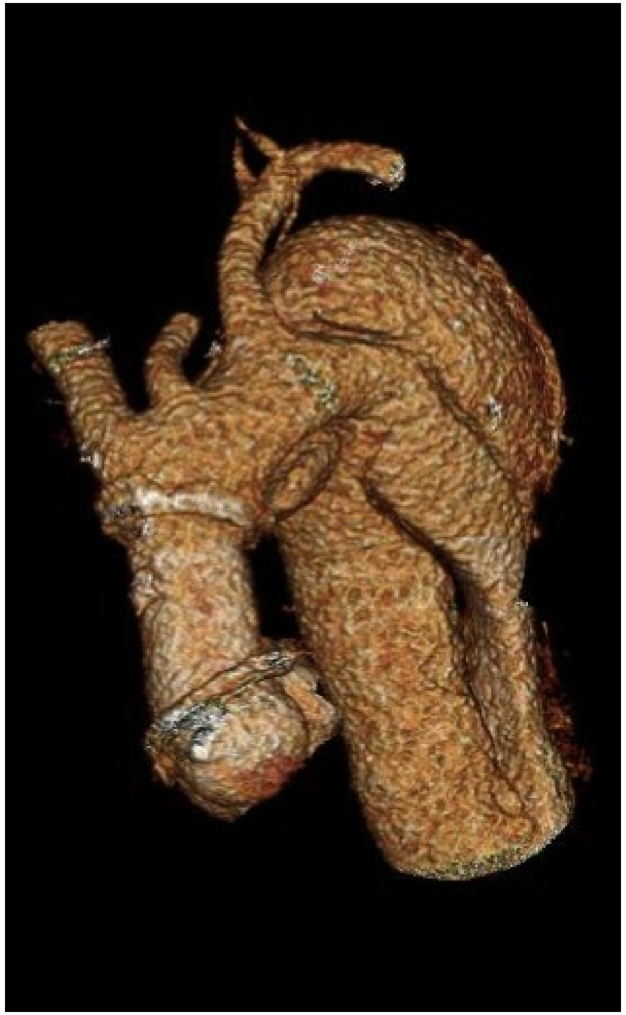

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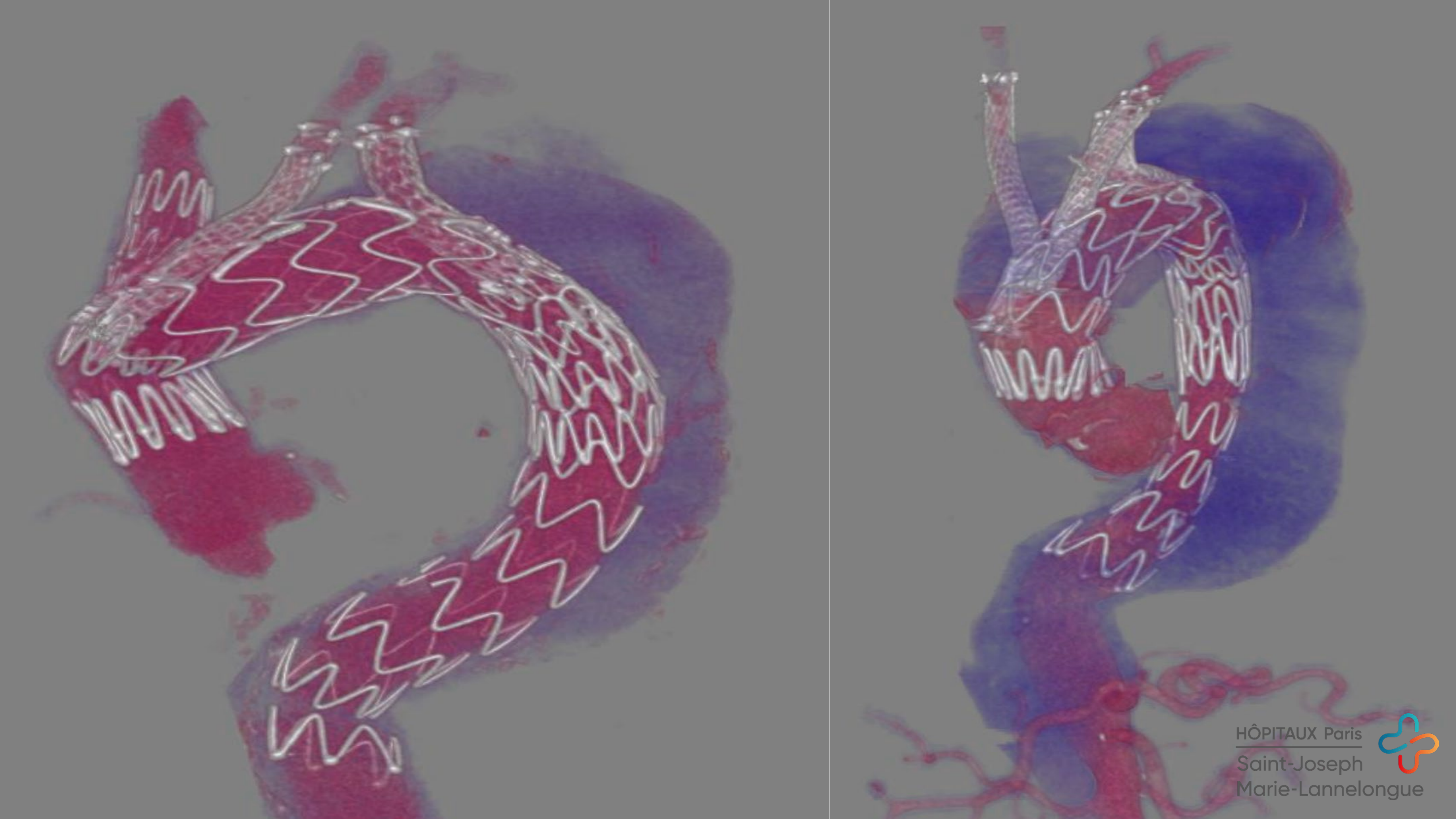
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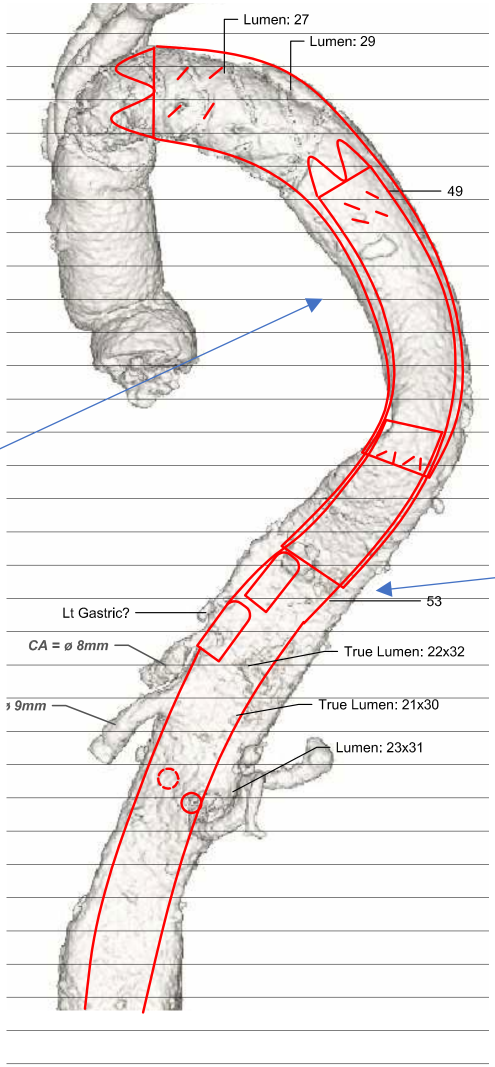
TWO-STEP ENDOVASCULAR REPAIR

Step one

TEVAR

+

Embolization of Polar Renal and gastric arteries



Step two

Embolization of IMA and Lumbar arteries

F-BEVAR

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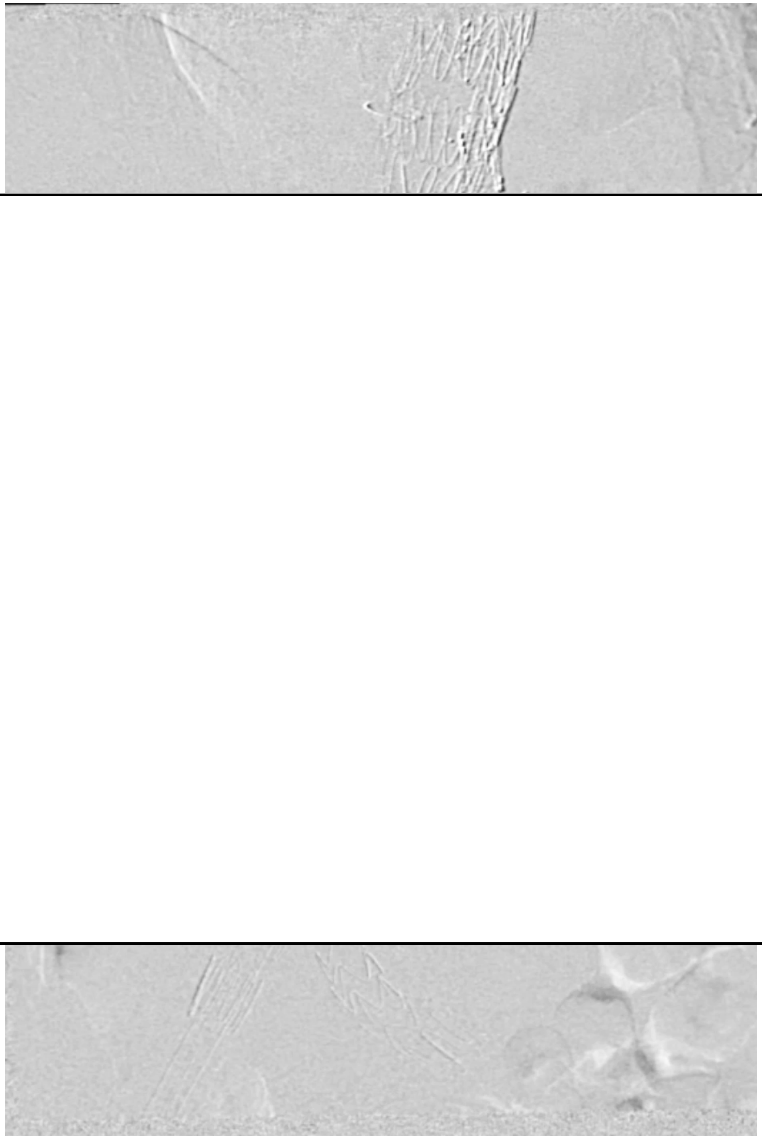

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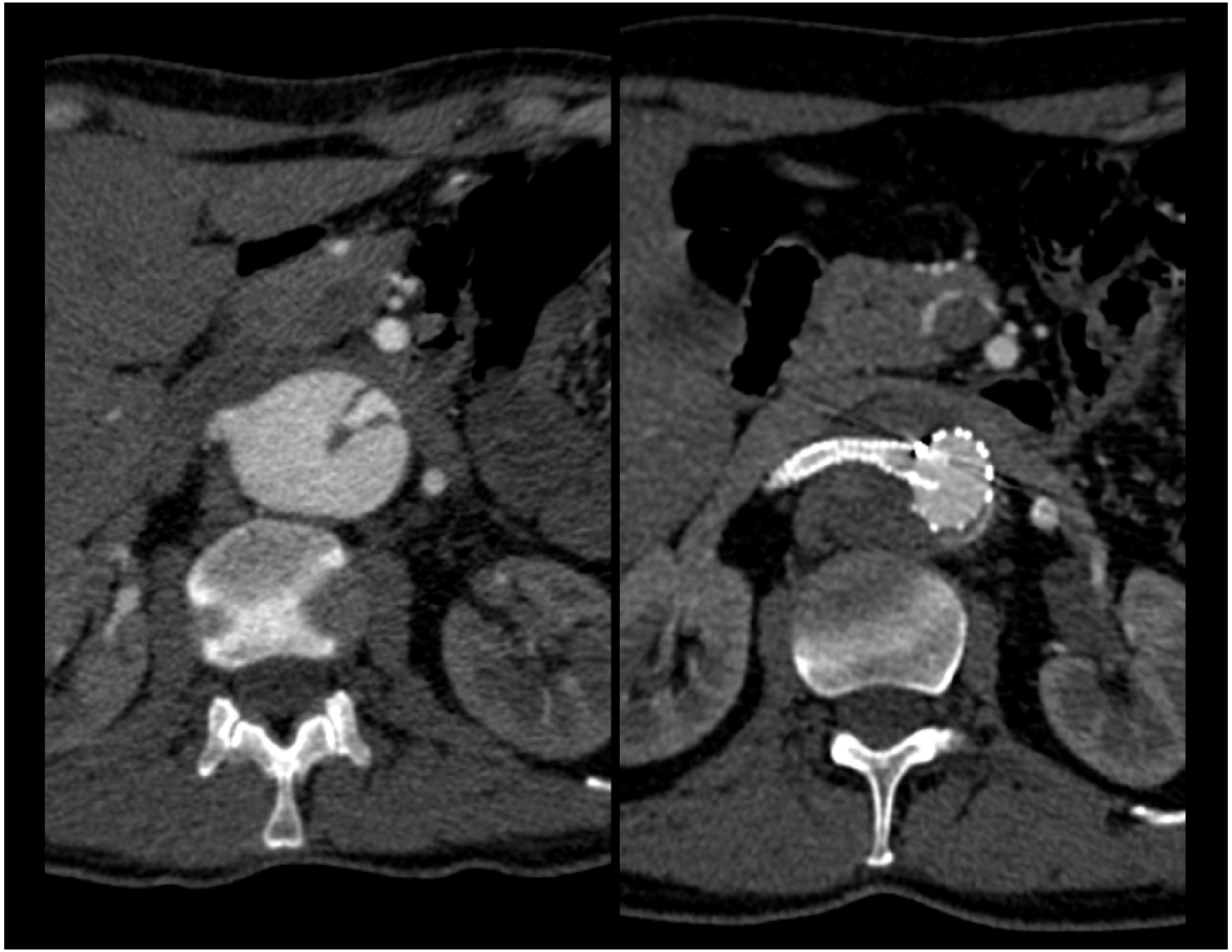

Post TEVAR

Post FEVAR

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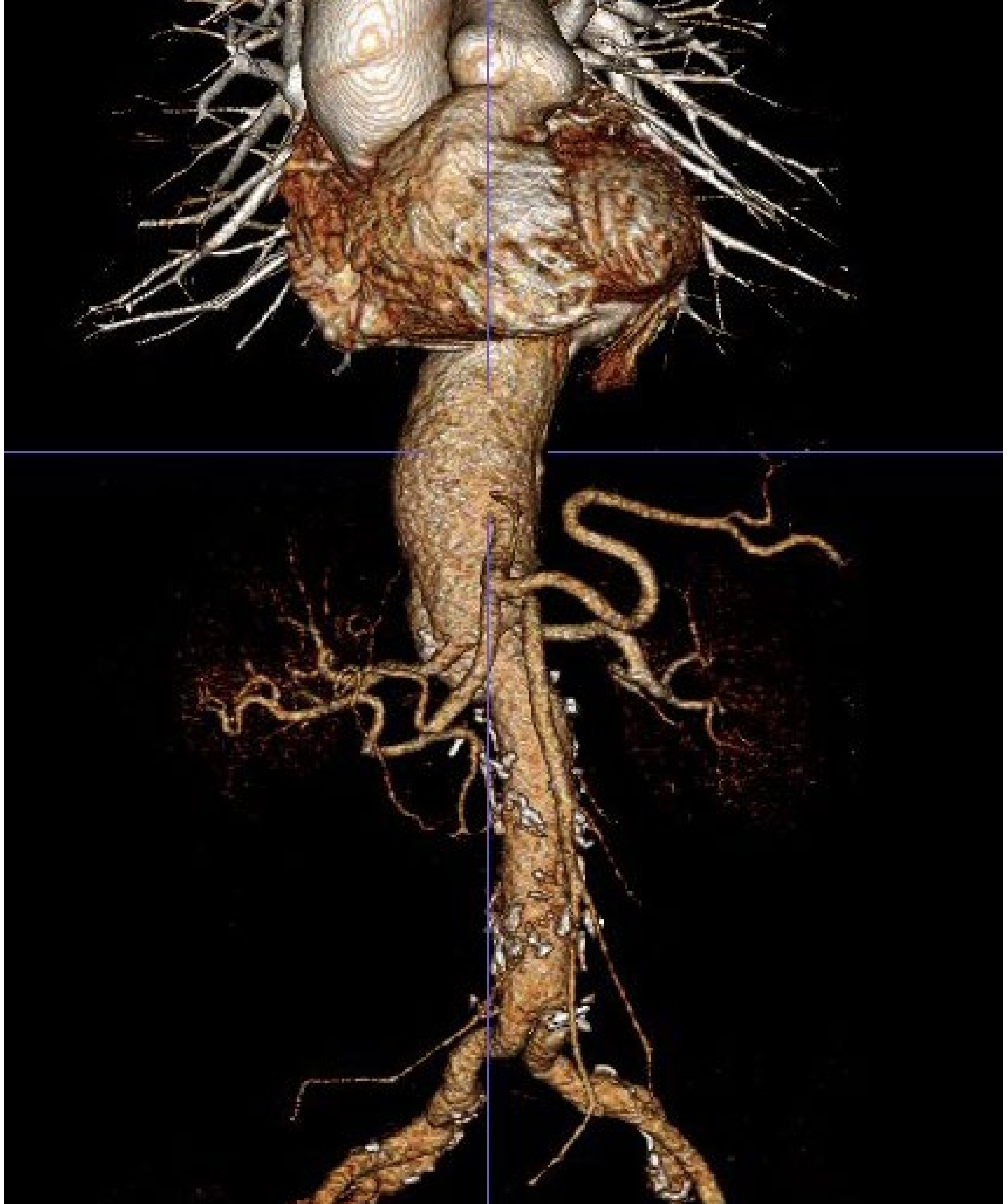

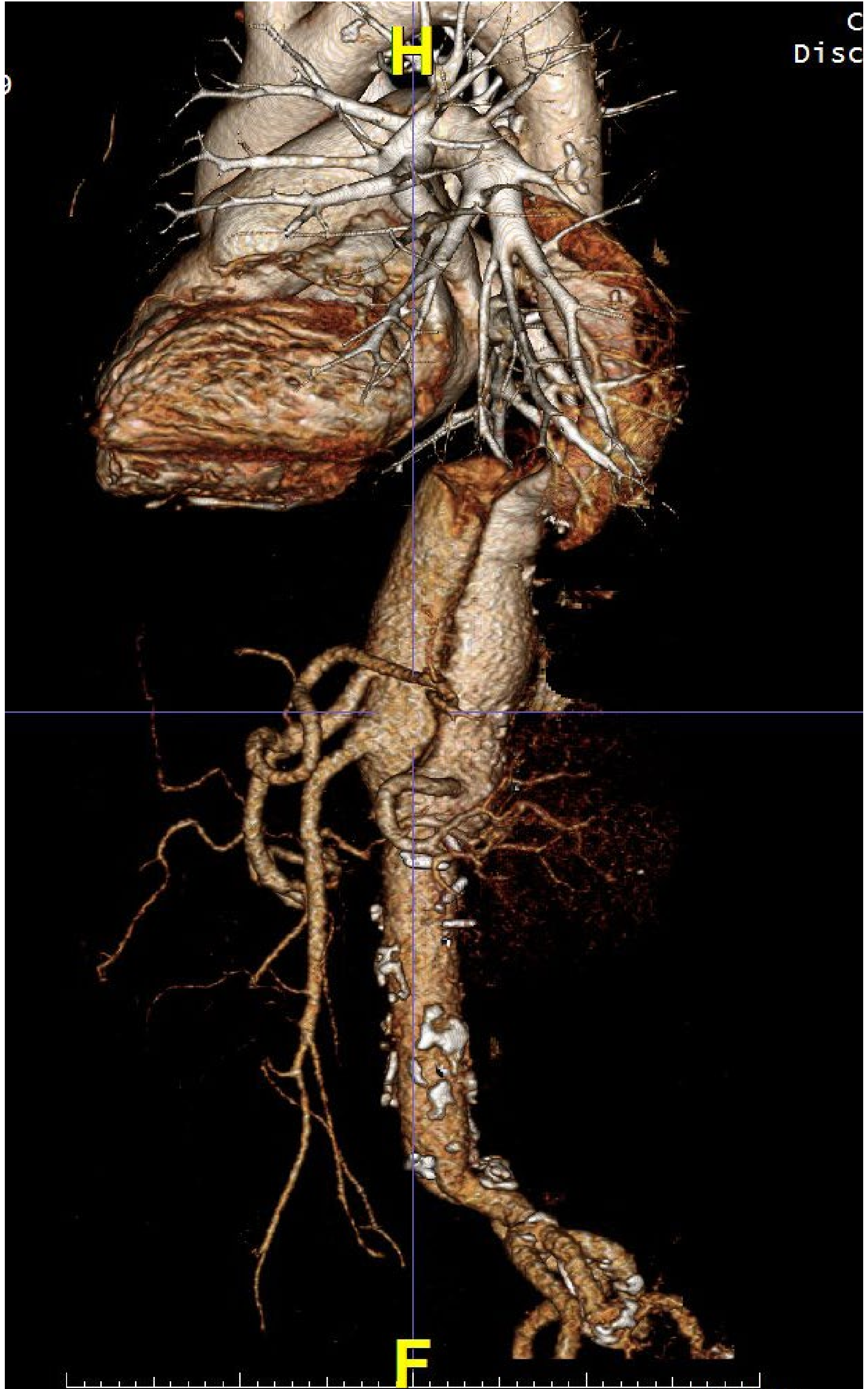
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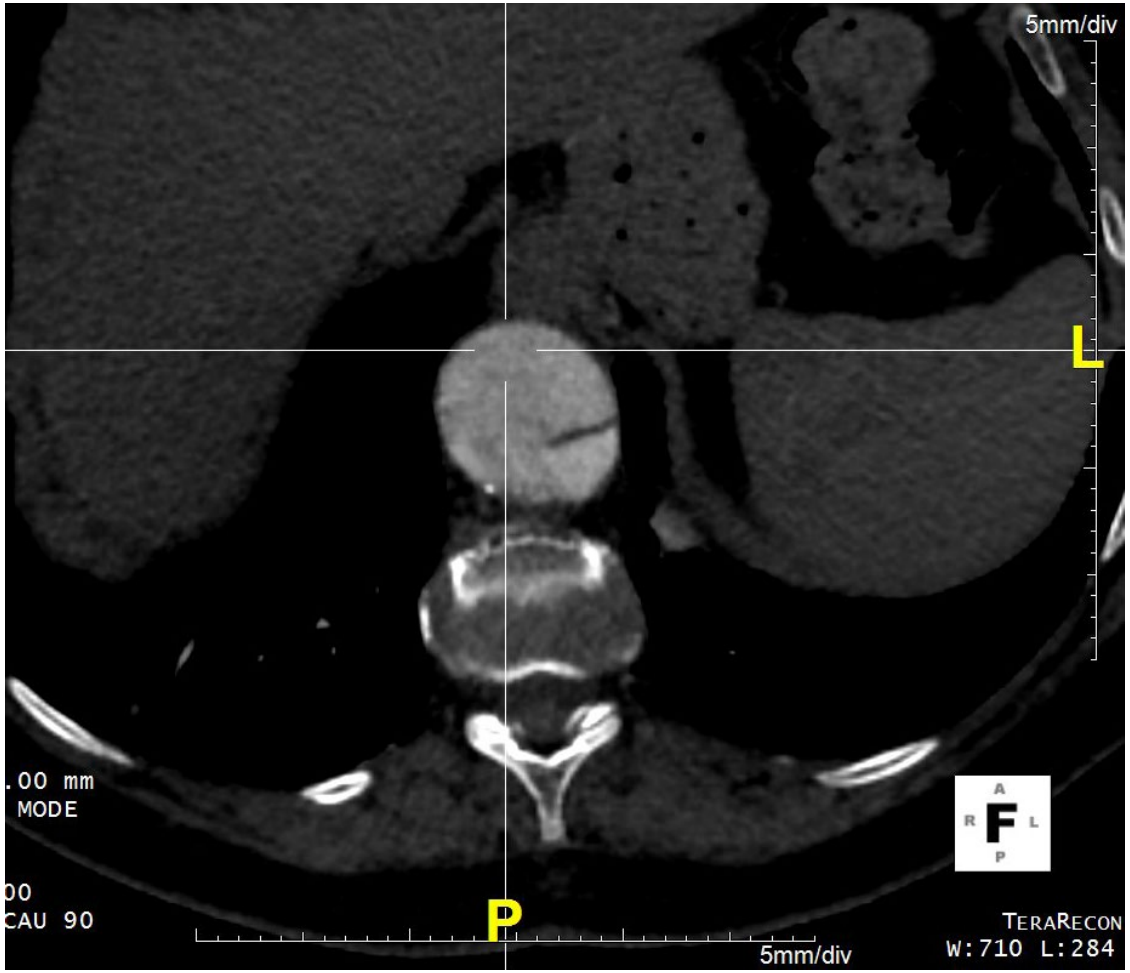

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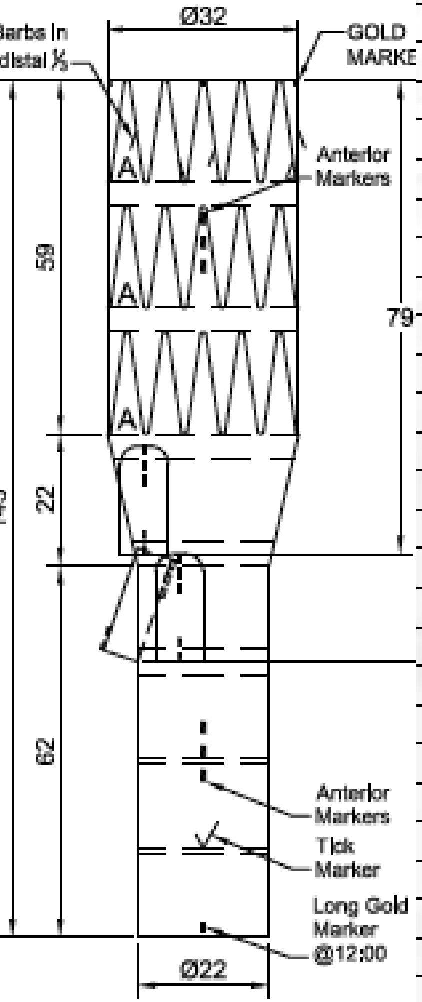

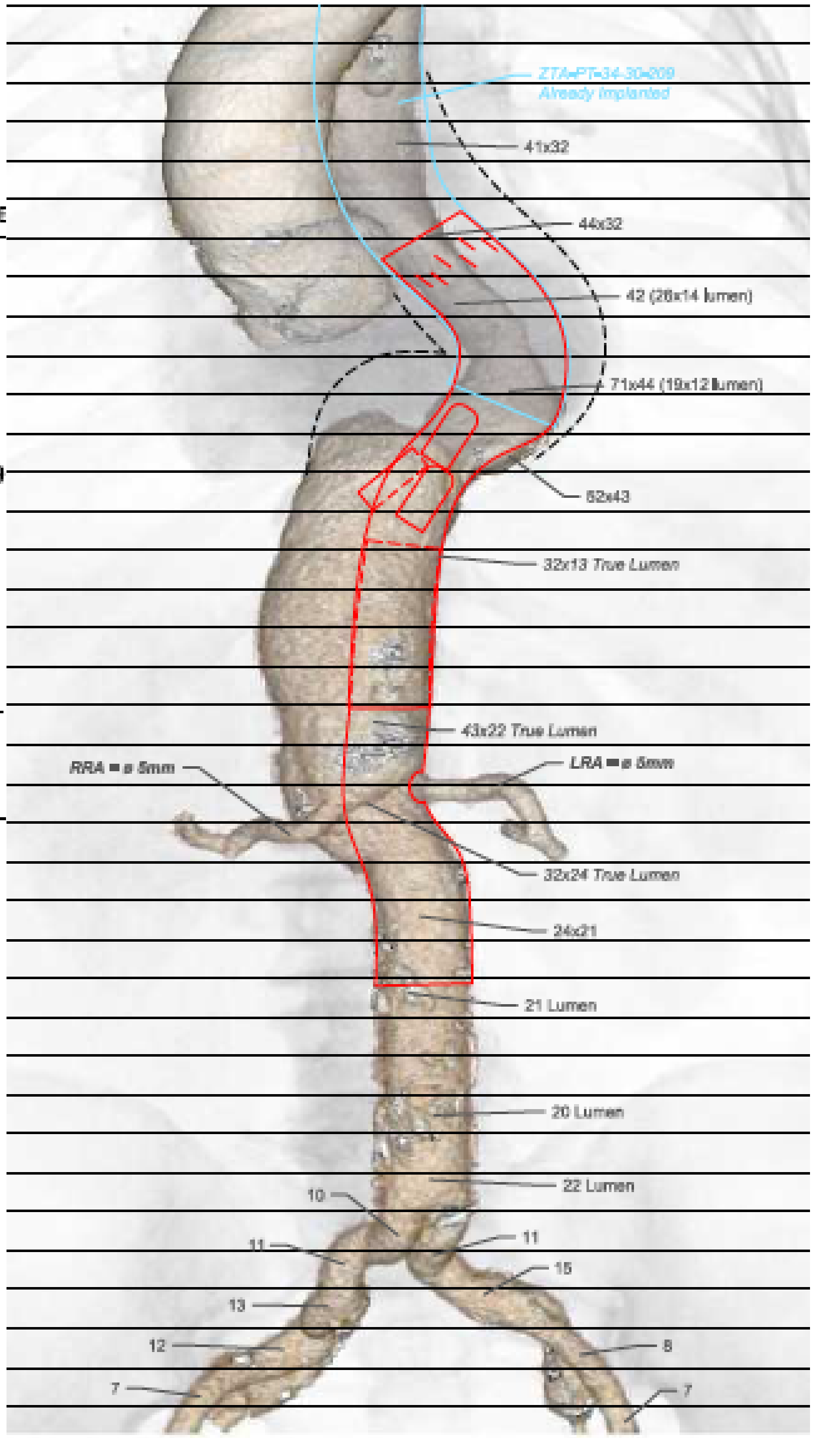

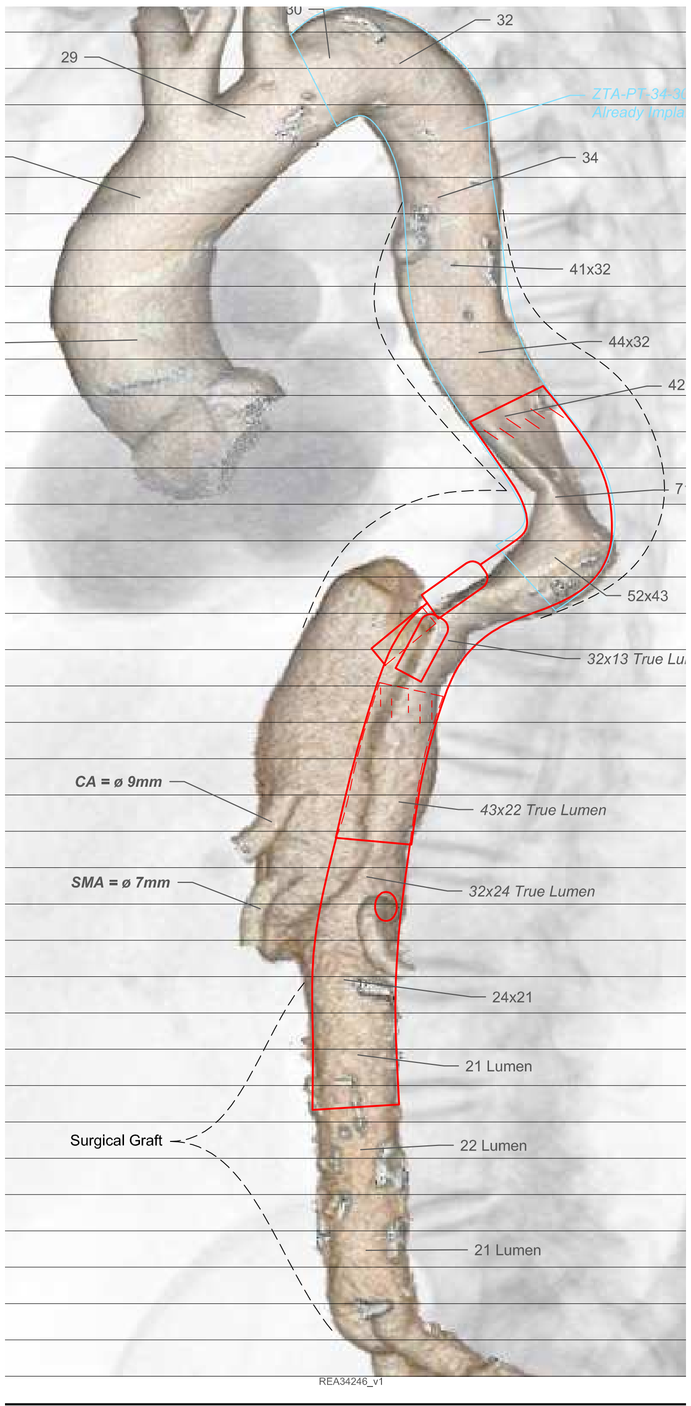

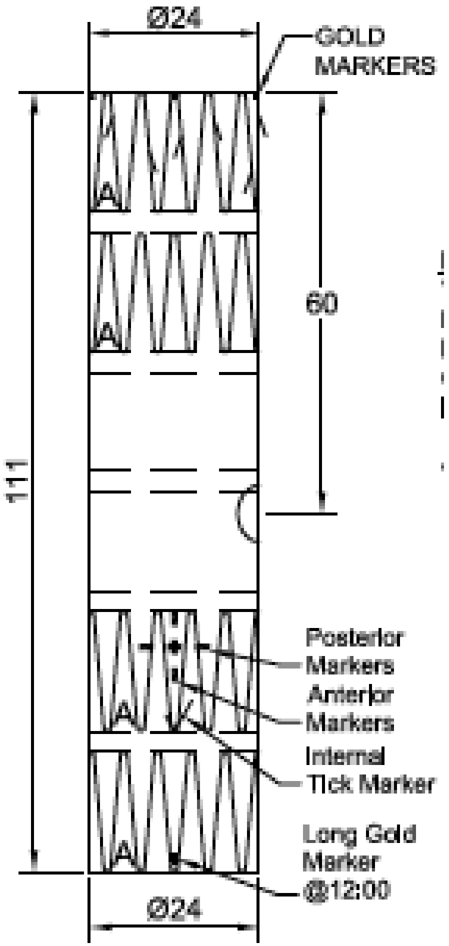

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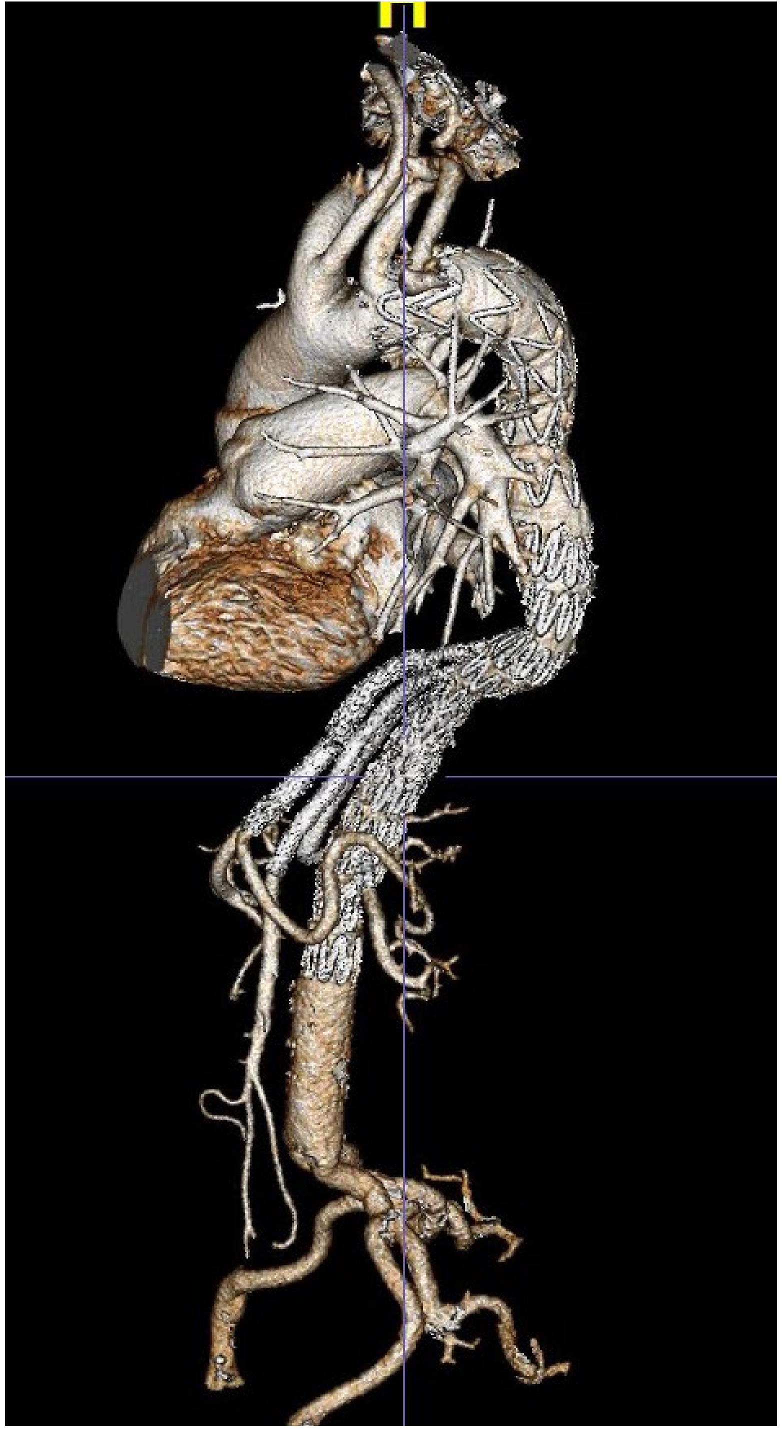

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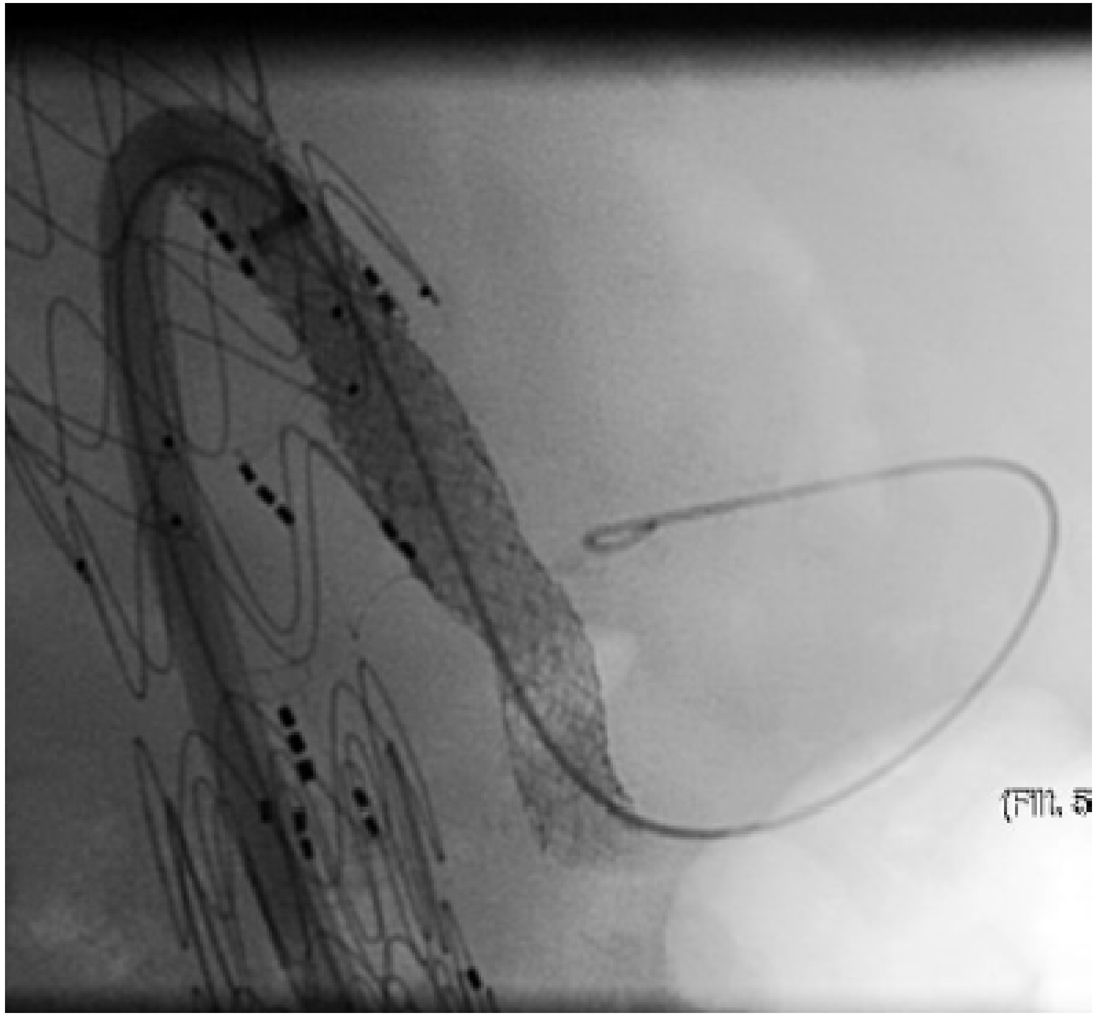

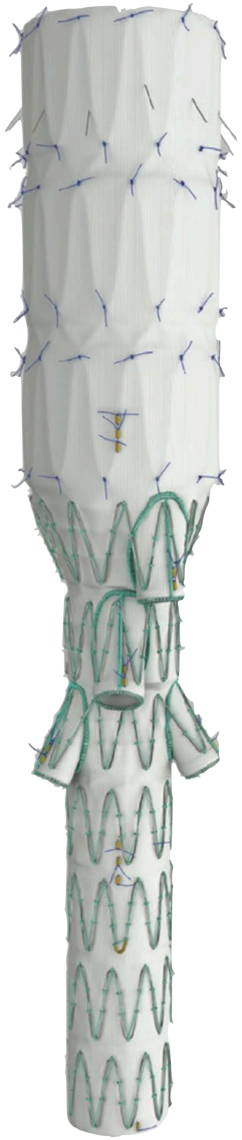

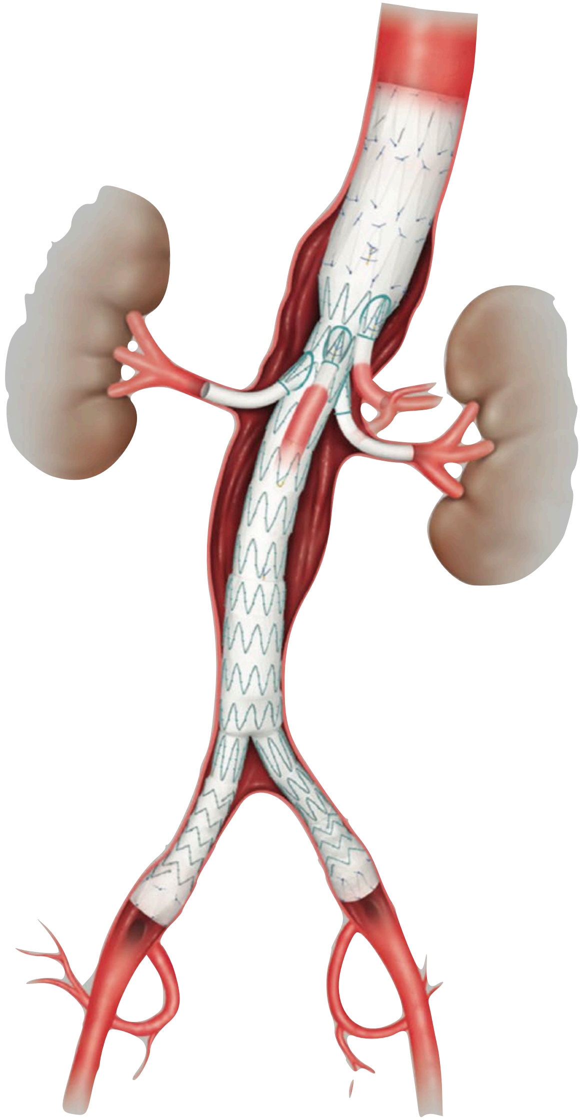

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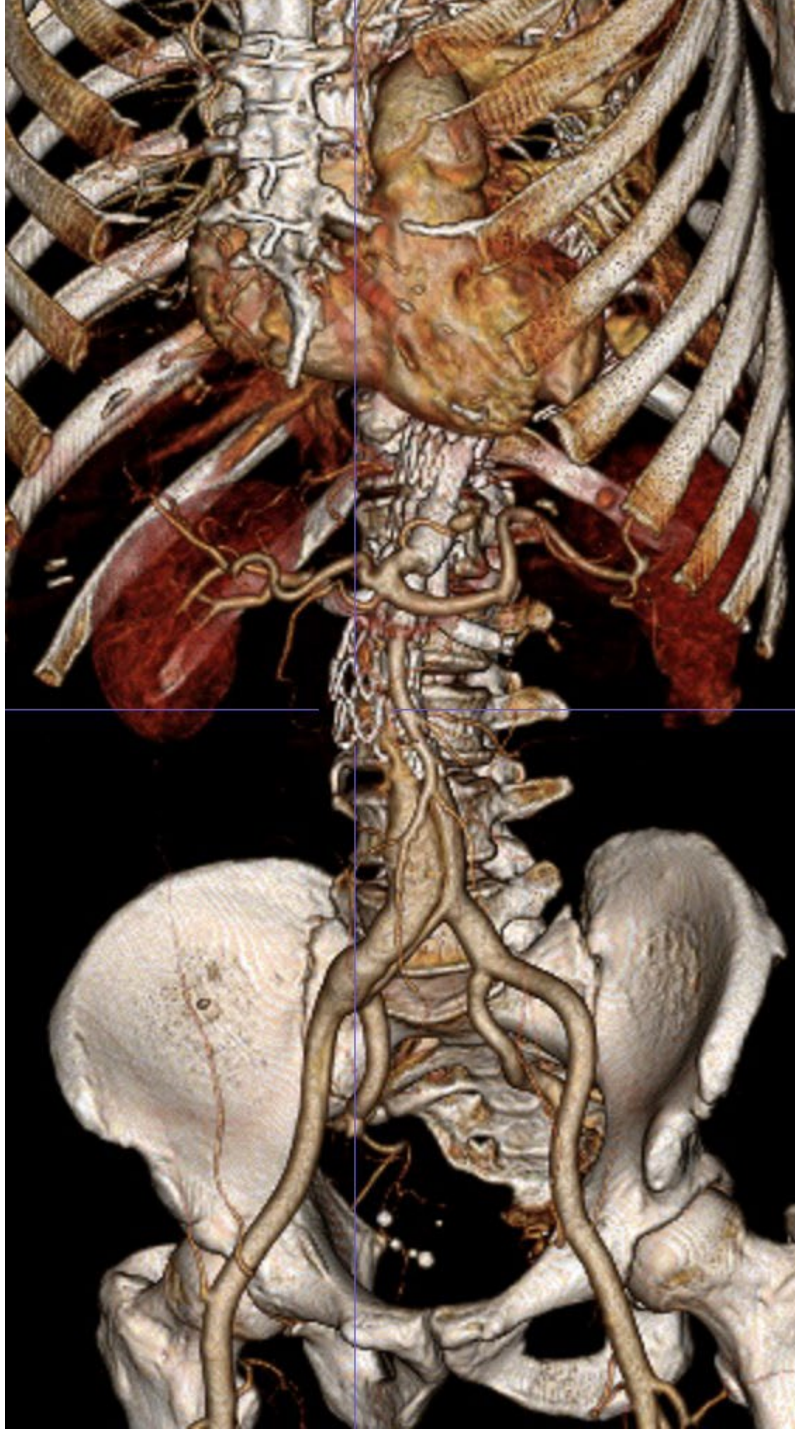

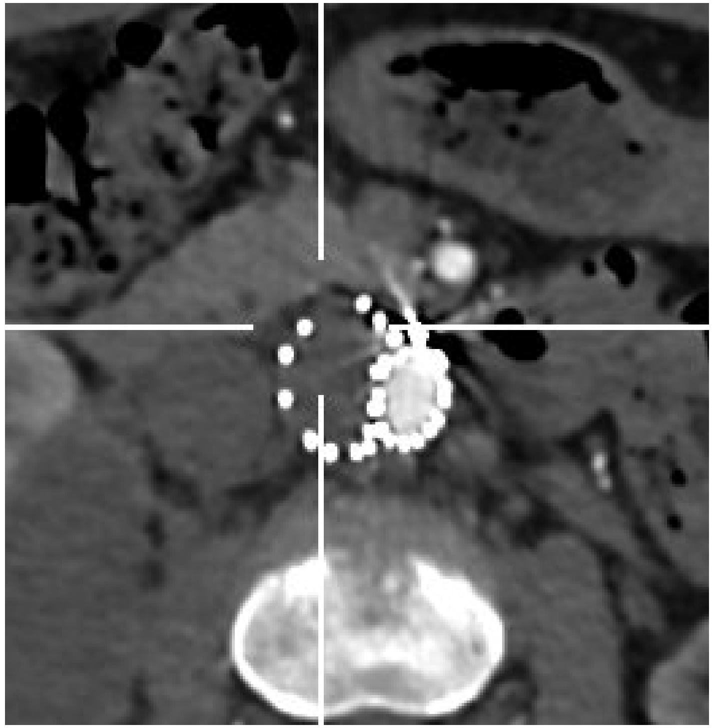

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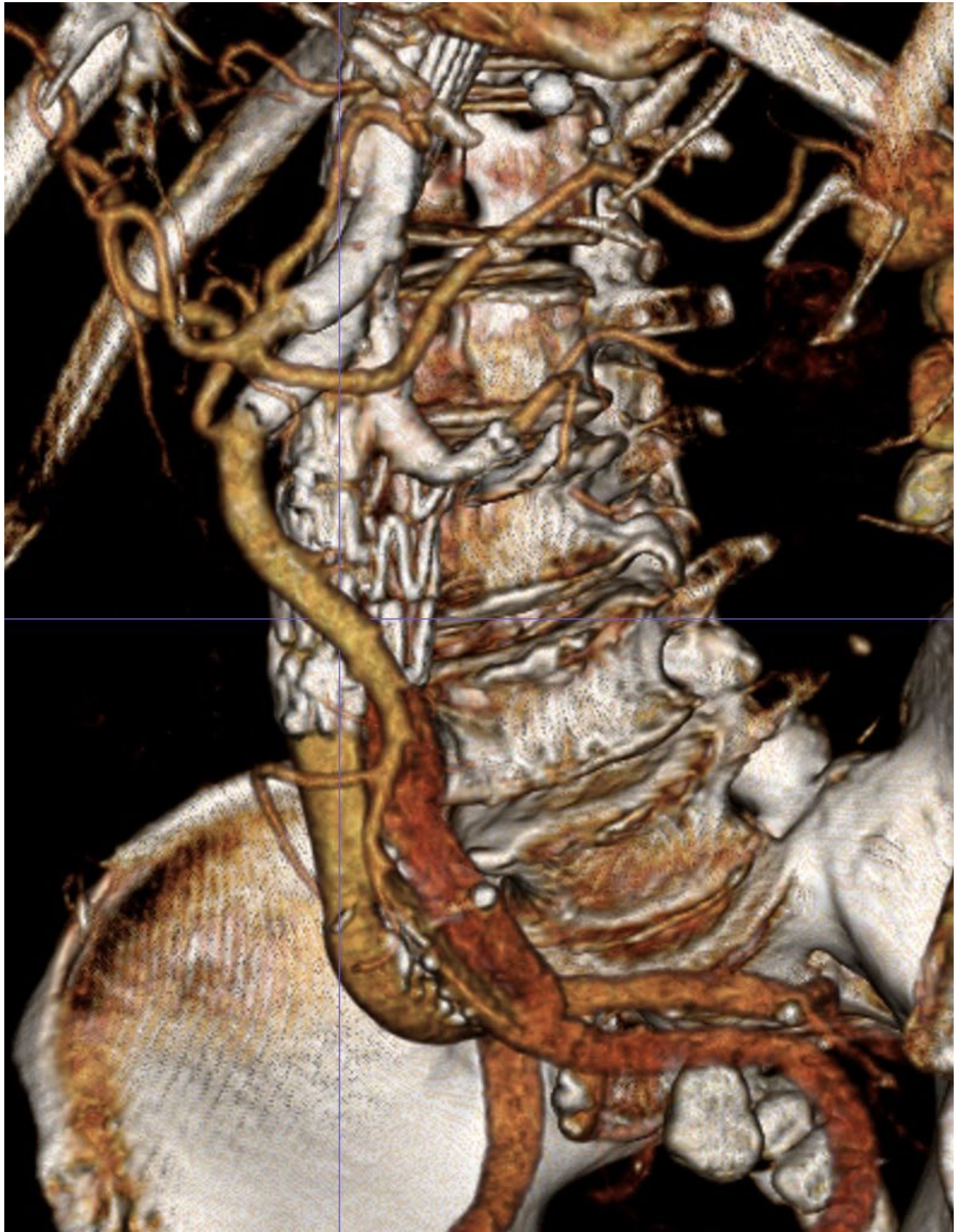

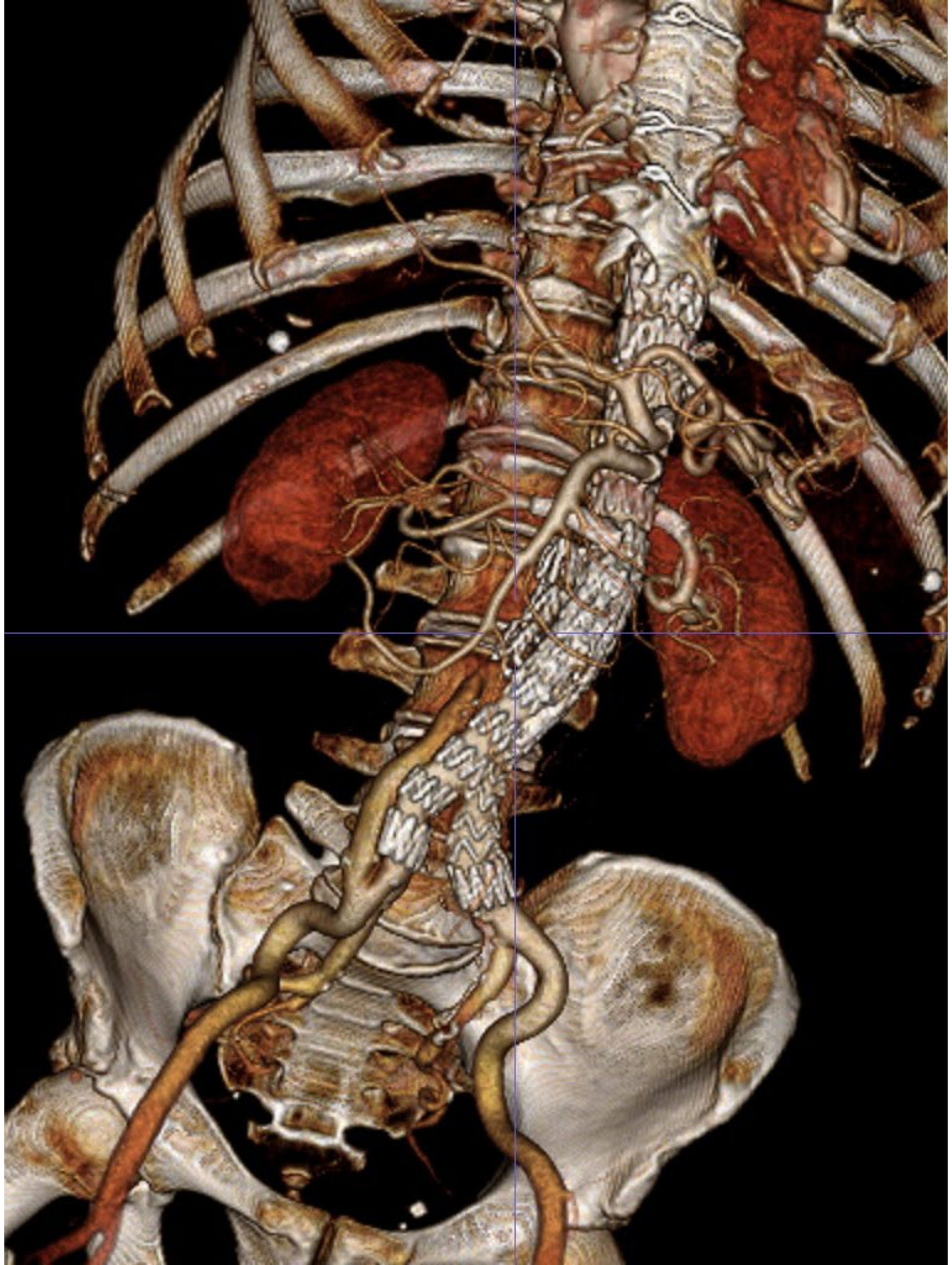

RESULTS
ABDOMINAL FLO in type 2 TAAA
(data analysis not finalized)

- 23 patients
- One SCI, no paraplegia
- No Aortic growth above FLO, 48% shrinking at one year
- Distal relining in 4

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Evaluation of false lumen occluders implanted in the abdominal aorta false lumen

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ABSTRACT

Objective: Management of postdissection thoracoabdominal aneurysms with a fenestrated and/or branched endograft (F/BEVAR) is associated with favorable outcomes. Treatment should include both true lumen endografting and false lumen occlusion (FLO). Favorable results have recently been reported for FLO in the false lumen of the thoracic aorta. The purpose of this study is to analyze the results of FLO of the abdominal aorta in patients treated for post dissection thoracoabdominal aneurysm.

Methods: A multi-center retrospective analysis of prospective data of consecutive patients managed for post dissection thoracoabdominal aortic aneurysm from April 2019 to December 2022 with F/BEVAR associated with FLO in the abdominal false lumen was conducted. The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) was followed. Baseline demographics, operative details, and early outcomes (mortality, length of stay) were recorded. Primary endpoints were technical and clinical success. FLO technical success was defined as complete occlusion of false lumen backflow above the FLO on completion angiogram.

Results: During the 3-year study, 23 patients were treated for post dissection thoracoabdominal aneurysm with F/BEVAR and the use of abdominal FLO. Twenty-one patients (91.3%) had received prior endovascular treatment. The technical and clinical success was 95.7%. The abdominal FLO had a technical success rate of 78.3%. The median diameter of the FLO was 34 mm. No patient died during the perioperative period, and one patient had spinal cord ischemia (4.3%) with partial recovery. Six patients (26.1%) required early reintervention. The median duration of hospitalization in the intensive care unit and overall was 1 day (interquartile range, 0-3 days) and 7.5 days (interquartile range, 2-22 days), respectively. During the mean follow-up of 9.9 ± 9.0 months, no patient died. False lumen occlusion was complete or partial in nine (39.1%) and nine (39.1%) patients, respectively. No aortic rupture occurred during follow-up. Maximum aortic diameter decreased in 48% and remained stable in 39% of cases.

Conclusions: Abdominal aorta FLO during endovascular treatment of post dissection thoracic abdominal aortic aneurysm is associated with favorable outcomes. It offers an additional staging therapeutic option before extensive aorto-bi-iliac coverage, associated with low spinal cord ischemia rates. FLO also provides high rates of false lumen occlusion and false lumen remodeling during follow-up. Longer follow-up and larger cohorts are required to confirm these very promising early findings. (J Vasc Surg 2023;■:1-7.)

Keywords: Aortic dissection; Aortic False lumen; F/BEVAR; Thoracoabdominal aortic aneurysm

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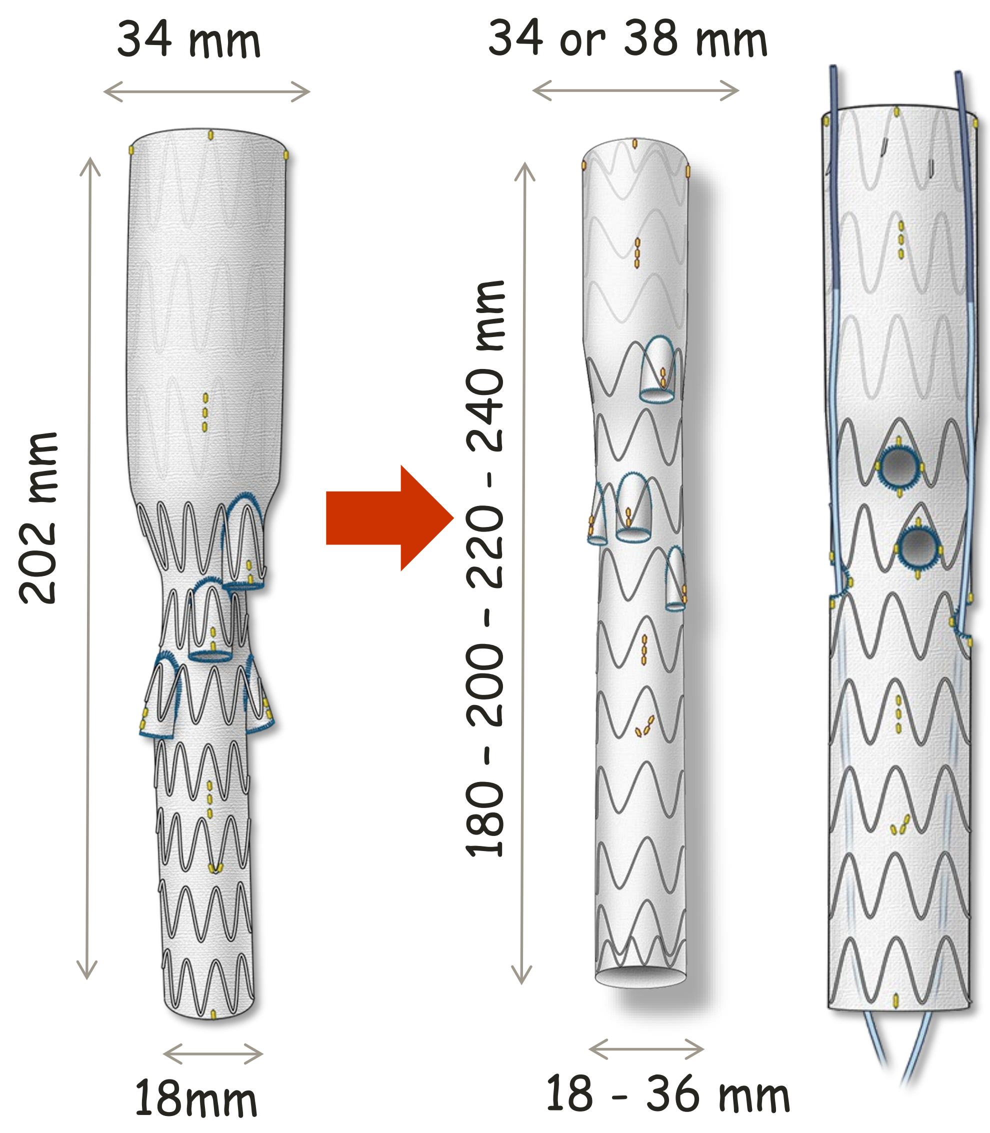
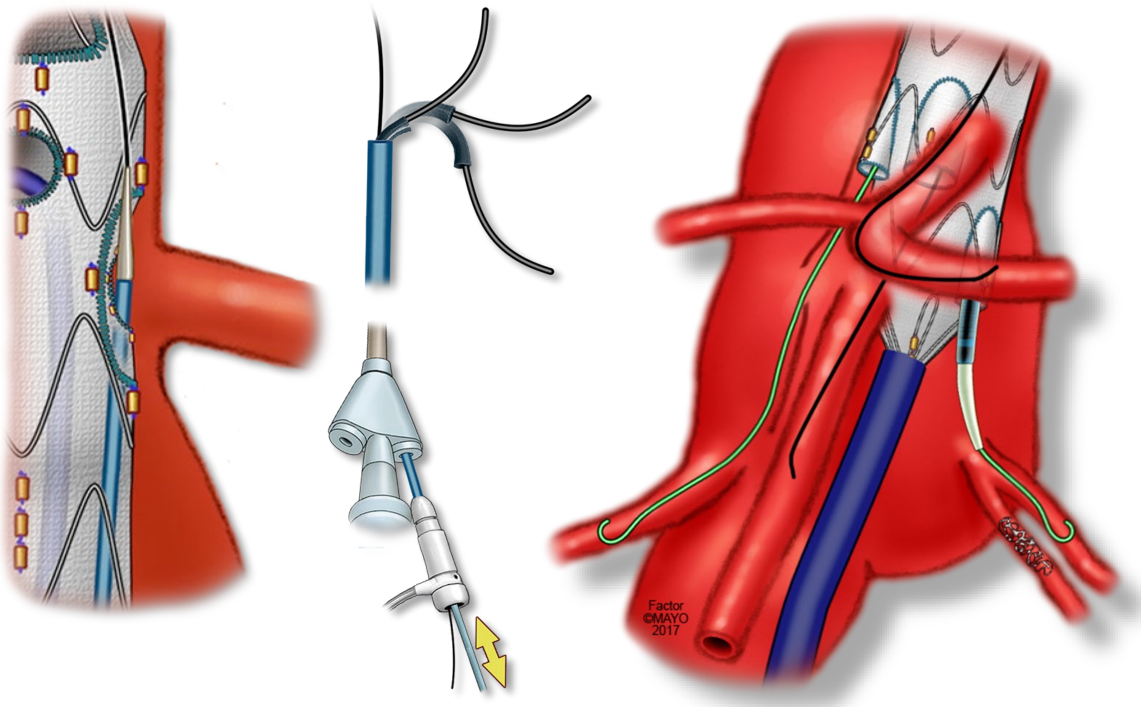
Specific designs





- Off-the-shelf 4Br
- Patient specific 3-5 Fen-Br
- Low profile (18-20 Fr)
- Preloaded guidewire system

Journal of Vascular Surgery 2023

From the Society for Vascular Surgery

Multicenter trans-Atlantic experience with fenestrated-branched endovascular aortic repair of chronic post-dissection thoracoabdominal aortic aneurysms

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ABSTRACT

Objective: This multicenter international study aimed to describe outcomes of fenestrated-branched endovascular aortic repairs (FB-EVAR) in a cohort of patients treated for chronic post-dissection thoracoabdominal aortic aneurysms (PD-TAAAs).

Supplementary Table (online only). Contributing centers and number of cases contributed

Contributing centers	Country	Cases contributed
Department of Cardiothoracic and Vascular Surgery, McGovern Medical School at The University of Texas Health Science Center, Houston, Texas	USA	38
Clinical Heart and Vascular Center, University of Texas Southwestern, Dallas, Texas	USA	17
Division of Vascular Surgery and Endovascular Therapy, University of Alabama at Birmingham, Birmingham, Alabama	USA	6
Division of Vascular Surgery, Department of Surgery, University of North Carolina, Chapel Hill, North Carolina	USA	15
Division of Vascular Surgery and Endovascular Therapy, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania	USA	5
Division of Vascular and Endovascular Surgery, Massachusetts General Hospital, Boston, Massachusetts	USA	6
Division of Vascular Surgery, University of Massachusetts, Worcester, Massachusetts	USA	12
Department of Surgery, University of California, San Francisco, San Francisco, California	USA	21
Academic Department of Vascular Surgery, St Thomas' Hospital, London	UK	12
University Hospitals Birmingham NHS Foundation Trust	UK	19
Department of Aortic and Vascular Surgery, Hôpital Marie Lannelongue, Paris	France	35
Section of Vascular Surgery, Department of Surgical Sciences, Uppsala University, Uppsala	Sweden	12
Department of Vascular Diseases, Malmö University Hospital, Malmö	Sweden	9
University Heart & Vascular Center, Hamburg	Germany	18
Metropolitan Unit of Vascular Surgery, IRCCS S. Orsola Hospital, Bologna	Italy	8
Department of Vascular Surgery, Maastricht University Medical Center, Maastricht	Netherlands	13

UK, United Kingdom; *USA,* United States.

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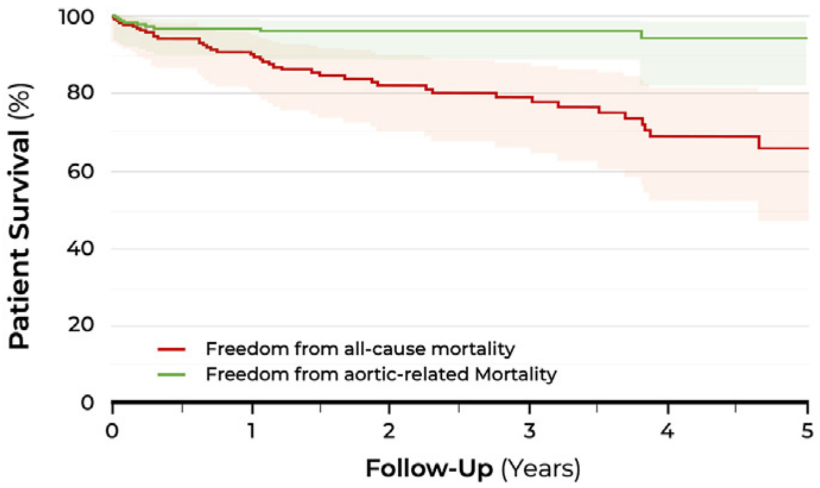
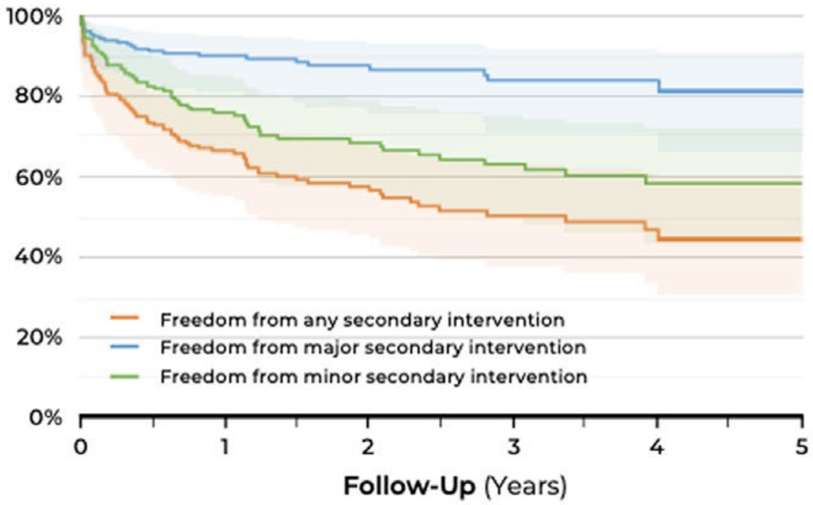
Variable	Overall (n = 246)
30-day mortality	8 (3)
Any MAE	68 (28)
Acute kidney injury	20 (8)
New onset dialysis	2 (1)
Any SCI[a]	18 (7)
Paraplegia	10 (4)
Grade 1-2	8 (3)
Permanent paraplegia	6 (2)
Estimated blood loss >1 liter	18 (7)
Respiratory failure	15 (6)
Stroke (minor or major)	3 (1)
Myocardial infarction	2 (1)
Bowel ischemia	1 (0.4)

SCI, Spinal cord injury.
Data are presented as number (%).
[a]Three due to complication of spinal drain.

Variable	Overall (n = 246)
General anesthesia	246 (100)
Cerebrospinal fluid drainage	174 (71)
Brachial access	124 (53)
Left side	57 (24)
Right side	68 (29)
Device design	
Patient specific device	209 (85)
t-Branch	37 (15)
Iliac branch device	45 (18)
Bilateral percutaneous femoral access	153 (62)
Amount of contrast used, mL	142 ± 85 (125 [81-180])
Total operating time, minutes	363 ± 170 (325 [230-479])
Cumulative air kerma, Gy	3.0 ± 2.5 (2.2 [1.1-4.6])
Dose area product, Gy.cm^2	403 ± 601 (261 [178-403])
Total fluoroscopy time, minutes	91 ± 38 (84 [64-110])
Estimated blood loss, mL	492 ± 470 (362 [200-500])
Intensive care unit stay, days	3.7 ± 3.1 (3 [3-4])
Hospital stay, days	10 ± 8 (8 [5-12])
Discharge home	193 (78)
Target vessels incorporated per patient	3.7 ± 0.5 (4 [4-4])
Technical success per patient	235 (96)

Data are presented as number (%), mean ± standard deviation, or median [interquartile range].





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Journal of Vascular Surgery 2023

From the Society for Vascular Surgery

Comparison of single- and multistage strategies during fenestrated-branched endovascular aortic repair of thoracoabdominal aortic aneurysms

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Table IV. Thirty-day outcomes after elective fenestrated-branched endovascular aortic repair (FB-EVAR) using single- or multi-stage approaches

	N	Single-stage (n = 713)	Multistage (n = 884)	Total	*P* value
Death or permanent paraplegia	1502	92 (13.7)	52 (6.3)	144 (9.6)	**<.001**
MAE	1478	189 (29.5)	165 (19.7)	354 (24.0)	**<.001**
Death	1594	49 (6.9)	37 (4.2)	86 (5.4)	**.017**
Myocardial infarction	1594	24 (3.4)	18 (2.0)	42 (2.6)	.099
Respiratory failure	1595	31 (4.3)	35 (4.0)	66 (4.1)	.705
AKI	1473	94 (14.8)	84 (10.0)	178 (12.1)	**.005**
Bowel ischemia	1597	13 (1.8)	6 (0.7)	19 (1.2)	**.036**
Major stroke	1597	24 (3.4)	19 (2.1)	43 (2.7)	.135
Paraplegia	1597	71 (10.0)	38 (4.3)	109 (6.8)	**<.001**
Any SCI	1597	108 (15.1)	92 (10.4)	200 (12.5)	**.004**
Permanent SCI	1501	59 (8.8)	33 (4.0)	92 (6.1)	**<.001**
Permanent paraplegia	1500	56 (8.3)	25 (3.0)	81 (5.4)	**<.001**

AKI, Acute renal injury; *MAE*, major adverse event; *SCI*, spinal cord injury.
Data are presented as number (%).
Boldface *P* values indicate statistical significance.

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Journal of Vascular Surgery 2023

Spinal cord ischemia rates and prophylactic spinal drainage in patients treated with fenestrated/branched endovascular repair for thoracoabdominal aneurysms

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ABSTRACT

Objective: Spinal cord ischemia (SCI) is a devastating complication after thoracoabdominal aortic aneurysm (TAAA) repair. The benefit of prophylactic cerebrospinal fluid drainage (pCSFD) to prevent SCI is still under investigation. The aim of this study was to evaluate the SCI rate and the impact of pCSFD following complex endovascular repair (fenestrated or branched endovascular repair [F/BEVAR]) for type I to IV TAAA.

Methods: The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) statement was followed. A single-center retrospective study was conducted, including all consecutive patients, managed for TAAA type I to IV using F/BEVAR, between January 1, 2018, and November 1, 2022, for degenerative and post-dissection aneurysms. Patients with juxta- or pararenal aneurysms were excluded, as well as cases managed urgently for aortic rupture or acute dissection. After 2020, pCSFD in type I to III TAAAs was abandoned and replaced by therapeutic CSFD (tCSFD), performed only in patients presenting SCI. The primary outcome was the perioperative SCI rate for the entire cohort and the role of pCSFD for type I to III TAAAs.

Results: In total, 198 patients were included (mean age, 71.1±3.4 years; 81.8% males), including 50.5% with type I to III TAAA. The primary technical success was 94.9%. The perioperative mortality was 2.5%. and the major adverse cardiovascular event (MACE) rate was 10.6%; 4.5% presented SCI of any type (2.5% paraplegia). When comparing the SCI group with the remaining cohort, patients with SCI presented higher MACE (66.7% vs 7.9%; $P < .001$) rate and longer intensive care unit stay (3.5 vs 1 day; $P = .002$). Following type I to III repair, similar SCI and paraplegia rates and paraplegia with no recovery rates were reported in the pCSFD and tCSFD groups (7.3% vs 5.1%; $P = .66$; 4.8% vs 3.3%; $P = .72$; and 2% vs 0%; $P = .37$).

Conclusions: The incidence of SCI after TAAA I to IV endovascular repair was low. SCI was associated with significantly increased MACE and intensive care unit stay. The prophylactic use of CSFD in type I to III TAAAs was not associated with lower SCI rates and may not be justified routinely. (J Vasc Surg 2023;■:1-9.)

Keywords: Aneurysm; Cerebrospinal fluid drainage; Mortality; Prevention; Spinal cord ischemia; Thoracoabdominal

Table III. Postoperative complications and comparative analysis regarding the evolution of spinal cord ischemia (*SCI*) in patients treated with fenestrated and branched endovascular aortic repair (F/BEVAR) for type I to IV thoracoabdominal aneurysms (TAAAs)

Variable	Total (N = 198)	Non-SCI (n = 189)	SCI (n = 9)	*P*-value
Postoperative complications	76/198 (38.4)	67/189 (35.4)	9/9 (100)	.03
MACE	21/198 (10.6)	15/189 (7.9)	6/9 (66.7)	<.001
Cardiac adverse events	9/198 (4.5)	8/189 (4.2)	1/9 (11.1)	.36
Kidney adverse events	3/198 (1.5)	2/189 (1.1)	1/9 (11.1)	.02
Respiratory adverse events	17/198 (8.6)	13/189 (6.9)	4/9 (44.4)	.001
Bowel ischemia	2/198 (1.0)	1/189 (0.5)	1/9 (11.1)	.003
Hemorrhagic adverse events	15/198 (7.6)	14/189 (7.4)	1/9 (11.1)	.71
Vascular access adverse events	18/198 (9.1)	18/189 (9.5)	0/9 (0.0)	.57
Acute limb ischemia	4/198 (2.0)	4/189 (2.1)	0/9 (0.0)	.92
Stroke of any severity				
Major stroke	2/198 (1.0)	1/189 (0.5)	1/9 (11.1)	.003
Minor stroke and TIA	5/198 (2.5)	5/189 (2.6)	0/9 (0.0)	.87
Length of ICU stay, days	1 (1)	1 (2)	3.0 (10.5)	.003
Length of hospital stay, days	7 (IQR 4)	7 (IQR 4)	9 (IQR 18)	.30
Endoleak at discharge CTA				
Absence of endoleak	184/198 (92.9)	176/189 (93.1)	8/9 (88.9)	.92
Type I	8/198 (4.0)	8/189 (4.3)	0/9 (0.0)	.78
Type Ia	0/198 (0)	-	-	-
Type Ib	1/198 (0.4)	1/189 (0.5)	0/9 (0.0)	1.0
Type Ic	7/198 (3.5)	7/189 (3.8)	0/9 (0.0)	.81
Type II	5/198 (2.5)	4/189 (2.1)	1/9 (11.1)	.11
Type III	1/198 (0.4)	1/189 (0.5)	0/9 (0.0)	1.0
Discharge status				
Home	159/198 (80.3)	156/189 (82.5)	3/9 (33.3)	.17
Swing bed	1/198 (0.5)	1/189 (0.5)	0/9 (0.0)	.75
Other hospital	12/198 (6.1)	10/189 (5.3)	2/9 (22.2)	.07
Rehabilitation center	18/198 (9.1)	15/189 (7.9)	3/9 (33.3)	.03
30-day reintervention	23/198 (11.6)	22/189 (11.6)	1/9 (11.1)	.96
30-day mortality	5/198 (2.5)	4/189 (2.1)	1/9 (11.0)	.11

CTA, Computed tomography angiography; *ICU*, intensive care unit; *MACE*, major adverse cardiovascular events; *TIA*, transient ischemic attack. Data are presented as number/total (%) or median (interquartile range).

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Table IV. Baseline, intraoperative, and postoperative comparative findings between patients managed with prophylactic (*pCSFD*) and therapeutic (*tCSFD*) spinal fluid drainage

Variable	pCSFD (n = 41)	tCSFD (n = 59)	*P*-value
Males	33/41 (80.5)	44/59 (74.6)	.80
Age, years	67.6 ± 8.4	67.2 ± 6.1	.63
Positive aortic history	33/41 (80.5)	45/59 (76.3)	.86
Genetically triggered aortic disease	6/41 (14.6)	4/59 (6.8)	.25
Prior open aortic repair	22/41 (53.6)	36/59 (61.0)	.70
Prior endovascular aortic repair	22/41 (53.6)	30/59 (50.8)	.88
Aneurysm classification			
Type I	5/41 (12.2)	21/59 (35.6)	.04
Type II	20/41 (48.8)	30/59 (50.8)	.91
Type III	16/41 (39.0)	8/59 (13.6)	.02
Aneurysm type			
Degenerative	22/41 (53.6)	27/59 (45.8)	.65
Dissective	19/41 (46.3)	32/59 (54.2)	.66
IIA occlusion	4/41 (9.8)	4/59 (6.8)	.62
Staged procedure	14/41 (34.1)	21/59 (35.6)	.92
Spinal drainage	41/41 (100.0)	4/59 (6.8)	<.001
Primary technical success	39/41 (95.1)	54/59 (91.5)	.90
Postoperative complications	21/41 (51.2)	26/59 (44.1)	.67
MACE	3/41 (7.3)	9/59 (15.3)	.28
SCI	3/41 (7.3)	3/59 (5.1)	.66
Grade 3 SCI (paraplegia)	2/41 (4.8)	2/59 (3.3)	.72
Paraplegia with no recovery	1/41 (2.0)	0/59 (0.0)	.37
Length of ICU stay, days	3 (2)	1 (1)	<.001
Length of hospital stay, days	9 (6)	7 (5)	.01
30-day mortality	2/41 (4.9)	2/59 (3.4)	.72

ICU, Intensive care unit; *IIA*, internal iliac artery; *MACE*, major adverse cardiovascular event; *SCI*, spinal cord ischemia.
Data are presented as number/total (%), mean ± standard deviation, or median (interquartile range).

Clinical Investigation

JOURNAL OF ENDOVASCULAR THERAPY
A SAGE Publication

Journal of Endovascular Therapy
2024, Vol. 31(5) 927–935

DOI: 10.1177/15266028221149912
www.jevt.org
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Management of the False Lumen in Post Type A Aortic Dissection Arch Aneurysms Treated With Branched Endografts

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Abstract

Introduction: The treatment of chronic postdissection aneurysms of the aortic arch is a challenge. This study aims to describe false lumen management after aortic arch endovascular repair of post-type A dissection aneurysms treated with a branched endograft. **Methods:** In this single-center retrospective observational study, all consecutive patients undergoing endovascular treatment of aneurysmal degeneration of chronic type A aortic dissections following open repair were enrolled. The primary endpoint was maximal aortic diameter evolution measured on computed tomography angiography (CTA) performed during follow-up. Secondary endpoints included procedural success, aortic reintervention, and remodeling during follow-up. **Results:** Between January 2017 and June 2020, 22 patients underwent endovascular branched arch repair for post type A dissection aneurysms. Technical success was 100%. Thirteen patients (59%) had dissection involvement of at least 1 supra-aortic vessel. Midterm follow-up CTA was performed for 20 patients, 23.1 (± 13.3) months after the procedure. Maximal aortic diameter at the level of the repair was decreasing in 13 (65%) patients, increasing in 2 (10%) patients, and no change was observed in 5 (25%) patients. During follow-up, 7 patients (35%) required aortic reintervention. Thoracic candy plugs were implanted for distal false lumen occlusion in 15 patients and associated with a high rate of complete remodeling (6/15 patients, 40%). **Conclusion:** Arch branch endografting of aneurysmal evolution of a post type A dissection aortic arch is a safe and feasible option in experienced hands. Candy plug use in favorable anatomies seems to be associated with accelerated remodeling of the aorta.

Clinical Impact

There are currently no recommendations on dissected supra- aortic vessels management and the use of thoracic aorta false lumen occlusion devices during endovascular repair of chronic post dissection aneurysm of the aortic arch with branched endografts. Based on our clinical experience reported in the current manuscript, we propose a treatment algorithm for the management of the false lumen in this setting.

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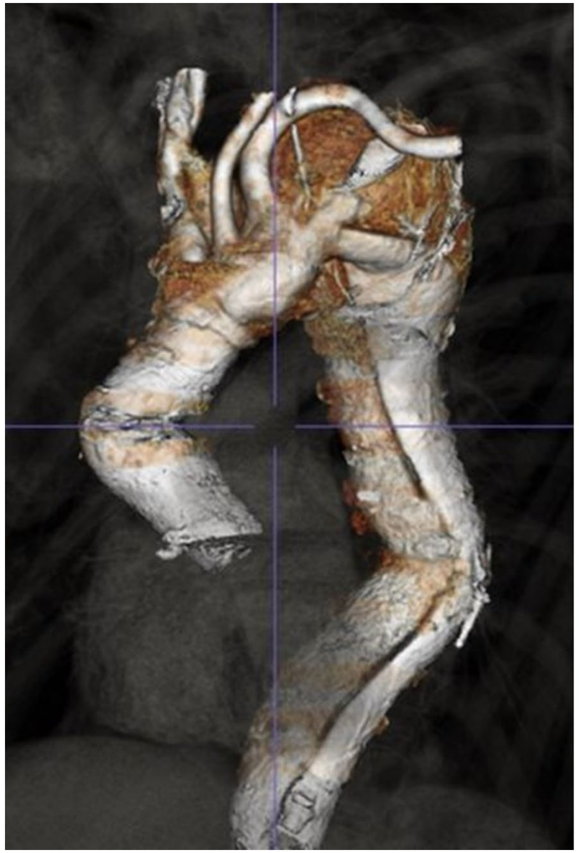

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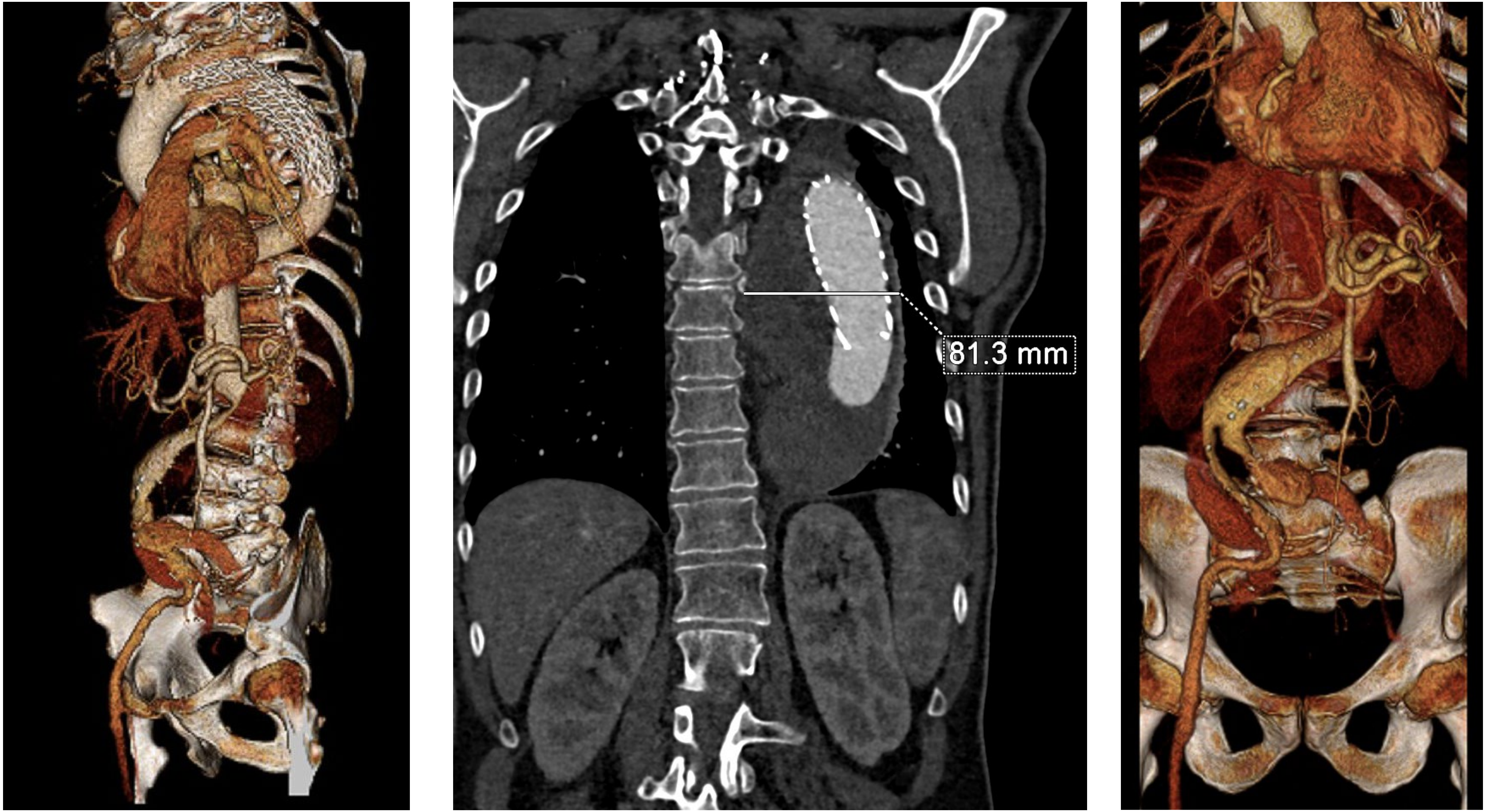
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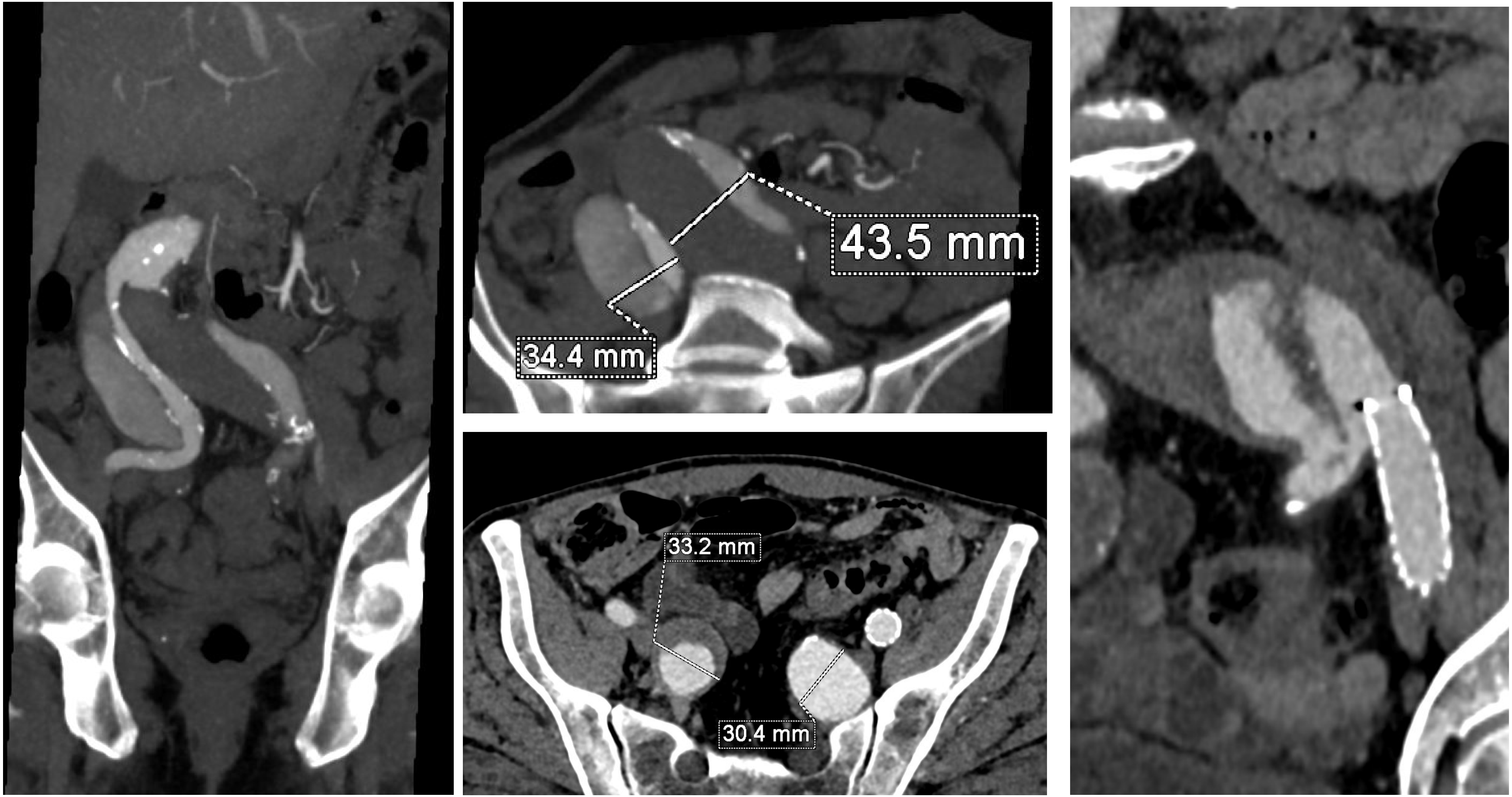
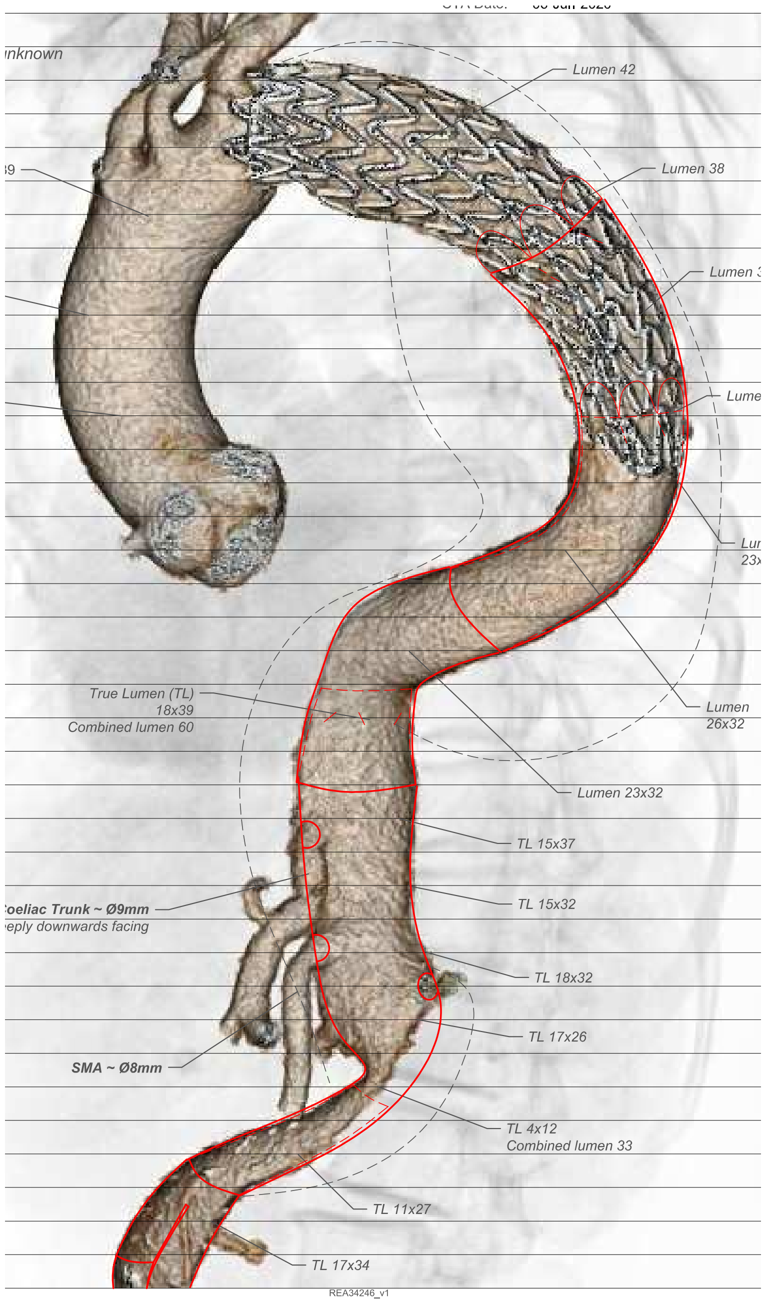
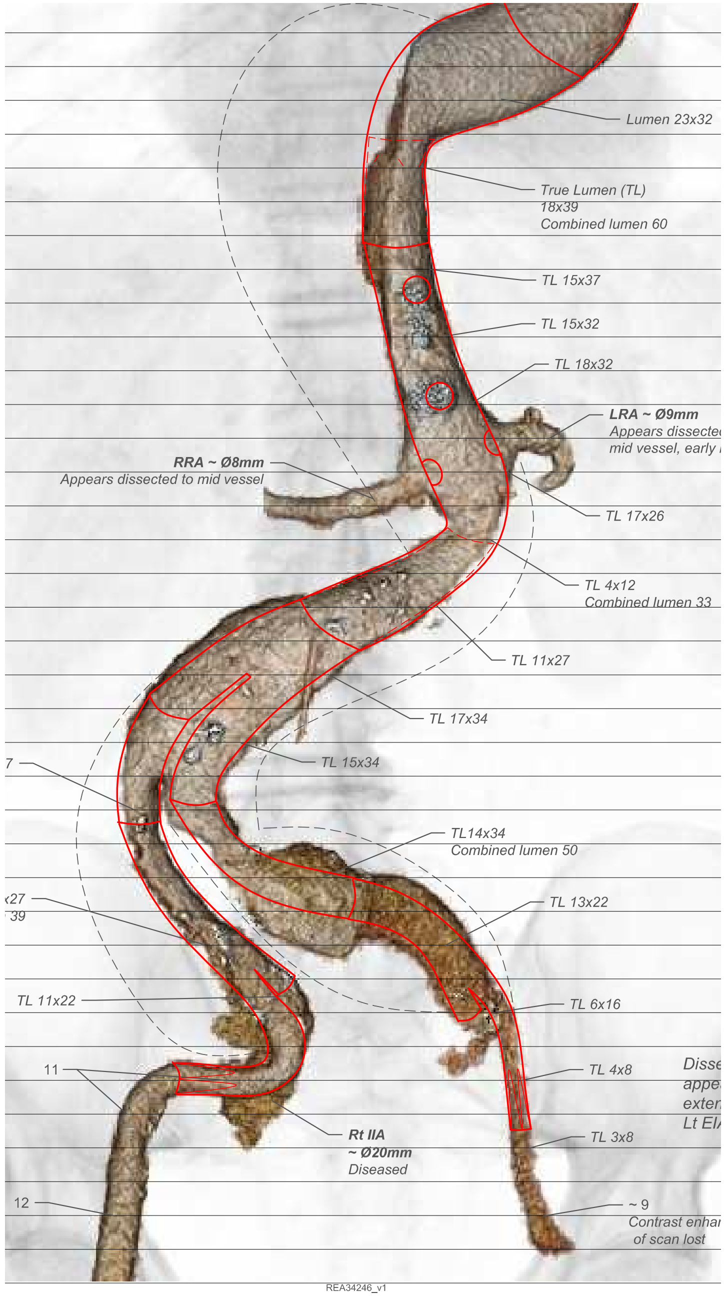
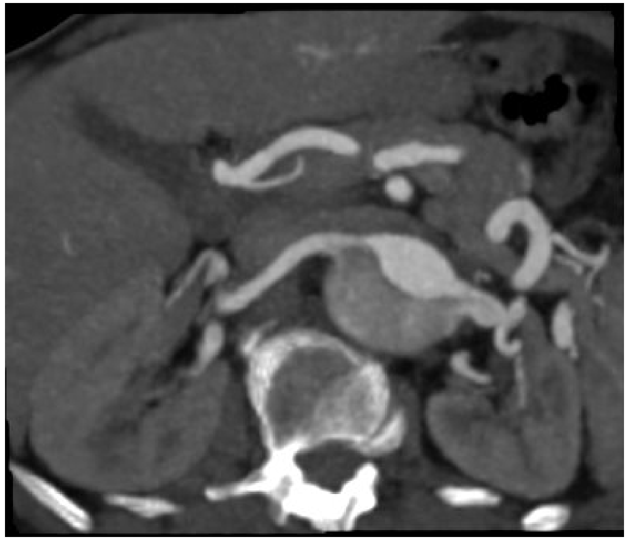
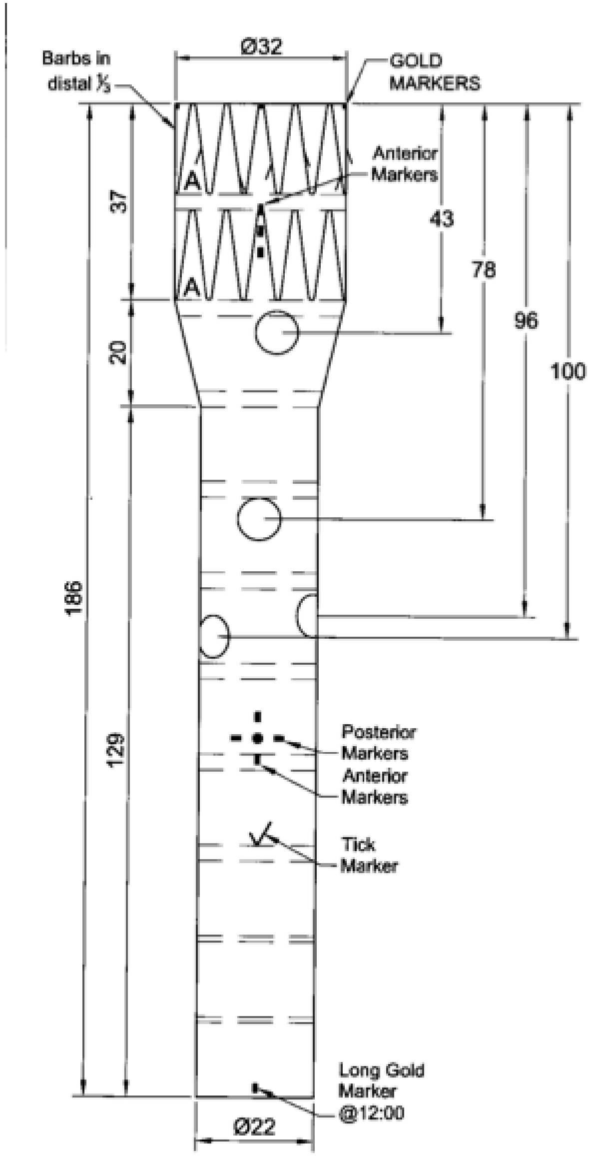

43.5 mm
34.4 mm
33.2 mm
30.4 mm


Lumen 42
Lumen 38
True Lumen (TL)
18x39
Combined lumen 60
Lumen 23x32
Lumen
26x32
TL 15x37
TL 15x32
TL 18x32
TL 17x26
TL 4x12
Combined lumen 33
TL 11x27
TL 17x34
SMA ~ Ø8mm
REA34246_v1


Lumen 23x32
True Lumen (TL)
18x39
Combined lumen 60
TL 15x37
TL 15x32
TL 18x32
LRA ~ Ø9mm
RRA ~ Ø8mm
Appears dissected to mid vessel
TL 17x26
TL 4x12
Combined lumen 33
TL 11x27
TL 17x34
TL 15x34
TL14x34
Combined lumen 50
TL 13x22
TL 11x22
TL 6x16
TL 4x8
11
Rt IIA
~ Ø20mm
Diseased
TL 3x8
12
~ 9
REA34246_v1





REINFORCED LARGE FENESTRATION #1
Strut Free
DIAMETER: 8mm
DIST FROM PROX EDGE: 43mm
CLOCK: 12:30
IVD: 23mm

REINFORCED LARGE FENESTRATION #2
Strut Free
DIAMETER: 8mm
DIST FROM PROX EDGE: 78mm
CLOCK: 12:00
IVD: 21mm

REINFORCED SMALL FENESTRATION #1
Preloaded Catheter
WIDTH: 6mm
HEIGHT: 8mm
DIST FROM PROX EDGE: 96mm
CLOCK: 3:45
IVD: 21mm

REINFORCED SMALL FENESTRATION #2
Preloaded Catheter
WIDTH: 6mm
HEIGHT: 8mm
DIST FROM PROX EDGE: 100mm
CLOCK: 10:15
IVD: 20mm

- SINGLE DIAMETER REDUCING TIES
- LOW PROFILE FABRIC

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

Plus:

Proximal Thoracic Component
ZTA-PT-38-34-167

Distal Thoracic Component
ZTA-PT-34-30-161

AAA-BIFURCATED-GRAFT
(As per ZFEN-D-12-28-94)

ZBIS-10-61-41
ZBIS-12-61-58
Bridging Limbs
ZSLE-16-74-ZT x2
ZSLE-16-90-ZT x2

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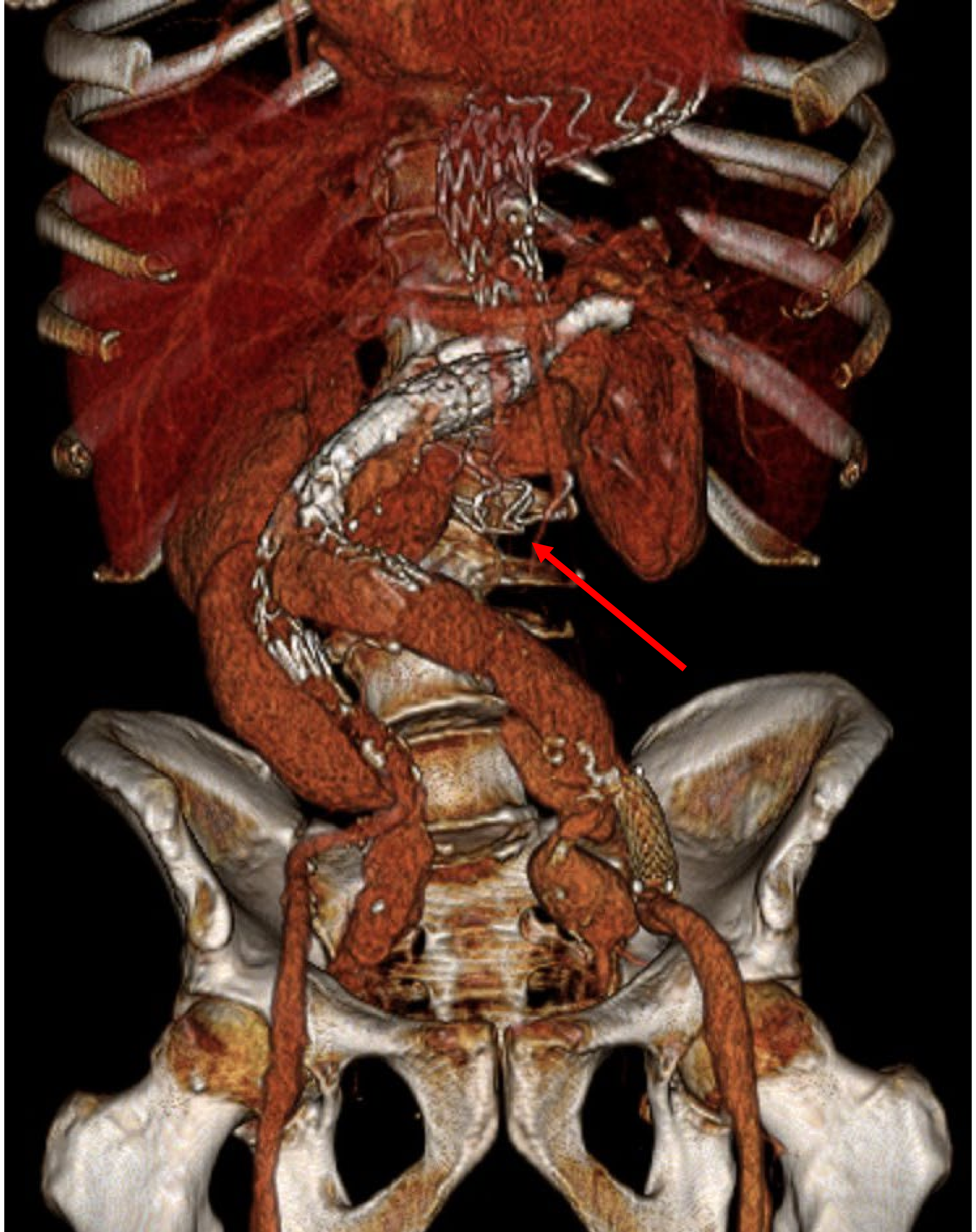

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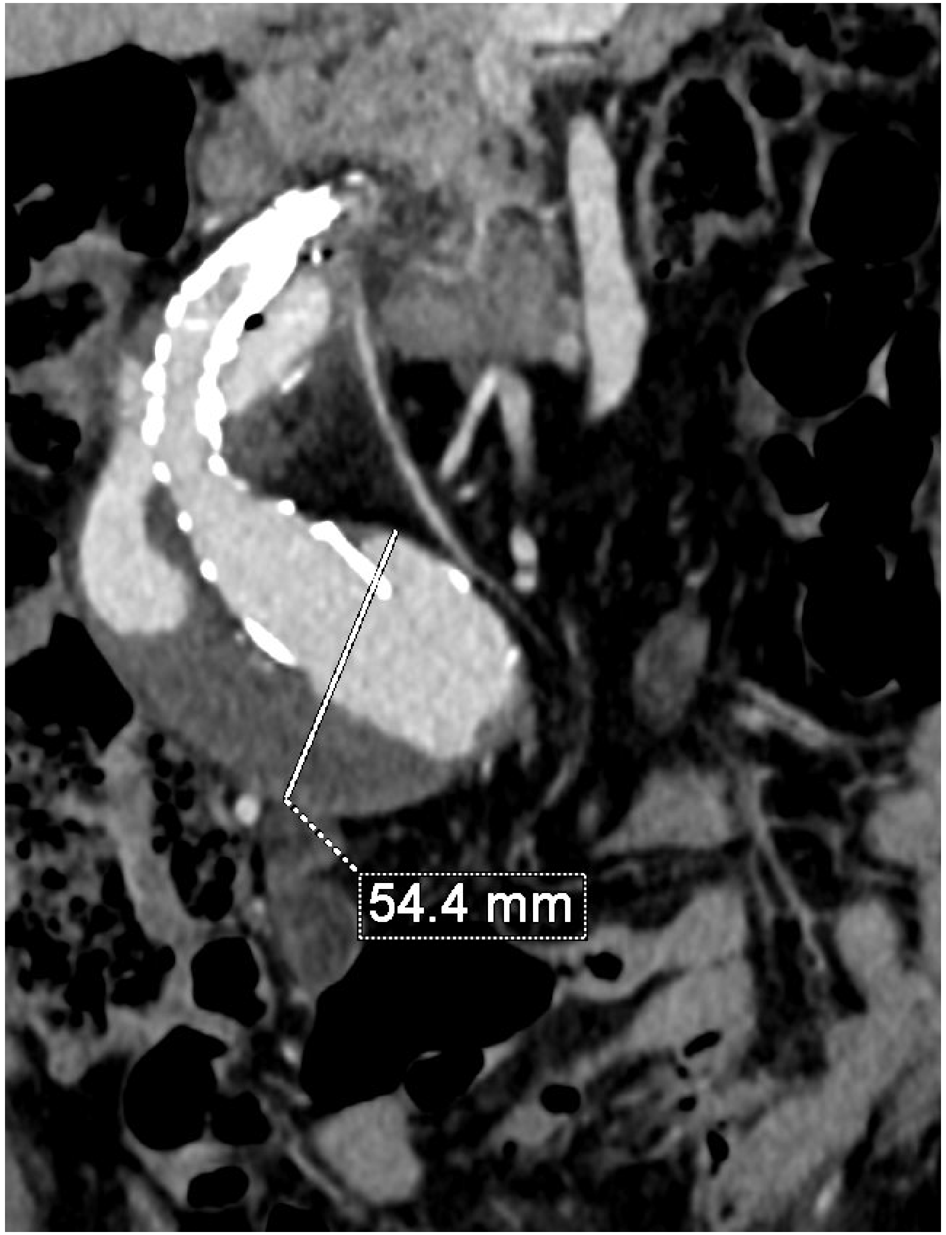
54.4 mm

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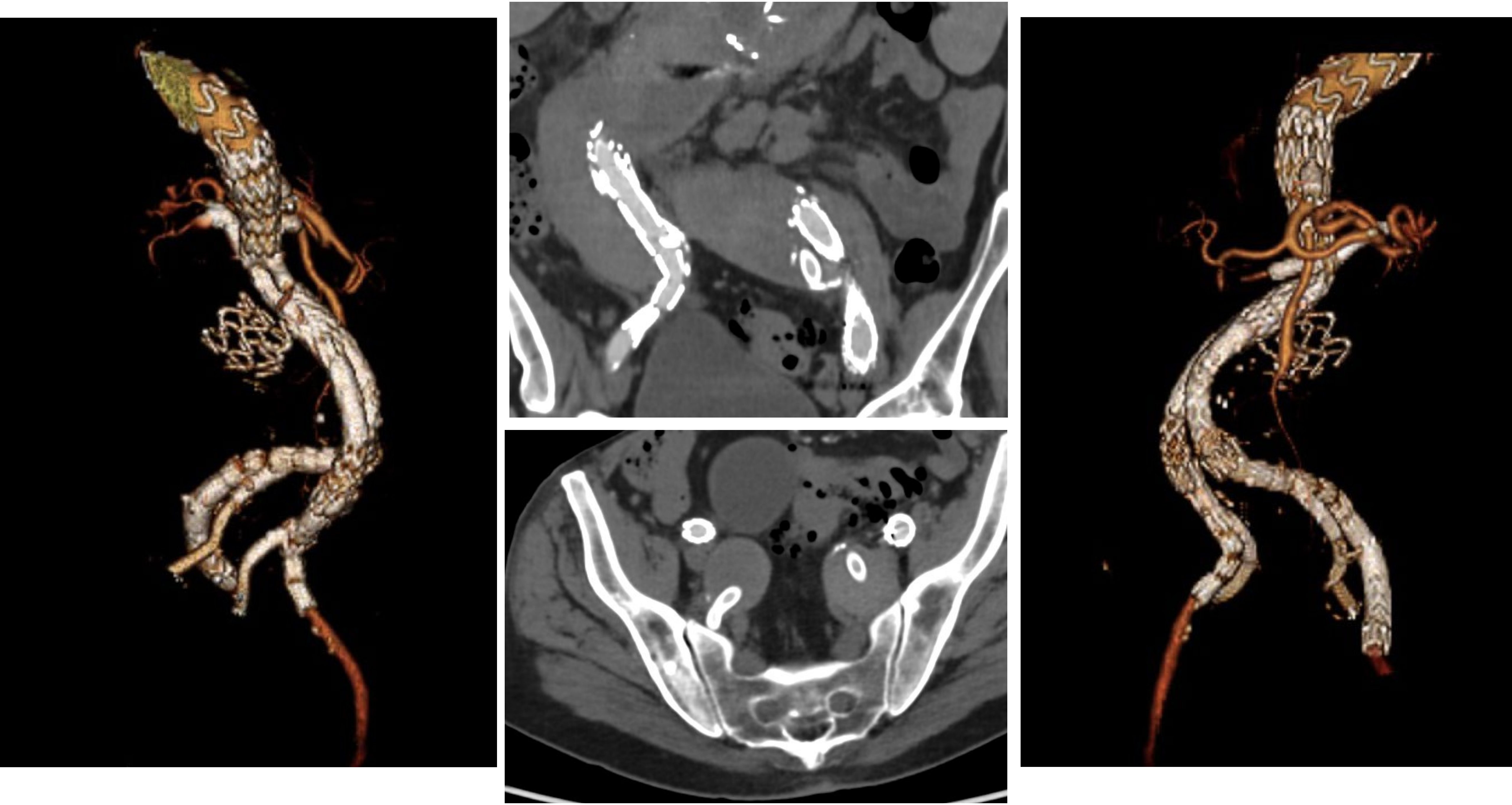

Staging Strategies for Chronic Dissections

- TEVAR / Open Repair
- Embolization
- False lumen occluders (Thoracic & Abdominal)
- FBEVAR / bifurcated and branched iliac
- **<5% SCI for Type II TAAA**