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How do I find my way to the true lumen, and when do I stent visceral branches?

Aaron Fargion



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Disclosures

□ I have the following potential conflicts of interest to report:

- □ Receipt of grants/research support
- □ Receipt of honoraria and travel support
- □ Participation in a company sponsored speakers' bureau
- Employment in industry
- □ Shareholder in a healthcare company
- Owner of a healthcare company

 \mathfrak{U} I do not have any potential conflict of interest



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How to Guide Stent-Graft Implantation in Type B Aortic Dissection?

Compare angiography (ANGIO), transesophageal echocardiography (TEE), and intravascular ultrasound (IVUS) intraprocedually before and after placement of 48 stent grafts in 42 consecutive patients (12 women, 61±11 years) with acute and chronic type-B aortic dissection for both usefulness and capability to guide aortic stent-graft implantation.

Comparison of ANGIO, IVUS, and TEE for Findings of Importance in Stent-Graft Implantation of Aortic Type-B Dissection

Patients (n=42) and Stent-Graft Characteristics (n=49)	ANGIO (n)	IVUS (n)	TEE (n)	P Valuo
	ANGIO (II)	1003 (11)		r value
Main entry localization	42	42	42	NS
Entry, total no.	34	52	43	<0.005*†
Lumen (TL, FL)	32	42	39	<0.05*†
Guide wire, position	25	42	40	<0.001*†
Closure proximal entry	42	32	31	<0.05*†
Slow-flow FL post-stent	24	32	31	<0.005*†
Remaining flow FL post-stent	0	5	13	<0.05*†
Endoleak	1	0	5	<0.05*†
Sidebranch, orientation	27	42	33	< 0.005*
				< 0.05†
Stent expansion/apposition				
Incomplete	8	18	16	<0.05*†
Need for balloon inflation	5*	14	12	<0.05*
No. of balloon inflations	7*	75	97	< 0.005†
Balloon inflation/patient	0.3*	2.5	3.5	< 0.001



ANGIO alone also has difficulties in the localization of the guide wire in either the true or false lumen (Table). In 4 of 44 stent-graft implantations in our group, the guide wire had to be repositioned based on IVUS or TEE after satisfactory positioning in ANGIO.

Conclusions

Guidance of aortic stent-graft implantation in type-B aortic dissection is improved by complimentary use of contrast fluoroscopy, multiplane TEE with Doppler flow interrogation, and IVUS. This imaging approach implies no additional risk and provides online visualization. Nevertheless, preinterventional and postinterventional computed tomography/magnetic resonance, as well as periinterventional ANGIO, will not be replaced. However, procedural complications with stent-graft implantation are likely to be avoided, because <u>TEE</u> and IVUS help navigate guide wires and catheters in the true lumen, which improve safety of stent-grafting and, thus, may eventually improve procedural outcomes, especially in the treatment of aortic dissection.

Koschyk DH. et al.; Circ 2005





THE REAL PROPERTY.



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Acute type B aortic dissection complicated by visceral ischemia

1996-2013: 1456 ABAD patients were identified in the IRAD Registry, of which 104 (7.1%) presented with visceral ischemia.



Visceral No visceral ischemia, ischemia, Definitive management n (%) n (%) P value 104 (7.1) 1352 (92.9) Total patients Medical management 22 (21.2) 901 (66.6) <.001 19 719 **B**-blockers Calcium channel antagonist 14 554 ACE inhibitor 11 488 31 (29.8) 161 (11.9) Surgery <.001 Replacement of descending 20 90 aorta Abdominal aortic repair 2 Surgical aortic fenestration 6 4 3 58 Other/unknown 51 (49.0) 290 (21.4) <.001 Endovascular management Endovascular aortic 16 41 fenestration Thoracic stent graft 224 53 Celiac/SMA/renal artery/ iliac stent

Management of patients with and without visceral ischemia

In-hospital mortality

Mortality	Visceral ischemia, n (%)	No visceral ischemia, n (%)	P value
Total patients	104 (7.1)	1352 (92.9)	
Overall	32 (30.8)	123 (9.1)	<.001
Medical	11 (50.0)	69 (7.7)	<.001
Surgical	8 (25.8)	25 (15.5)	.131
Endovascular	13 (25.5)	29 (10.0)	.004
	Î		

Patients with ABAD complicated by visceral ischemia have a high risk of mortality. We observed similar outcomes for patients treated by endovascular management versus surgery, whereas medical management was an independent predictor of mortality. Early diagnosis and intervention for visceral ischemia seems to be crucial.

Jonker FH. et al.; J Thorac Cardiovasc Surg 2015

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Malperfusions in Acute Type B Aortic Dissection—Predictors of Outcomes

2005-2016: 41 patients (60 yrs old, IQR 51-68.5; 78% men) in 2 European high-volume centers. Patients were mostly (68.3%) affected by only 1 malperfusion syndrome, with renal ischemia being the most frequent (53.6%).

							TEVAR details	Median	IQR					
Organ(s) affected by malperfusion syndrome	<i>n</i> = 41	100%			none both st	tatic & dynamic	Estimated aortic coverage (mm)	197	157-209	1	00			
Renal Visceral Spinal cord Lower limb Cumulated malperfusion(s) syndrome(s) at onset per patient 1	53.7% (22) 41.5% (17) 12.2% (5) 34.1% (14) 68.3% (28)	75%			static	ic	Proximal stent graft diameter (mm) Number of stent grafts implanted LSA origin coverage (%, n) Ishimaru zone 1 Ishimaru zone 2	36 1 78% (32) 5.0% (2) 73.2% (30)	36-40 1-1	Survival (%)	50			
2 3 4 Other complications described at onset Transaortic diameter >55 mm Persistent hypertension Intractable pain	$\begin{array}{c} 24.4\% (10) \\ 7.3\% (3) \\ 0 \\ 2.4\% (1) \\ 46.3\% (19) \\ 78.0\% (32) \end{array}$	25%					Procedural details Selective stenting and/or fenestration Visceral (CT or SMA) Renal (1 or both) Iliac (1 or both)	% (n) 43.9% (18) 9.8% (4) 24.4% (10) 14.6% (6)			0 0 Survival (%)	6 mo 80.0 (70.5-96.0)	2 nths 80.0 (71.5-96.0)	24 24 mo 77.4 (67.3-93.8
		0%	celiac trunk superior mesenteric artery	left renal right rena artery artery	l left common iliac	right common iliac	(bypass or transposition) LCC chimney Preoperative CSF drainage Procedural time (min)	5.0% (2) 17% (7) 150	120-227		no at risk	33	33	31

Prognosis of patients with acute type B AoD complicated initially with malperfusion syndrome(s) is severe, especially if several territories are ischemic.

Sobocinski J. et al.; Ann Vasc Surg 2019

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Hepatic dysfunction in patients who received acute DeBakey type I aortic dissection repair surgery: incidence, risk factors, and long-term outcomes

2014-2019: 634 patients with acute DeBakey type I aortic dissection (ADIAD) enrolled in this study, 401 (63.2%) experienced postoperative HD with a 30-Day mortality of 15.5%.



Decreased PFL, elevated sCr, prolonged CPB duration, and longer postoperative MV time were independent risk factors for postoperative HD

Wang Z. et al.; J Cardiothorac Surg 2021

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When to stent visceral branches?

SUPERIOR MESENTERIC ARTERY

- Always in case of symptoms/signs of mesenteric malperfusion related to static obstruction
- Clinical and CTA-scan evaluation after central aortic repair in case of dynamic obstruction

RENAL ARTERIES

- In case of evolving renal insufficiency or computed tomography evidence of bilateral impaired renal blood flow related to static obstruction
- Excluded in case of dissection extending into the lobar arteries or extensive thrombosis or in presence of a "warm-ischemia" lasting >6h
 <u>CELIAC TRUNK</u>
- Generally not stented, attempt may be performed if other visceral stenting is needed

VISCERAL BRACNHES should be stented during STABILISE procedures if arising from FL and not visible after stent placement/ballooning



TYPE OF OBSTRUCTION	TREATMENT STRATEGY
DYNAMIC	FLAP FENESTRATION/CENTRAL AORTIC REPAIR
STATIC	VISCERAL STENTING
STATIC+DYNAMIC	FLAP FENESTRATION/CENTRAL AORTIC REPAIR+STENTING

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Conclusions

- Navigate through a dissected aorta it's not always an easy procedure. Advancing curved catheters from below may be hard especially in case of a collapsed true lumen or when multiple re-entries are present in the visceral aorta (snaring from above helps)
- IVUS it's better than DSA (multiple checks increase too much the overall contrast medium used) in assessing guidewire position but the real advantage has been introducing hybrid operating theaters and vessel navigation software
- In our experience we tend to aggressively stent SMAs in all patients presenting symptoms/signs of mesenteric malperfusion due to static obstruction (eventually checking with a DSA or repeating a CTA-scan after central aortic repair for type A dissections)
- We stent only RAs in case of evolving renal insufficiency or CTA evidence of bilateral impaired renal blood flow related to static obstruction, excluding dissections extending into the lobar arteries or with extensive thrombosis
- During STABILISE procedures be prepared to stent visceral branches originating form FL (leaving a guidewire from the FL inside the branch before deploying/ballooning the dissection stent)

