

Is Pleural Effusion an indication for interventions ?

And what are the others indications ?

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Disclosure

Speaker name: **Mauro Gargiulo**

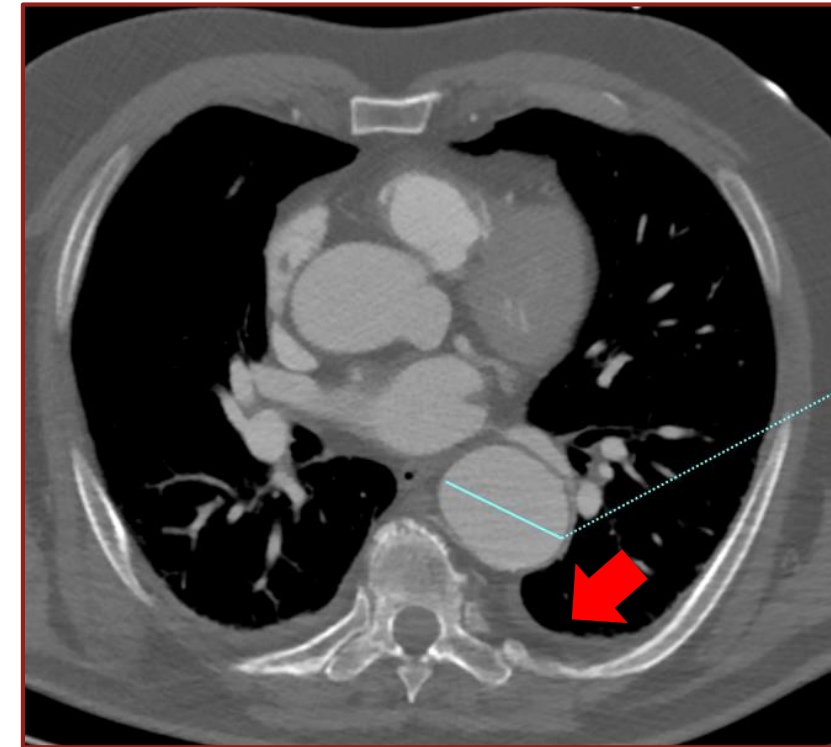
I have the following potential conflicts of interest to report:

- ☐ Receipt of grants/research support
- ☐ Receipt of honoraria and travel support
- ☐ Participation in a company-sponsored speaker bureau
- ☐ Employment in industry
- ☐ Shareholder in a healthcare company
- ☐ Owner of a healthcare company
- ☒ **X Principal Invesigator Expand Registry VBX 17-04**
- ☒ **X Consulting : Cook Medical, WL Gore & Associates, Medtronic**



Acute Type B Aortic Dissection

- Is Pleural Effusion an indication for interventions ?
- And what are the others indications ?



Editor's Choice — Management of Descending Thoracic Aorta Diseases

Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS)

V. Riambau^a, D. Böckler^a, J. Brunkwall^a, P. Cao^a, R. Chiesa^a, G. Coppi^a, M. Czerny^a, G. Fraedrich^a, S. Haulon^a, M.J. Jacobs^a, M.L. Lachat^a, F.L. Moll^a, C. Setacci^a, P.R. Taylor^a, M. Thompson^a, S. Trimarchi^a, H.J. Verhagen^a, E.L. Verhoeven^a, ESVS Guidelines Committee^b P. Kolh, G.J. de Borst, N. Chakfé, E.S. Debus, R.J. Hinchliffe, S. Kakkos, I. Koncar, J.S. Lindholt, M. Vega de Ceniga, F. Vermassen, F. Verzini, Document Reviewers^c P. Kolh, J.H. Black III, R. Busund, M. Björck, M. Dake, F. Dick, H. Eggebrecht, A. Evangelista, M. Grabenwöger, R. Milner, A.R. Naylor, J.-B. Ricco, H. Rousseau, J. Schmidli

Table 4. Main clinical presentations of ATBAD.

Signs and symptoms	Incidence, %
Acute excruciating chest or interscapular pain	80
Chest pain	79
Back pain	64
Abdominal pain	43
Syncope	4
Pulse deficits	9
Hypotension/shock	4
Visceral ischaemia	7
Renal ischaemia	15
Limb ischaemia	9
Recurrent pain, refractory pain, or refractory hypertension	18
Spinal cord ischaemia	3

Complicated ATBAD is defined as the presence of rapid aortic expansion, aortic rupture and/or hypotension/shock, visceral, renal, or limb ischaemia, paraplegia/paraparesis, peri-aortic haematoma, recurrent or refractory pain, and refractory hypertension despite adequate medical therapy.

5. GAPS IN THE EVIDENCE


5.2. Acute type B dissection




- 5.2.1.** TEVAR indications for uncomplicated ATBAD need to be elucidated by prospective and randomized studies.
- 5.2.2.** It would be useful to define early unfavourable clinical and imaging signs and biomarkers as predictive factors to identify patients who can benefit the most from thoracic endografting.

CRITICAL ISSUES

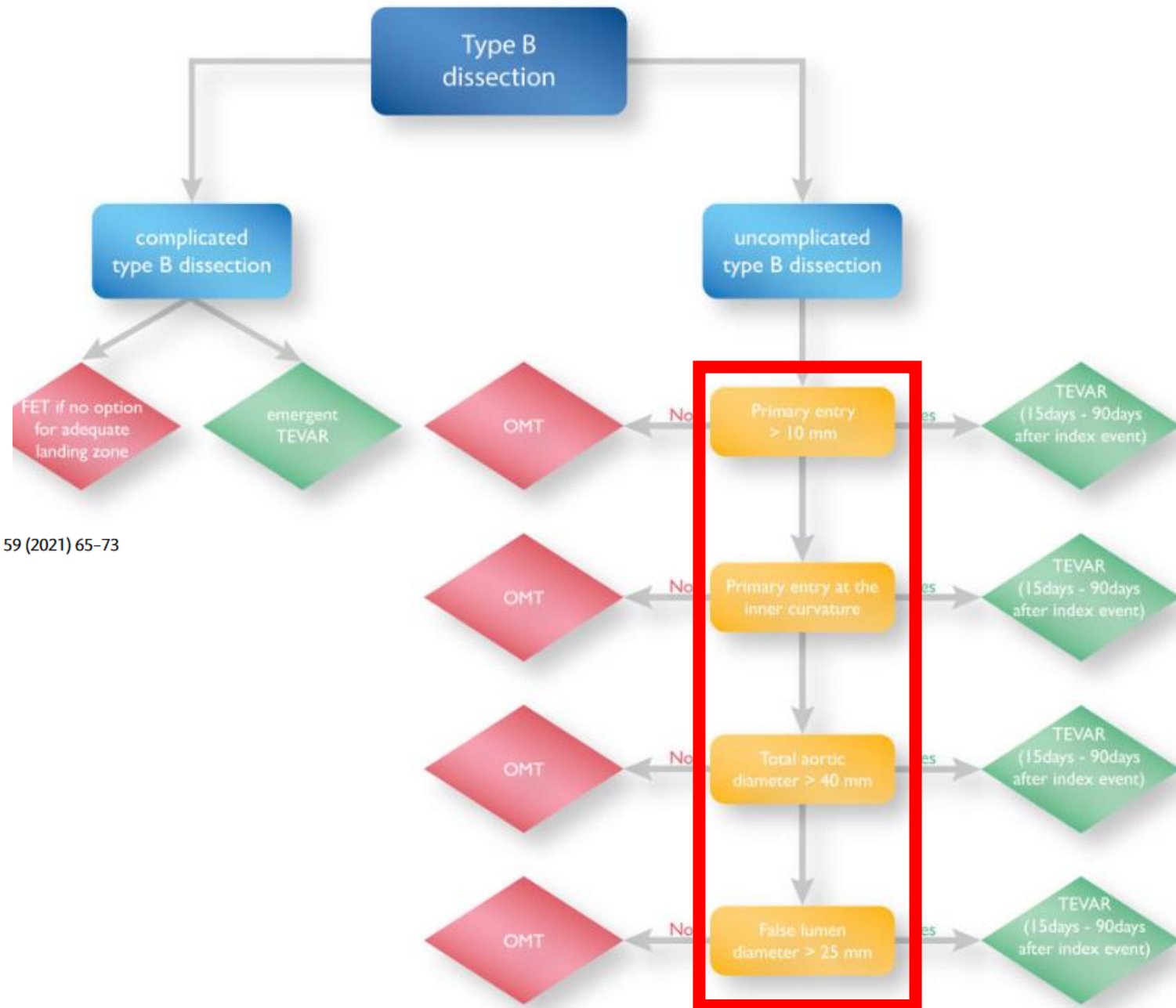
IN AORTIC ENDOGRAFTING

Current options and recommendations for the use of thoracic endovascular aortic repair in acute and chronic thoracic aortic disease: an expert consensus document of the European Society for Cardiology (ESC) Working Group of Cardiovascular Surgery, the ESC Working Group on Aorta and Peripheral Vascular Diseases, the European Association of Percutaneous Cardiovascular Interventions (EAPCI) of the ESC and the European Association for Cardio-Thoracic Surgery (EACTS)

Martin Czerny (ESC Chairperson)^{a,*} and Davide Pacini (EACTS Chairperson) ^{b,†}

Writing Committee: Victor Aboyans^{c,†}, Nawwar Al-Attar^{d,†}, Holger Eggebrecht^{e,†}, Arturo Evangelista^{f,†}, Martin Grabenwöger^{g,†}, Eugenio Stabile^{h,†}, Maciej Kolowca^{i,†}, Mario Lescan^{j,†}, Antonio Micari ^{k,†}, Claudio Muneretto^{l,†}, Christoph Nienaber ^{m,†}, Ruggero de Paulis ^{n,†}, Konstantinos Tsagakis^{o,†} and Bartosz Rylski^{a,†}

European Journal of Cardio-Thoracic Surgery 59 (2021) 65–73



Society for Vascular Surgery (SVS) and Society of Thoracic Surgeons (STS) reporting standards for type B aortic dissections



Joseph V. Lombardi, MD (SVS Co-Chair),^a G. Chad Hughes, MD (STS Co-Chair),^b Jehangir J. Appoo, MD,^c Joseph E. Bavaria, MD,^d Adam W. Beck, MD,^e Richard P. Cambria, MD,^f Kristofer Charlton-Ouw, MD,^g Mohammad H. Eslami, MD,^h Karen M. Kim, MD,ⁱ Bradley G. Leshnower, MD,^j Thomas Maldonado, MD,^k T. Brett Reece, MD,^l and Grace J. Wang, MD,^d Camden, NJ; Durham, NC; Calgary, Alberta, Canada; Philadelphia and Pittsburgh, Pa; Birmingham, Ala; Brighton, Mass; Houston, Tex; Ann Arbor, Mich; Atlanta, Ga; New York, NY; and Denver, Colo

J Vasc Surg 2020; 71:723-47

SECTION 4. PRESENTATION

Aortic Dissection Acuity

- Uncomplicated
- High risk
- Complicated

High-risk aortic dissection

Although dissections without overt malperfusion or rupture may not be immediately life-threatening, there are patients who fall into a category of high-risk uncomplicated dissection because of a significant risk of subsequent complications. These include both early complications, such as rupture in the subacute period, and late complications including aneurysmal degeneration. The high-risk group includes patients with refractory pain or hypertension and those with high-risk radiographic features.

SVS/STS REPORTING STANDARDS DOCUMENT

Editors' Choice

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High-risk aortic dissection

The high-risk group includes patients with refractory pain or hypertension and those with high-risk radiographic features.

Table III. Aortic dissection acuity

Uncomplicated

No rupture

No malperfusion

No high-risk features

High risk

Refractory pain

Refractory hypertension

Bloody pleural effusion

Aortic diameter >40 mm

Radiographic only malperfusion

Readmission

Entry tear: lesser curve location

False lumen diameter >22 mm

Complicated

Rupture

Malperfusion

Pleural Effusion (PE) and ABAD

- PE is a complication of acute aortic dissection
- PE in 9-88% of ABAD
- Inflammation may play a role (white blood cell count, serum CPR concentration and body temperature) (*Hata N et al Chest 2002, reported half specimens obtained by thoracentesis were bloody and half exudates*)
- In the first 14 days after onset of dissection pts have a left-sided PE > right-sided PE (side closed to the descending aorta)
- Can the presence of PE influence the patient's management ?

Clinical implications of pleural effusion in patients with acute type B aortic dissection

European Heart Journal: Acute Cardiovascular Care
2016, Vol. 5(7) 72–81
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DOI: 10.1177/2048872615594498
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SAGE

Yoshihiro Yamada¹, Jun Tanno¹, Shintaro Nakano¹,
Takatoshi Kasai², Takaaki Senbonmatsu¹ and Shigeyuki Nishimura¹

The purpose of our study was to examine the quantity, time-course, side and likely aetiology of pleural effusion in patients with ABAD, and to disclose the impact of quantity and laterality of the effusions on clinical outcomes.

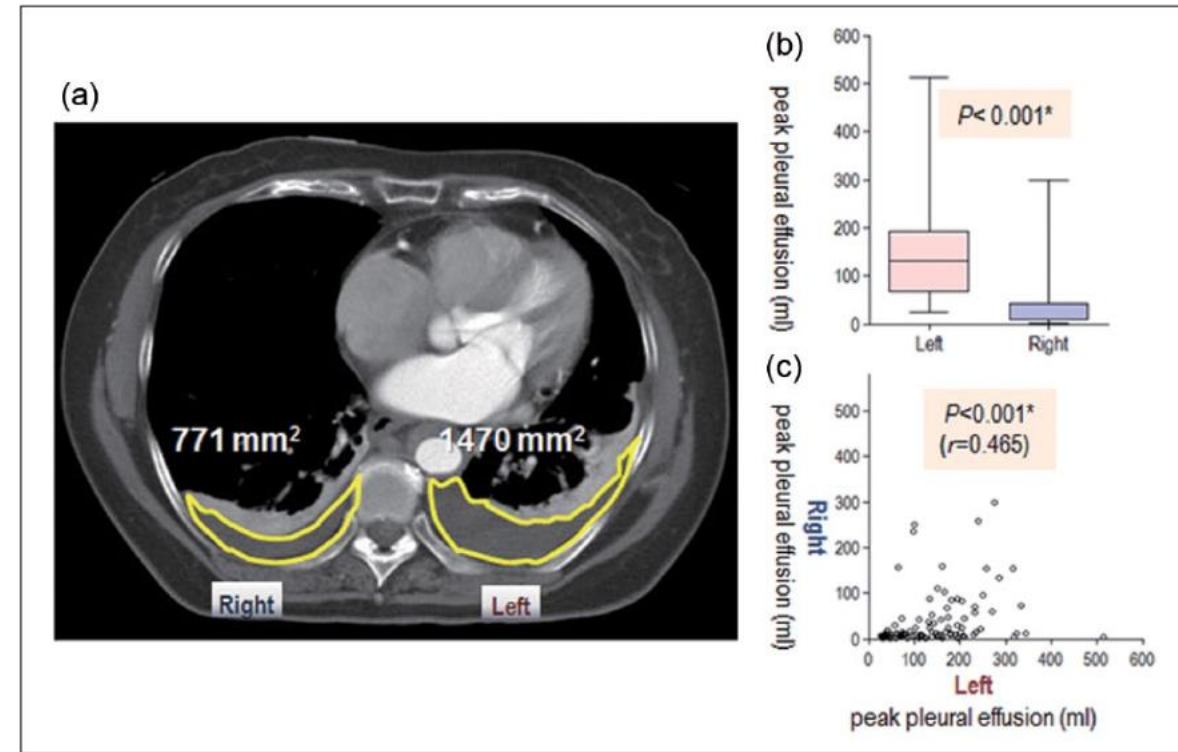
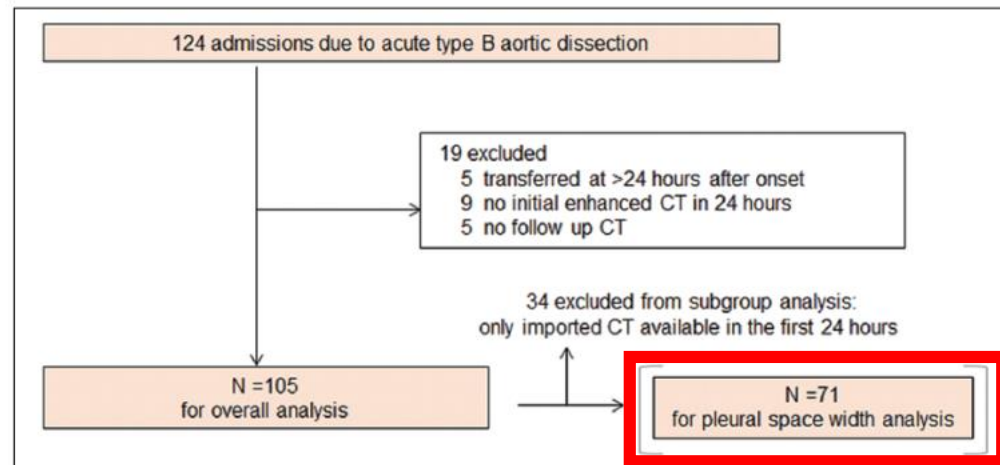



Figure 1. Flow diagram showing patient eligibility. CT: Computed tomography.

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**Yoshihiro Yamada¹, Jun Tanno¹, Shintaro Nakano¹,
Takatoshi Kasai², Takaaki Senbonmatsu¹ and Shigeyuki Nishimura¹**

Results

- The appearance of PE suggested that it contained blood in 3 pts (2.9%) (no thoracentesis)
- The peak dimension of the pleural space and volume of pleural effusion occurred 6.7 ± 3.5 days after onset
- All pts had pleural effusion on the left-side and 89.5% on the right-side
- The peak volume of the pleural effusion was significantly greater on the left than the right side
- Reduction in volume of the PE was confirmed visually on follow up CT 12.3 ± 6.9 days after onset

Clinical implications of pleural effusion in patients with acute type B aortic dissection

Yoshihiro Yamada¹, Jun Tanno¹, Shintaro Nakano¹,
Takatoshi Kasai², Takaaki Senbonmatsu¹ and Shigeyuki Nishimura¹

Association between peak volume of pleural effusion and clinical endpoints

Univariate analyses showed no significant relationship between the peak volume of pleural effusion on either side and all-cause mortality, cardiovascular mortality, inhospital complications or requirement for invasive therapy.

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Univariate analyses showed no significant relationship between the peak volume of pleural effusion on either side and all-cause mortality, cardiovascular mortality, in-hospital complications or requirement for invasive therapy.

Table 4. Impact of peak pleural effusion volume on clinical endpoints.

	Total (n=105)	Versus left peak pleural effusion (ml)			Versus right peak pleural effusion		
		Estimate	SE	P level	Estimate	SE	P level
Length of hospital stay (days)	26 (20–34)	0.0011	0.0005	0.019*	0.0011	0.0007	0.129
Length of ICU stay (days)	8 (6–12)	0.0017	0.0007	0.012*	0.0020	0.0010	0.050*
Length of oxygen use (days)	10 (6–16)	0.0014	0.0007	0.052	0.0027	0.0009	0.006*

ABAD - Is Pleural Effusion an indication for interventions ?

Answer: NO

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Answer: NO



Images in cardiology

Ruptured type B aortic dissection masquerading as massive left pleural effusion

Vijayakumar Subban^{1*}, Jaishankar Krishnamoorthy², Mullasari S. Ajit³, Mathew V. Kurian⁴

- Hata N et al Chest 2002
50% specimens obtained by thoracentesis were bloody and 50% exudates
- Ymada Y et al EHJ: Acute Cardiovascular Care 2016
2.9% of CT appearance of blood

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**CT attenuation
(Hounsfield units)**

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High-risk aortic dissection

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Radiographic only malperfusion
Readmission
Entry tear: lesser curve location
False lumen diameter >22 mm
Complicated
Rupture
Malperfusion

Acute Type B Aortic Dissection

- Is Pleural Effusion an indication for interventions ?
- And what are the others indications ?



Readmissions after acute type B aortic dissection



Brett J. Carroll, MD,^a Marc Schermerhorn, MD,^b Kevin F. Kennedy, MS,^c Nicholas Swerdlow, MD,^b Kevin M. Soriano, MD,^d Robert W. Yeh, MD, MSc,^a and Eric A. Secemsky, MD, MSc,^a *Boston, Mass; and Kansas City, Mo*

Matsushita et al

Risk score system for late aortic events in patients with uncomplicated type B aortic dissection



Akihito Matsushita, MD,^{a,b} Minoru Tabata, MD, PhD, MPH,^c Wahei Mihara, MD,^a Takeshi Shimamoto, MD, PhD,^d Tatsuhiko Komiya, MD, PhD,^d Shuichiro Takanashi, MD, PhD,^e Tetsuya Tobaru, MD, PhD,^f Tatsuya Nakao, MD, PhD,^g Sunao Nakamura, MD, PhD,^h and Yasunori Sato, PhDⁱ

Predictors of late aortic intervention in patients with medically treated type B aortic dissection



Samuel I. Schwartz, MD, Christopher Durham, MD, W. Darrin Clouse, MD, Virendra I. Patel, MD, MPH, R. Todd Lancaster, MD, MPH, Richard P. Cambria, MD, and Mark F. Conrad, MD, MMSc, *Boston, Mass*

Timing of thoracic endovascular aortic repair for uncomplicated acute type B aortic dissection and the association with complications

Daniel J. Torrent, MD, MPH,^a Graeme E. McFarland, MD,^a Grace Wang, MD, MSCE,^b Mahmoud Malas, MD, MHS,^c Benjamin J. Pearce, MD,^a Victoria Aucoin, MD,^a Dan Neal, MS,^d Emily L. Spangler, MD,^a Zdenek Novak, MD, PhD,^a Salvatore T. Scali, MD,^d and Adam W. Beck, MD,^a *Birmingham, Ala; Philadelphia, Pa; San Diego, Calif; and Gainesville, Fla*

Endovascular treatment of complicated versus uncomplicated acute type B aortic dissection

Domenico Spinelli, MD, PhD,^a Fred A. Weaver, MD,^b Ali Azizzadeh, MD, FACS,^c Gregory A. Magee, MD, MSc,^b Gabriele Piffaretti, MD, PhD,^d Filippo Benedetto, MD, PhD,^a Charles C. Miller, PhD,^e Harleen K. Sandhu, MD, MPH,^e Dennis R. Gable, MD, DFSVS, FACS,^f and Santi Trimarchi, MD, PhD^g

Circulation

IN DEPTH

Insights From the International Registry of Acute Aortic Dissection

A 20-Year Experience of Collaborative Clinical Research

ABSTRACT: Acute aortic dissection (AAD) is a life-threatening condition associated with high morbidity and mortality rates, and it remains a challenge to diagnose and treat. The International Registry of Acute Aortic Dissection was established in 1996 with the mission to raise awareness of this condition and provide insights to guide diagnosis and treatment. Since then, >7300 cases have been included from >51 sites in 12 countries. Although presenting symptoms and physical findings have not changed significantly over this period, the use of computed tomography in the diagnosis has increased, and more patients are managed with interventional procedures: surgery in type A AAD and endovascular therapy in type B AAD; with these changes in care, there has been a significant decrease in overall in-hospital mortality in type A AAD but not in type B AAD. Herein, we summarized the key lessons learned from this international registry of patients with AAD over the past 20 years.

Acute aortic dissection (AAD) is a rare, life-threatening condition that remains a challenge to diagnose and treat. The International Registry of Acute Aortic Dissection (IRAD) was established in 1996 with the mission to raise awareness of this condition and provide insights to guide diagnosis and treatment.

Arturo Evangelista, MD
 Eric M. Isselbacher, MD
 Eduardo Bossone, MD
 Thomas G. Gleason, MD
 Marco Di Eusanio, MD
 Udo Sechtem, MD
 Marek P. Ehrlich, MD
 Santi Trimarchi, MD
 Alan C. Braverman, MD
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 Stuart Hutchinson, MD
 Patrick O'Gara, MD
 Toru Suzuki, MD
 Christoph A. Nienaber, MD
 Kim A. Eagle, MD
 on behalf of the IRAD Investigators

Management of acute type B aortic dissection

Bijit Munshi ,*†‡§ Jens C. Ritter,§ Barry J. Doyle*† and Paul E. Norman*†‡§

Editors' Choice

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High-risk aortic dissection

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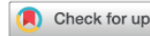


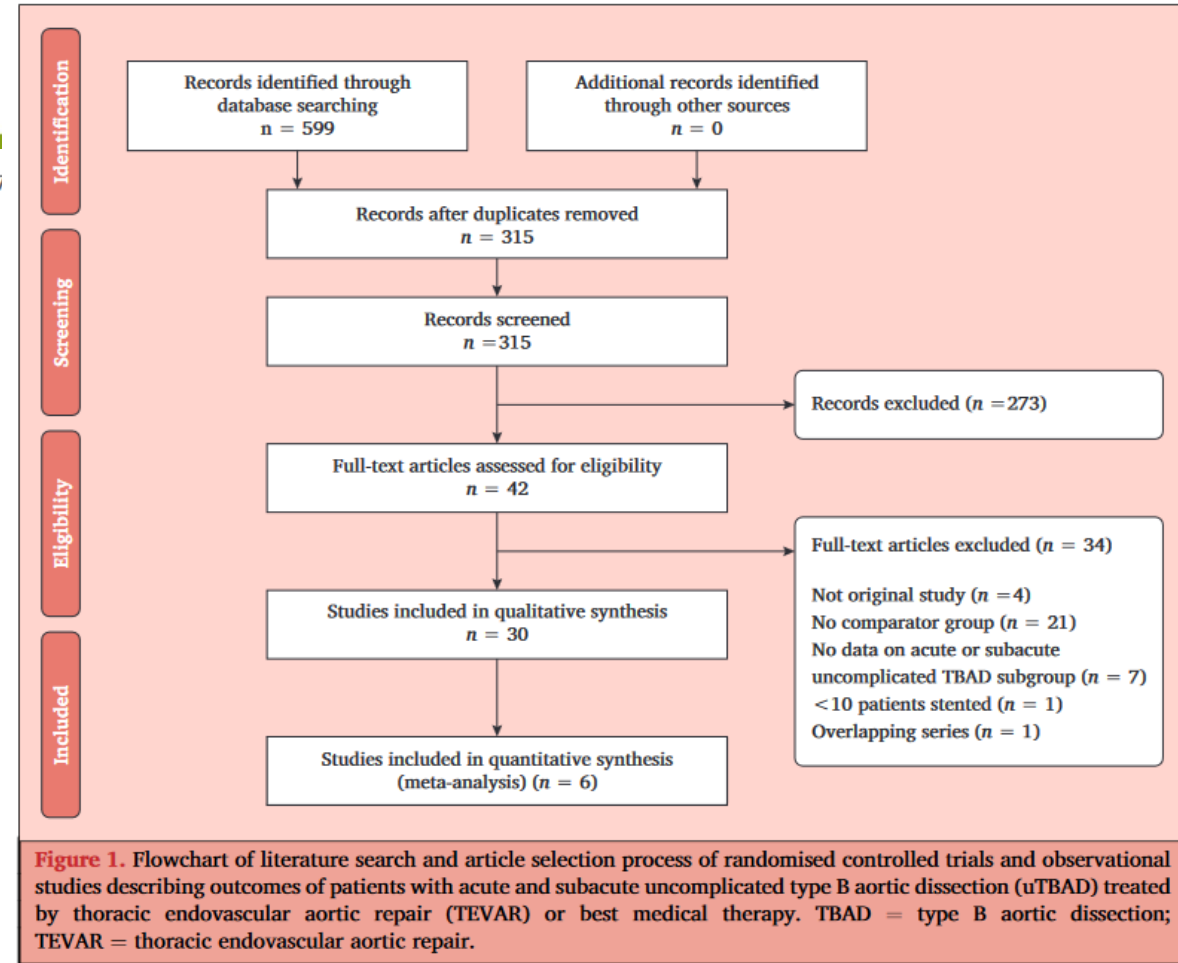
Table III. Aortic dissection acuity

Uncomplicated	
No rupture	
No malperfusion	
No high-risk features	
High risk	
Refractory pain	
Refractory hypertension	
Bloody pleural effusion	
Aortic diameter >40 mm	←
Radiographic only malperfusion	←
Readmission	
Entry tear: lesser curve location	←
False lumen diameter >22 mm	←
Complicated	
Rupture	
Malperfusion	

SYSTEMATIC REVIEW

Endovascular vs. Medical Management for Uncomplicated Acute and Sub-acute Type B Aortic Dissection: A Meta-analysis

Martin Hossack ^{a,*}, Shaneel Patel ^a, Ivancarmine Gambardella ^b, Simon Neequaye ^a, George A. Antoniou ^{c,d}, Francesco Torella ^a



Conclusion: Given the limited number and quality of suitable studies it remains uncertain whether TEVAR is beneficial in the management of acute/subacute uTBAD. Further research is required to understand which dissections would benefit from pre-emptive treatment.



Predictors of adverse events in uncomplicated type B aortic dissection: a systematic review with meta-analysis

Ana B. ROMEIRO ^{1 *}, Clara NOGUEIRA ^{1, 2}, Andreia COELHO ^{1, 3}, Armando MANSILHA ^{1, 4}

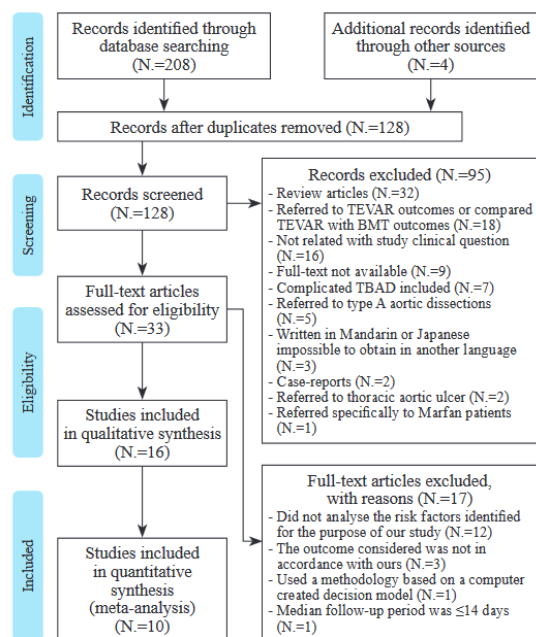


Figure 1.—PRISMA flow diagram.

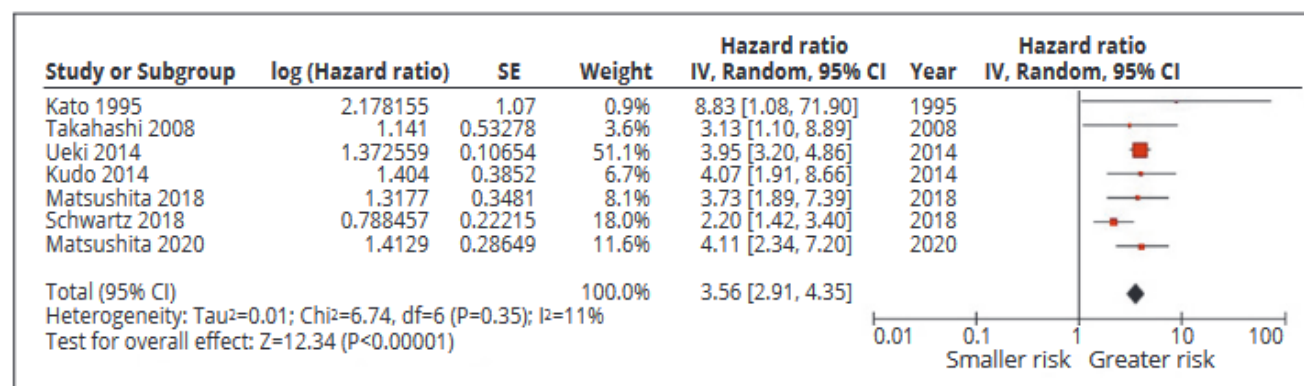
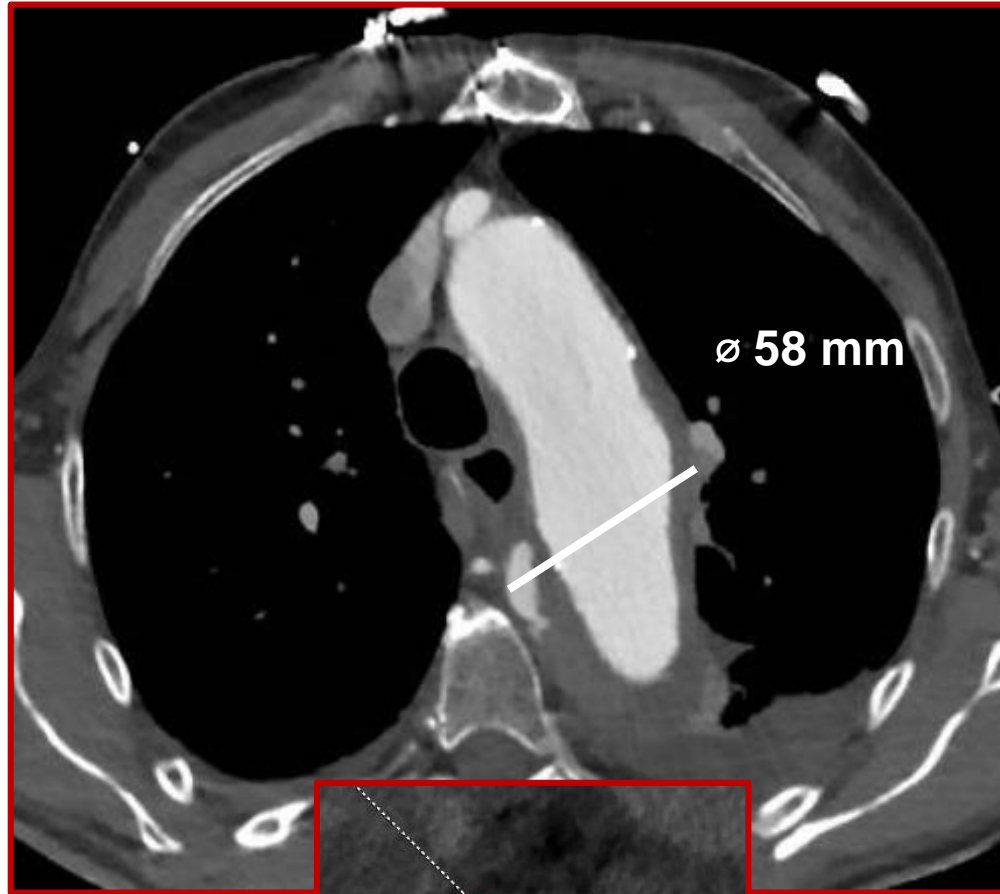


Figure 2.—Forest plot: aortic diameter ≥40 mm versus aortic diameter <40 mm and the occurrence of major adverse events.^{17, 18, 21-24, 30}

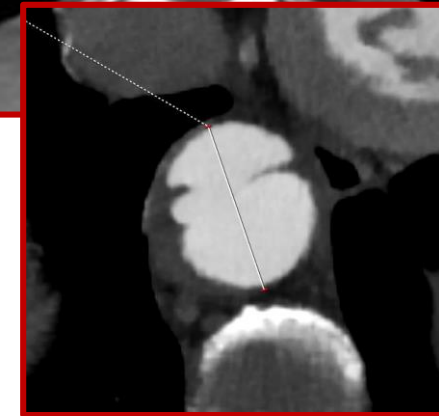
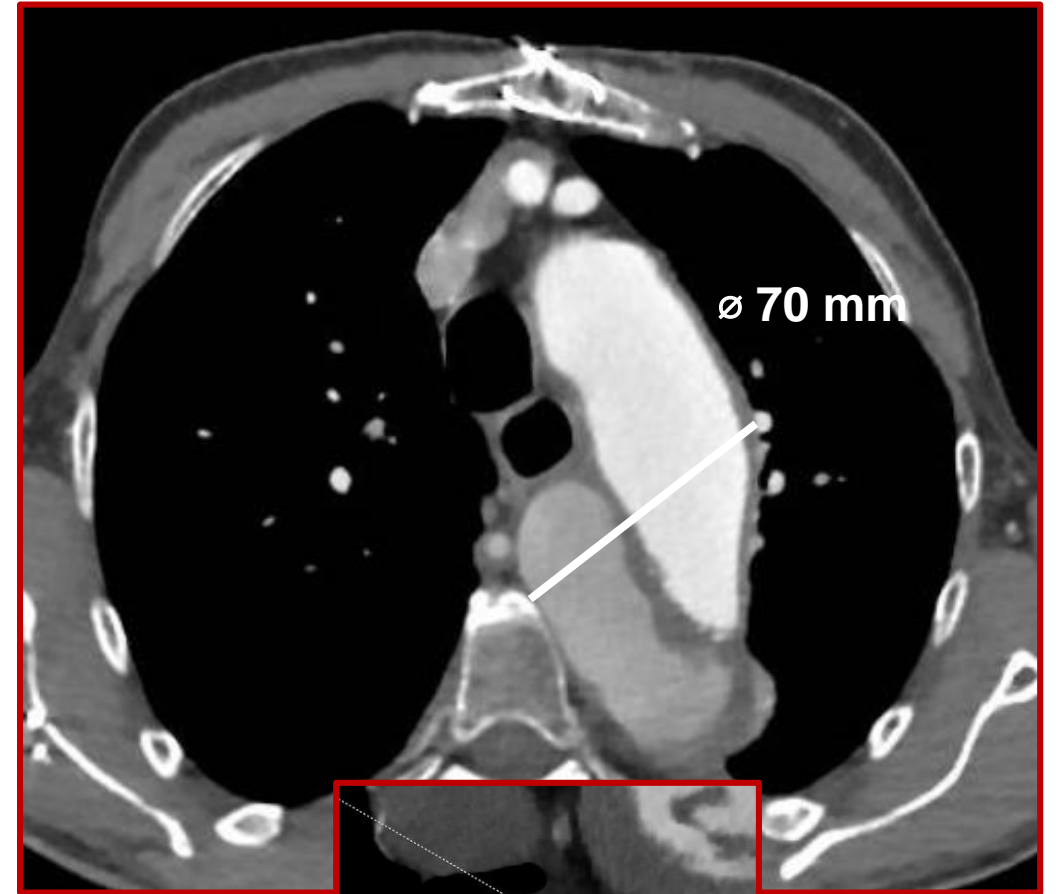
Risk factors with weak evidence for «unfavorable outcome»:

- False lumen patency
- Location of the primary tear
- Size of the entry tear
- Numbers of vessels originating from the false lumen
- Age
- Connective tissue disease

June 2020



July 2020



Surgical Decision Making in Uncomplicated Type B Aortic Dissection: A Survey of Australian/New Zealand and European Surgeons

Bijit Munshi ^{a,b,f,*}, Barry J. Doyle ^{a,c,d,e}, Jens C. Ritter ^f, Shirley Jansen ^{b,g,h,i}, Louis P. Parker ^{a,c}, Vincent Riambau ^j, Colin Bicknell ^{k,l}, Paul E. Norman ^{a,b,f}, Anders Wanhainen ^m

Background (*Eur J Vasc Endovasc Surg* 2019;57:615-6)

Verhoeven *et al.*⁵ recently reported that more vascular surgeons are adopting an aggressive approach towards early TEVAR. However, “(over)treatment of these patients by TEVAR may only mean operative risk without later benefit.”⁵

Objective: There is controversy about the role of pre-emptive thoracic endovascular aortic repair (TEVAR) in uncomplicated type B aortic dissection (TBAD). The aim was to understand expert opinions and the factors influencing decision making.

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Table 1. Risk predictors and critical thresholds for surgical decision making in type B aortic dissection identified in current literature

Risk predictor	Critical thresholds
Uncontrolled heart rate/blood pressure ^{15,16}	Acute: HR < 60 beats/min, SBP 100–120 mmHg Chronic: SBP <120 mmHg
Uncontrolled pain ¹⁵	—
Proximal entry tear (to left subclavian artery origin) ^{13,17}	<20 mm
Entry tear on aortic concavity/inner curvature ^{17,18}	—
Large entry tear size ^{8,13}	≥10 mm
Single entry tear ¹⁹	—
Partial false lumen thrombosis or patent false lumen ^{20–22}	—
Large baseline aortic diameter ^{8–12}	≥40 mm
Large false lumen diameter ^{8,14}	≥22 mm
Rapidly expanding aortic diameter ²³	≥10 mm per year

HR = heart rate; SBP = systolic blood pressure.

Table 3. Anatomical and technical risk factors which surgeons were asked to rank in order of importance for type B aortic dissection (TBAD) management in a study of surgical decision making in uncomplicated TBAD among Australian, New Zealand, and European surgeons.

Anatomical risk factors	Technical risk factors
Maximum total aortic diameter ≥40 mm	Proximal sealing zone length <20 mm requiring single vessel debranching
False lumen diameter ≥22 mm	Proximal sealing zone length <20 mm requiring multiple vessel debranching
Rapid aortic enlargement ≥10 mm within acute phase (<14 days)	Distal extension of dissection involving visceral segment or iliac arteries
Primary entry tear diameter ≥10 mm	Poor access vessels
Single primary entry tear	Custom made graft required
Primary entry tear location on concavity/inner curve of thoracic aorta	
Partial false lumen thrombosis	

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Table 2. Case details designed using current literature, and corresponding expected answers to study surgical decision making in uncomplicated type B aortic dissection among Australian, New Zealand, and European surgeons. Established risk factors are marked with asterisk		
Case	Case details	Expected answer
Case 1	Severe hypertension (240/130 mmHg)* Tachycardia (100 bpm)* Extensive disease (visceral segment and iliac arteries)* Partial false lumen thrombosis* Large false lumen diameter 30 mm* Large baseline aortic diameter 48 mm*	Stent graft and BMT
Case 2	Mild hypertension (160/110 mmHg) Normal heart rate (80 bpm) Limited extent (only descending thoracic aorta) Patent false lumen Baseline aortic diameter 36 mm	BMT alone
Case 3	Moderate hypertension (180/110 mmHg) Normal heart rate (90 bpm) Extensive disease (visceral segment and iliac arteries) Large entry tear (single, 12 mm, inner curvature)* Patent false lumen Baseline aortic diameter 36 mm Fusiform index 0.60	Ambiguous
Case 4	Moderate hypertension (180/110 mmHg) Normal heart rate (90 bpm) Extensive disease (visceral segment and iliac arteries) Multiple re-entry tears Partial false lumen thrombosis* Borderline false lumen diameter (22 mm)* Borderline baseline aortic diameter (40 mm)* Borderline fusiform index 0.64*	Ambiguous
Case 5	Moderate hypertension (180/110 mmHg) Normal heart rate (90 bpm) Extensive disease (visceral segment and iliac arteries) Multiple re-entry tears Patent false lumen Large false lumen diameter (24 mm)* Baseline aortic diameter (44 mm)* Fusiform index 0.68*	Ambiguous

BMT = best medical therapy.
* Established risk factors.

Surgical Decision Making in Uncomplicated Type B Aortic Dissection: A Survey of Australian/New Zealand and European Surgeons

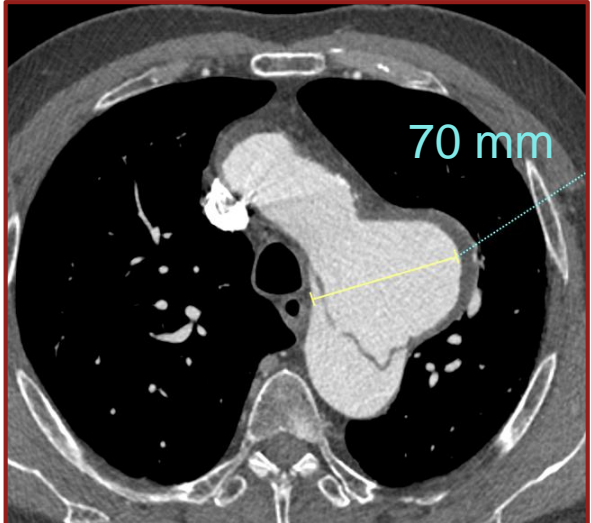
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Table 5. Anatomical and technical risk factors in descending order of importance for type B aortic dissection (TBAD) management based on a survey among Australian, New Zealand, and European surgeons to study surgical decision making in uncomplicated TBAD

Risk factor	Score
<i>Anatomical (maximum score 10)</i>	
Rapid aortic diameter enlargement ≥10 mm in acute phase	9.21
Maximum total aortic diameter ≥40 mm	8.92
Primary entry tear diameter ≥10 mm	6.81
False lumen diameter ≥22 mm	6.68
Single primary entry tear	6.61
Partial false lumen thrombosis	6.09
Primary entry tear location on concavity/inner curve of thoracic aorta	5.41
Fusiform index ≥0.64	4.76
Proximal primary entry tear location	0.00
<i>Technical (maximum score 6)</i>	
Proximal sealing zone length <20 mm requiring multiple vessel debranching	5.23
Poor access vessels	4.29
Proximal sealing zone length <20 mm requiring single vessel debranching	4.03
Distal extension of dissection involving visceral segment or iliac arteries	3.64

Preferred timing of intervention?

Overall, 60/72 (83.3%, incomplete $n = 3$) surgeons prefer to perform TEVAR in the subacute phase (14 days to three months) followed by 10/72 (13.9%) choosing the acute phase (<14 days), and 2/72 (2.8%) opting for the chronic phase (>3 months).



Current evidence in predictors of aortic growth and events in acute type B aortic dissection

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Table. Quality of evidence

Predictor of AG or event	Study design	Class	Level of evidence	Studies		
				Report is statistically significant for AG and events	Report is not statistically significant for AG and events	Report is statistically significant for no AG and events (opposite data)
Increased aortic diameter	Observational	IIA	B	26	6	3
Increased FL size	Observational	IIB	C	8	1	—
Increased ET size	Observational	IIB	C	1	2	—
Proximal location of ET	Observational	IIB	C	9	5	—
Location of ET in inner curvature	Observational	IIB	C	2	—	—
Absence of FL complete thrombosis	Observational	I	B	18	9	—
FL partial thrombosis	Observational	IIB	C	3	8	—
Increased number of branch vessels involvement	Observational	IIB	C	2	2	1
Lower number of ETs	Observational	IIB	C	2	2	1
FL distal extent (Type IIIa vs IIIb)	Observational	IIB	C	—	12	1
FL arch extent	Observational	IIB	C	3	3	—
FL extent to inner curvature	Observational	IIB	C	1	1	—
FL length in cm	Observational	IIB	C	2	1	—

ET, Entry tear; FL, false lumen.

CONCLUSIONS

Aortic size at presentation is a fairly consistent predictor of AG and AE, while complete FL thrombosis has a well-established protective role.

AG: Aortic Growth
AE: Aorta-related adverse Events

Is Pleural Effusion an indication for interventions ?

And what are the others indications ?

Take-Home Messages

- Pleural effusion: increase the length of ICU stay; the relationship with requirement for invasive therapy is related to CT attenuation (Hounsfield units)
- Aortic size at presentation is a fairly consistent predictor of Aortic Growth and Aorta-Related Adverse Events while complete False Lumen Thrombosis has a well-established protective role
- The remaining anatomical, clinical and technical risk factors that have been studied in the literature have weaker evidence and need additional evidence.
- Consistent evidence justifies the use of pre-emptive TEVAR in the subacute phase in patients with large diameter (≥ 40 mm)