

2017 MID-ATLANTIC  
CONFERENCE

7th *ANNUAL* CURRENT CONCEPTS IN  
**VASCULAR THERAPIES**

2017



Animesh Rathore, MD

4/22/17

The Great Debate

**45yo Man With Uncomplicated Acute TBAD: The  
Case For Medical Management**

# Disclosures

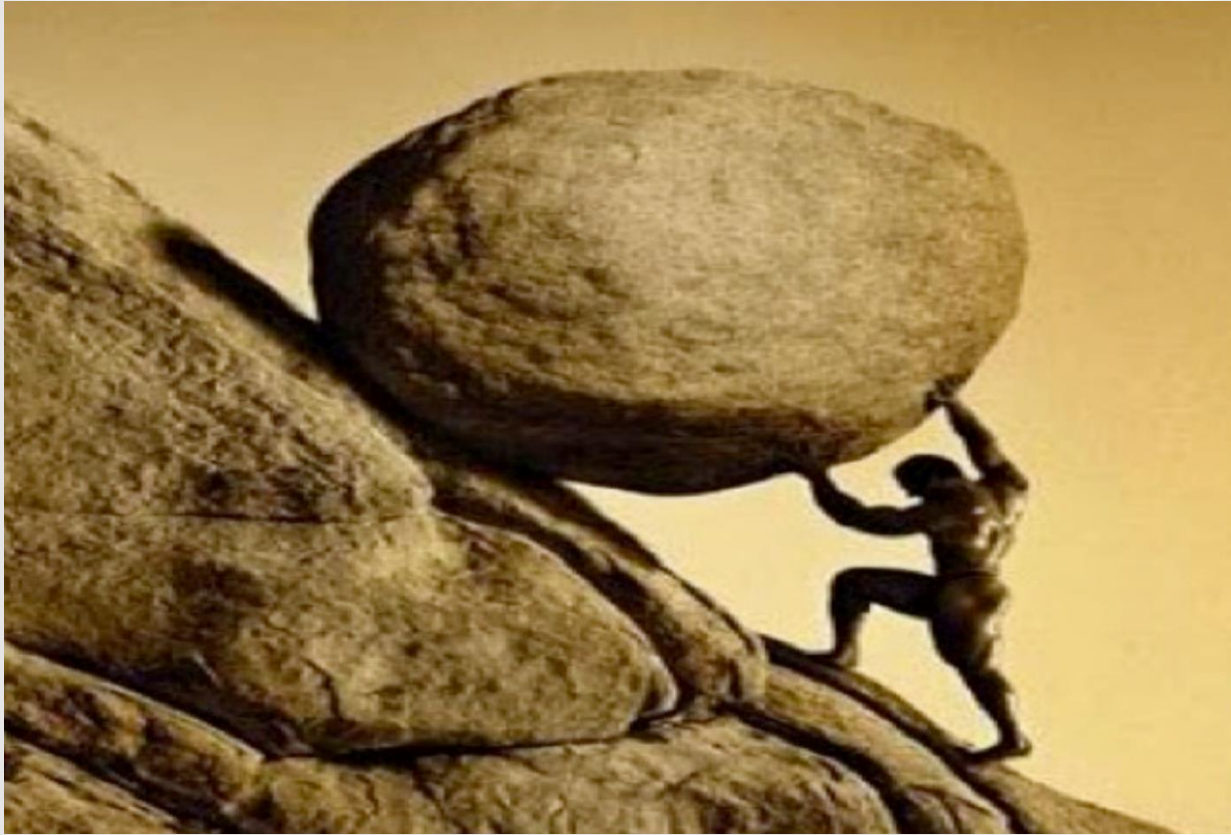
- Just a young vascular surgeon who would like to keep his job



# My opponent



# This is an uphill battle



And the goal is to make the best out of it





# Case of a 45 year old with uncomplicated TBAD

45 years old AA male otherwise healthy, smoker presents to the emergency room with type B aortic dissection complaining of severe tearing upper back and chest pain. Admits to using crack cocaine last night before the pain started. Denies family history.

## Exam:

HR 89, BP: 220/130, RR: 16, Temp: 37.0

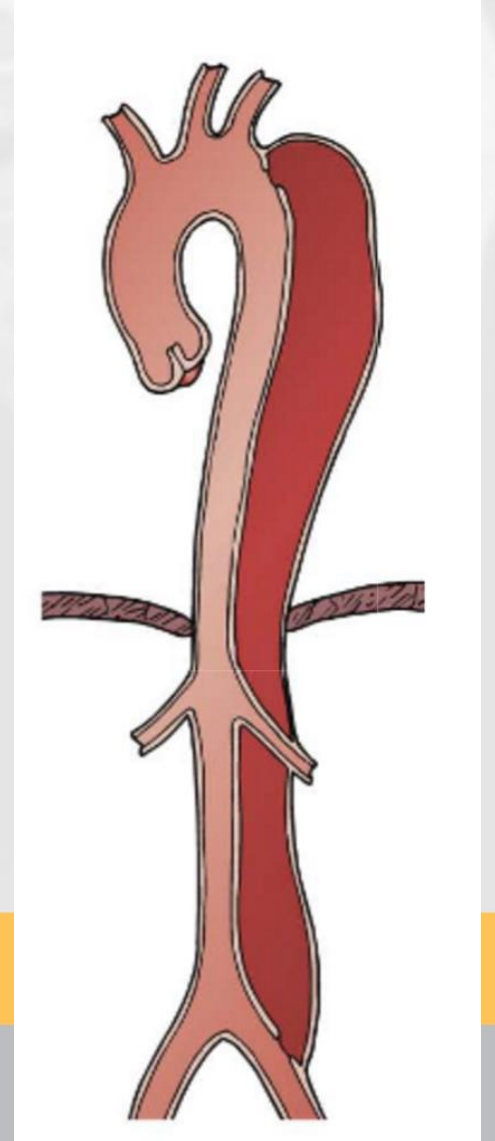
Alert and awake

Chest: clear

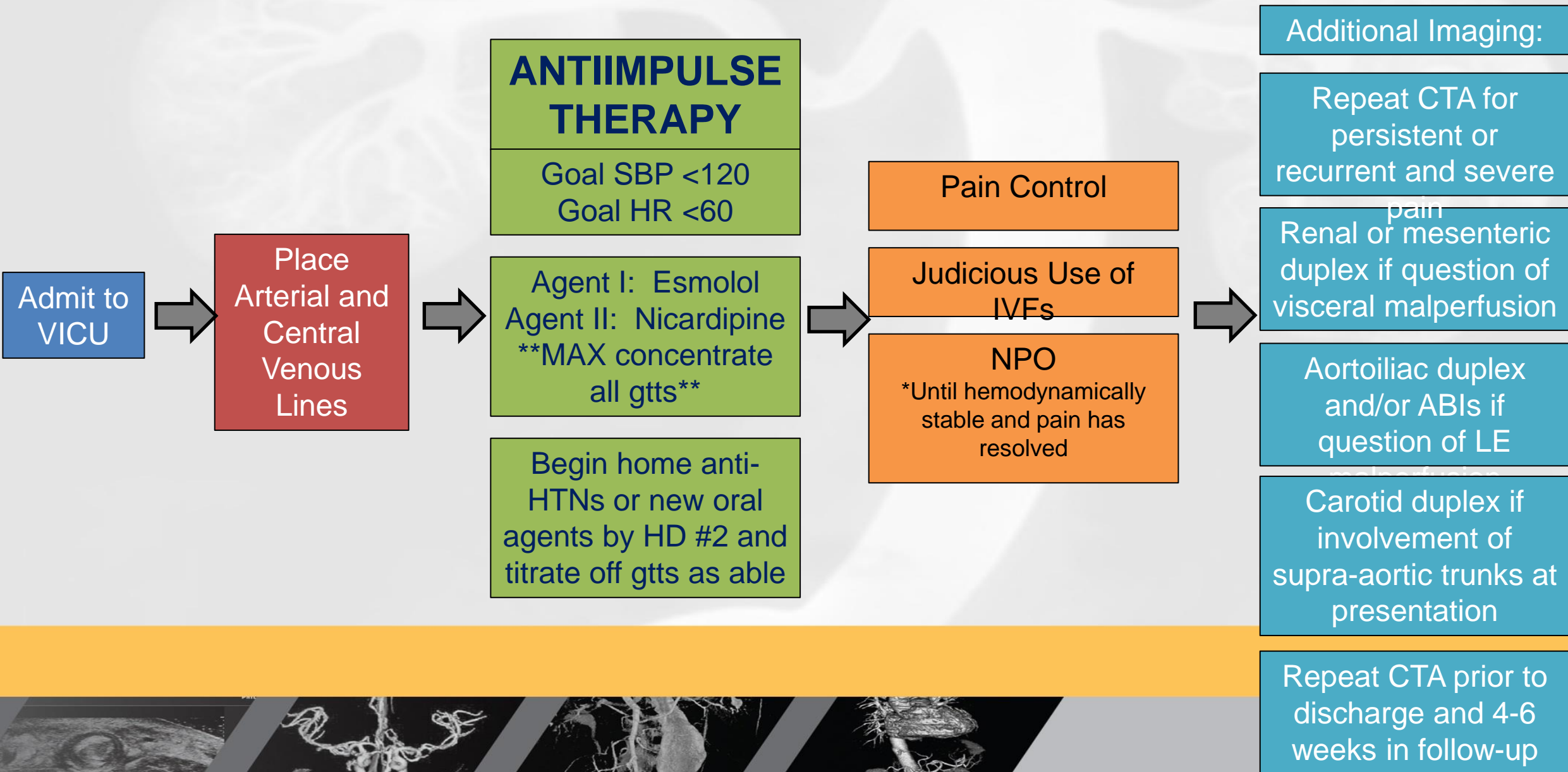
Heart: RRR

Abdomen soft, nontender

Distal pulses palpable and symmetrical



# Management of Type B Aortic Dissection



# Management options after stabilization?

- Continued medical management with elective TEVAR based on clinical and anatomic criteria
- Early TEVAR



# TEVAR in uncomplicated TBAD

- Aortic related mortality is primary
- Prevent all cause and aortic re
- Difficult to predict which TBAD and rupture
- Would prevent aneurysm formation and
- There is a minimal risk to TEVAR

Lets take these  
one by one



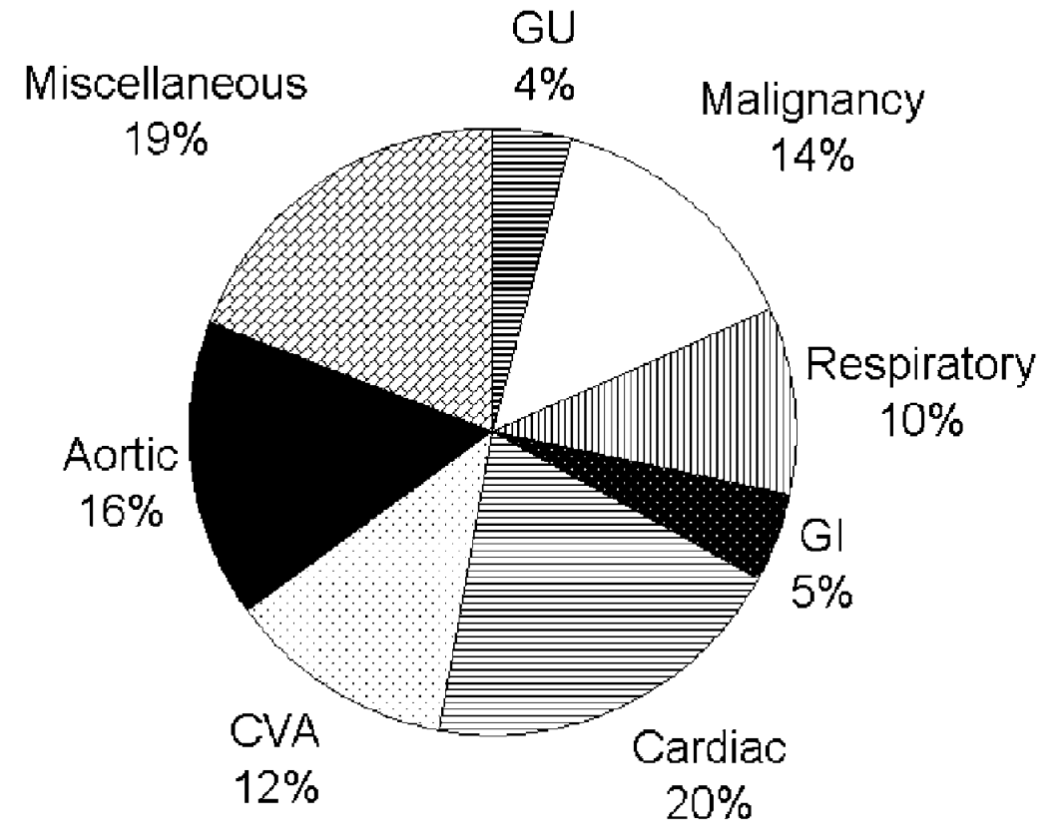


# Causes of Mortality in TBAD

Population based analysis of 3616 pts. Overall survival at 6 years **46.1 %**

Aortic related causes for mortality only **16%** of all causes

**Aortic related event rate 2.48 per year**



# Late mortality among 189 TBAD pts by tt mode

Aortic dissection rupture or extension contributed to only 18% deaths

	Medical		Surgical	
	No.	%	No.	%
Dissection rupture or extension	8	18	3	10
Sudden unexplained death	2	5	4	14
Arrhythmia	1	2	2	7
Myocardial infarction	2	5	3	10
CHF	5	11	2	7
Prosthetic valve structural valve dysfunction	1	2	0	0
Renal failure	3	7	1	3
Respiratory failure or pneumonia	5	11	2	7
Stroke	3	7	0	0
Anticoagulant hemorrhage	0	0	1	3
Multisystem organ failure	1	2	1	3
Sepsis	3	7	0	0
Malignancy	3	7	2	7
Suicide or accident	1	2	1	3
Gastrointestinal disease	0	0	1	3
Unknown	5	11	2	7
Other	1	2	2	7
Total	44		27	



# Myth # 1

- ~~• Aortic related mortality is primary cause of death in TBAD~~

## FACT

- Aortic related mortality contributes to less than 30% of all cause mortality with annual event rate 2.5 per year
- TBAD represent a high risk group for cardiovascular events



# TEVAR prevents mortality

## Endovascular Repair of Acute Uncomplicated Aortic Type B Dissection Promotes Aortic Remodelling: 1 Year Results of the ADSORB Trial

J. Brunkwall <sup>a,\*</sup>, P. Kasprzak <sup>b</sup>, E. Verhoeven <sup>c</sup>, R. Heijmen <sup>d</sup>, P. Taylor <sup>d</sup>, the ADSORB Trialists <sup>e</sup>

<sup>a</sup> Department of Vascular and Endovascular Surgery, University Clinics, University of Cologne, Cologne, Germany

<sup>b</sup> Section of Vascular Surgery, Department of Surgery, University of Regensburg, Department of Vascular Surgery, Klinikum Nuernberg, Nuremberg, Germany

<sup>c</sup> Department of Cardiovasc Surgery Antonius Hospital, Nieuwegein, The Netherlands

<sup>d</sup> Department of Vascular Surgery, St Guys Hospital, London, UK

## Randomized Comparison of Strategies for Type B Aortic Dissection

### The INvestigation of STEnt Grafts in Aortic Dissection (INSTEAD) Trial

Christoph A. Nienaber, MD, PhD; Hervé Rousseau, MD, PhD; Holger Eggebrecht, MD; Stephan Kische, MD; Rossella Fattori, MD, PhD; Tim C. Rehders, MD; Günther Kundt, PhD; Dierk Scheinert, MD, PhD; Martin Czerny, MD, PhD; Tilo Kleinfeldt, MD; Burkhard Zipfel, MD; Louis Labrousse, MD, PhD; Hüseyin Ince, MD, PhD;  
for the INSTEAD Trial



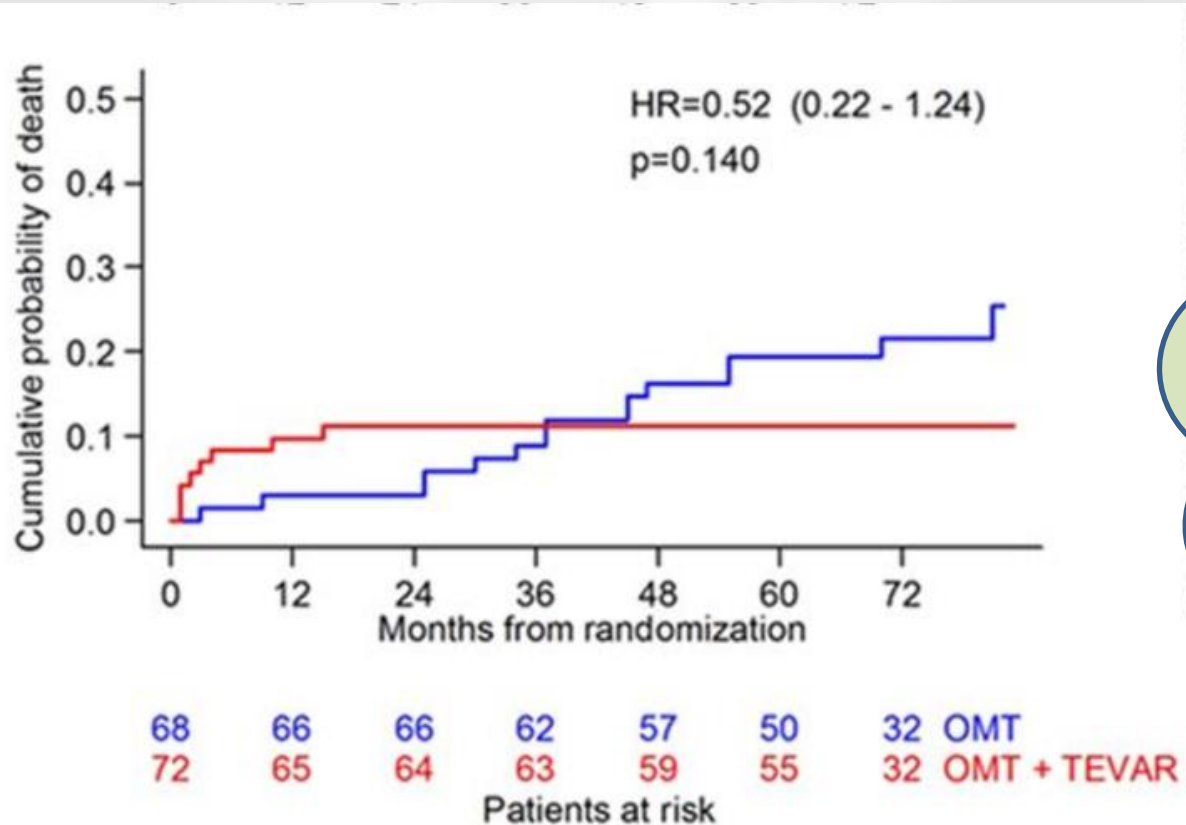
# INSTEAD Trial

- Investigation of Stent-grafts in Aortic Dissection (INSTEAD): prospective randomized multicenter European trial. Early (>14d) TEVAR for (majority at 10-12 weeks) assigned OMT versus OMT + TEVAR.
  - 1 yr mortality higher with TEVAR + OMT (8.7 % vs 3 %)
  - Aortic remodeling improved with TEVAR + OMT (91.3 % vs 19.4%)
  - 5 yr mortality TEVAR vs OMT (11.2 % vs 20.3 %)





# All cause of mortality

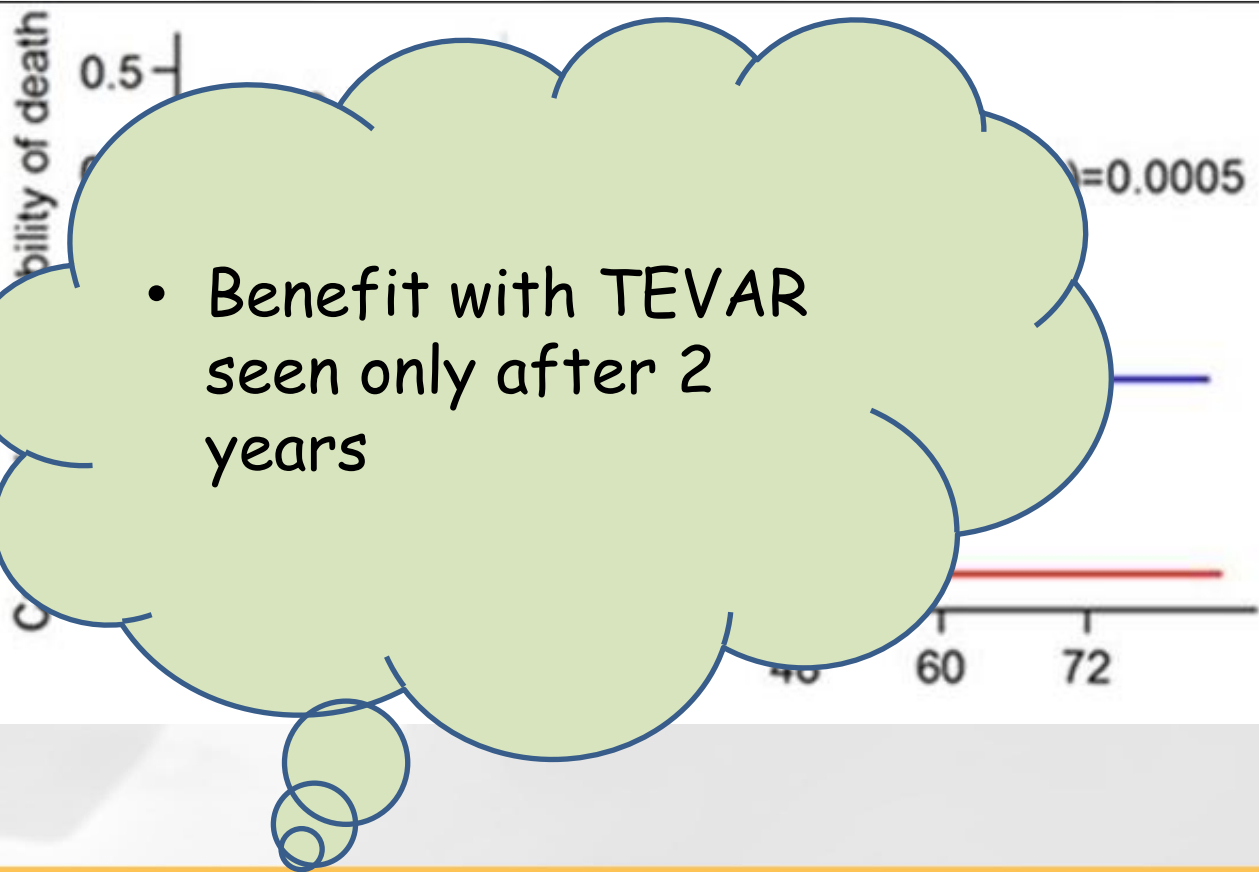
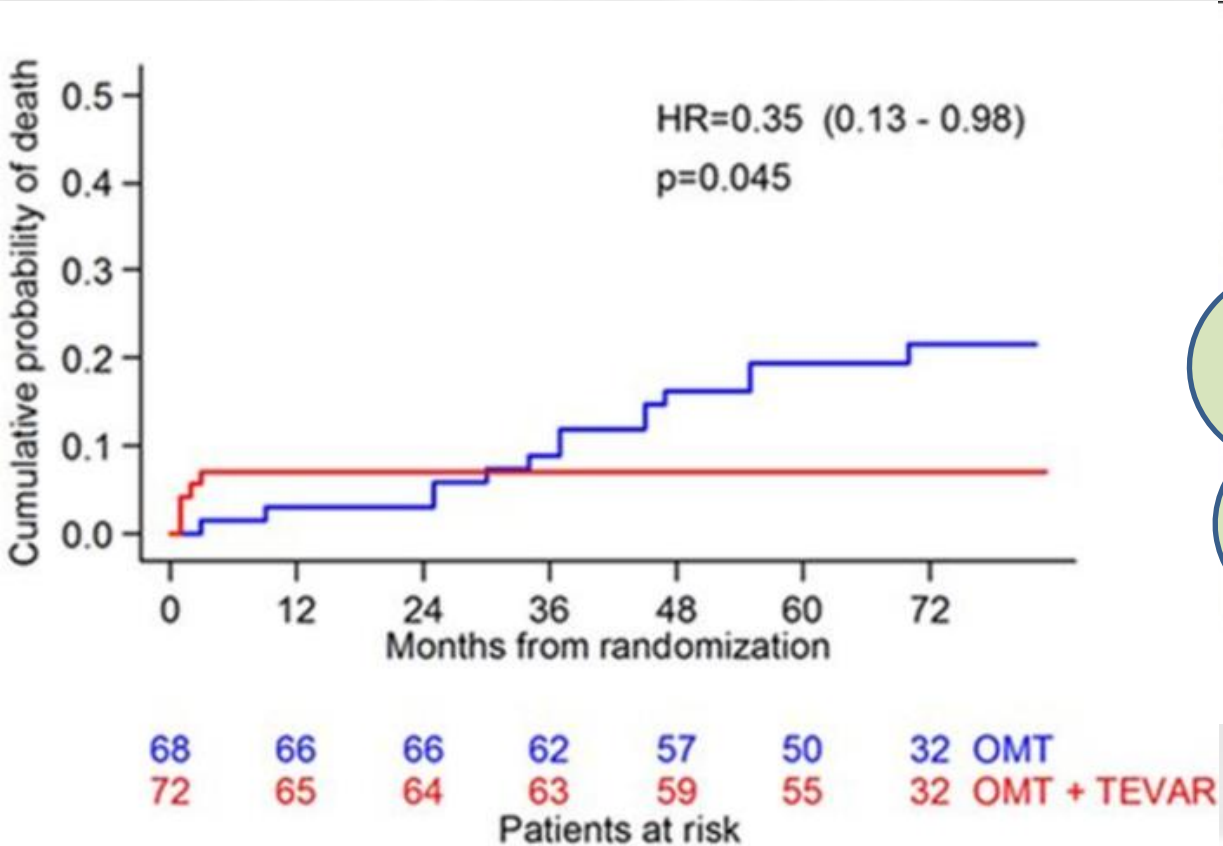


- Underpowered
- No significant difference in overall survival at 1 year, 2 year and 5 years
- Early disadvantage with TEVAR

HR=3.96  
p=0.0003



# Aorta related mortality



## MYTH #2

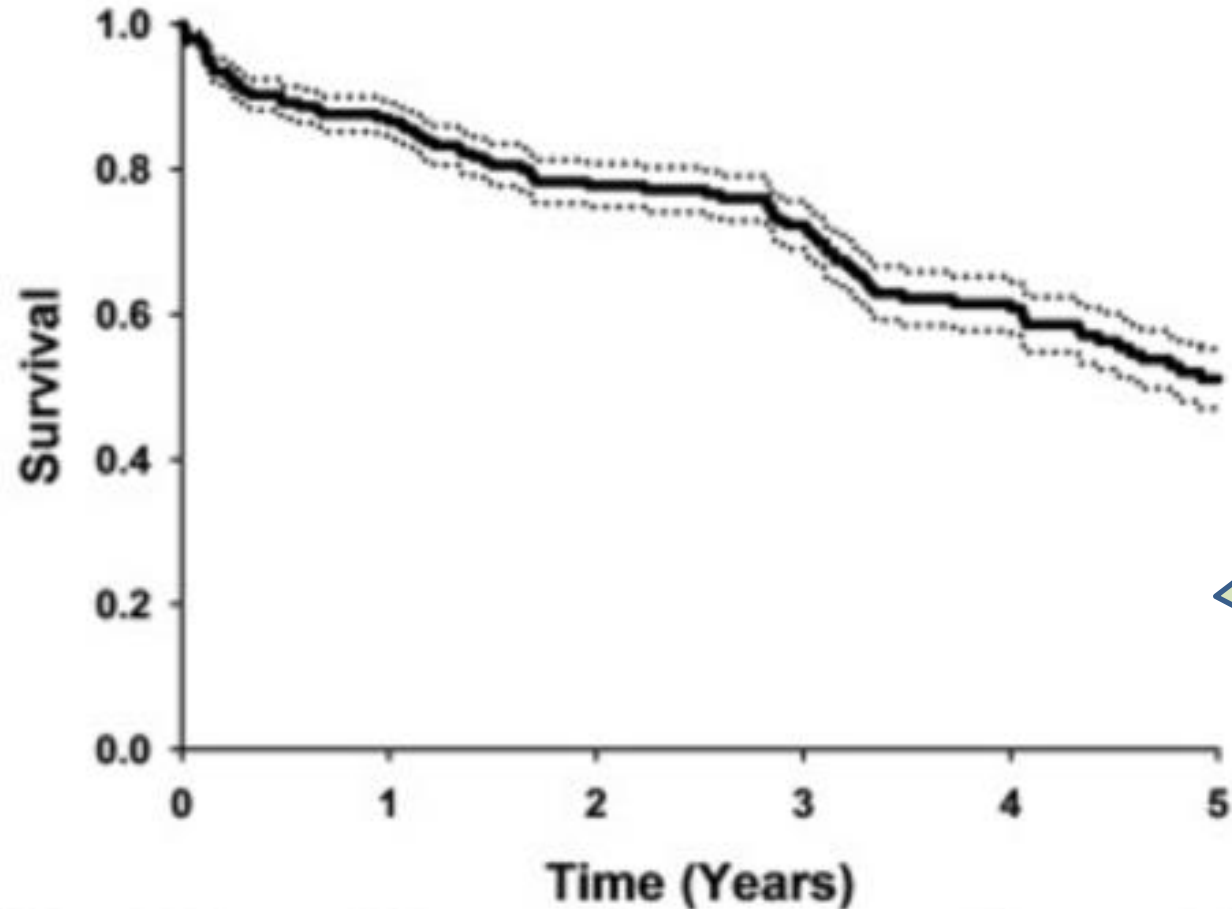
- ~~TEVAR prevents mortality~~

## FACT

- TEVAR doesn't prevent all cause mortality on RCT
- ?survival advantage (all cause and aorta related) with TEVAR 2 years later



# Freedom from aortic growth

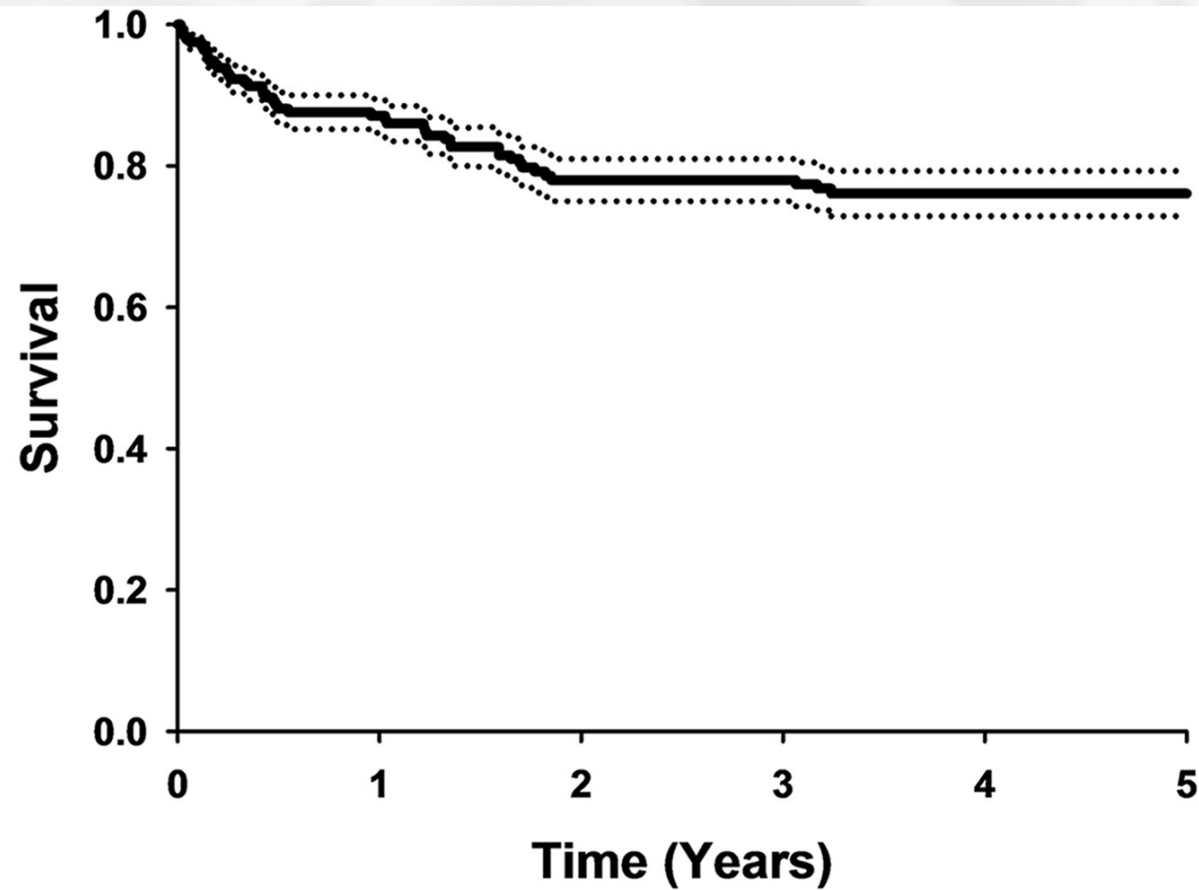


- 200 patients with medically managed TBAD (61% men)
- Follow up 5.3 years
- Mean rate of aortic growth 12.3 mm/year (3.8 true, 8.6 false)
- Aortic diameter at index presentation > 3.5 cm predicted (OR 2.54) aneurysm
- Thrombosed false lumen protective (OR 0.19)

	0	1	2	3	4	5
<b>At risk:</b>	200	161	134	117	85	54
<b>Survival (%)</b>	100.0	86.6	77.8	72.3	60.8	51.1
<b>SE (%)</b>	0.0	2.5	3.0	3.3	3.7	4.1

Durham et al. JVS 2015 Oct;62(4):900-6.

# Freedom from intervention



- 5 year freedom from intervention 76%
- Only 51% free from aortic growth at 5 years

<u>At risk:</u>	200	161	131	122	100	76
<u>Survival (%)</u> :	100.0	87.1	78.0	78.0	76.1	76.1
<u>SE (%)</u> :	0.0	2.4	3.0	3.0	3.2	3.2

Durham et al. JVS 2015 Oct;62(4):900-6.





# Clinical and radiologic predictors of growth

**Table 3.** Clinical and Radiological Predictive Findings

	Influence Mortality (Reference Source)	Influence Growth Rate or Rupture (Reference Source)
<b>Clinical Parameters</b>		
Recurrent/refractory pain	↑ OR 3.3 [25]	
Age (> 70 yr)	↑ OR 5.1 [25]	
Absence of CP on admission	↑ OR 3.5 [25]	
BP control (< 120 mm Hg)		↓ [44,46-48]
White race		↓ [32,43-46]
Marfan syndrome		↓ [32,43-46]
Tight rate control (<60 bpm)		↓ [32,43-46]
Ca-channel blockers		↓ [32,43-46]
<b>Radiological Predictors</b>		
Initial diameter > 5.5-6.0 cm	↑ 4×	↑ [13,52,56]
False lumen diameter > 22 mm		↑ [32]
Crescentic false lumen		↑ [46]
Patent false lumen*	↑ [31]	↑ [48-51,50,55,57,58]
Patent entry tear		↑ [30]
Entry tear near subclavian (< 5 cm)		↑ [63,64,66]
Single entry tear (without multiple fenestrations)		↑ [63,64]
Multiple false lumens	↑ OR 5.6 [65]	
Large entry tear (> 10 mm)		↑ [43]
False lumen on inner curve		↑ [33,46]

\*Partial thrombosis controversial, in terms of negative impact on natural history [15,31,46,58,59,60,61].

# Myth # 3

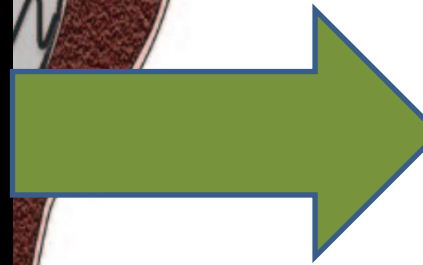
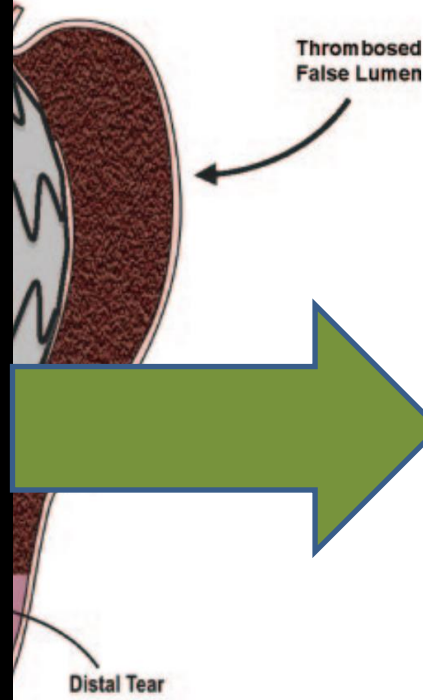
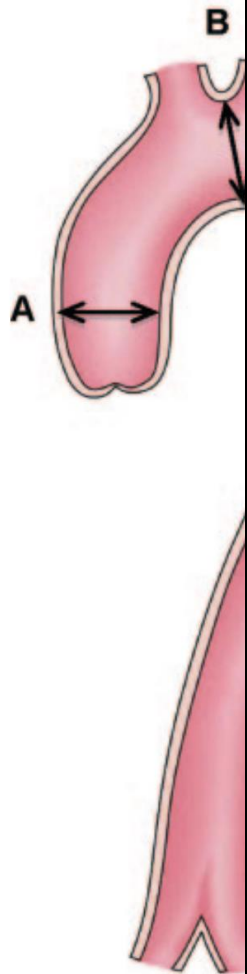
- ~~• Cannot predict which TBAD will develop aneurysm and rupture~~

## FACT

- **Natural history defined** (50 % free from aortic growth at 5 years only 24 % required interventions at 5 years)
- **Clinical predictors of mortality exist** (Refractory pain, age >70, chest pain, poor BP and HR control, black race, CCB)
- **Anatomic predictors for growth** (Initial diameter > 55mm, False lumen diameter >22 mm, Crescentic false lumen, patent false lumen, large entry tear > 10 mm, entry tear near LSA, false lumen on inner curve, multiple branch involvement)



# Dissection aortic



Stenosis  
by  
flow  
distortion due  
to presence of false

atrial

# Survival After Endovascular Therapy in Patients With Type B Aortic Dissection

## A Report From the International Registry of Acute Aortic Dissection (IRAD)

Rossella Fattori, MD,\* Daniel Montgomery, BS,† Luigi Lovato, MD,‡ Stephan Kische, MD,§  
Marco Di Eusanio, MD,‡ Hüseyin Ince, MD,§ Kim A. Eagle, MD,†  
Eric M. Isselbacher, MD,|| Christoph A. Nienaber, MD§

*Pesaro and Bologna, Italy; Ann Arbor, Michigan; Rostock, Germany; and Boston, Massachusetts*

IRAD study on 1,129 patients with TBAD

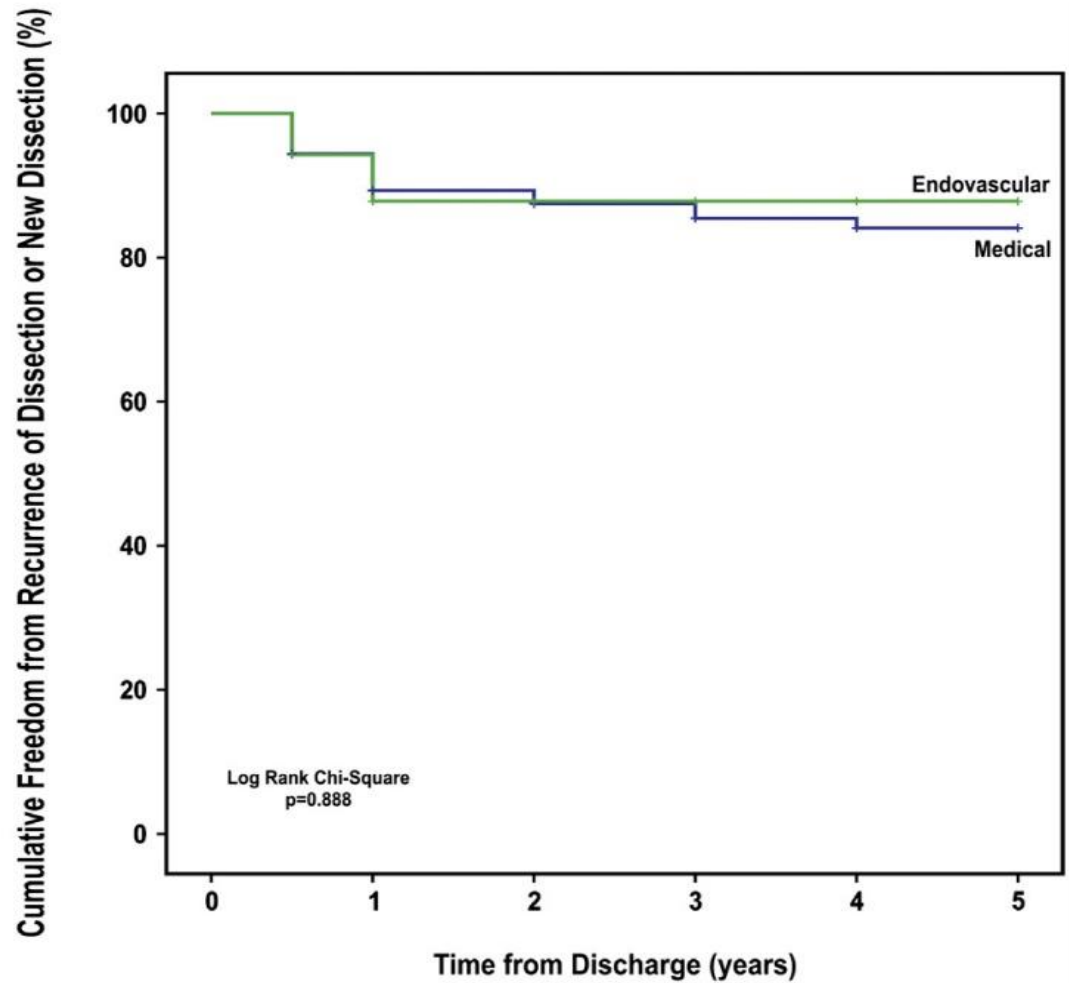
-860 Medical Treatment

-290 TEVAR

-56% had follow up imaging







No. at Risk	0	1	2	3	4	5
Endovascular	87	72	40	26	13	7
Medical	303	259	143	86	63	40

**Figure 3. Kaplan-Meier Estimates of Freedom From New Dissection or Extension of Dissection**

Patients with type B dissection subjected to thoracic endovascular aortic repair are compared with those treated with medical therapy alone.

- No difference in Aortic growth or New aneurysm between Medical(73%) Vs Endovascular (63%)
- Aortic diameter at 5 years only slightly larger in medical group 4.6 cm vs 4.2 cm (Endo)





# What about the abdominal aorta?

- Most trials only report changes to the thoracic component of dissected aorta
- Yet will report that stents grafts : "Induce remodeling in the dissected aorta"



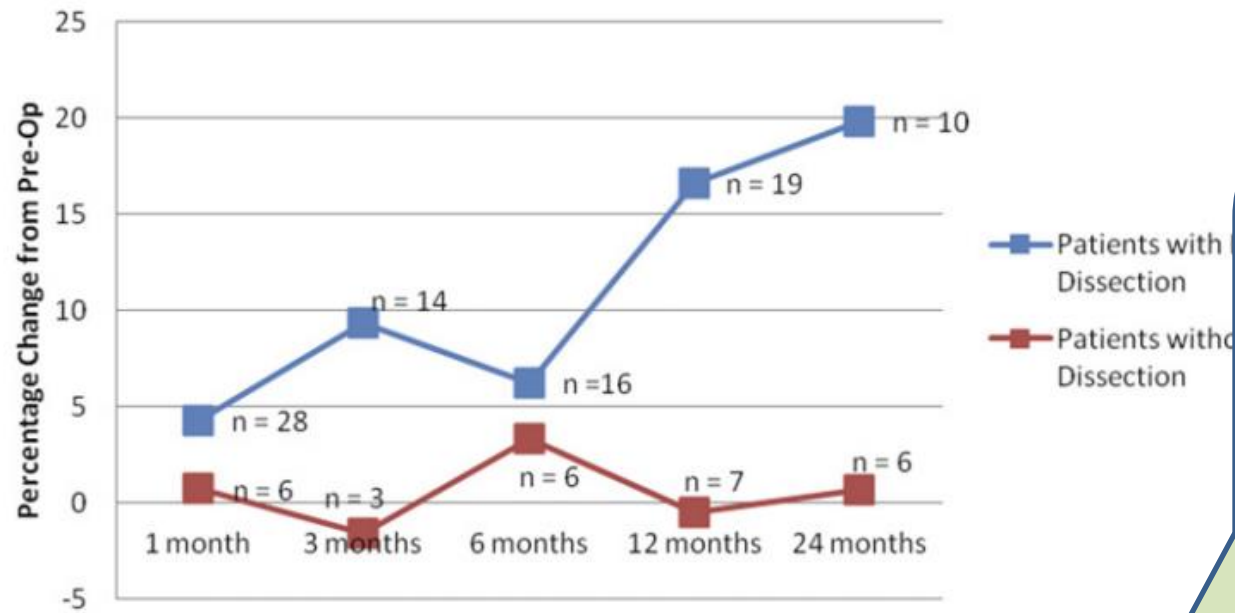
# Patient outcomes and thoracic aortic volume and morphologic changes following thoracic endovascular aortic repair in patients with complicated chronic type B aortic dissection

Iben David Andacheh, MD, Carlos Donayre, MD, Fiezel Othman, MD, Irwin Walot, MD, George Kopchok, BS, and Rodney White, MD, *Torrance, Calif*

(J Vasc Surg 2012;56:644-50.)

Series of 72 patients treated with TEVAR for TBAD  
46 patients (64%) had extension of the dissection into the abdominal aorta





- TBAD where dissection extends to infrarenal aorta, aneurysmal degeneration continues, despite TEVAR

**Fig 6.** Percent change in maximal infrarenal diameter: Patients with preoperative evidence of infrarenal dissection vs. patients without preoperative evidence of infrarenal dissection.

While the thoracic aorta appears to remodel in a favorable manner following TEVAR, remodeling of the infrarenal aorta does not. Our volumetric and diameter measurements suggest that postprocedure infrarenal remodeling may be influenced by the extent of type B dissection.



# Volume analysis of true and false lumens in acute complicated type B aortic dissections after thoracic endovascular aortic repair with stent grafts alone or with a composite device design

Jonathan Sobocinski, MD, PhD,<sup>a</sup> Joseph V. Lombardi, MD,<sup>b</sup> Nuno V. Dias, MD, PhD,<sup>c</sup> Ludovic Berger, MD, PhD,<sup>d</sup> Qing Zhou, PhD,<sup>c</sup> Feiyi Jia, PhD,<sup>c</sup> Timothy Resch, MD, PhD,<sup>c</sup> and Stéphan Haulon, MD, PhD,<sup>a</sup> *Lille and Caen, France; Camden, NJ; Malmö, Sweden; and West Lafayette, Ind*

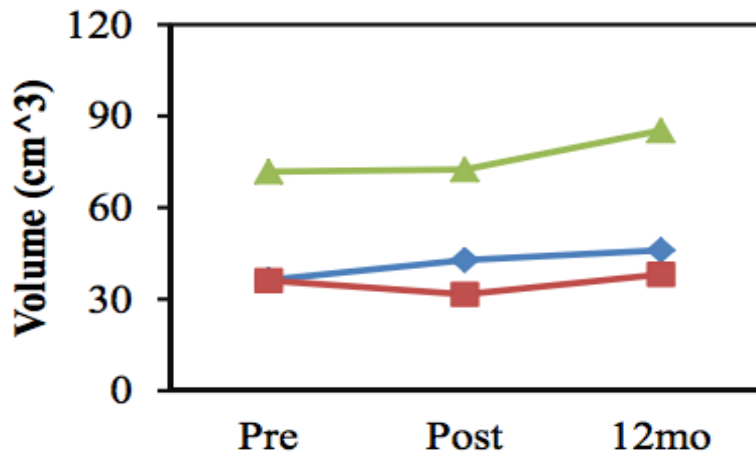
(J Vasc Surg 2016;63:1216-24.)

- Compared aortic remodeling at 12 months in patients with acute complicated TBAD between:
- 45 patients who underwent standard TEVAR
  - 39 patients who underwent composite repair (TEVAR+dissection stents-STABLE)
  - Compared aortic remodeling in both thoracic and abdominal aorta



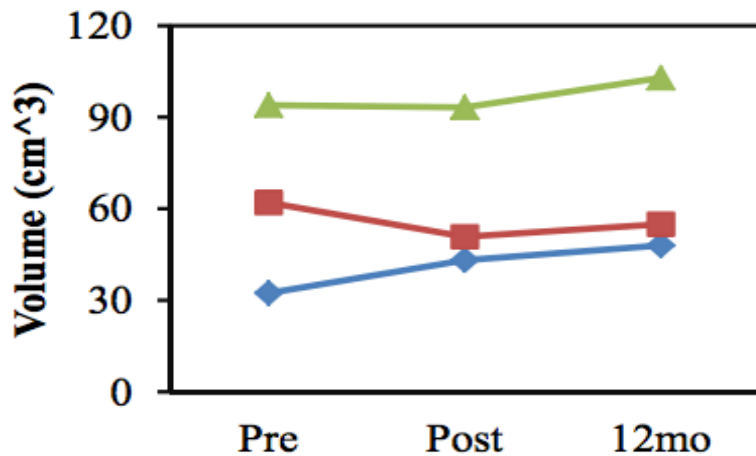


### TEVAR - Abdominal



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	36 (5)	43 (5)	46 (5)		
False lumen	36 (5)	31 (5)	39 (5)		
Total lumen	72 (10)	74 (10)	85 (10)		

### STABLE - Abdominal



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	32 (6)	43 (6)	48 (6)		
False lumen	62 (6)	51 (6)	55 (6)	.004	.254
Total lumen	94 (12)	94 (12)	103 (12)	.827	.003

"Vulnerability of the abdominal aorta after acute aortic dissection repair is a very problematic challenge regardless of the endovascular strategy chosen"





# Myth # 4

- ~~TEVAR would prevent aneurysm formation and rupture~~

## FACT

- TEVAR does induce remodeling primarily in the stented aorta
- Ongoing degeneration continues to occur in the untreated aorta



# Just a TEVAR

**Table 3. Periprocedural Outcomes After TEVAR (30 Days)**

Deaths, n (%)	2 (2.8)
Periprocedural events, n (%)	
Retrograde type A dissection	1 (1.5)
Rupture of iliac access vessel	1 (1.5)
Conversion to open surgery	0 (..)
Ancillary procedures/injuries	3 (4.5)
Stenting of iliac artery	1 (1.5)
Aortic stent-graft extension	1 (1.5)
Aortic bare-stent extension	1 (1.5)
Periprocedural neurological events, n (%)	
Paraplegia/paraparesis	2 (2.9)
Major stroke	1 (1.5)

# Just a TEVAR

**Table II. B,** Morbidity of thoracic endovascular aneurysm repair (*TEVAR*) and open repair for all type B aortic dissections<sup>a</sup>

<i>Complication</i>	<i>Open</i> %	<i>TEVAR</i> %	<i>OR (95% CI)</i>	<i>P</i>
Cardiac	12	5	3.07 (1.41-6.69)	.01
Respiratory	8	4	2.33 (1.01-5.37)	.05
Genitourinary	9	3	5.72 (2.13-15.37)	.01
Hemorrhage	14	3	7.74 (3.56-16.85)	<.01
Acute renal failure	32	17	2.59 (1.66-4.03)	<.01
Stroke	6	3	2.23 (0.93-5.39)	.07
Peripheral vascular	1	2	0.71 (0.19-2.58)	.60
Acute myocardial infarction	3	1	1.66 (0.46-5.99)	.44

*CI*, Confidence interval; *OR*, odds ratio.

<sup>a</sup>Adjusted for age, gender, comorbidities, and admission type.

- NIS database between 2005 and 2007
- 5000 TBAD (1381 TEVAR)
- Inpatient mortality 10.6 % with TEVAR (all comers)

Sachs et al. J Vasc Surg 2010;52:860-6

# Myth # 5

- ~~• TEVAR for uncomplicated acute TBAD is a rather benign procedure~~

## FACT

- TEVAR is associated with 2-10% early mortality and 2-5% stroke/paraparesis risk
- Retrograde type A dissection although rare (~1%) can be potentially fatal
- Risk of cardiovascular, pulmonary, renal and access related complications is not zero





## Society Position Statement

# Canadian Cardiovascular Society/Canadian Society of Cardiac Surgeons/Canadian Society for Vascular Surgery Joint Position Statement on Open and Endovascular Surgery for Thoracic Aortic Disease

19. We suggest that endovascular repair be considered for patients with uncomplicated type B aortic dissections to improve aorta-specific end points (Weak Recommendation, Low-Quality Evidence).
17. We recommend that endovascular repair be first-line therapy for complicated type B aortic dissections to reduce mortality and morbidity (Strong Recommendation, Medium-Quality Evidence).





# Summary

- TBAD represent a high risk cardiovascular condition
- Mortality benefit TEVAR for uncomplicated TBAD remains uncertain
- Clinical and anatomic high risk features should guide use of TEVAR
- TEVAR induces remodeling in stented thoracic aorta, but non-stented aortic segment will likely continue to degenerate
- Procedure related mortality and morbidity should be a consideration when evaluating TEVAR for uncomplicated TBAD



# Summary

- TEVAR for uncomplicated TBAD is a **WEAK RECOMMENDATION AND BASED ON LOW QUALITY EVIDENCE**



## Back to our case...

- 45 years old male with acute uncomplicated type B aortic dissection is **best managed with medical therapy** with judicious use of TEVAR based on clinical and anatomical risk factors, with understanding of potential procedure related complications and a possible long term aortic related mortality benefit





# THANK YOU

Animesh Rathore, MD RPVI

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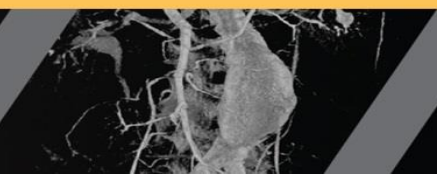
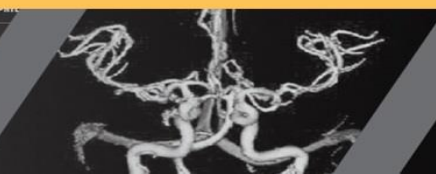
[axrathor@Sentara.com](mailto:axrathor@Sentara.com)



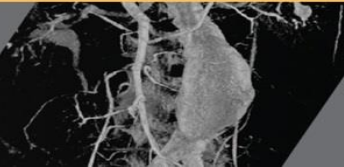
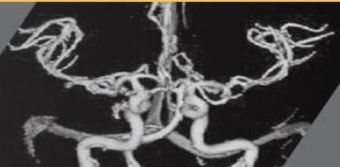
**WOMEN CAN SELL OFF USED UNDERWEAR, SOCKS  
AND GOD KNOWS WHAT ELSE TO LONELY PERVERTED  
MEN.**

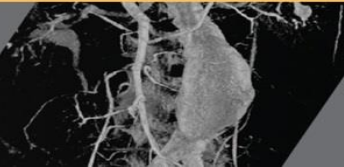
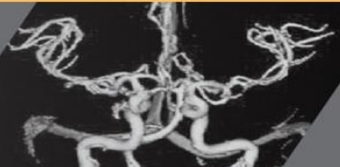


**MEN CANT.**







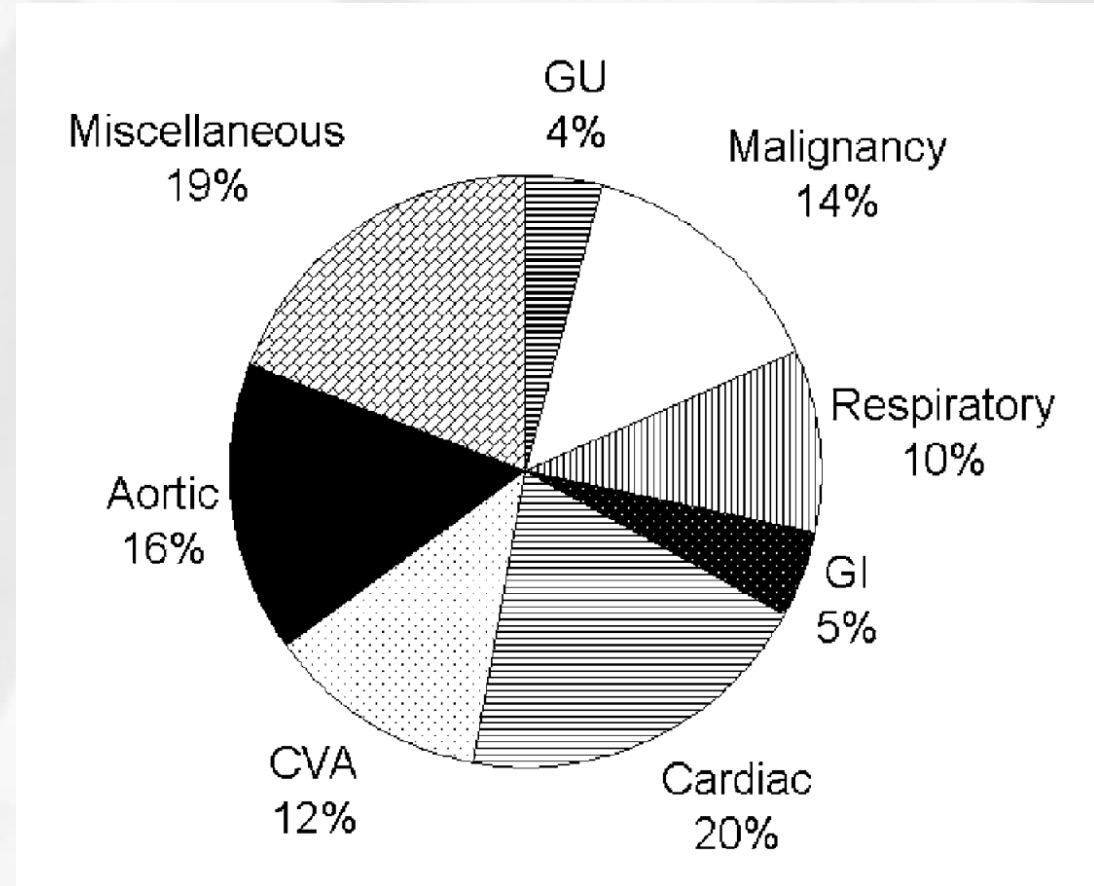


# Causes of late mortality for patients with aortic dissection

Population based analysis of 3616 pts. Overall survival at 6 years 46.1 %

Aortic related causes for mortality only 16% of all causes

Aortic related event rate 2.48 per year



# Surgery for Acquired Cardiovascular Disease

## Is medical therapy still the optimal treatment strategy for patients with acute type B aortic dissections?

ACD

Juan P. Umaña, MD<sup>a</sup>  
David T. Lai, FRACS<sup>a</sup>  
R. Scott Mitchell, MD<sup>a</sup>  
Kathleen A. Moore, BS<sup>a</sup>  
Filiberto Rodriguez, MD<sup>a</sup>  
Robert C. Robbins, MD<sup>a</sup>  
Phillip E. Oyer, MD<sup>a</sup>  
Michael D. Dake, MD<sup>b</sup>  
Norman E. Shumway, MD<sup>a</sup>  
Bruce A. Reitz, MD<sup>a</sup>  
D. Craig Miller, MD<sup>a</sup>

Single center study-Stanford  
122 patients with Type B dissection treated medically  
60 % 5 years survival



**TABLE 5. Causes of the late deaths among the 189 patients subdivided according to treatment method**

	Medical		Surgical	
	No.	%	No.	%
Dissection rupture or extension	8	18	3	10
Sudden unexplained death	2	5	4	14
Arrhythmia	1	2	2	7
Myocardial infarction	2	5	3	10
CHF	5	11	2	7
Prosthetic valve structural valve dysfunction	1	2	0	0
Renal failure	3	7	1	3
Respiratory failure or pneumonia	5	11	2	7
Stroke	3	7	0	0
Anticoagulant hemorrhage	0	0	1	3
Multisystem organ failure	1	2	1	3
Sepsis	3	7	0	0
Malignancy	3	7	2	7
Suicide or accident	1	2	1	3
Gastrointestinal disease	0	0	1	3
Unknown	5	11	2	7
Other	1	2	2	7
<b>Total</b>	<b>44</b>		<b>27</b>	

J Thorac Cardiovasc  
Surg 2002;124: 896-910

Aortic dissection extension rupture accounted for only 18% of deaths





# Argument #1

- Early TEVAR prevents mid and long term aortic related mortality
- FACT:
  - TBAD represent a high risk group for cardiovascular events
  - Aortic related mortality account for only ~ 20% mortality in TBAD



## Argument #2

- Stent graft will induce remodeling in the dissected aorta



# Endovascular Repair of Acute Uncomplicated Aortic Type B Dissection Promotes Aortic Remodelling: 1 Year Results of the ADSORB Trial

J. Brunkwall <sup>a,\*</sup>, P. Kasprzak <sup>b</sup>, E. Verhoeven <sup>c</sup>, R. Heijmen <sup>d</sup>, P. Taylor <sup>d</sup>, the ADSORB Trialists <sup>e</sup>

<sup>a</sup> Department of Vascular and Endovascular Surgery, University Clinics, University of Cologne, Cologne, Germany

<sup>b</sup> Section of Vascular Surgery, Department of Surgery, University of Regensburg, Department of Vascular Surgery, Klinikum Nuernberg, Nuremberg, Germany

<sup>c</sup> Department of Cardiovasc Surgery Antonius Hospital, Nieuwegein, The Netherlands

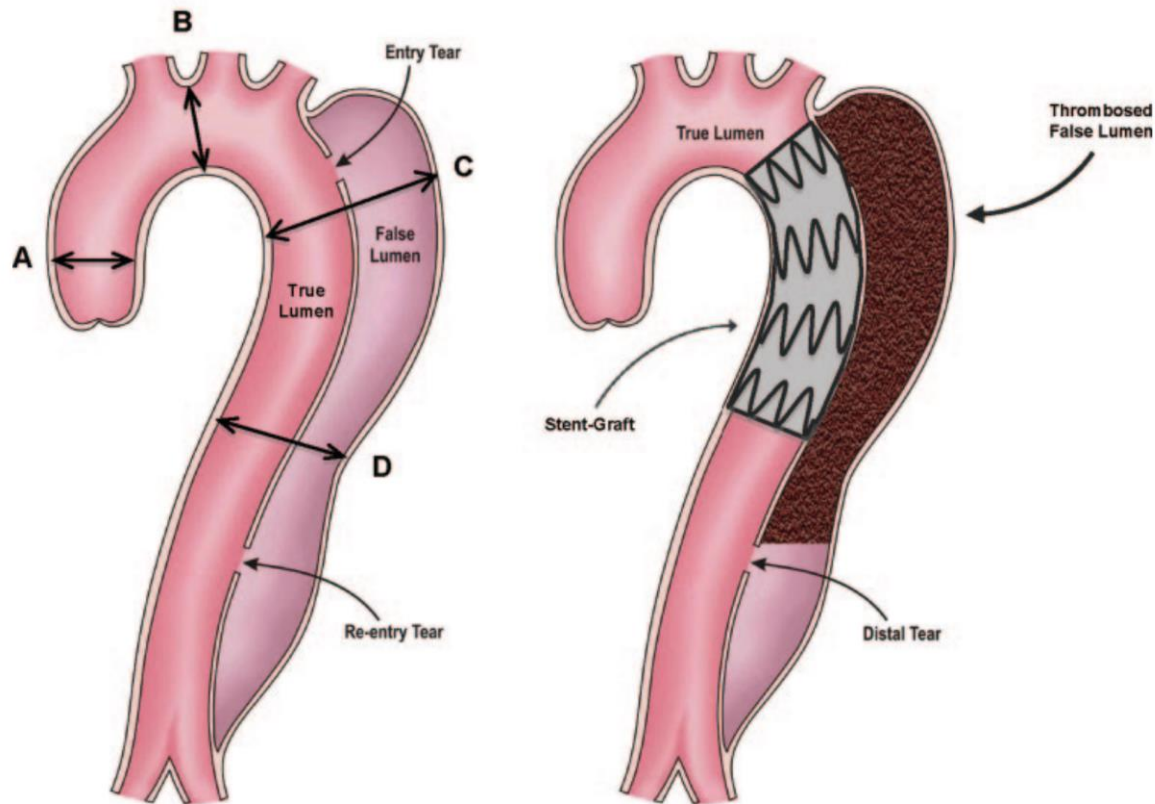
<sup>d</sup> Department of Vascular Surgery, St Guys Hospital, London, UK

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for the INSTEAD Trial





**Figure 2.** Endovascular stent graft in type B dissection. Cartoon demonstrating the typical features of type B dissection with flow in both the true and the expanded false lumen resulting from a major proximal entry tear (left); planes A to D were followed up longitudinally in every patient. A stent graft was placed to scaffold the dissected aorta and to seal the entry to the false lumen, resulting in reconstruction of the true lumen with subsequent false-lumen thrombosis (right). Levels were defined as (A) at the sinotubular junction, (B) at the center of the arch between truncus brachiocephalicus and left common carotid artery, (C) at the level of the maximum aortic diameter, and (D) at the hiatus.

INSTEAD trial Circ 2009

1. *Incomplete or no false lumen thrombosis* in any portion of the false lumen parallel to the stent graft, excluding the distal 2 cm, and in the BMT group at any point in the descending thoracic aorta.
2. *Aortic dilatation* of  $\geq 5$  mm or the maximum diameter of the descending thoracic aorta  $\geq 55$  mm.

ADSORB Trial





# What about the abdominal aorta?

- Most trials only report changes to the thoracic component of dissected aorta
- Yet will report that stents grafts : "Induce remodeling in the dissected aorta"





# What happens to the un-stented aorta after TEVAR for Type B aortic dissection?

Late aortic remodeling persists in the stented segment after endovascular repair of acute complicated type B aortic dissection

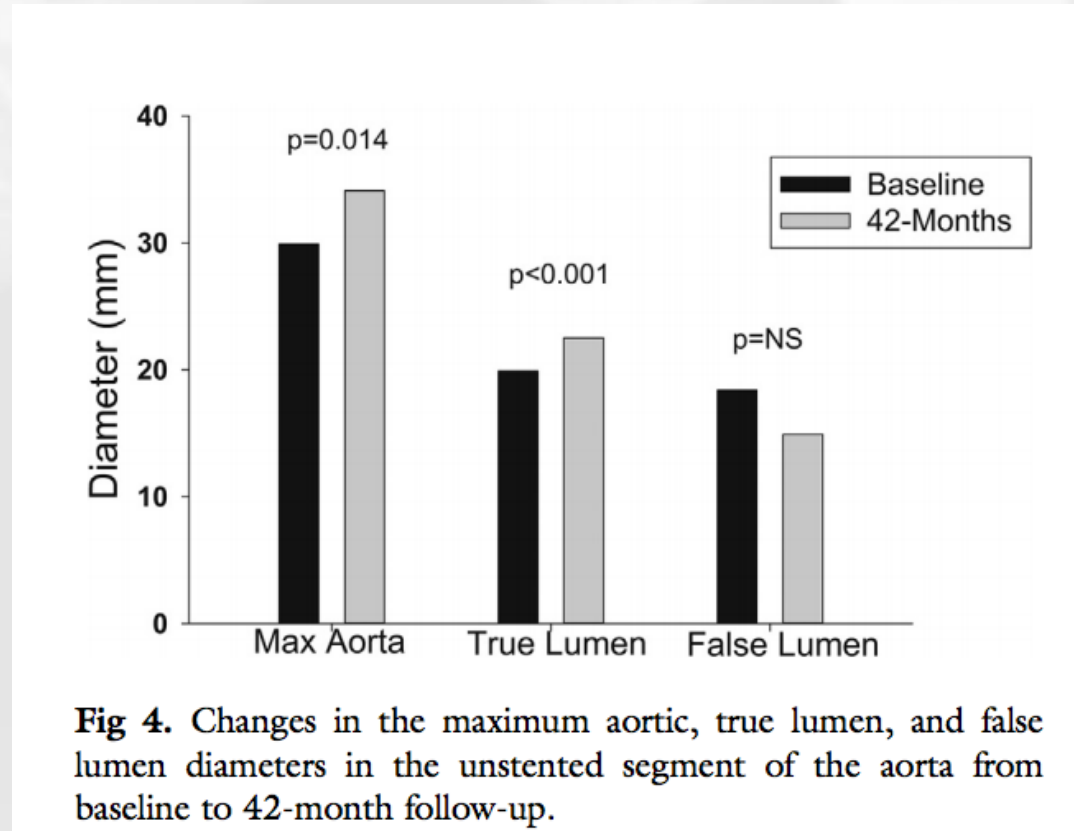
Mark F. Conrad, MD, MMSc, Stephanie Carvalho, BS, Emel Ergul, MS, Christopher J. Kwolek, MD, R. Todd Lancaster, MD, MPH, Virendra I. Patel, MD, MPH, and Richard P. Cambria, MD, *Boston, Mass*

(J Vasc Surg 2015;62:600-5.)

31 Patients treated with TEVAR for TBAD  
Mean follow up 42 months



# What happens to the un-stented aorta after TEVAR for Type B aortic dissection?



Conclusions: TEVAR of acute AD promotes long-term remodeling across the stented segment, with false lumen obliteration in 84% of patients. However, false lumen obliteration beyond the stented segment appears necessary to prevent late aneurysmal degeneration of the distal aorta. (J Vasc Surg 2015;62:600-5.)

Increase in aortic diameter in the un-stented aorta

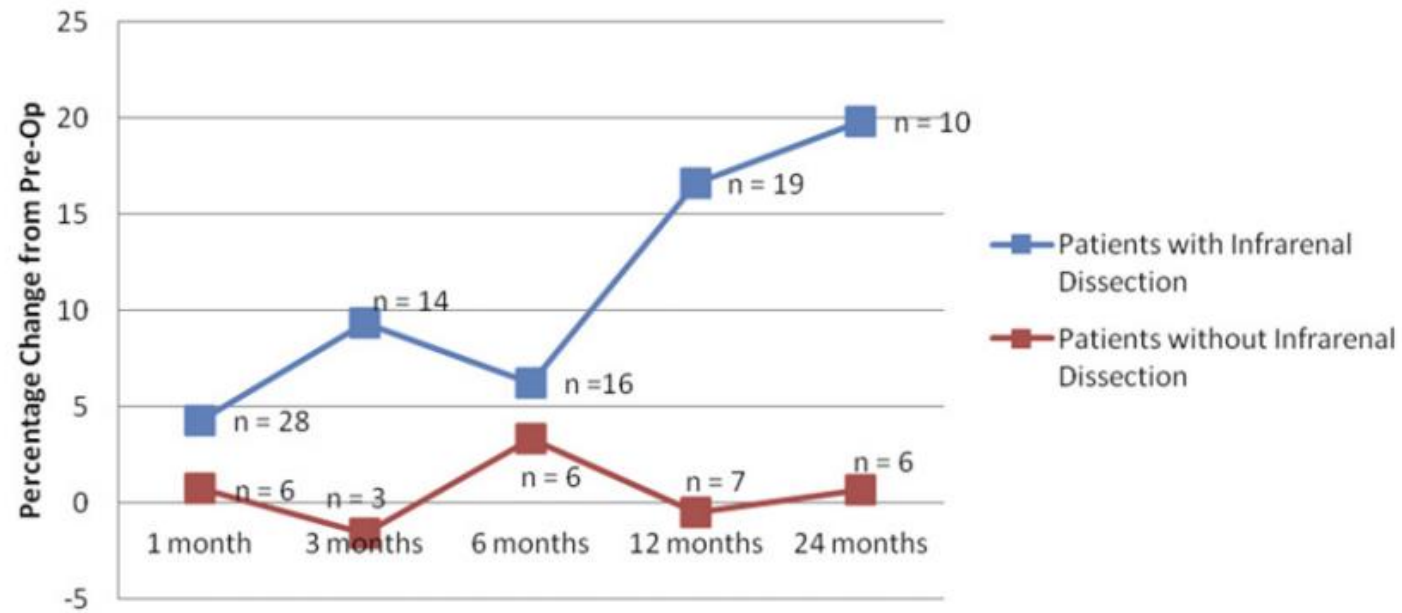
# Patient outcomes and thoracic aortic volume and morphologic changes following thoracic endovascular aortic repair in patients with complicated chronic type B aortic dissection

Iben David Andacheh, MD, Carlos Donayre, MD, Fiezel Othman, MD, Irwin Walot, MD, George Kopchok, BS, and Rodney White, MD, *Torrance, Calif*

(J Vasc Surg 2012;56:644-50.)

Series of 72 patients treated with TEVAR for TBAD  
46 patients (64%) had extension of the dissection into the abdominal aorta



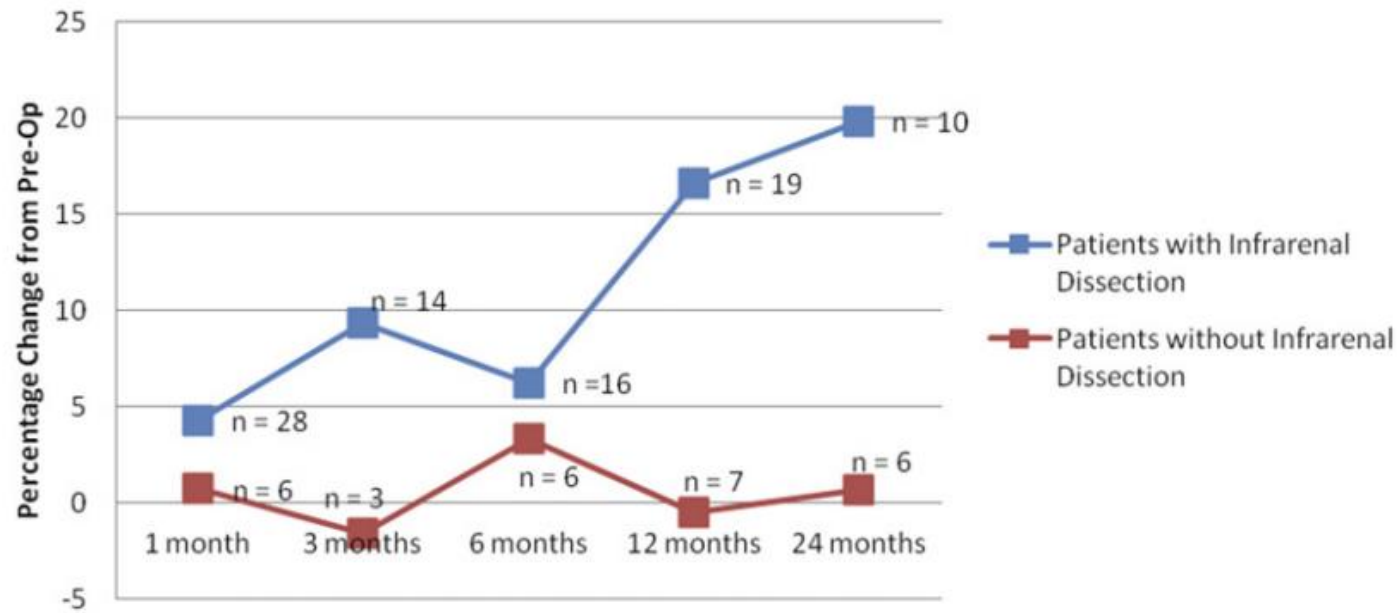


**Fig 6.** Percent change in maximal infrarenal diameter: Patients with preoperative evidence of infrarenal dissection vs patients without preoperative evidence of infrarenal dissection.

Abdominal aortic diameter increased by 17% and volume by 22% at 1-year







**Fig 6.** Percent change in maximal infrarenal diameter: Patients with preoperative evidence of infrarenal dissection vs patients without preoperative evidence of infrarenal dissection.

**While the thoracic aorta appears to remodel in a predictable manner following TEVAR, remodeling of the infrarenal aorta does not. Our volumetric and diameter measurements suggest that postprocedure infrarenal remodeling may be influenced by the extent of type B dissection.**





# Volume analysis of true and false lumens in acute complicated type B aortic dissections after thoracic endovascular aortic repair with stent grafts alone or with a composite device design

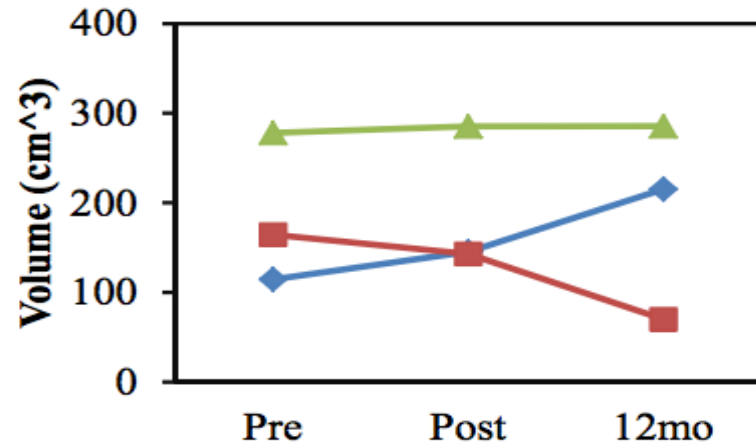
Jonathan Sobocinski, MD, PhD,<sup>a</sup> Joseph V. Lombardi, MD,<sup>b</sup> Nuno V. Dias, MD, PhD,<sup>c</sup> Ludovic Berger, MD, PhD,<sup>d</sup> Qing Zhou, PhD,<sup>c</sup> Feiyi Jia, PhD,<sup>c</sup> Timothy Resch, MD, PhD,<sup>c</sup> and Stéphan Haulon, MD, PhD,<sup>a</sup> *Lille and Caen, France; Camden, NJ; Malmö, Sweden; and West Lafayette, Ind*

(J Vasc Surg 2016;63:1216-24.)

- Compared aortic remodeling at 12 months in patients with acute complicated TBAD between:
- 45 patients who underwent standard TEVAR
  - 39 patients who underwent composite repair (TEVAR+dissection stents-STABLE)
  - Compared aortic remodeling in both thoracic and abdominal aorta

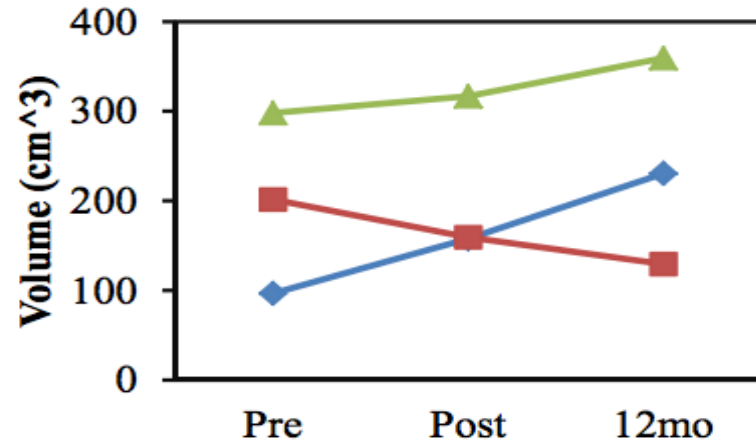


### TEVAR - Thoracic



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	114 (9)	146 (11)	215 (9)	.008	<.001
False lumen	165 (13)	143 (15)	70 (13)	.099	<.001
Total lumen	278 (16)	285 (18)	286 (16)	.559	>.99

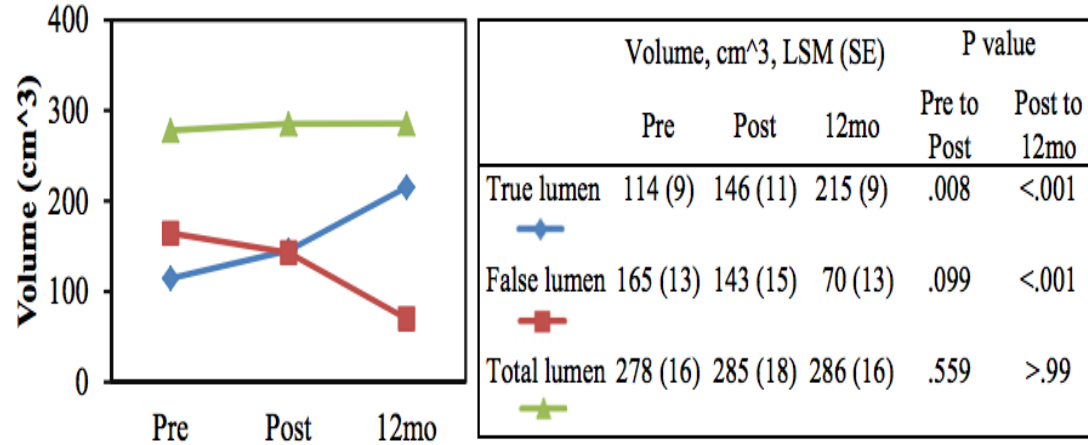
### STABLE - Thoracic



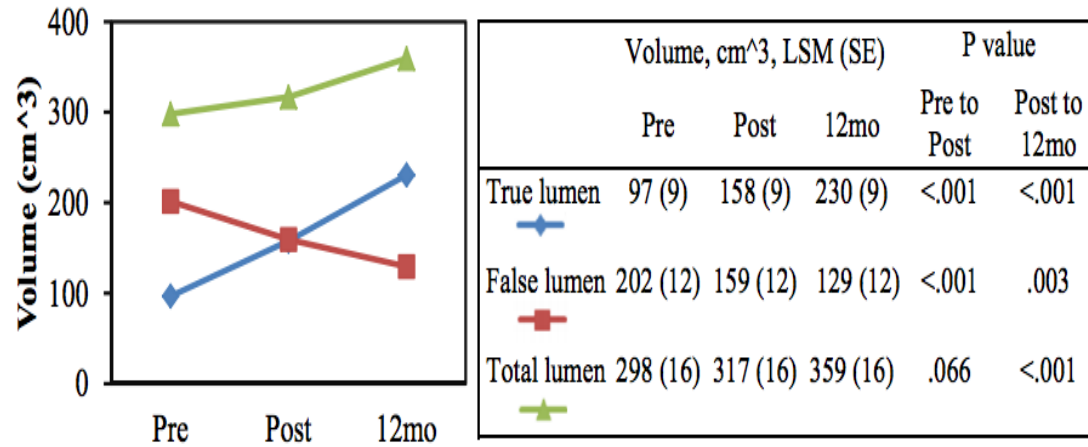
	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	97 (9)	158 (9)	230 (9)	<.001	<.001
False lumen	202 (12)	159 (12)	129 (12)	<.001	.003
Total lumen	298 (16)	317 (16)	359 (16)	.066	<.001



### TEVAR - Thoracic



### STABLE - Thoracic

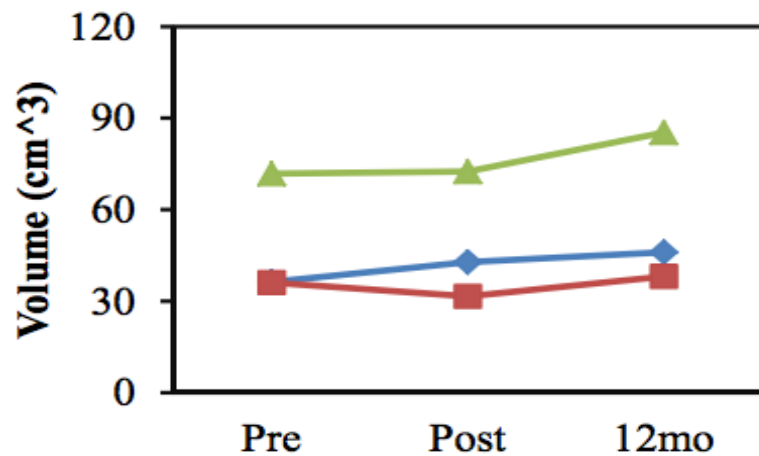


Complete thrombosis of the Thoracic false lumen occurred in:

- 51% of the TEVAR patients
- 38% on STABLE patients

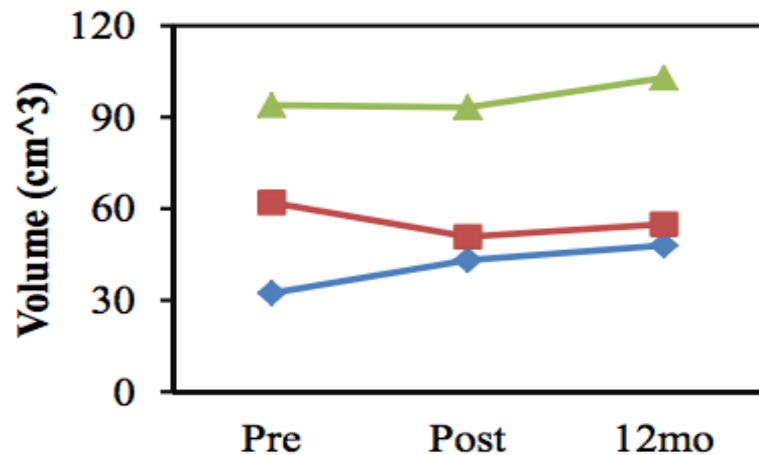


### TEVAR - Abdominal



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen —◆—	36 (5)	43 (5)	46 (5)	.055	.328
False lumen —■—	36 (4)	31 (5)	38 (4)	.238	.085
Total lumen —▲—	72 (6)	72 (7)	85 (6)	.870	.002

### STABLE - Abdominal

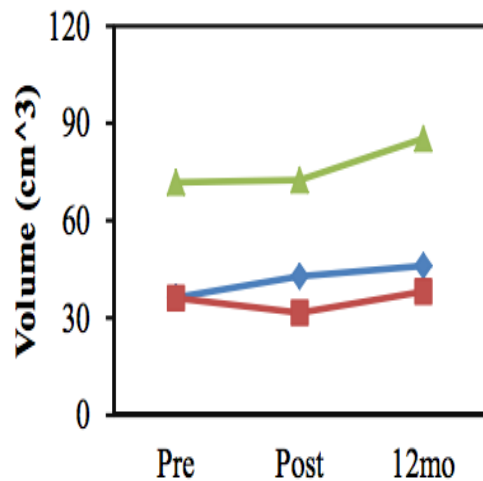


	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen —◆—	32 (4)	43 (4)	48 (4)	<.001	.035
False lumen —■—	62 (5)	51 (5)	55 (5)	.004	.254
Total lumen —▲—	94 (6)	93 (6)	103 (6)	.827	.003



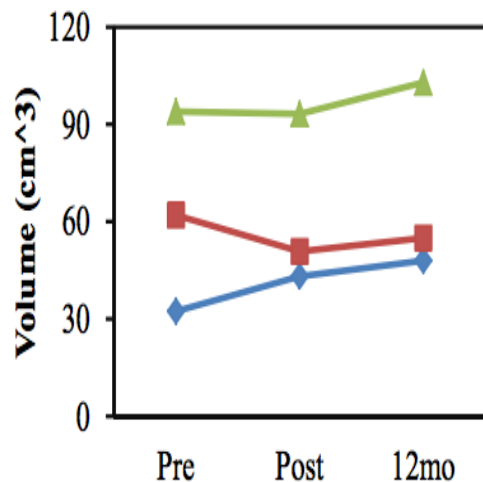


### TEVAR - Abdominal



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	36 (5)	43 (5)	46 (5)	.055	.328
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Total lumen	72 (6)	72 (7)	85 (6)	.870	.002

### STABLE - Abdominal



	Volume, cm <sup>3</sup> , LSM (SE)			P value	
	Pre	Post	12mo	Pre to Post	Post to 12mo
True lumen	32 (4)	43 (4)	48 (4)	<.001	.035
False lumen	62 (5)	51 (5)	55 (5)	.004	.254
Total lumen	94 (6)	93 (6)	103 (6)	.827	.003

Complete thrombosis of the abdominal false lumen occurred in:

- 18% of the TEVAR patients
- 11% of the STABLE patients



# Volume analysis of true and false lumens in acute complicated type B aortic dissections after thoracic endovascular aortic repair with stent grafts alone or with a composite device design

Jonathan Sobocinski, MD, PhD,<sup>a</sup> Joseph V. Lombardi, MD,<sup>b</sup> Nuno V. Dias, MD, PhD,<sup>c</sup> Ludovic Berger, MD, PhD,<sup>d</sup> Qing Zhou, PhD,<sup>e</sup> Feiyi Jia, PhD,<sup>e</sup> Timothy Resch, MD, PhD,<sup>c</sup> and Stéphan Haulon, MD, PhD,<sup>a</sup> *Lille and Caen, France; Camden, NJ; Malmö, Sweden; and West Lafayette, Ind*

1 year. This study indicates that the vulnerability of the abdominal aorta after acute aortic dissection repair is a very problematic challenge regardless of the endovascular strategy chosen.



## Myth #2

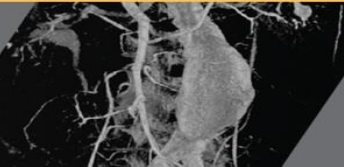
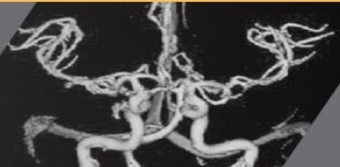
- Early TEVAR can induce positive remodeling of the ***entire*** dissected aorta
- TEVAR does induce remodeling in the thoracic aorta
- Ongoing degeneration does occur in the untreated aorta



# Myth #3

- It's just a TEVAR





# Myth #4

- Aortic related complications cannot be predicted by clinical and anatomic factors





**Table 3.** Clinical and Radiological Predictive Findings

	Influence Mortality (Reference Source)	Influence Growth Rate or Rupture (Reference Source)
<b>Clinical Parameters</b>		
Recurrent/refractory pain	↑ OR 3.3 [25]	
Age (> 70 yr)	↑ OR 5.1 [25]	
Absence of CP on admission	↑ OR 3.5 [25]	
BP control (< 120 mm Hg)		↓ [44,46-48]
White race		↓ [32,43-46]
Marfan syndrome		↓ [32,43-46]
Tight rate control (<60 bpm)		↓ [32,43-46]
Ca-channel blockers		↓ [32,43-46]
<b>Radiological Predictors</b>		
Initial diameter > 5.5-6.0 cm	↑ 4×	↑ [13,52,56]
False lumen diameter > 22 mm		↑ [32]
Crescentic false lumen		↑ [46]
Patent false lumen*	↑ [31]	↑ [48-51,50,55,57,58]
Patent entry tear		↑ [30]
Entry tear near subclavian (< 5 cm)		↑ [63,64,66]
Single entry tear (without multiple fenestrations)		↑ [63,64]
Multiple false lumens	↑ OR 5.6 [65]	
Large entry tear (> 10 mm)		↑ [43]
False lumen on inner curve		↑ [33,46]

\*Partial thrombosis controversial, in terms of negative impact on natural history [15,31,46,58,59,60,61].

Thomas Luebke, MD, PhD  
Aorta, December 2014,  
Volume 2, Issue 6: 265–278



## Society Position Statement

# Canadian Cardiovascular Society/Canadian Society of Cardiac Surgeons/Canadian Society for Vascular Surgery Joint Position Statement on Open and Endovascular Surgery for Thoracic Aortic Disease

19. We suggest that endovascular repair be considered for patients with uncomplicated type B aortic dissections to improve aorta-specific end points (Weak Recommendation, Low-Quality Evidence).
17. We recommend that endovascular repair be first-line therapy for complicated type B aortic dissections to reduce mortality and morbidity (Strong Recommendation, Medium-Quality Evidence).





# Cardiovascular Surgery

## Randomized Comparison of Strategies for Type B Aortic Dissection

### The INvestigation of STEnt Grafts in Aortic Dissection (INSTEAD) Trial

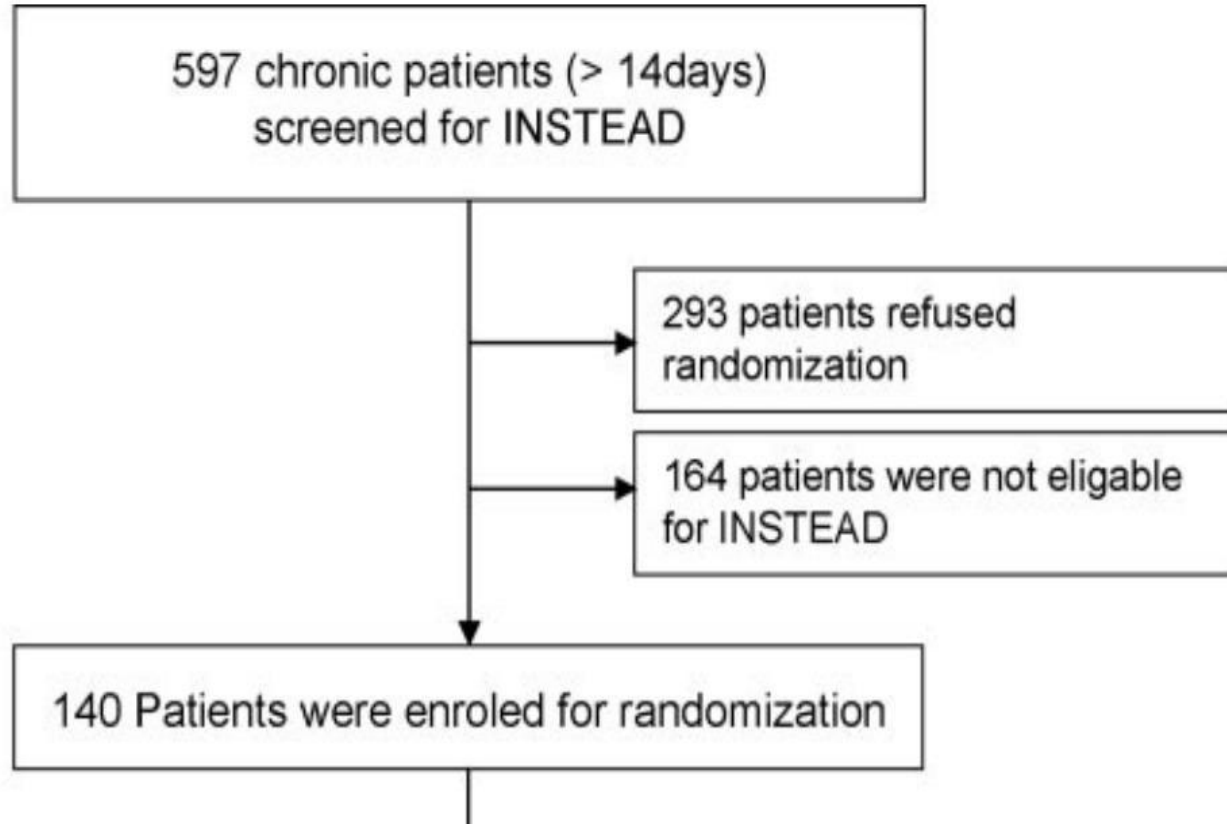
Christoph A. Nienaber, MD, PhD; Hervé Rousseau, MD, PhD; Holger Eggebrecht, MD;  
Stephan Kische, MD; Rossella Fattori, MD, PhD; Tim C. Rehders, MD; Günther Kundt, PhD;  
Dierk Scheinert, MD, PhD; Martin Czerny, MD, PhD; Tilo Kleinfeldt, MD; Burkhard Zipfel, MD;  
Louis Labrousse, MD, PhD; Hüseyin Ince, MD, PhD;  
for the INSTEAD Trial

(Circulation. 2009;120:2519-2528.)

Randomized 140 patients to TEVAR vs BMT with >14 days uncomplicated TBAD



Of those screened only 23% were enrolled



**Table 3. Periprocedural Outcomes After TEVAR (30 Days)**

Deaths, n (%)	2 (2.8)
Periprocedural events, n (%)	
Retrograde type A dissection	1 (1.5)
Rupture of iliac access vessel	1 (1.5)
Conversion to open surgery	0 (...)
Ancillary procedures/injuries	3 (4.5)
Stenting of iliac artery	1 (1.5)
Aortic stent-graft extension	1 (1.5)
Aortic bare-stent extension	1 (1.5)
Periprocedural neurological events, n (%)	
Paraplegia/paraparesis	2 (2.9)
Major stroke	1 (1.5)

70 Patients with TEVAR





**Table 3. Periprocedural Outcomes After TEVAR (30 Days)**

Deaths, n (%)	2 (2.8)
Periprocedural events, n (%)	
Retrograde type A dissection	1 (1.5)
Rupture of iliac access vessel	1 (1.5)
Conversion to open surgery	0 (. . .)
Ancillary procedures/injuries	3 (4.5)
Stenting of iliac artery	1 (1.5)
Aortic stent-graft extension	1 (1.5)
Aortic bare-stent extension	1 (1.5)
Periprocedural neurological events, n (%)	
Paraplegia/paraparesis	2 (2.9)
Major stroke	1 (1.5)

30- day mortality in population sample  
for elective TEVAR was 5%

# Open and endovascular repair of type B aortic dissection in the Nationwide Inpatient Sample

**Teviah Sachs, MD, Frank Pomposelli, MD, Robert Hagberg, MD, Allen Hamdan, MD, Mark Wyers, MD, Kristina Giles, MD, and Marc Schermerhorn, MD, *Boston, Mass***



**Table 5. Events Within 2 Years of Randomization**

	OMT	OMT+TEVAR	<i>P</i>
Overall deaths, n (%)	3 (4.4)	8 (11.1)	0.20
Aorta-related deaths, n (%)	2 (2.9)	4 (5.6)	0.68
Secondary interventions, n (%)	15 (22.1)	13 (18.1)	0.74
Crossover	11 (16.2)	N/A	N/A
Conversion to surgery	3 (4.4)	3 (4.2)	1.00
Stent-graft extension	N/A	6 (8.3)	N/A
Aortic bare-stent extension	N/A	1 (1.4)	N/A
PTA/access-vessel repair	1 (1.5)	3 (4.2)	0.62
Adverse events, n (%)			
Persistent paraplegia/ paraparesis	1 (1.4)	2 (2.8)	0.90
Major stroke	0 (..)	2 (2.8)	0.53

OMT indicates optimal medical treatment; N/A, not applicable; and PTA, percutaneous transluminal angioplasty.

No difference in clinically relevant endpoints in 2 years

Criticized for being underpowered



## 2-Year follow-up

Maximum aortic diameter	48.3±13.1	43.8±12.5	0.31
True-lumen diameter at level C	22.7±10.9	32.3±6.4	<0.001
False-lumen diameter at level C	26.8±9.4	12.5±16.7	<0.001
True-lumen diameter at level D	18.3±7.8	27.0±7.3	<0.001
False-lumen diameter at level D	26.9±10.3	13.8±14.9	<0.001
False-lumen thrombosis at 2 y, n (%)‡			
Complete	13 (19.4)	63 (91.3)	<0.001
Incomplete	6 (9.1)	6 (8.7)	0.79

Values are mean±SD.

Aortic remodeling was superior in the TEVAR group

Did not measure changes to the abdominal aorta





- All-cause mortality at 5 years was no different between TEVAR (11% vs 19%,  $P=0.13$ )
- Thus the primary endpoint of the trial ***was not significantly different***



# Myth #5

- There is a strong evidence supporting the treatment of all uncomplicated type B dissection with TEVAR





## Survival After Endovascular Therapy in Patients With Type B Aortic Dissection

### A Report From the International Registry of Acute Aortic Dissection (IRAD)

Rossella Fattori, MD,\* Daniel Montgomery, BS,† Luigi Lovato, MD,‡ Stephan Kische, MD,§ Marco Di Eusanio, MD,‡ Hüseyin Ince, MD,§ Kim A. Eagle, MD,† Eric M. Isselbacher, MD,|| Christoph A. Nienaber, MD§

*Pesaro and Bologna, Italy; Ann Arbor, Michigan; Rostock, Germany; and Boston, Massachusetts*

- Compared 5 year survival between TEVAR (n=853) and medical treatment (n=276)
- TEVAR group had lower 5 year survival 29% vs 15% in medical group despite more complicated patients in TEVAR group



# Endovascular Repair of Acute Uncomplicated Aortic Type B Dissection Promotes Aortic Remodelling: 1 Year Results of the ADSORB Trial

J. Brunkwall <sup>a,\*</sup>, P. Kasprzak <sup>b</sup>, E. Verhoeven <sup>c</sup>, R. Heijmen <sup>d</sup>, P. Taylor <sup>d</sup>, the ADSORB Trialists <sup>e</sup>

<sup>a</sup> Department of Vascular and Endovascular Surgery, University Clinics, University of Cologne, Cologne, Germany

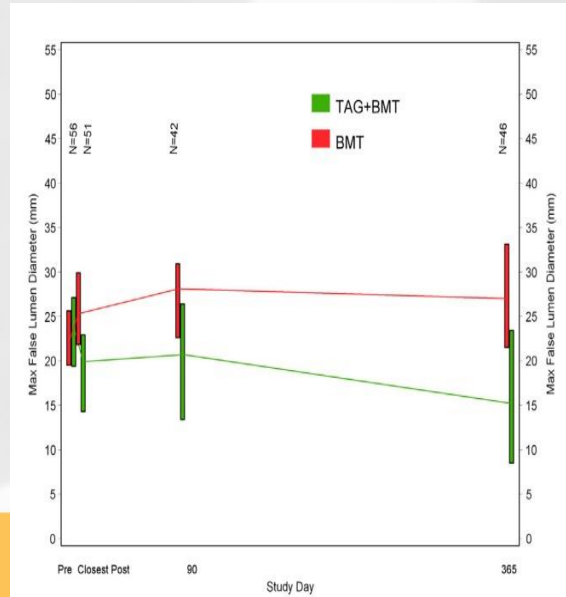
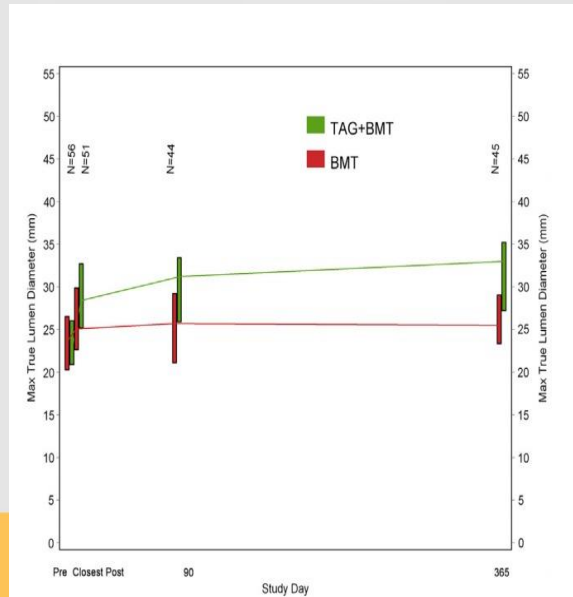
<sup>b</sup> Section of Vascular Surgery, Department of Surgery, University of Regensburg, Department of Vascular Surgery, Klinikum Nuernberg, Nuremberg, Germany

<sup>c</sup> Department of Cardiovasc Surgery Antonius Hospital, Nieuwegein, The Netherlands

<sup>d</sup> Department of Vascular Surgery, St Guys Hospital, London, UK

[Eur J Vasc Endovasc Surg.](#) 2014  
Sep;48(3):285-91.

TEVAR+BMT: Better re-expansion of the true lumen



TEVAR+BMT: reduction in false lumen diameter



# From the horse's mouth



# Summary

