How to prevent retrograde type A aortic dissection after TEVAR

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Retrograde Aortic Dissection After Thoracic Endovascular Aortic Repair

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MOTHER Registry

- 1010 total patients
  - Data from 5 prospective trials St. George's Hospital
  - 16 patients (1.6%) with RTAD

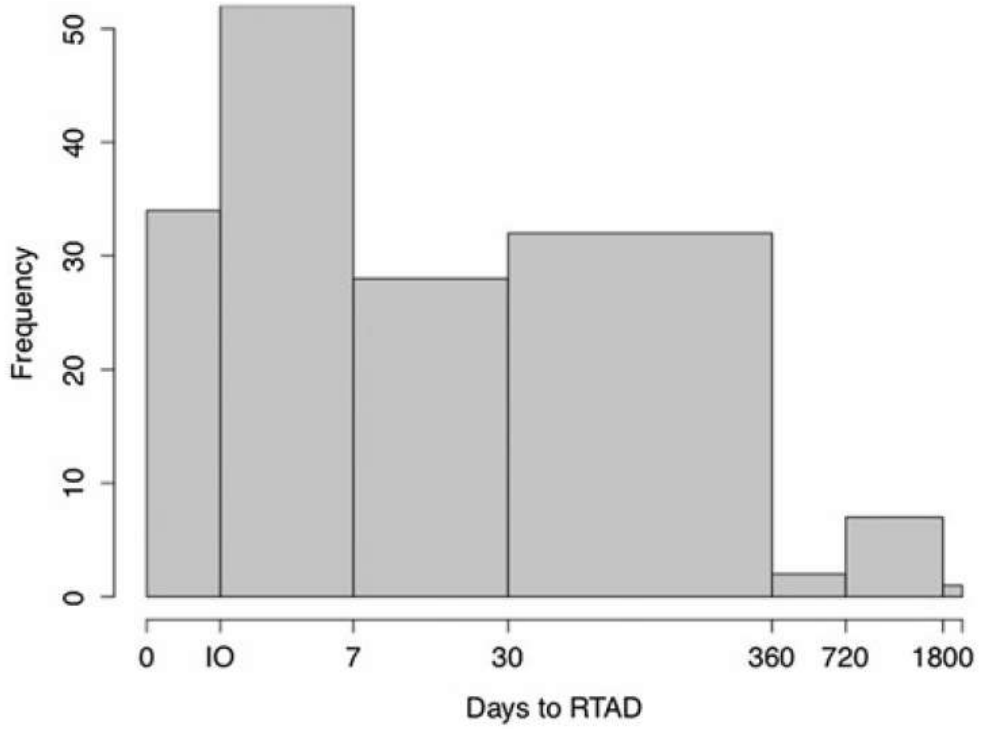
Systematic Review

- EMBASE, Medline, Cochrane
  - 51 series
  - 174 patients with RTAD

Ann Surg 2014;260:389-395.

Results of Pooled Analysis

Incidence of RTAD: 1.7% (168/9594)
30-day mortality: 33.6%



Timing of RTAD: range 0-1825 days

Intra-operatively:	21%
Within 30 days:	50%
Greater than 30 days:	29%

Ann Surg 2014;260:389-395.

Results of Pooled Analysis

Proximal Stent-Graft Configuration

TABLE 3. Incidence of RTAD: Combined Data From MOTHER, and Published Literature From Units Reporting Incidence of RTAD Alongside Both Their Whole Experience of TEVAR As Well As Proximal Stent Graft Configuration

	BS	Non-BS	Ration BS/No BS	Stent-Graft Involved
Pamler et al[11]	2	0	3/11	Talent (2)
Shimono et al[12]	0	1	0/37	Homemade nonbare stent
Czermak et al[14]	1	0	14/4	Talent (1)
Kato et al[15]	0	1	0/38	Homemade nonbare stent
Hansen et al[16]	3	0	28/32	Talent (3)
Grabenwoger et al[19]	1	0	32/48	Talent (3)
Lee et al[20]	1	0	26/20	Homemade bare stent
Dong Xu et al[23]	3	0	30/0	Talent (3)
Böckler et al[25]	0	1	6/31	TAG (1)
Xu et al[26]	4	0	63/0	Talent or Vasoflow
		RR	2.8% 2.4%	2883
Dubener et al[28]	1	0	13/0	Talent (1)
Kpodonu et al[33]	0	7	0/287	TAG (7)
Kische et al[34]	1	0	180/0	Talent (1)
Kaya et al[1]	2	0	113/0	Talent (2)
Oberhuber et al[44]	0	1	10/19	TAG (1)
Parsa et al[45]	0	2	1/50	Zenith TX (1)
Kim et al[48]	3	0	41/0	Talent/Valiant (3)
Canaud et al[49]	1	3	42/140	Valiant (1) TAG (3)

Incidence of RTAD

Proximal Bare Stent Endografts 2.8%

vs.

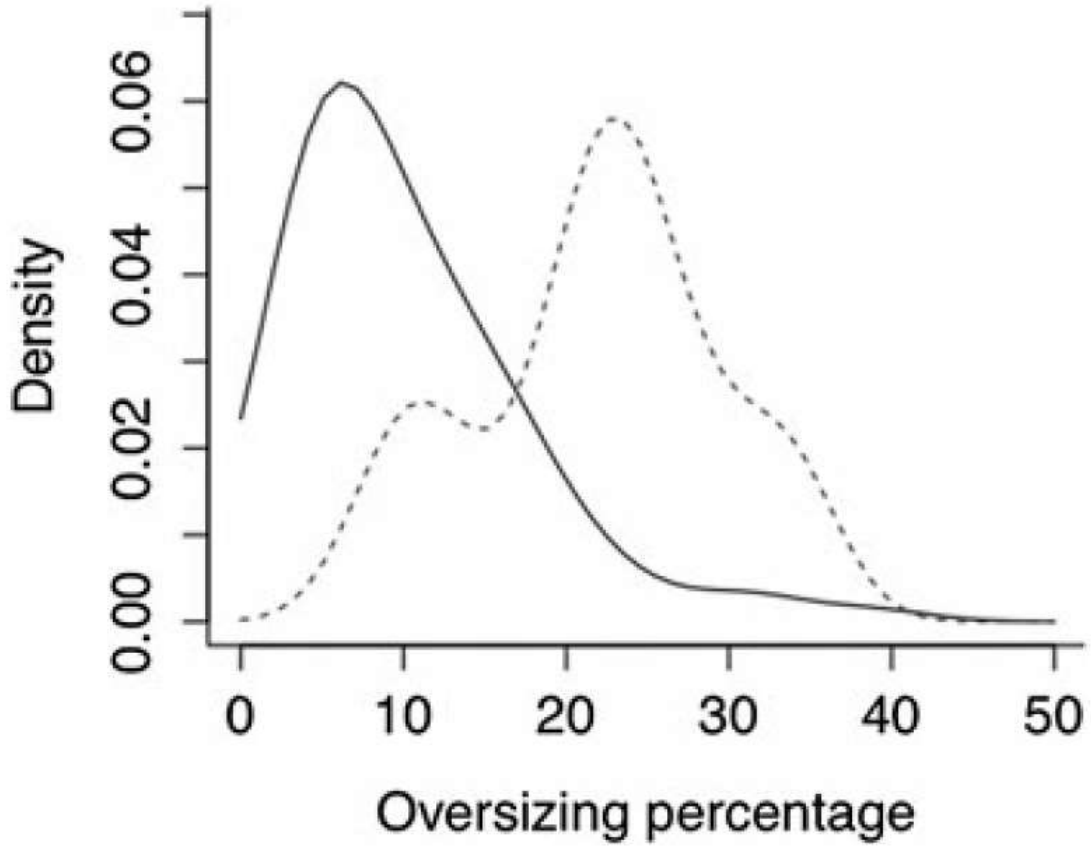
Non-bare stent Endografts 2.4%

p = 0.5895

Ann Surg 2014;260:389-395.

Results of Pooled Analysis

Comparative Kernal density plots of % oversizing



RTAD associated with device oversizing > 9% (each 1% oversizing increase lead to increase in OR of RTAD by 1.14, $p < 0.0001$)

Ann Surg 2014;260:389-395.

Results of Pooled Analysis

Proximal Landing Zone

0: 6.8% 1: 2.4% 2: 4.1% 3/4: 1.9%

TABLE 1. Incidence, Timing, Indication for TEVAR, Proximal Landing Zone (Ishimaru Classification), Outcomes, Proximal Stent-Graft Configuration Oversizing of Patients Included in the Systematic Review and of the MOTHER Database

			MOTHER Registry	Pooled Systematic Review and MOTHER	*P*
RTAD (n)			16	190	
Incidence, % (n)			1.58 (16/1010)	1.7 (168/9894)	
Time to RTAD (mean days)			110.1	257.4	
Indication	Aortic dissection	Acute	4.3 (5/114)	8.4 (26/309)*	*$P = 0.0000000000591$
		Chronic	3 (6/195)	3 (10/325)*	
		Total	3.5 (11/309)	4% (81/2004)	
	Degenerative aneurysm		0.7 (5/670)	0.9% (12/1315)*	
	Traumatic aortic transection		0 (0/15)	0 (0/99)*	
	Penetrating aortic ulcer		0 (0/16)	0 (0/112)*	
Proximal landing zone	Zone 0		0 (0/12)	6.8 (8/118)†	†$P = 0.00002555$
	Zone 1		1.5 (1/68)	2.4 (2/85)†	
	Zone 2		2.7 (9/330)	4.1 (28/691)†	
	Zone 3		1.0 (4/409)	1.3 (17/1346)†	
	Zone 4		1 (2/191)		
Proximal stent-graft configuration	Proximal bare stent		1.6 (16/997)	2.8 (48/1724)‡	‡$P = 0.1298$
	Nonproximal bare stent		0 (0/13)	1.9 (28/1456)‡	
Oversizing			RTAD: 22% Non RTAD: 10.3%§	—	§$P < 0.0000001217$
30-day mortality			32.1 (56/174)	50 (8/16)	33.6 (64/190)

Ann Surg 2014;260:389-395.

Results of Pooled Analysis

Type of Aortic Pathology

Dissection: 4% Aneurysm: 0.9% TAI/PAU: 0%

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Results of Pooled Analysis

Type of Dissection

Acute: 8.4% Chronic 3.1%

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Ann Surg 2014;260:389-395.

2017 Meta-Analysis

- 50 publications
- 8969 pts
- Incidence: 2.5%
- Mortality: 37.1%
- Acute>>Chronic
- Dissection>>Aneurysm
- Proximal Bare Stent>>Non-Bare

American Heart Association | American Stroke Association

Retrograde Type A Aortic Dissection After Thoracic Endovascular Aortic Repair: A Systematic Review and Meta-Analysis

Yanqing Chen, MD;* Simeng Zhang, MD;* Lei Liu, MD;* Qingsheng Lu, MD; Tianyi Zhang, MD; Zaiping Jing, MD

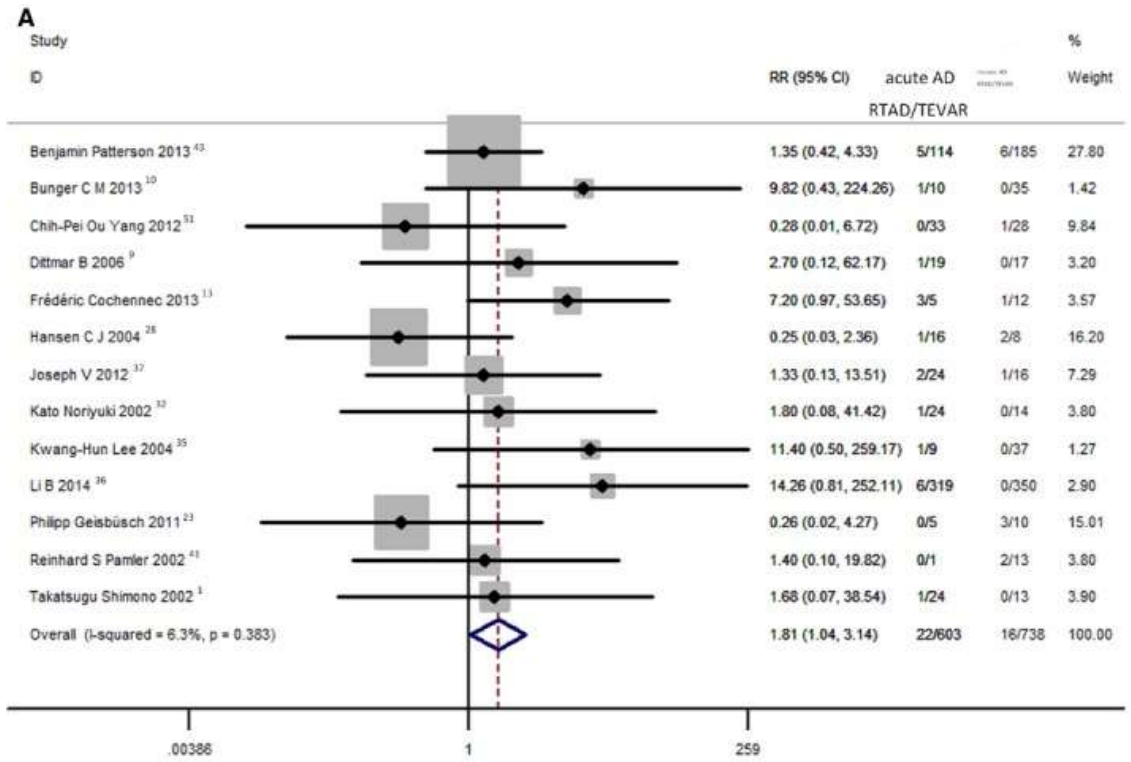
Background—Retrograde type A aortic dissection (RTAD) is a potentially lethal complication after thoracic endovascular aortic repair (TEVAR). However, data are limited regarding the development of RTAD post-TEVAR. This systematic review aims to define the incidence, mortality, and potential risk factors of RTAD post-TEVAR.

Methods and Results—Multiple electronic searches were performed. Fifty publications with a total of 8969 patients were analyzed. Pooled estimates for incidence and mortality of RTAD were 2.5% (95% confidence interval [CI], 2.0–3.1) and 37.1% (95% CI, 23.7–51.6), respectively. Metaregression analysis evidenced that RTAD rate was associated with hypertension (P=0.043), history of vascular surgery (P=0.042), and American Surgical Association (P=0.044). The relative risk of RTAD was 1.81 (95% CI, 1.04–3.14) for acute dissection (relative to chronic dissection) and 5.33 (95% CI, 2.70–10.51) for aortic dissection (relative to a degenerative aneurysm). Incidence of RTAD was significantly different in patients with proximal bare stent and nonbare stent endografts (relative risk [RR]=2.06; 95% CI, 1.22–3.50). RTAD occurrence rate in zone 0 was higher than other landing zones.

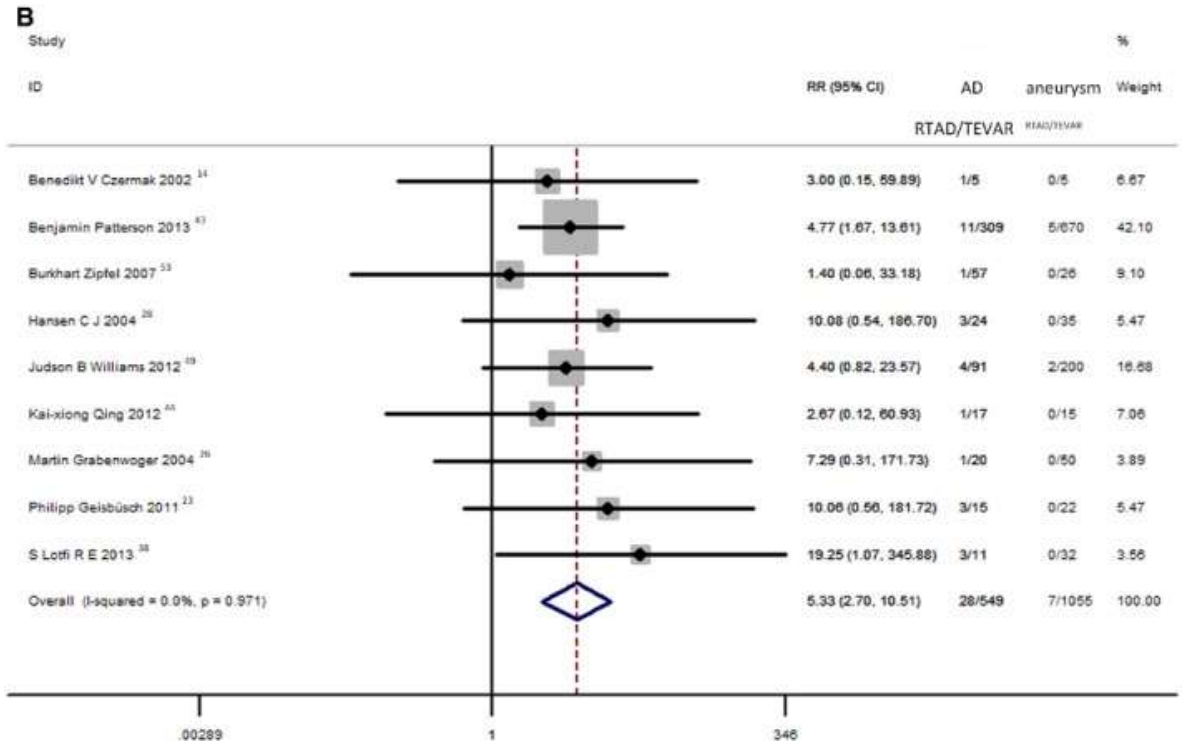
Conclusions—The pooled RTAD rate after TEVAR was calculated at 2.5% with a high mortality rate (37.1%). Incidence of RTAD is significantly more frequent in patients treated for dissection than those with an aneurysm (especially for acute dissection), and when the proximal bare stent was used. Rate of RTAD after TEVAR varied significantly according to the proximal Ishimaru landing zone. The more-experienced centers tend to have lower RTAD incidences. (***J Am Heart Assoc.* 2017;6:e004649. DOI: 10.1161/JAHA.116.004649.**)

Key Words: complication • endograft • retrograde type A aortic dissection • TEVAR

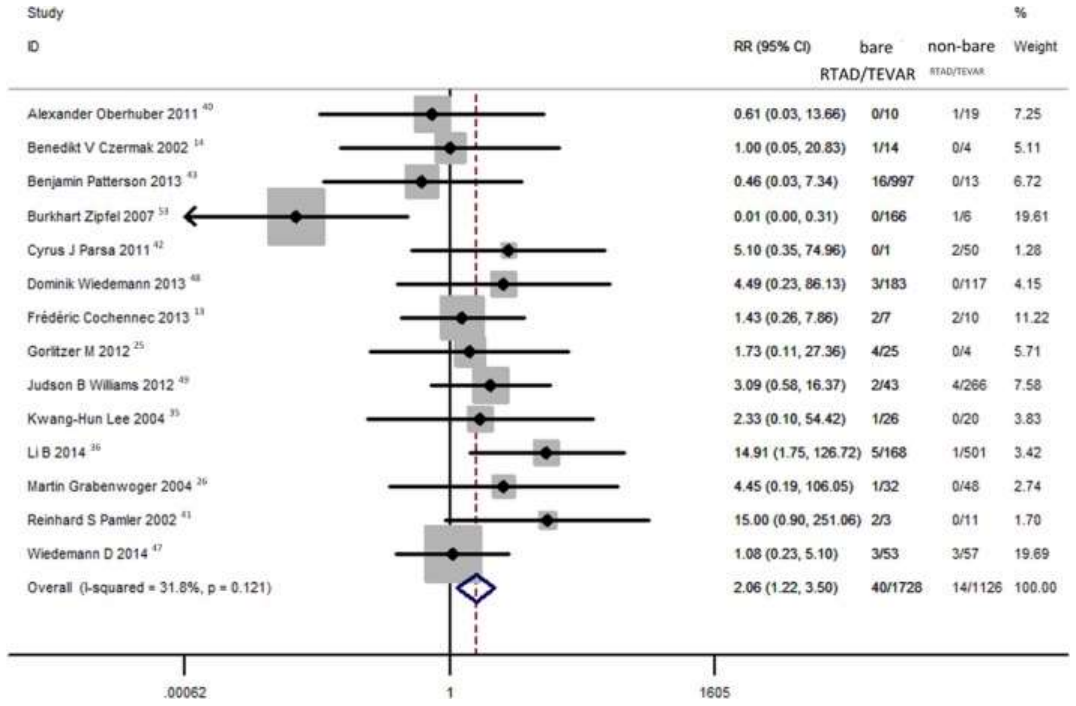
Acute vs. Chronic Dissection
RR 1.81



Dissection vs. Aneurysm
RR 5.33



Proximal Bare vs. Non-bare Stent
RR 2.06



Incidence: Proximal Landing Zone

	Incidence, %	P Value
Zone 0	8.12 (16/197)	<0.0001
Zone 1	2.57 (7/272)	
Zone 2	2.66 (24/903)	
Zones 3 & 4	0.67 (8/1195)	

Shanghai, China Series 2018

- 2005-2013
- 997 pts TEVAR for TBAD
- 852 pts with mean f/u 2.6 years
- No difference b/w Proximal Bare Stent (PBS) vs. Non PBS in incidence of RTAD

Incidence and risk factors for retrograde type A dissection and stent graft-induced new entry after thoracic endovascular aortic repair

Tao Ma, MD,[a] Zhi Hui Dong, MD,[a] Wei Guo Fu, MD,[a] Da Qiao Guo, MD,[a] Xin Xu, MD,[a] Bin Chen, MD,[a] Jun Hao Jiang, MD,[a] Jue Yang, MD,[a] Zhen Yu Shi, MD,[a] Ting Zhu, MD,[a] Yun Shi, MD,[a] Bao Hong Jiang, PhD,[b] and Xiao Yun Xu, MD,[c] *Shanghai, China; and London, United Kingdom*

ABSTRACT

Objective: Stent graft (SG)-induced new entry (SINE) and retrograde type A dissection (RTAD) are serious device-related complications occurring after thoracic endovascular aortic repair (TEVAR) for Stanford type B aortic dissection (TBAD) and may lead to endograft-related complications including retrograde dissection and death. The purpose of this study was to investigate the incidence and risk factors for the development of RTAD and SINE after TEVAR for TBAD and to identify the complications associated with this.

Methods: From April 2005 to October 2013, there were 997 patients who underwent TEVAR for TBAD; 852 were followed up (0-6 years; mean, 2.6 years), and 59 SINEs developed in 53 patients. The oversizing ratio and incidence of RTAD and SINE were compared between proximal bare stent (PBS) and non-PBS groups and RTAD and SINE and non-RTAD and non-SINE groups. The baseline characteristics and SG configurational factors potentially affecting both RTAD and distal SINE were analyzed.

Results: There was no significant difference between PBS and non-PBS groups in the incidence of RTAD. A greater oversizing ratio was related to a higher distal SINE rate. SINE was seen more frequently in smokers and in patients with hypertension, Marfan syndrome, and TEVAR in the chronic phase and less frequently in complicated dissection cases. Device-related factors for SINE were SG with a connecting bar and SG length <165 mm. The SG length <165 mm increased the overall proximal and distal SINE incidence in multivariate analysis.

Conclusions: The presence of a PBS is not associated with a higher RTAD rate, whereas the use of an SG with a connecting bar and length <165 mm increases the risk of RTAD and SINE after TEVAR. (J Vasc Surg 2018;67:1026-33.)

Charlotte, NC, USA Series 2019

- 2012-2017
- 186 TEVAR for TBAD
- 15 pts with RTAD (8%)
- Proximal landing zone 1&2
- Ascending diameter >4cm

Retrograde type A dissection after thoracic endovascular aortic repair for type B aortic dissection

Halim Yammine, MD, Charles S. Briggs, MD, Gregory A. Stanley, MD, Jocelyn K. Ballast, BA, William E. Anderson, MS, Tzvi Nussbaum, MD, Jeko Madjarov, MD, John R. Frederick, MD, *and* Frank R. Arko III, MD, *Charlotte, NC*

ABSTRACT

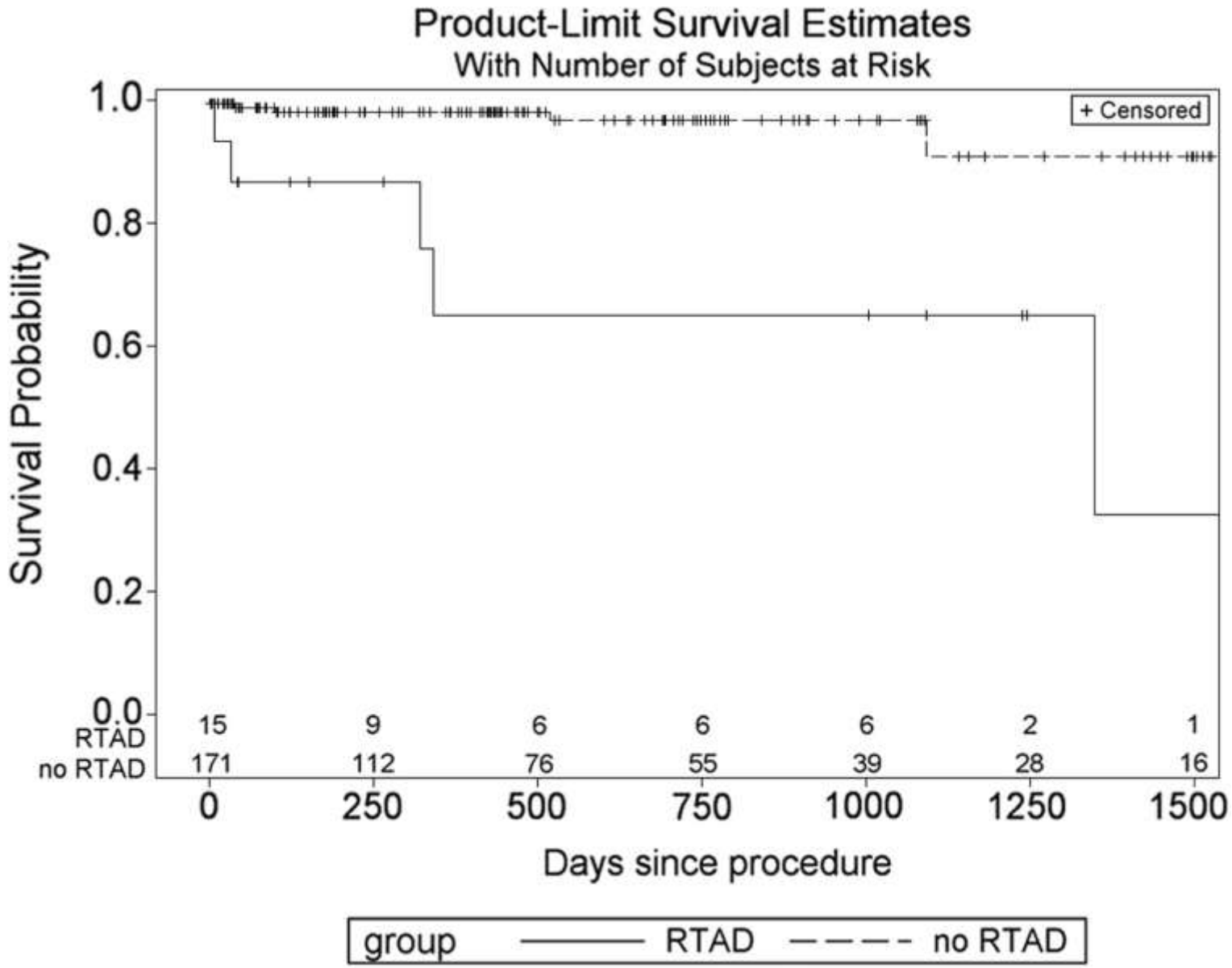
Background: The purpose of this study was to evaluate clinical, anatomic, and procedural characteristics of patients who developed retrograde type A dissection (RTAD) after thoracic endovascular aortic repair (TEVAR) for type B aortic dissection (TBAD).

Methods: Between January 2012 and January 2017, there were 186 patients who underwent TEVAR for TBAD at a multidisciplinary aortic center. Patients who developed RTAD after TEVAR (n = 15) were compared with those who did not (no-RTAD group, n = 171). Primary outcomes were survival and need for reintervention.

Results: The incidence of RTAD in our sample was 8% (n = 15). Kaplan-Meier estimates found that no-RTAD patients had better survival ($P = .04$). Survival rates at 30 days, 1 year, and 3 years were 93%, 60%, and 60% for RTAD patients and 94%, 87%, and 80% for no-RTAD patients. One RTAD was diagnosed intraoperatively, 5 were diagnosed within 30 days of the index procedure, 6 were diagnosed within 1 year, and 3 were diagnosed after 1 year. Reintervention for RTAD was undertaken in 10 of 15 patients, with a 50% survival rate after reintervention. Partial or complete false lumen thrombosis was more frequently present in RTAD patients ($P = .03$). RTAD patients more frequently presented with renal ischemia ($P = .04$). Most RTAD patients (93%, RTAD patients; 64%, no-RTAD patients; $P = .02$) had a proximal landing zone in zone 0, 1, or 2. Aortic diameter was more frequently ≥40 mm in the RTAD group (47%, RTAD patients; 21%, no-RTAD patients; $P = .05$). Patients with RTAD had stent grafts placed in the renovisceral arteries for complicated dissections, and this approached significance ($P = .05$). Three RTAD patients had a type II arch (20%) compared with 53 no-RTAD patients (31%; $P = .6$), but a comparison of type II arch with type I or type III found no statistical significance ($P = .6$). No correlations were found between ratio of descending to ascending diameters, average aortic sizing, graft size, or bare-metal struts at proximal attachment zone and development of RTAD. We found no statistically significant differences in demographics, genetic disease, comorbidities, or previous repairs.

Conclusions: The development of RTAD after TEVAR for TBAD does not appear to be correlated with any easily identifiable demographic feature but appears to be correlated with proximal landing zones in zone 1 and 2 and an ascending diameter >4 cm. Furthermore, the presence of partial or complete false lumen thrombosis as well as more complicated presentation with renal ischemia was significantly more frequent in patients with RTAD. TBAD patients should be observed long term, as type A dissections in our patients occurred even after 1 year. (J Vasc Surg 2019;69:24-33.)

Keywords: Dissection; Type B aortic dissection; TEVAR; Retrograde type A dissection; Complications


Product-Limit Survival Estimates
With Number of Subjects at Risk
+ Censored
Survival Probability
1.0
0.8
0.6
0.4
0.2
0.0
RTAD 15 9 6 6 6 2 1
no RTAD 171 112 76 55 39 28 16
0 250 500 750 1000 1250 1500
Days since procedure
group RTAD no RTAD

Conclusion

- RTAD uncommon complication (1.6-8%)
- High mortality rate (33.6%-37.1%)
- Typically occurs within 30 days (70%)
- Associated with acute dissection, oversizing > 9%, and proximal landing zones
- Role of bare metal vs non-bare stents controversial (probably best to avoid)


Thank You
CEDARS-SINAI