chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

How to prevent persistent flow in the false lumen: coils, occluders, endotrash?

Quentin Pellenc

Vascular Surgery Department
National Referral Center for Marfan Syndrome
Bichat University Hospital, Paris
www.marfan.fr

THE 24TH INTERNATIONAL EXPERTS SYMPOSIUM
CRITICAL ISSUES
IN AORTIC ENDOGRAFTING

DECEMBER 17 & 18 2021
PULLMAN PARIS BERCY PARIS - FRANCE

chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

- **Disclosures:**
  - Consulting: Cook Medical, WL Gore, Boston Scientific
  - Proctoring: Cook Medical

chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

Why treating False lumen (FL) in Chronic Aortic Dissection ?

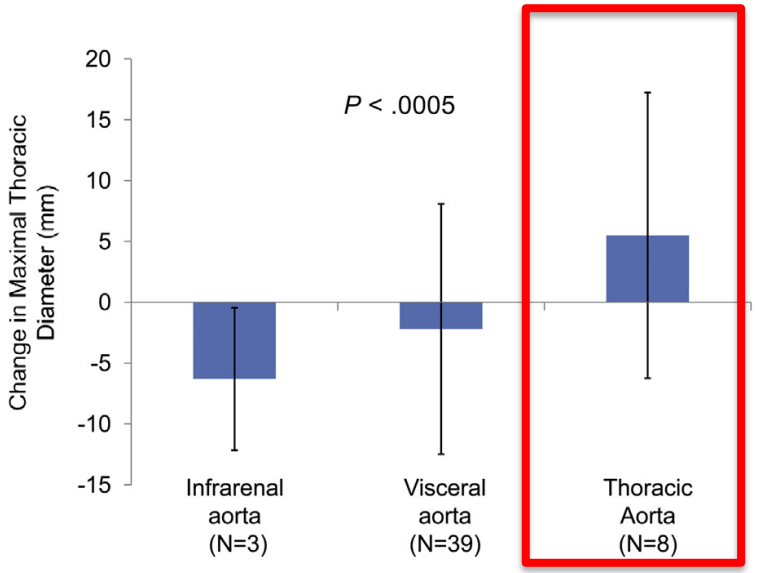
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

TEVAR: moderate efficiency in Chronic type B AD

Efficacy of thoracic endovascular stent repair for chronic type B aortic dissection with aneurysmal degeneration

Salvatore T. Scali, MD,[a] Robert J. Feezor, MD,[a] Catherine K. Chang, MD,[a] David H. Stone, MD,[c] Philip J. Hess, MD,[b] Tomas D. Martin, MD,[b] Thomas S. Huber, MD, PhD,[a] and Adam W. Beck, MD,[a]
Gainesville, Fla; and Lebanon, NH

JVS, 2013



- 80 patients
- 50% incomplet thoracic FL thrombosis
- **35% aortic dilatation**

From the Society for Clinical Vascular Surgery

Outcomes of thoracic endovascular aortic repair for chronic aortic dissections

Allan M. Conway, MBChB (Hons), MRCS, Khalil Qato, MD, Laurie R. Mondry, BSN, Guillaume J. Stoffels, MS, MA, Gary Giangola, MD, *and* Alfio Carroccio, MD, *New York, NY*

ABSTRACT

Background: Open surgical repair remains the "gold standard" treatment for chronic type B aortic dissection (cTBD) with aneurysm. Thoracic endovascular aortic repair (TEVAR) has gained popularity in recent years for the treatment of thoracic aortic diseases, including cTBD. We assessed the effectiveness of TEVAR in the treatment of cTBD using the Vascular Quality Initiative (VQI) database.

Methods: The VQI registry identified 4713 patients treated with TEVAR from July 2010 to November 2015, including 125 repairs for cTBD. We analyzed TEVAR outcomes in this cohort per the Society for Vascular Surgery reporting standards for TEVAR.

Results: Median age was 65.0 years (interquartile range [IQR], 56.0-72.0 years), and 85 (68.0%) were male. Median aneurysm diameter was 5.5 cm (IQR, 4.8-6.3 cm). Sixty-two (49.6%) patients were asymptomatic on presentation, 57 (45.6%) were symptomatic, and 6 (4.8%) presented with rupture. Median length of stay was 8.0 days (IQR, 4.0-11.0 days). Fluoroscopy time was 17.3 minutes (IQR, 10.5-25.6 minutes). The distal landing zone was aortic zone 4 in 27 (21.6%) and aortic zone 5 and distal in 98 (78.4%) patients. Successful device delivery occurred in 123 (98.4%) patients. Conversion to open repair occurred in one (0.8%) patient. A type IA endoleak was present in 2 (1.6%), type IB endoleak in 2 (1.6%), and type II endoleak in 2 (1.6%) patients. Perioperative complications included stroke in 2 (1.6%), respiratory complications in 6 (4.8%), and spinal cord ischemia symptoms present at discharge in 3 (2.4%) patients. In-hospital mortality occurred in three (2.4%) patients. Reintervention was required in two (1.6%) patients for false lumen perfusion and in two (1.6%) patients for extension of the dissection. Follow-up was available for 43 patients at a median time of 239 days (IQR, 38-377 days). Median change in sac diameter was −0.2 cm (IQR, −0.5 to 0.1 cm). Sac shrinkage of 0.5 cm was noted in 12 (27.9%), with sac growth >0.5 cm in four (9.3%) patients. Extent of stent graft coverage did not affect sac shrinkage (P = .65). Patients with aneurysms ≥5.5 cm compared with <5.5 cm were more likely to demonstrate shrinkage (−0.6 cm vs 0.0 cm; 95% confidence interval, 0.3-11.7; P = .04).

Conclusions: TEVAR for cTBD may be performed with acceptable rates of morbidity and mortality. Changes in sac diameter in the midterm are promising. Long-term data are needed to determine whether this approach is durable. (J Vasc Surg 2017;■:1-7.)

JVS, 2017

- VQI database
- 125 chronic TBAD
- FU 8 months:43 patients

- Shrinkage ≥ 5mm: **28%**

Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Aortic remodelling

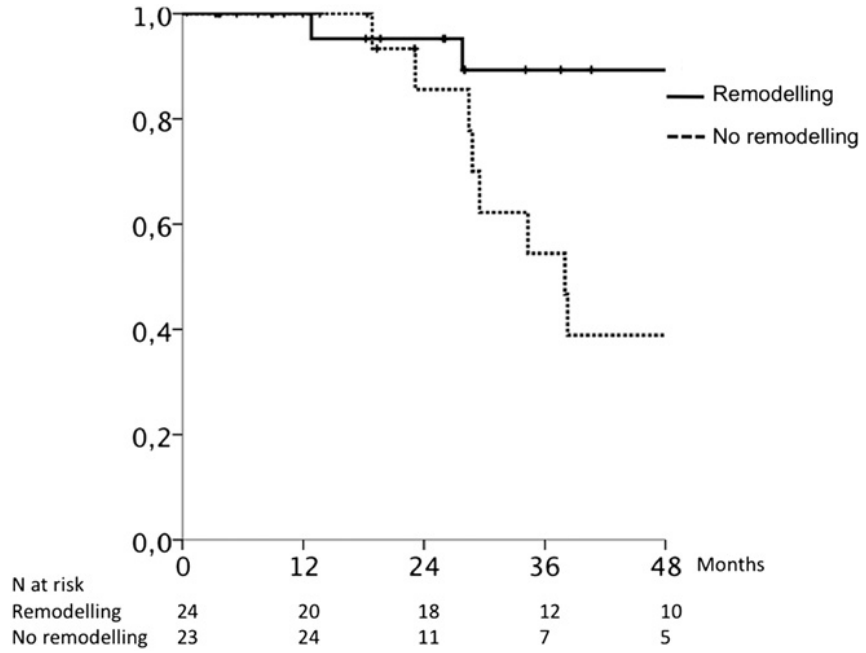
Contents lists available at SciVerse ScienceDirect

European Journal of Vascular and Endovascular Surgery

journal homepage: www.ejves.com

Predictors of Outcome after Endovascular Repair for Chronic Type B Dissection

K. Mani [a,d,*], R.E. Clough [a,b], O.T.A. Lyons [a,c], R.E. Bell [a], T.W. Carrell [a,b], H.A. Zayed [a], M. Waltham [a,c], P.R. Taylor [a,b]



- Partial FL thrombosis
- No aortic remodelling
- Worse aortic prognosis

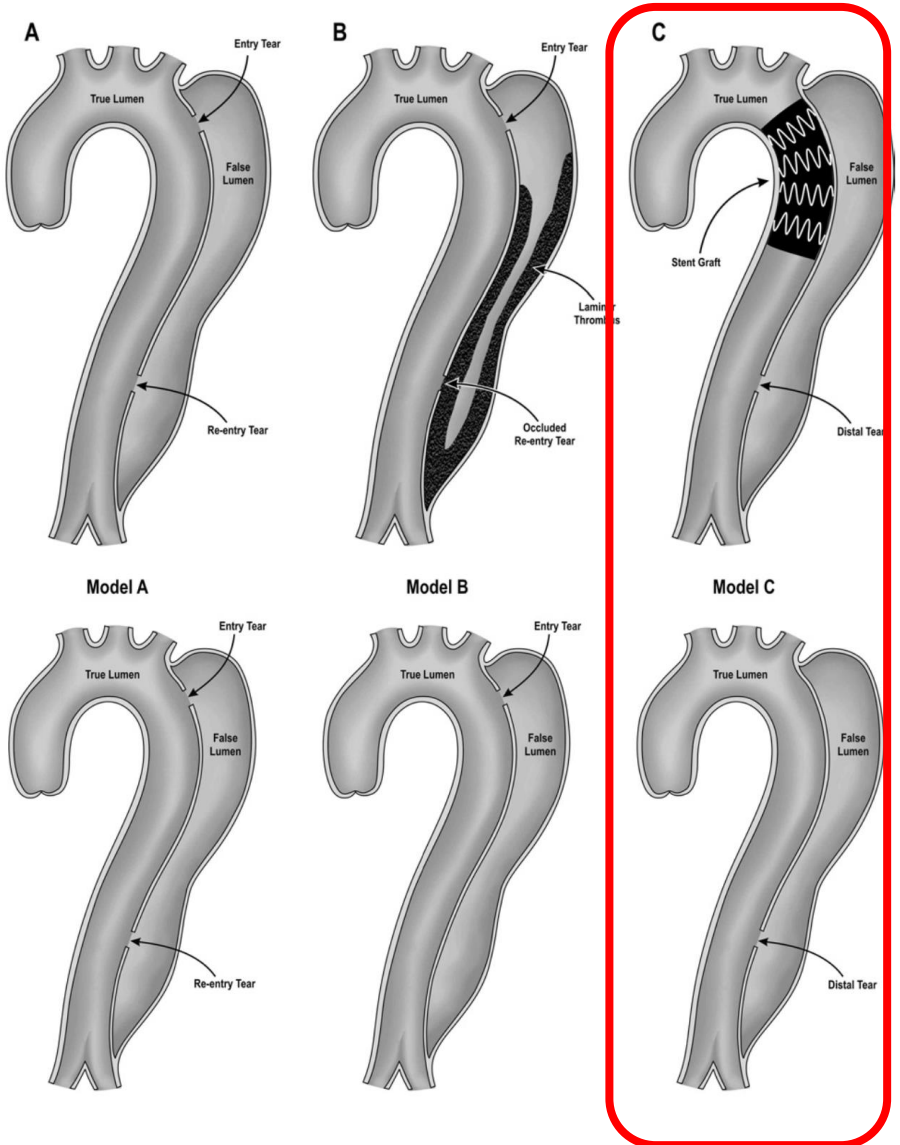
Figure 5. Kaplan–Meier analysis of survival based on remodelling of the aorta after endovascular intervention for chronic type B dissection.

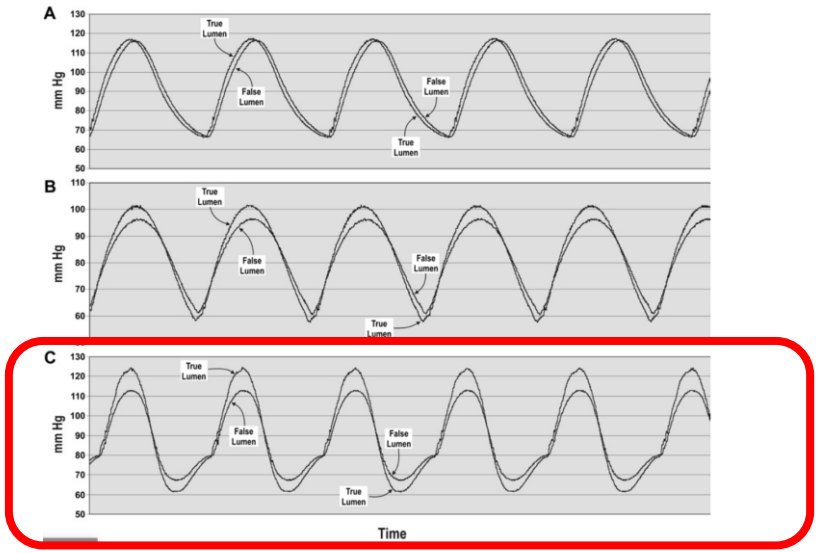
chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

Physical point of view

Tear size and location impacts false lumen pressure in an ex vivo model of chronic type B aortic dissection

Thomas T. Tsai, MD,[a] Marty S. Schlicht, MS,[b] Khalil Khanafer, PhD,[b] Joseph L. Bull, PhD,[b,c] Doug T. Valassis, BSE,[b] David M. Williams, MD,[d] Ramon Berguer, MD, PhD,[b,c] and Kim A. Eagle, MD,[a] *Ann Arbor, Mich*



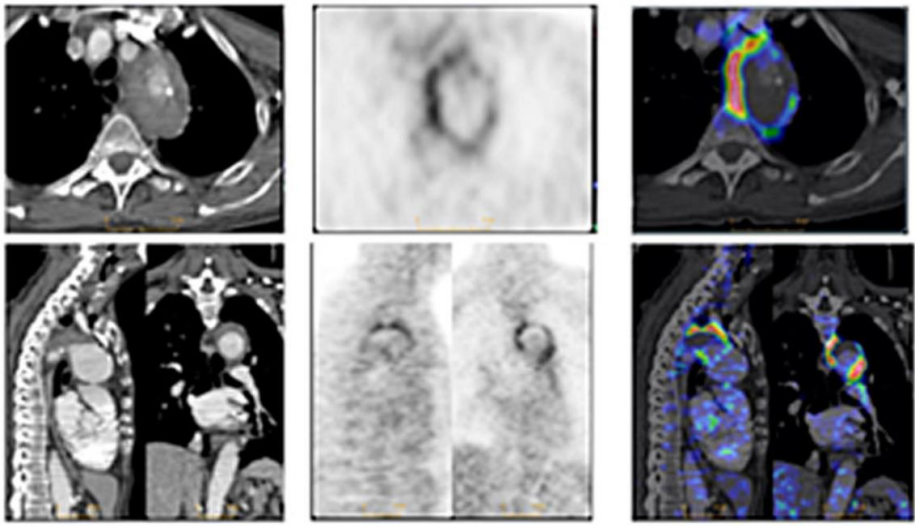


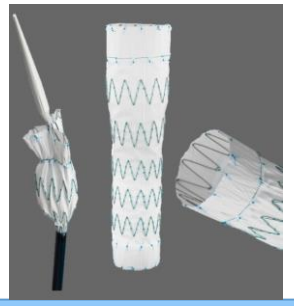
Biological point of view

Chirurgie Vasculaire, Thoracique

Table 4 Associations between aneurysmal progression, false lumen morphology, PET/CT imaging, aortic diameter, and biomarker levels recorded during follow-up ($N = 23$)

Variable	Aneurysmal progression[a]		*P*-value[b]
	No ($N = 11$)	Yes ($N = 12$)	
False lumen			
Patent	9	1	<0.0001
Partial thrombosis	0	11	
Complete thrombosis	2	0	
SUV_{max}	2.8 ± 0.5	3.4 ± 0.9	0.0090
SUV_{RL}	0.72 ± 0.15	0.95 ± 0.30	0.0029
Aortic diameter (mm)	36.4 ± 10.4	54.7 ± 12.3	<0.0001
P-selectin (ng/mL)	34.3 ± 16.2	55.1 ± 21.6	0.0009
TAT (ng/mL)	7.5 ± 8.5	18.6 ± 14.8	0.0075
D-dimers (µg/L)	838 ± 563	3117 ± 2048	0.0006
PAP (ng/mL)	259 ± 129	934 ± 1026	<0.0001
MPO (ng/mL)	45.2 ± 44.7	32.0 ± 25.8	0.27
Elastase (ng/mL)	84.4 ± 39.1	91.5 ± 46.4	0.54
MMP-9 (ng/mL)	7.9 ± 4.1	5.5 ± 5.1	0.014
Ferritin (ng/mL)	222 ± 113	354 ± 350	0.64
Transferrin (ng/mL)	2.5 ± 0.38	2.5 ± 0.55	0.85



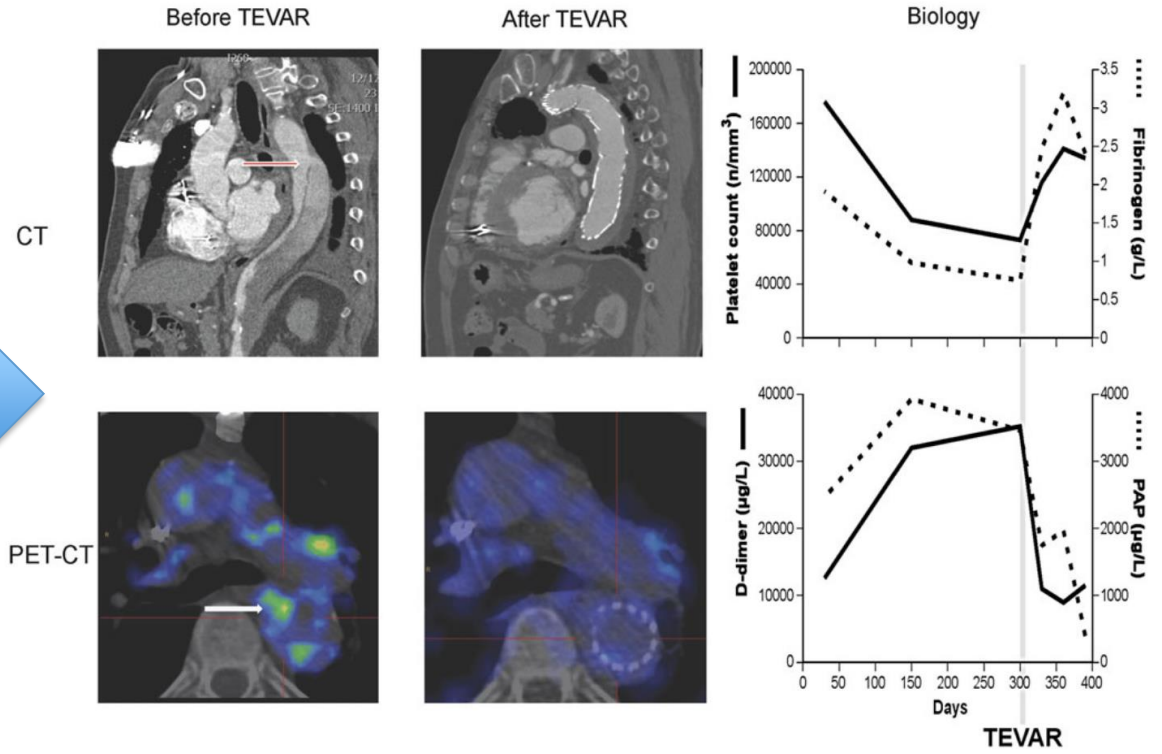


European Heart Journal – Cardiovascular Imaging (2015) 16, 626–633
doi:10.1093/ehjci/jeu283

(Tissue PET) Vascular metabolic imaging and peripheral plasma biomarkers in the evolution of chronic aortic dissections

Natzi Sakalihasan[1]*, Christoph A. Nienaber[2], Roland Hustinx[3], Pierre Lovinfosse[3], Mounia El Hachemi[4], Jean-Paul Cheramy-Bien[1], Laurence Seidel[5], Jean-Paul Lavigne[1], Janine Quaniers[1], Marie-Ange Kerstenne[1], Audrey Courtois[1], Annie Ooms[1], Adelin Albert[5], Jean-Olivier Defraigne[1], and Jean-Baptiste Michel[6]

[1]Cardiovascular and Thoracic Surgery Department, University Hospital, Sart Tilman B35, Liège 4000, Belgium; [2]University Heart Center Rostock, University of Rostock, Rostock, Germany; [3]Nuclear Medicine Department, University Hospital, Liège, Belgium; [4]Radiology Department, University Hospital, Liège, Belgium; [5]Biostatistics, University Hospital of Liège, Liège, Belgium; and [6]UMR 1148 Inserm-Paris7 University, Hôpital Xavier Bichat, Paris, France



Plasmin activation = intraparietal **proteolysis** = **Aortic dilatation**

Sakalihasan N , Eur Heart J Cardiovasc Imaging, 2015

Borges LF, Hisotpathology, 2010

chir vtt Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

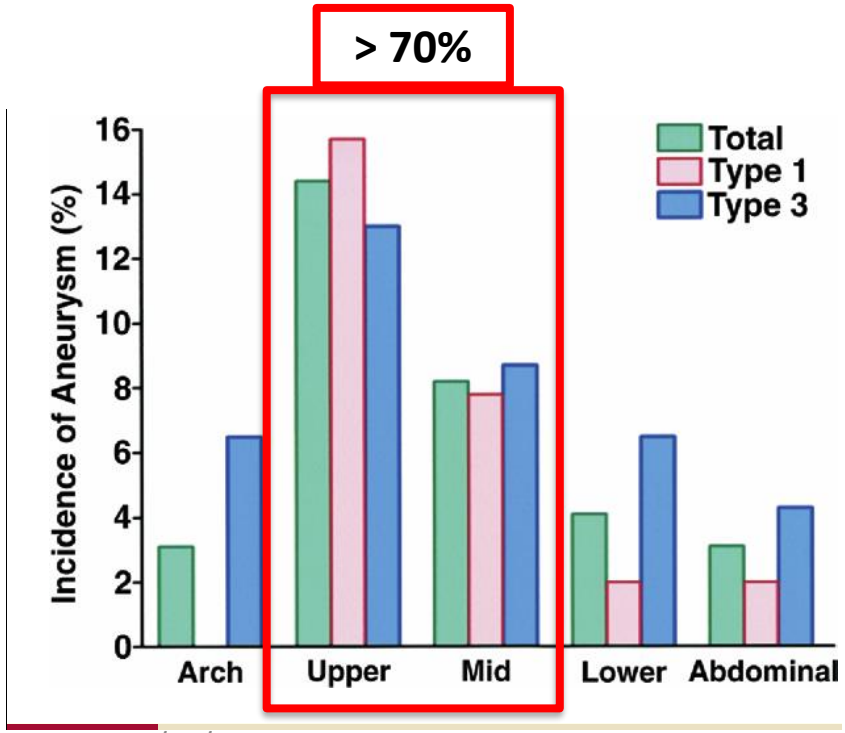
Aortic dissections Natural History

Long-Term Predictors of Descending Aorta Aneurysmal Change in Patients With Aortic Dissection

Jong-Min Song, MD, PHD,* Sung-Doo Kim, MD,* Jeong-Hoon Kim, MD,* Mi-Jeong Kim, MD,* Duk-Hyun Kang, MD, PHD,* Joon Beom Seo, MD, PHD,† Tae-Hwan Lim, MD, PHD,† Jae Won Lee, MD, PHD,‡ Meong-Gun Song, MD, PHD,‡ Jae-Kwan Song, MD, PHD, FACC*

Seoul, South Korea

JACC 2007

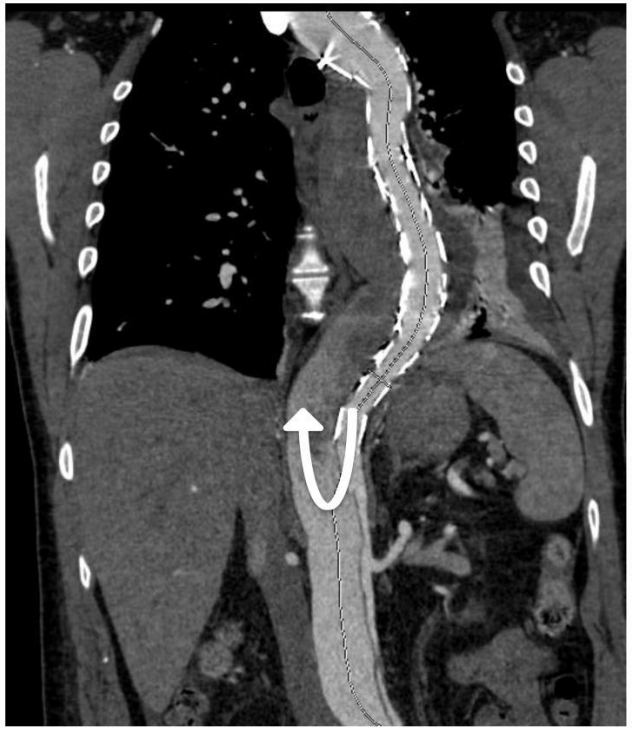


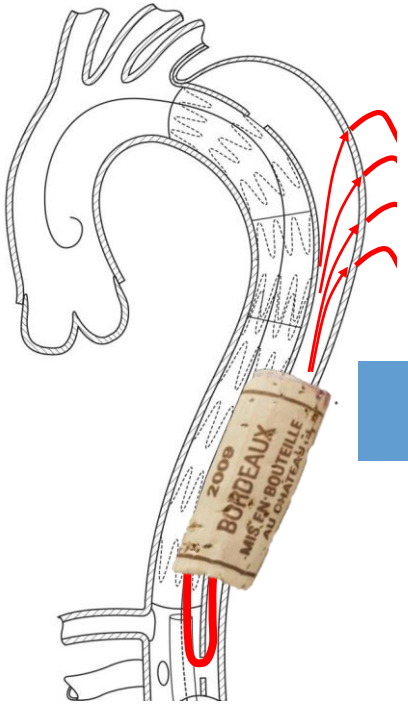
- Same evolution for type A ou B
- Aortic dilatation in 40 % of patients
- Main expansion zone:
  - Descending thoracic Aorta (prox + mid)
- > 70% of patients dilate Thoracic Ao

Only <u>proximal descending</u> aorta needs repair

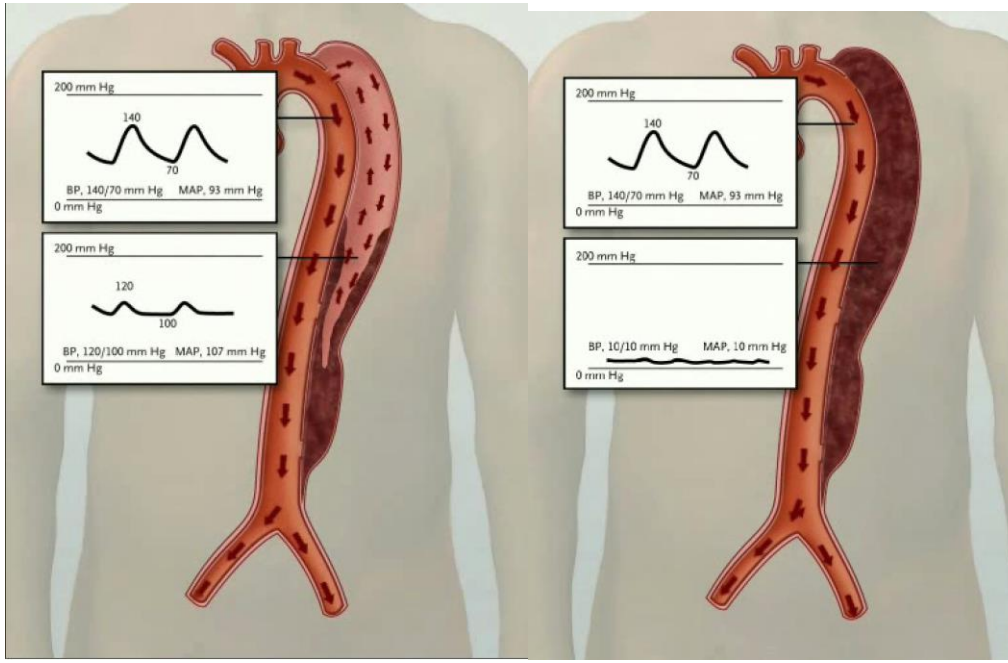
chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Concept of FL occlusion

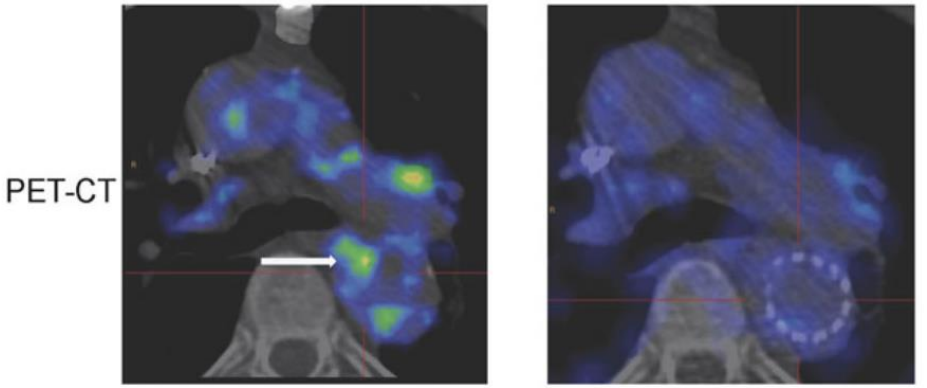




T.KÖLBEL



TSAI T, N Engl J Med, 2007

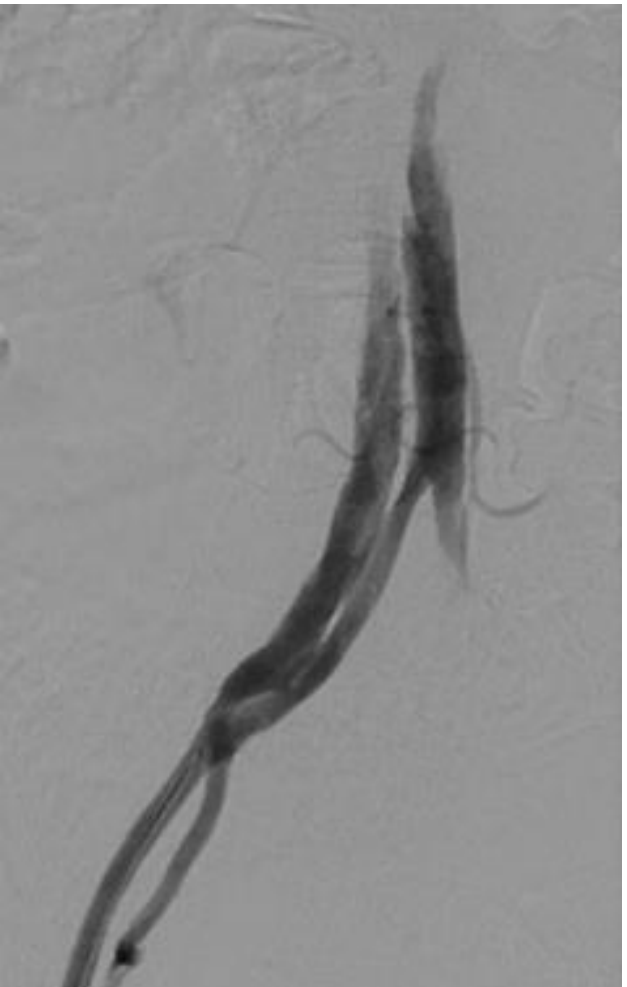


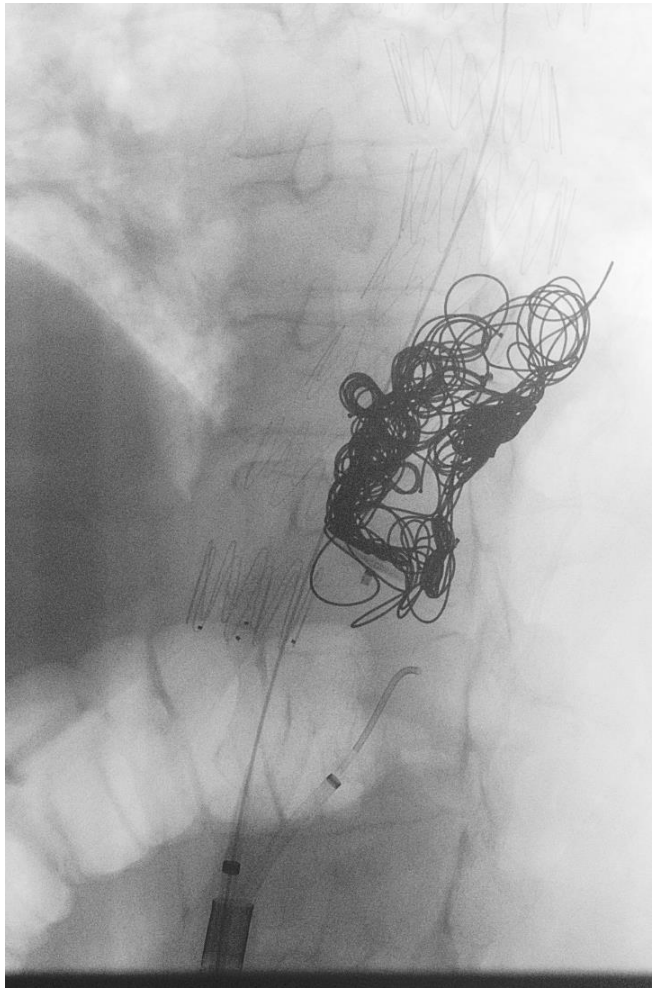
Sakalihasan N , Eur Heart J Cardiovasc Imaging, 2015

chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

False lumen access

- Retrograde access through distal re-entry tears

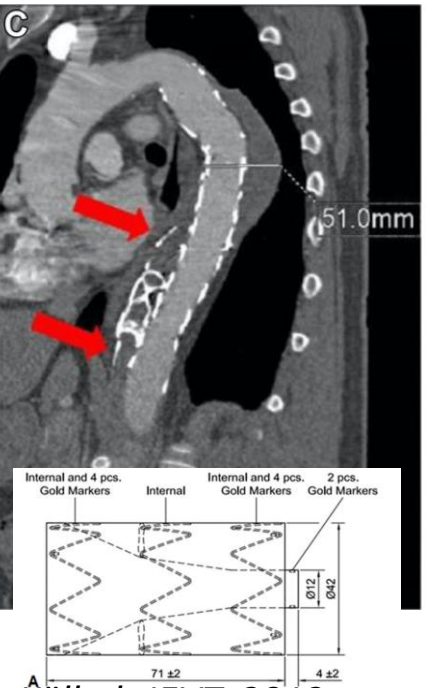




chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Different Devices

Candy Plug



Kölbel, JEVT, 2013

Rohlffs, JEVT, 2017

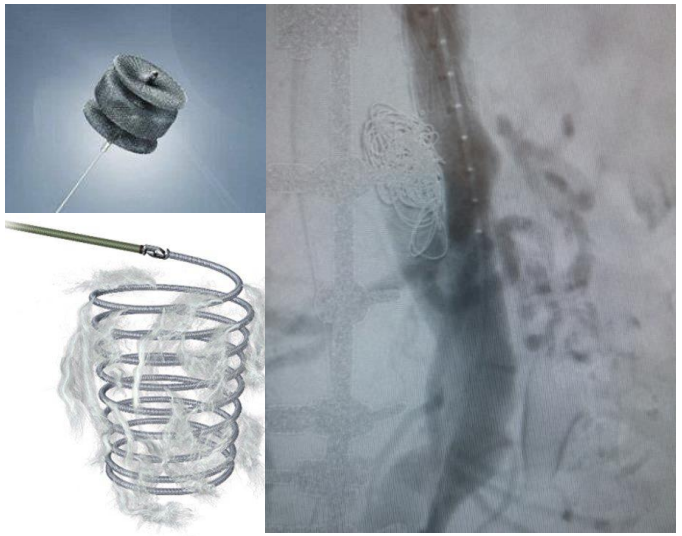
Eleshra, JEVT, 2019

Coils

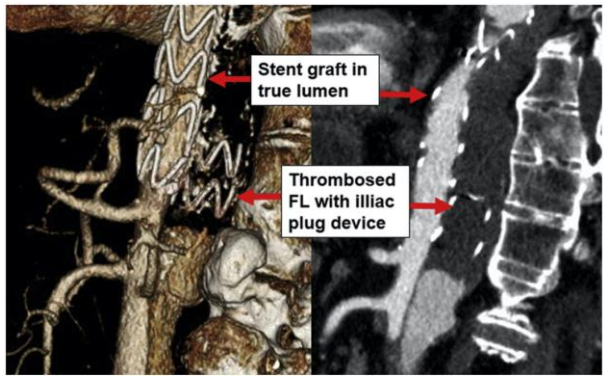
False lumen embolization in chronic aortic dissection promotes thoracic aortic remodeling at midterm follow-up

Quentin Pellenc, MD,[a,b] Arnaud Roussel, MD,[a,b] Romain De Blic, MD,[a] Antoine Girault, MD,[a,b] Pierre Cerceau, MD,[a] Iannis Ben Abdallah, MD,[a,b] Olivier Milleron, MD,[b,c] Guillaume Jondeau, MD, PhD,[b,c] *and* Yves Castier, MD, PhD,[a,b] *Paris, France*

Pellenc, JVS, 2019



Iliac occluders



Outcomes after false lumen embolization with covered stent devices in chronic dissection

Jahanzaib Idrees, MD, Eric E. Roselli, MD, Susan Shafii, MD, Joshua Reside, BS, and Bruce W. Lytle, MD, *Cleveland, Ohio*

Idrees, JVS, 2014

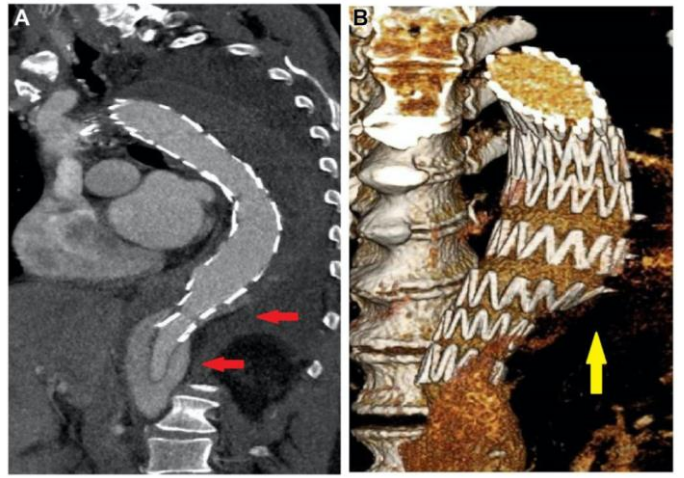
Knickerbocker

Addressing Persistent False Lumen Flow in Chronic Aortic Dissection: TI Knickerbocker Technique

Tilo Kölbel, MD, PhD, Sebastian W. Carpenter, MD, Christina Lohrenz, MD, more...

First Published February 1, 2014 | Research Article | Find in PubMed | Check for updates
https://doi.org/10.1583/13-4463MR-R.1

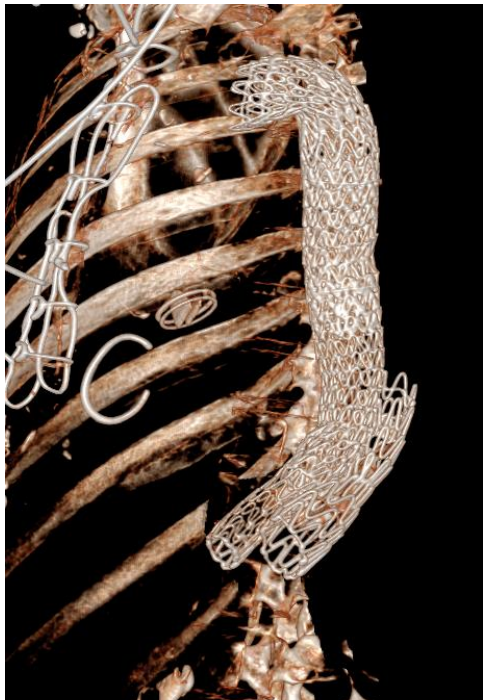
Kölbel, JEVT, 2014



chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Exotic devices: endotrash

Pellenc, personal data



Technical Note

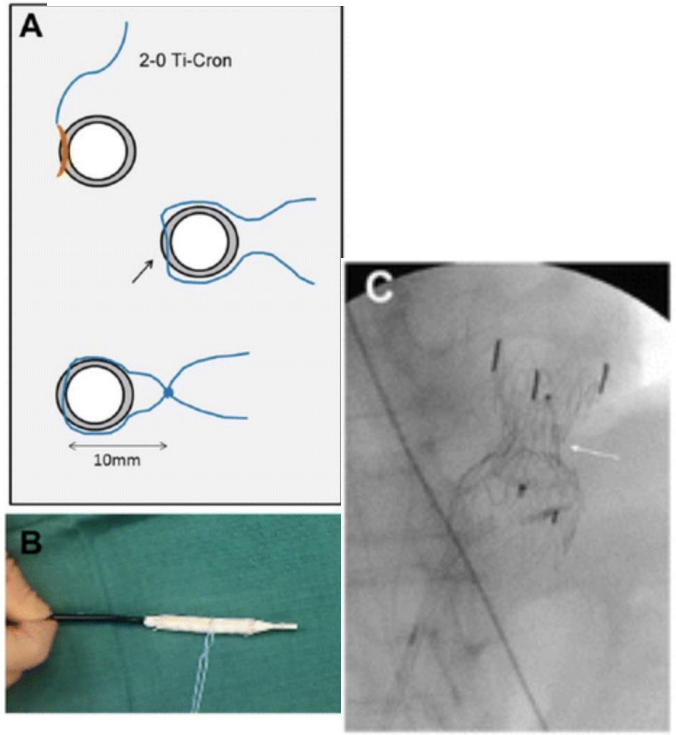
ENDOVASCULAR THERAPY

Candy-Plug Technique Using an Excluder Aortic Extender for Distal Occlusion of a Large False Lumen Aneurysm in Chronic Aortic Dissection

Journal of Endovascular Therapy
2016, Vol. 23(3) 483–486

DOI: 10.1177/1526602816640523
www.jevt.org
SAGE

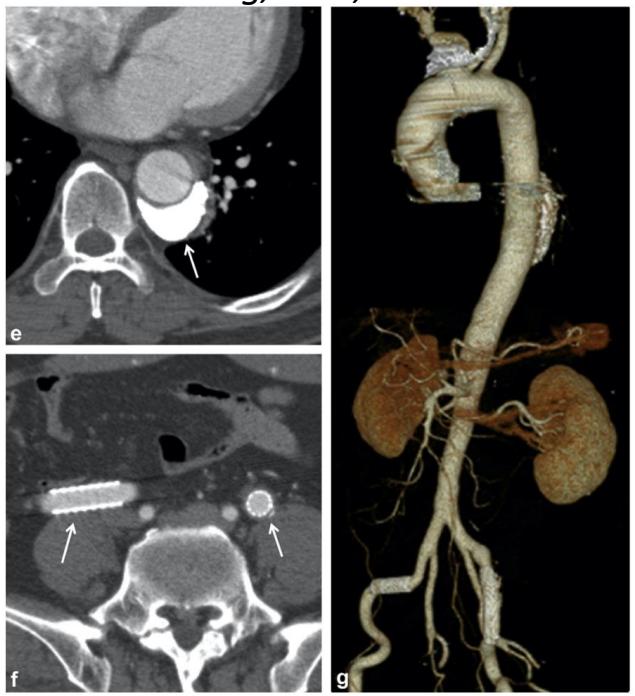
Yukihisa Ogawa, MD, PhD[1], Hiroshi Nishimaki, MD, PhD[2], Kiyoshi Chiba, MD, PhD[2], Kenji Murakami, MD[1], Yuka Sakurai, MD[2], Keishi Fujiwara, MD[1], Takeshi Miyairi, MD, PhD[2], and Yasuo Nakajima, MD, PhD[1]



Comparative Outcome Analysis of *N*-Butyl Cyanoacrylate Embolization of the False Lumen Versus Thoracic Endovascular Aortic Repair in Aortic Dissection

Dong Kyu Kim, MD, Joon Ho Kwon, MD, Heung Kyu Ko, MD, Junhyung Lee, MD, Kichang Han, MD, Gyoung Min Kim, MD, Man-Deuk Kim, MD, Jong Yun Won, MD, Hyun-Chel Joo, MD, Young-Guk Ko, MD, and Do Yun Lee, MD

Dong, JVIR, 2020



Original Off-Label Endovascular Solution to Occlude False Lumen Rupture in Chronic Type B Aortic Dissection

Enrico Maria Marone,[1] Marco Leopardi,[2] Luca Bertoglio,[2] Daniele Mascia,[2] and Roberto Chiesa,[2] Pavia, and Milan, Italy

AVS, 2016

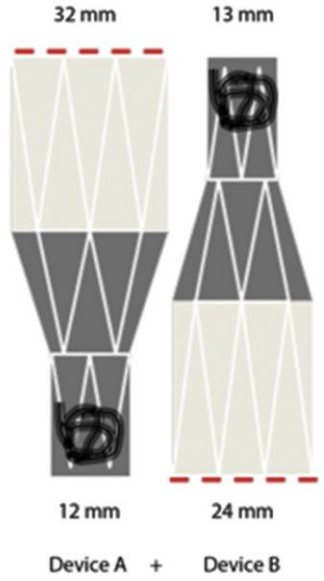


Fig. 2. Homemade candy plug using a Cook Converter (32 mm) and a Cook Limb extension (24 mm) occluded using 2 Cook Zip (16 mm and 20 mm) occluders and 2 Amplatzer Vascular Plug II placed in parallel fashion.

chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Results

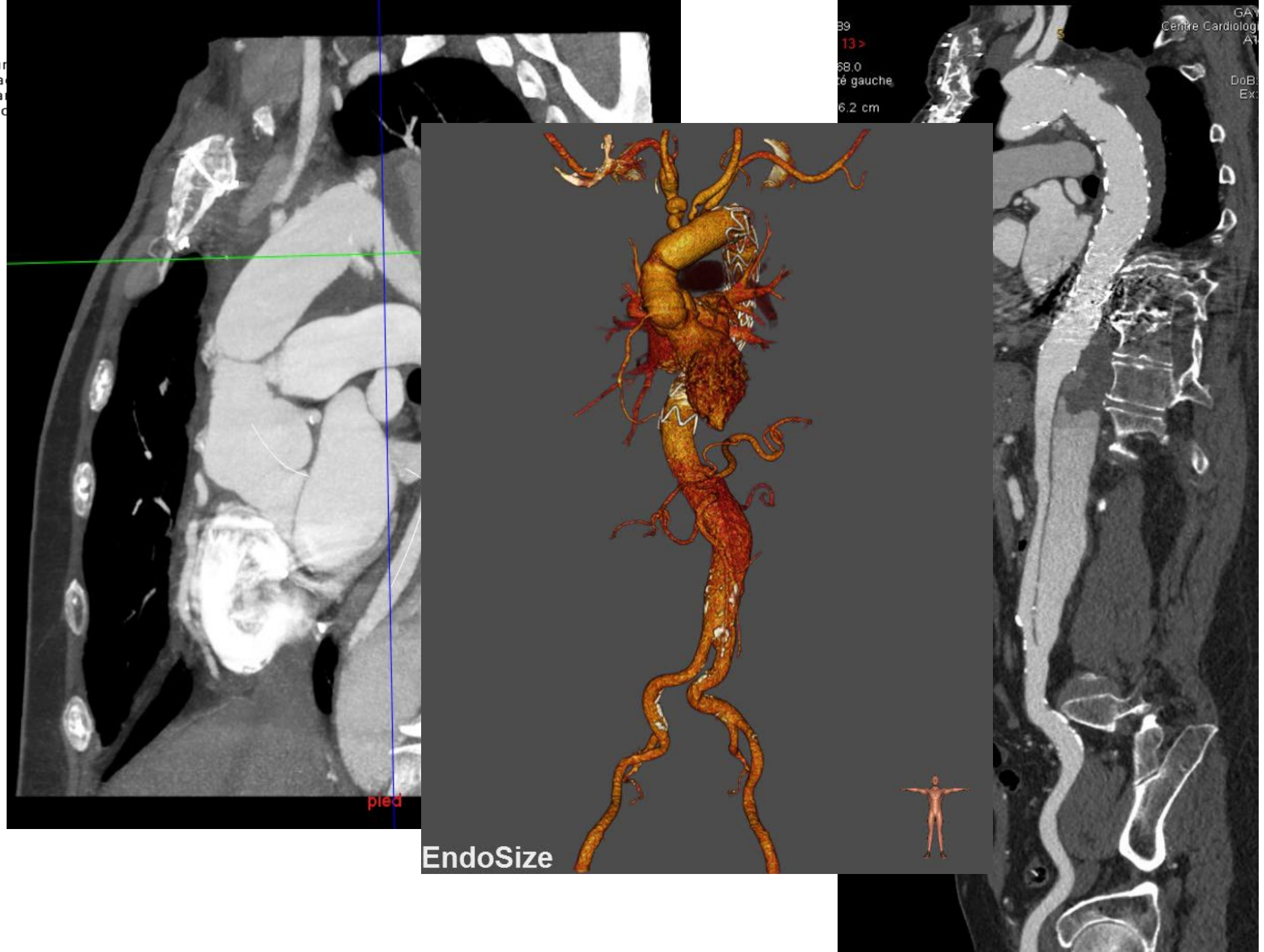
- 27 patients
- Marfan: 30%
- Chronic dissection
  - Type A: 26%
  - **Type B: 74%**
- **CSF drainage: 74%**
- Plugs + coils
- Permanent **Spinal cord ischemia: 4%**

False lumen embolization in chronic aortic dissection promotes thoracic aortic remodeling at midterm follow-up

Quentin Pellenc, MD,[a,b] Arnaud Roussel, MD,[a,b] Romain De Blic, MD,[a] Antoine Girault, MD,[a,b] Pierre Cerceau, MD,[a] Iannis Ben Abdallah, MD,[a,b] Olivier Milleron, MD,[b,c] Guillaume Jondeau, MD, PhD,[b,c] *and* Yves Castier, MD, PhD,[a,b] *Paris, France*

Pellenc, JVS, 2019

- **FL Thrombosis: 90%**
- Midterm follow-up: 20 months
- Remodelling:
  - max diameter 63 → 54 mm ($p<0.001$)
- Shrinkage > 5mm: 80%


pied
EndoSize

chir vtt
Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Results

- 51 patients
- Iliac plugs, nitinol plugs, coils
- Chronic dissection
  - **Type A: 73%**
  - Type B: 27%
- **CSF drainage: 40%**

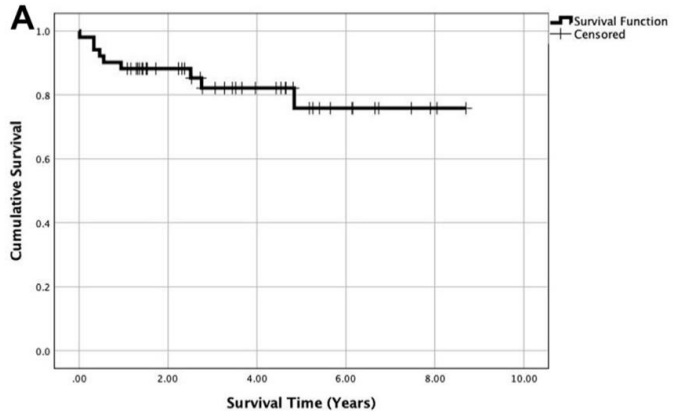
- Permanent **Spinal cord ischemia: 0%**
- **FU: 27 months**
- **31% positive remodelling**
- 51%: diameter stability
- 18% progression:
  - 5 open TAAA
  - 4 other FL embolization

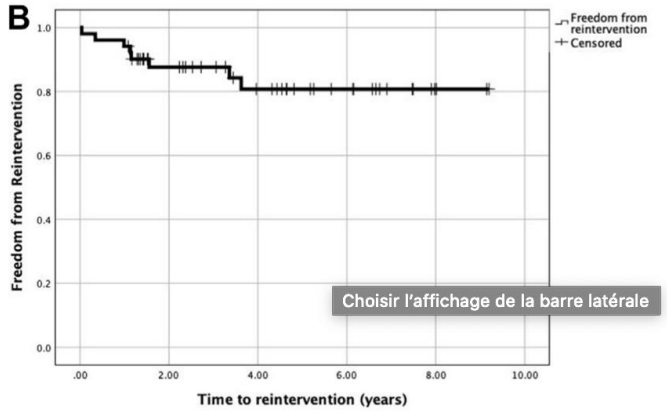
Impact of Endovascular False Lumen Embolization on Thoracic Aortic Remodeling in Chronic Dissection

Kyle G. Miletic, MD, Bogdan A. Kindzelski, MD, MS, Kevin E. Hodges, MD, Jocelyn Beach, MD, Michael Z. Tong, MD, Faisal Bakaeen, MD, Douglas R. Johnston, MD, Milind Desai, MD, Sean Lyden, MD, and Eric E. Roselli, MD

Department of Thoracic and Cardiovascular Surgery, Heart Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio; Department of Vascular Surgery, Heart Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio; Aorta Center, Heart Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio; and Department of Cardiology, Heart Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio

ATS, 2021





chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

Results

- 57 patients
- Chronic dissection
  - **Type A: 51%**
  - **Type B: 49%**
- Candy-plug: I and II
- CSF drainage: ?
- FL occlusion: 88%
- Permanent **spinal cord ischemia: 0%**
- max diameter: 57 → 49 mm

JOURNAL OF ENDOVASCULAR THERAPY
A SAGE Publication
ISEVS

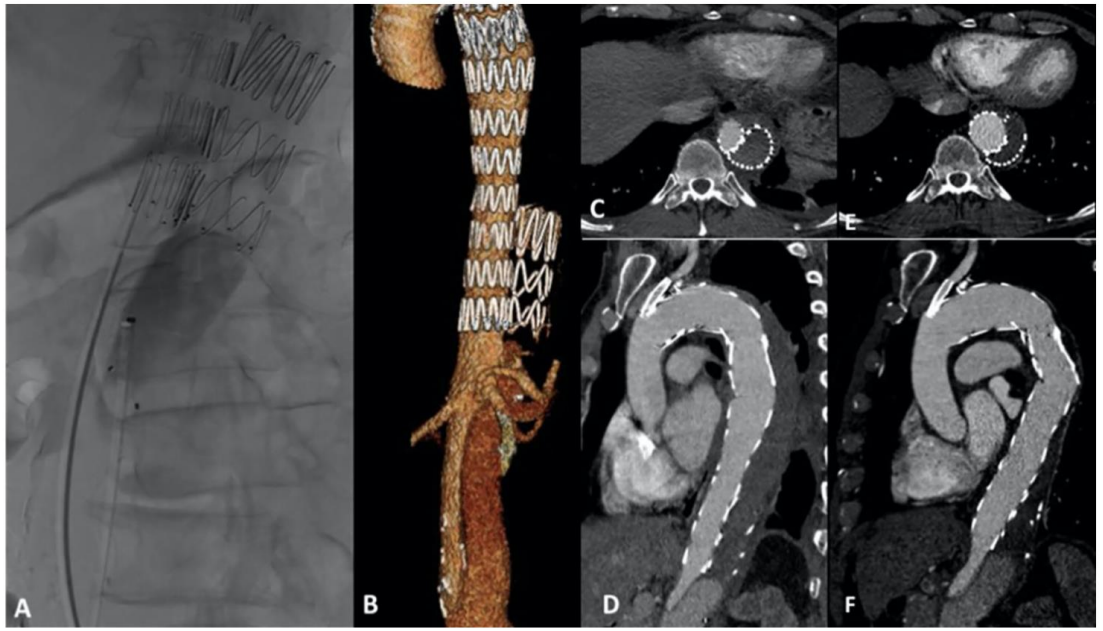
Clinical Investigation

Journal of Endovascular Therapy
2021, Vol. 28(3) 399–406

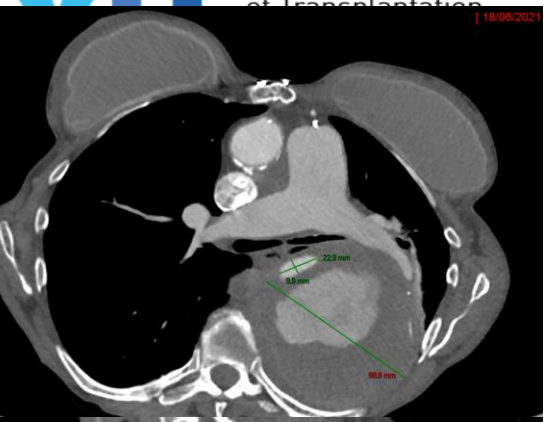
DOI: 10.1177/1526602821996722
www.jevt.org
SAGE

Aortic Remodeling After Custom-Made Candy-Plug for Distal False Lumen Occlusion in Aortic Dissection

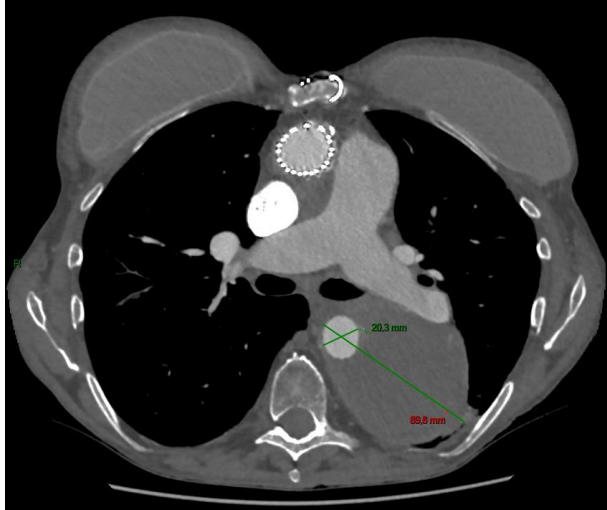
Ahmed Eleshra, MD[1], Fiona Rohlffs, MD, PhD[1], Konstantinos Spanos, MD, MSc, PhD[1], Giuseppe Panuccio, MD, PhD[1], Franziska Heidemann, MD[1], Nikolaos Tsilimparis, MD, PhD[1], and Tilo Kölbel, MD, PhD[1]



Pushing the limits: chronic type A AD



6 months FU



chir vtt Chirurgie Vasculaire, Thoracique et Transplantation Pulmonaire

Conclusion

- Treatment of **chronic Dissection**:
  - Needs FL treatment regarding results of TEVAR alone

- **FL intentional occlusion**:
  - Can be achieve with different devices
  - With a low morbidity especially spinal cord ischemia rate
  - Promotes thoracic aortic remodelling
  - Abdominal aorta: low risk of dilatation

- Probably leads to **lower aortic event rates**

chir vtt
Chirurgie Vasculaire,
Thoracique
et Transplantation
Pulmonaire

www.marfan.fr

quentin.pellenc@aphp.fr