A lifetime of specialist care

Royal Brompton & Harefield NHS
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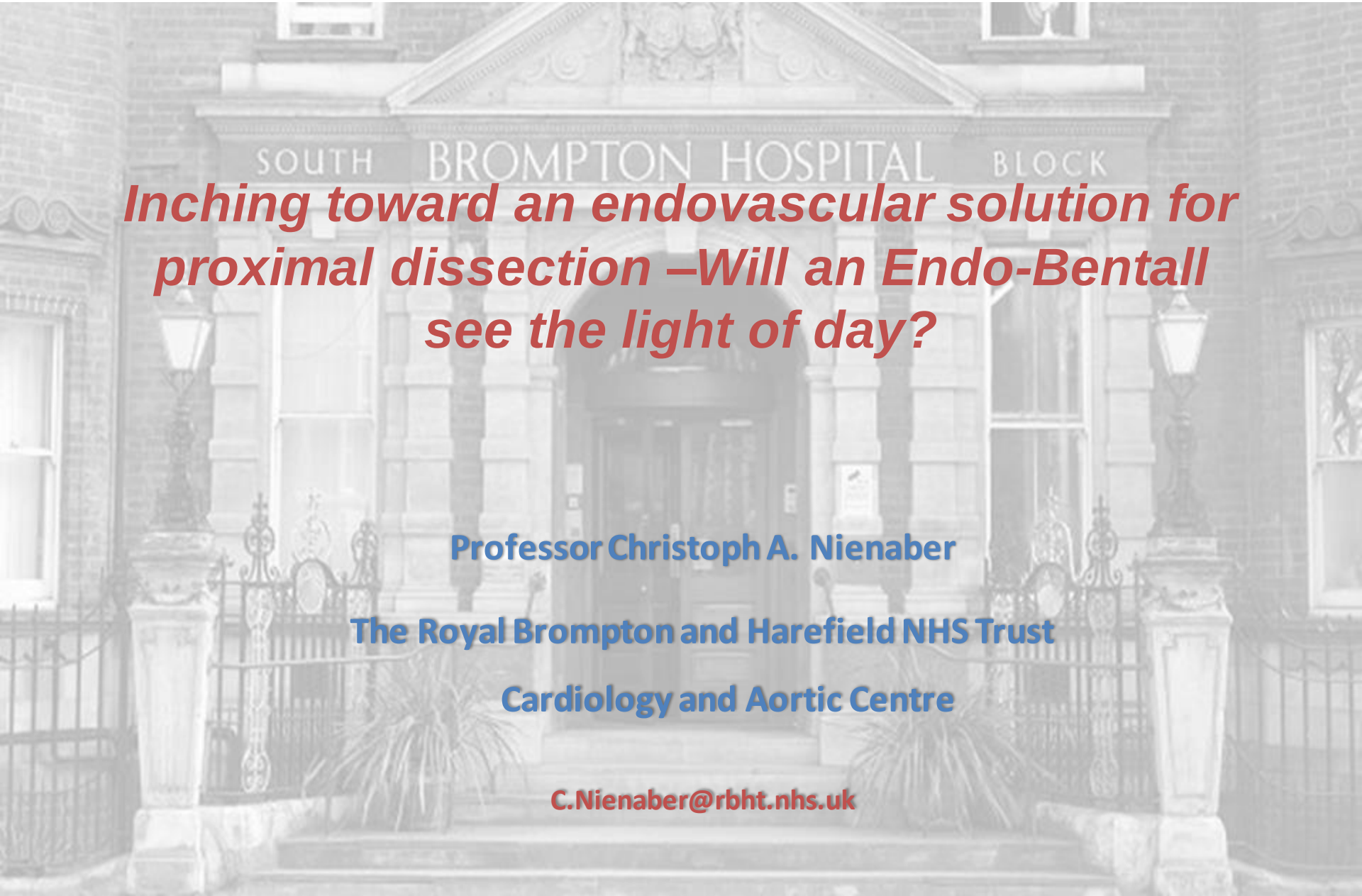


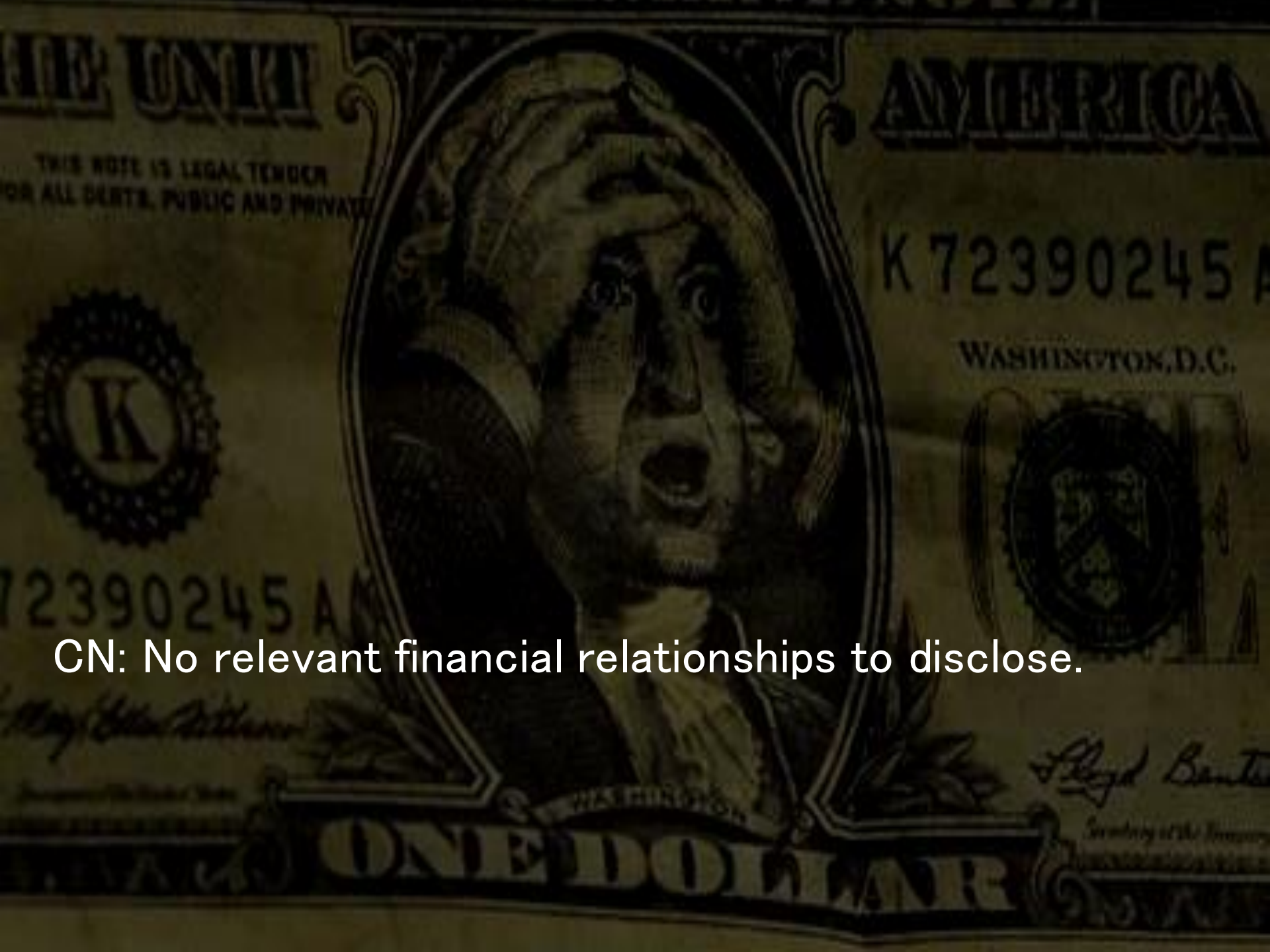
Inching toward an endovascular solution for proximal dissection –Will an Endo-Bentall see the light of day?

Professor Christoph A. Nienaber

The Royal Brompton and Harefield NHS Trust

Cardiology and Aortic Centre

C.Nienaber@rbht.nhs.uk



CN: No relevant financial relationships to disclose.

On October 23, 1760 George II rose at 6 am, asked for his chocolate and repaired to his closet-stool. The valet heard a "noise louder than the royal wind and a groan." The King was

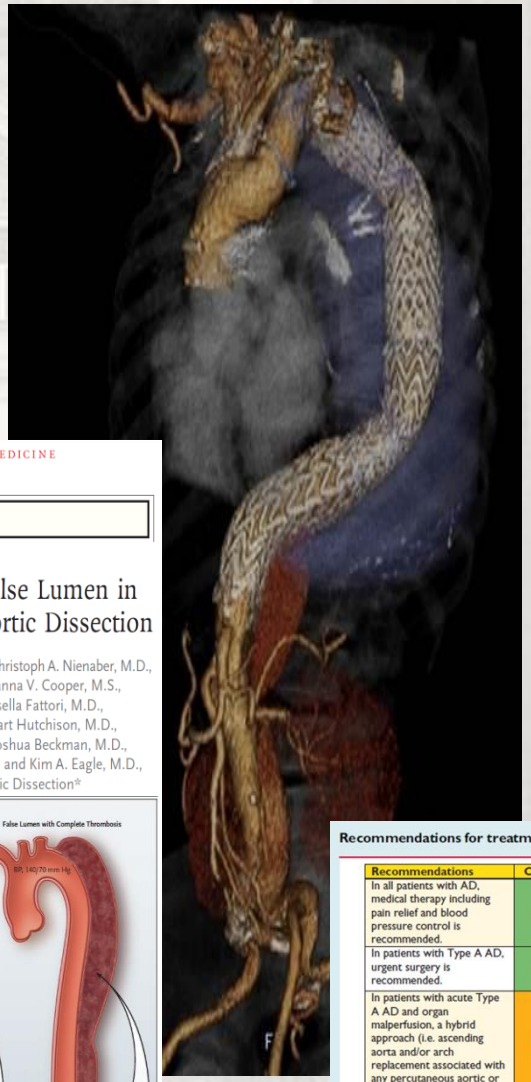
...pericardium extended with coagulated blood and a transverse fissure on the inner side of the ascending aorta 3.75 cm...

fissure on the inner side of the ascending aorta 3.75 cm long through which blood had passed to form an ecchymosis, which was interpreted as an incipient aneurysm

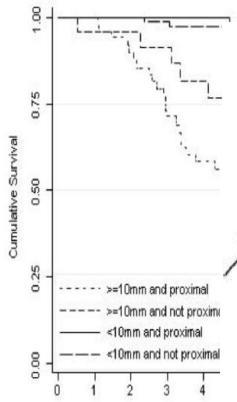
All Type B Dissection

ESC 2014

- Complicated
- Chronic
- Uncomplicated

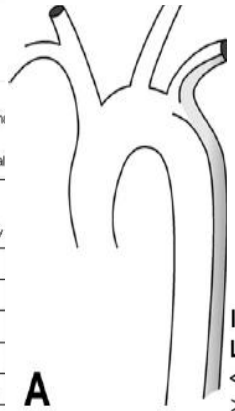


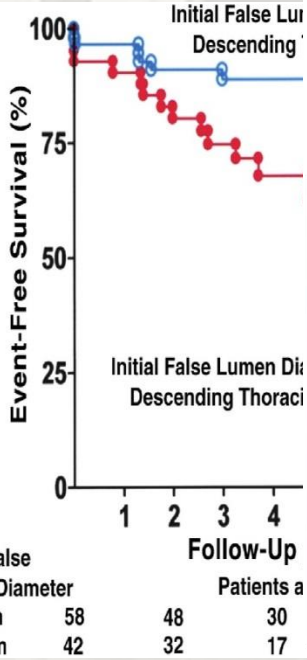
3140 Circulation June 26, 2012



Follow

	0	1	2	3	4
≥10mm prox	49	49	43	34	28
≥10mm not prox	23	22	21	19	17
<10mm prox	38	38	35	31	29
<10mm not prox	74	74	66	58	54



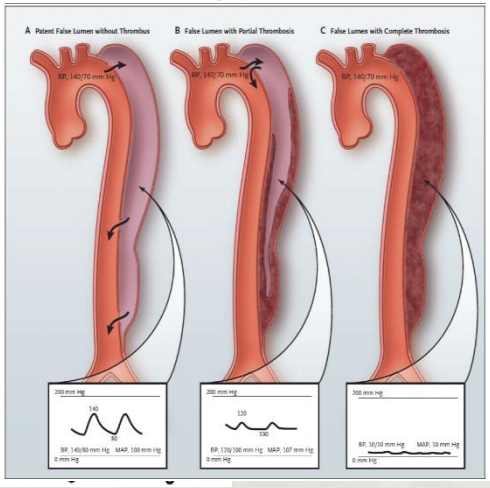


The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Partial Thrombosis of the False Lumen in Patients with Acute Type B Aortic Dissection

Thomas T. Tsai, M.D., M.Sc., Arturo Evangelista, M.D., Christoph A. Nienaber, M.D., Truls Myrmel, M.D., Gabriel Meinhardt, M.D., Jeanna V. Cooper, M.S., Dean E. Smith, Ph.D., Toru Suzuki, M.D., Rossella Fattori, M.D., Alfredo Llovet, M.D., James Froehlich, M.D., Stuart Hutchison, M.D., Alessandro Distante, M.D., Thoralf Sundt, M.D., Joshua Beckman, M.D., James L. Januzzi, Jr., M.D., Eric M. Isselbacher, M.D., and Kim A. Eagle, M.D., for the International Registry of Acute Aortic Dissection*

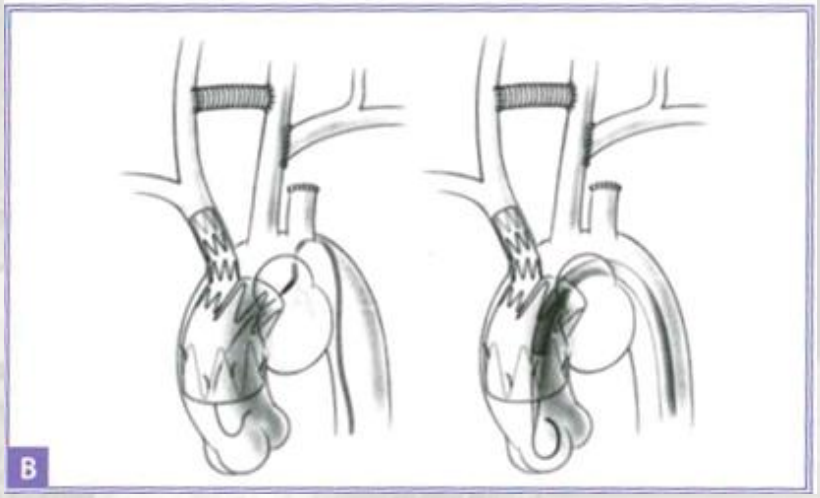


Recommendations for treatment of aortic dissection

Recommendations	Class[a]	Level[b]	Ref.[c]
In all patients with AD, medical therapy including pain relief and blood pressure control is recommended.	I	C	
In patients with Type A AD, urgent surgery is recommended.	I	B	1,2
In patients with acute Type A AD and organ malperfusion, a hybrid approach (i.e. ascending aorta and/or arch replacement associated with any percutaneous aortic or branch artery procedure) should be considered.	IIa	B	2,118, 202–204, 227
In uncomplicated Type B AD, medical therapy should always be recommended.	I	C	
In uncomplicated Type B AD, TEVAR should be considered.	IIa	B	218,219
In complicated Type B AD, TEVAR is recommended.	I	C	
In complicated Type B AD, surgery may be considered.	IIb	C	

[a]Class of recommendation.
[b]Level of evidence.
[c]Reference(s) supporting recommendations.
AD = aortic dissection; TEVAR = thoracic endovascular aortic repair.

Pioneering work led to custom-made Chuter endograft



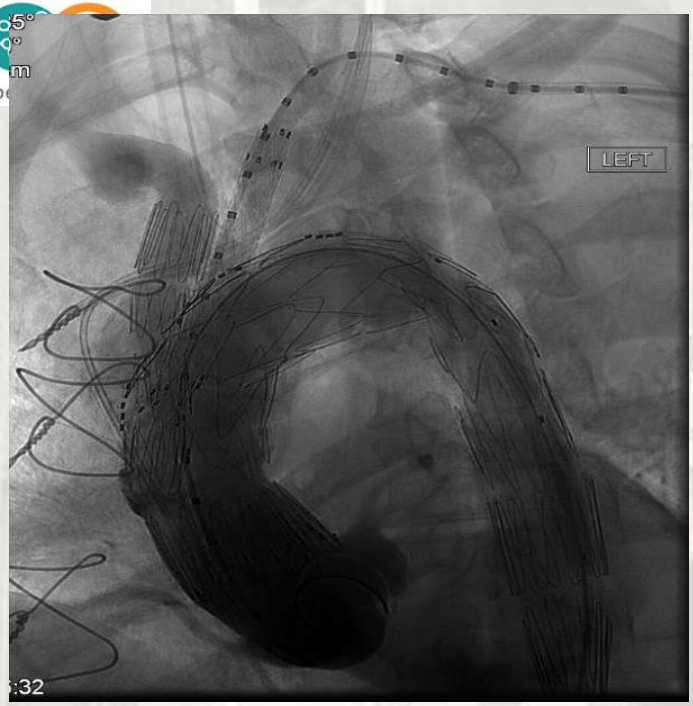
Ready for broader applications? TEVAR and the near future

Expanding Indications

- Total-arch solutions
- Ascending aorta
- Dissection-specific devices
- Type A dissections
- More long-term data

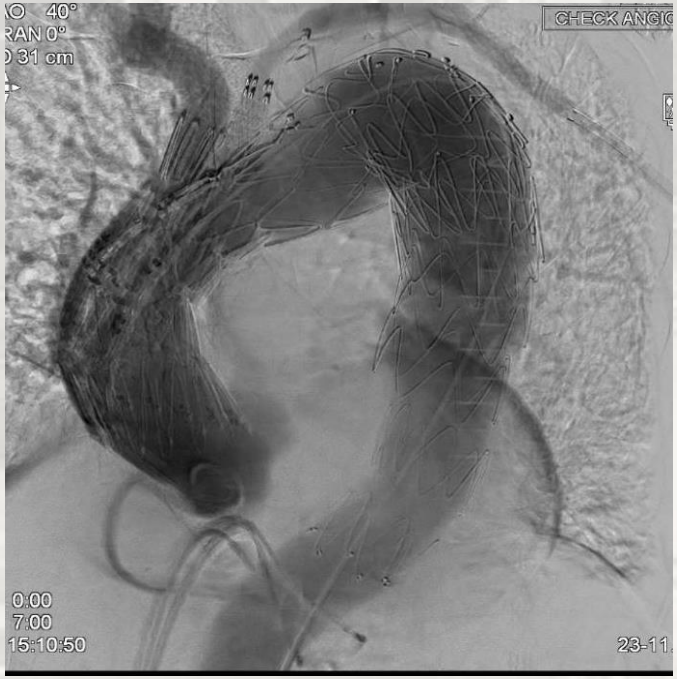
Low profile branch technology

Technology on the horizon, but not successful and not approved


LEFT

LEF
12MMX40MM
FLEUNCY 9MMX60MM
LUMINEXX 9MMX60MM
MX80MM
2MMX60MM

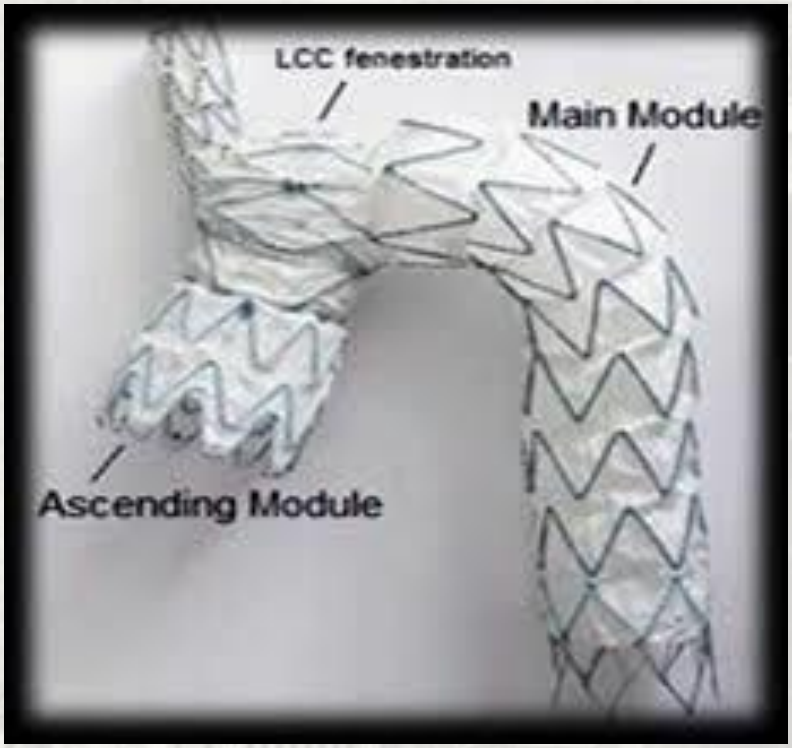
AO 44°
CAUD 2°
FD 42 cm
LEFT
BARD E-LUMINEXX LCCA
9MM X 60MM
FLUENCY PLUS LCCA
9MM X 60MM
COOK IA
13 X 16 X 73
COOK ARCH BRANCH
42 X 42 X 256
COOK DISTAL THORACIC
42 X 42 X 173
0:00
6:50
14:43:47


AO 40°
RAN 0°
31 cm
CHECK ANGI
0:00
7:00
15:10:50

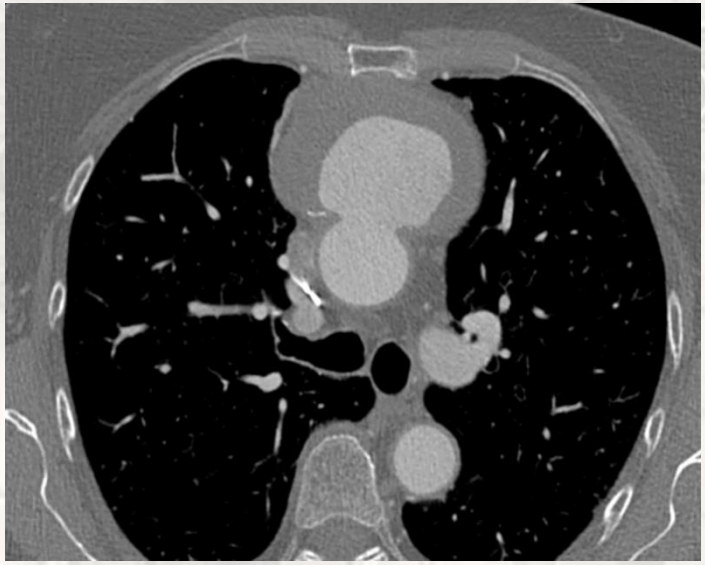
Selection

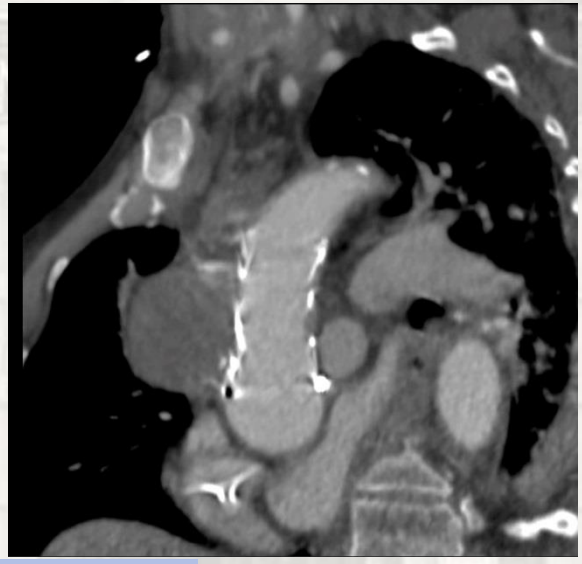
Previous sternotomy for type A
Not suitable for re-do surgery

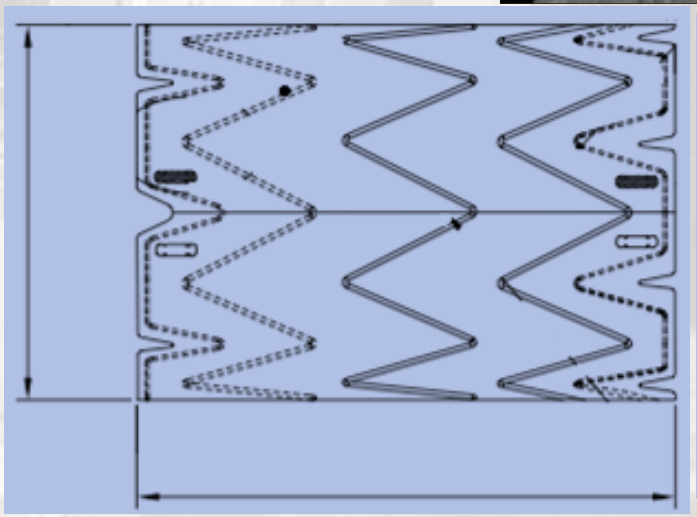
Pharyngolaryngectomy
Neck dissection, radiotherapy..etc
Tracheostomy

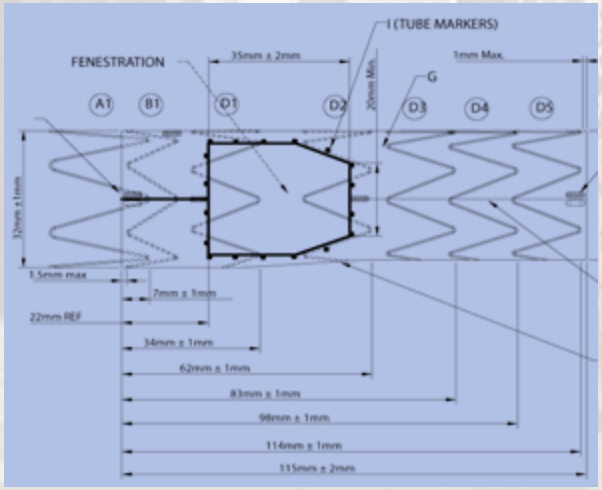

LCC fenestration
Main Module
Ascending Module

Emerging Management of the ascending aorta







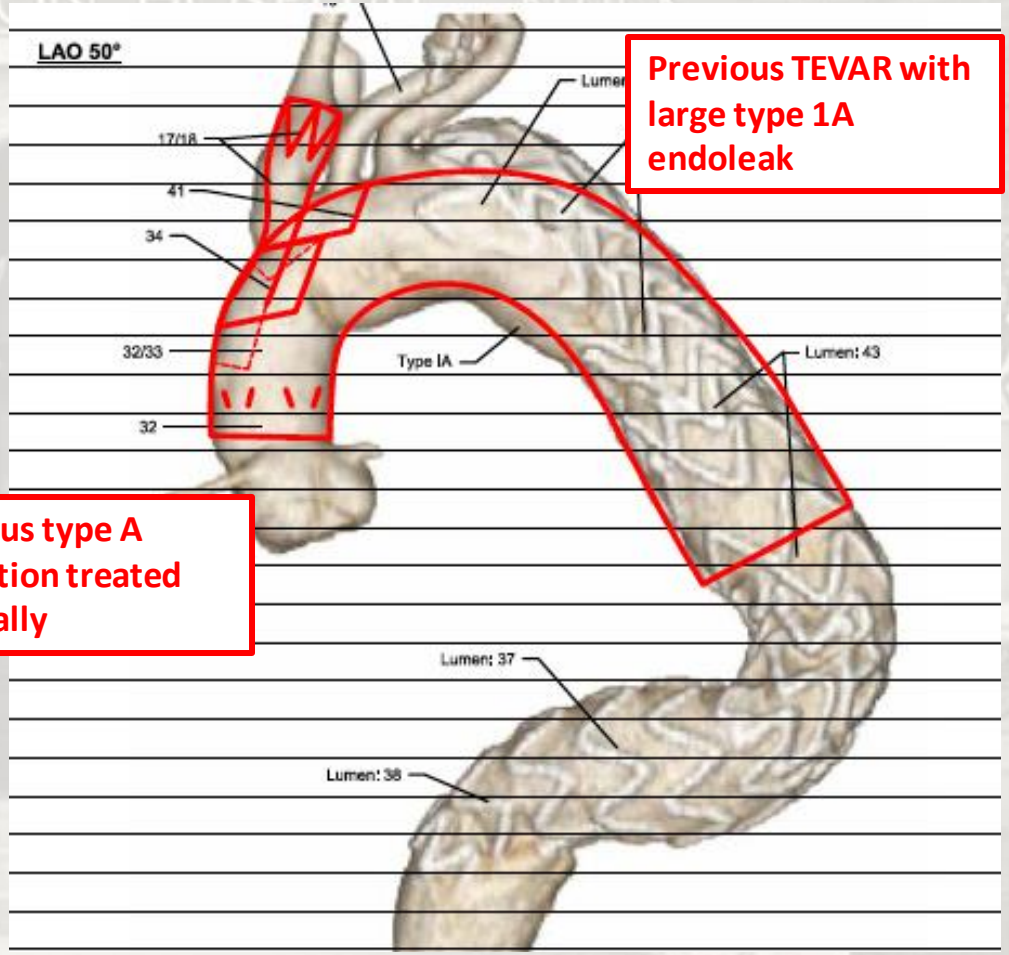


Courtesy of Dr. M. Mattson– Dept. of Interventional Radiology, Royal London Hospital - London

- Patients turned down for surgery for frailty or old age at MDT

- Special cases
  - Previous TEVAR

Future case



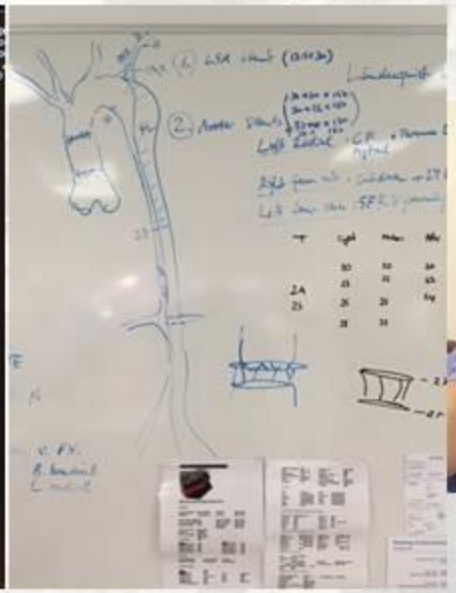
Previous TEVAR with large type 1A endoleak

Previous type A dissection treated surgically

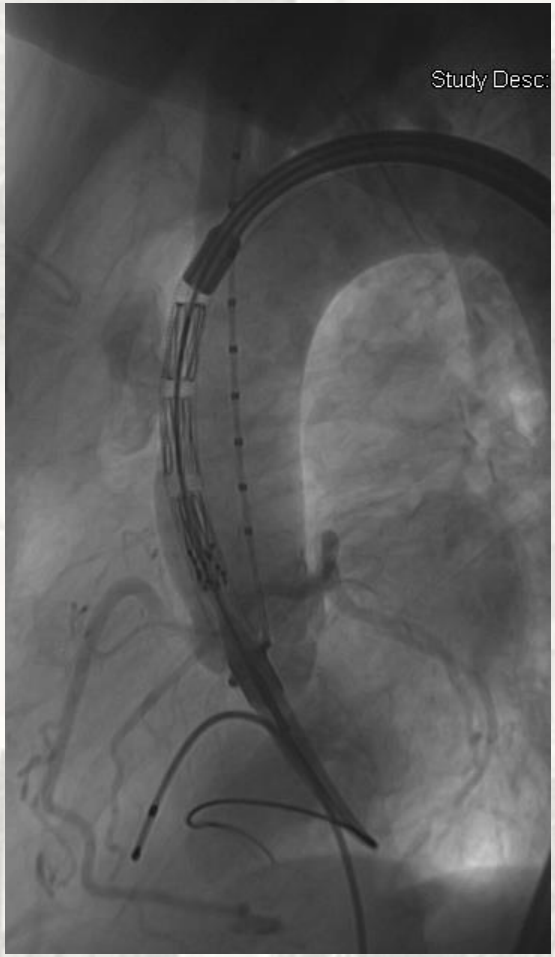
A lifetime of specialist care

Royal Brompton & Harefield NHS
NHS Foundation Trust

Hybrid theatre: *new options of complex endovascular approaches*



Acute Type A Dissection: proximal TEVAR ?



Implantation under rapid RV pacing
Delivery of 36 mm x 6.4 cm TX2 Graft

Series of 12 patients unfit for open surgery

Patient	Age & Sex	Diagnosis	Euroscore II	SG	Procedure duration (min)	Follow-up (months)	Complications
1.	74M	cTAAD	6.9	Cook	90	32	None
2.	75M	aTAAD	8.1	Bolton NBS	140	29	None
3.	87M	aTAAD	13.4	Bolton NBS	79	35	None
4.	89M	cTAAD	15.0	Cook	149	15, †	None
5.	90M	cTAAD	19.3	Cook	70	0, †	Ventricular rupture, tamponade
6.	69M	aTAAD	3.9	Cook	61	36, †	None
7.	75M	cTAAD (PAH)	4.9	Bolton NBS	70	24	None
8.	87M	cTAAD	9.4	Cook	49	15	Minor Stroke
9.	87F	aTAAD post TAVR	7	Optimed	120	23, †	None
10.	83M	cTAAD	6.9	Cook	89	19, †	None
11.	75F	aTAAD	5.9	Cook	60	5	none
12.	75F	aTAAD	8.9	Gore + Viabahn in innominate artery	60	0	none

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Address for reprints: Christoph A. Nienaber, MD, PhD, Cardiology and Aortic Centre Royal Brompton Hospital, Royal Brompton and Harefield NHS Foundation Trust, Sydney St, London SW3 6NP, United Kingdom (E-mail: c.nienaber@rbht.nhs.uk).
0022-5223/$36.00
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http://dx.doi.org/10.1016/j.jtcvs.2016.07.078

Scanning this QR code will take you to the videos for the article.

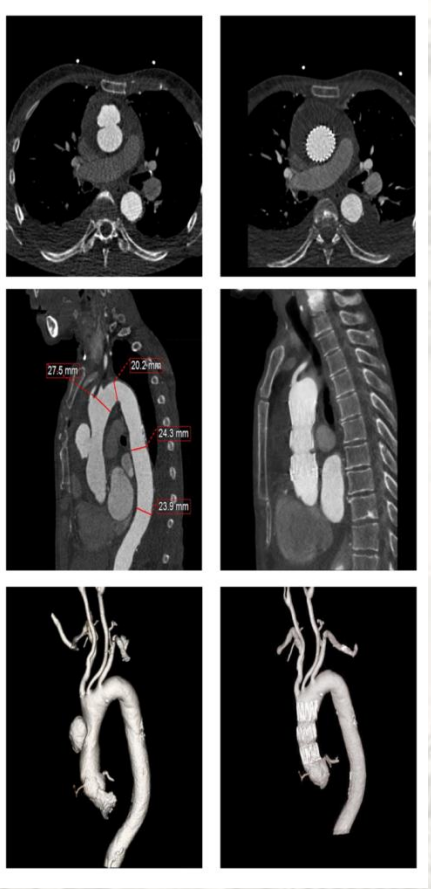
Characteristics

- 9 M, 3F, aged 81±7 years
- Proximal tear in ascending aorta
- EuroScore II 9.1±4.5
- Procedural success 91.7%
- 30 d mortality 8.3%

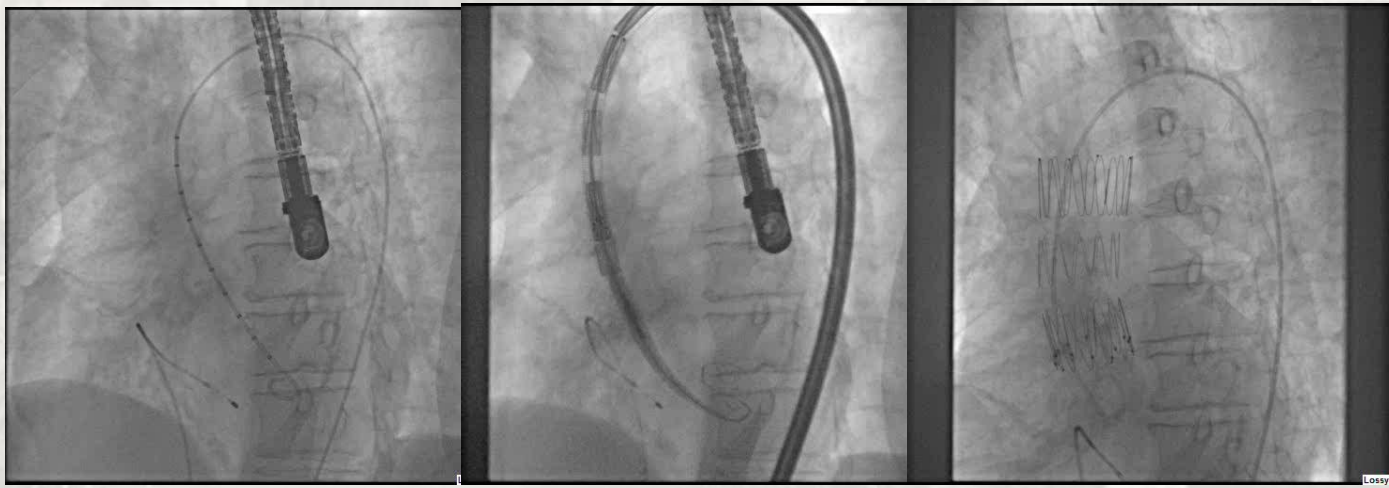
Nienaber C, Sakalihasan N, Clough R et al. JCTS 2017

Olsson C. et al., Circulation 2006;114:2611-2618

Nice initial result after TEVAR in ascending aorta



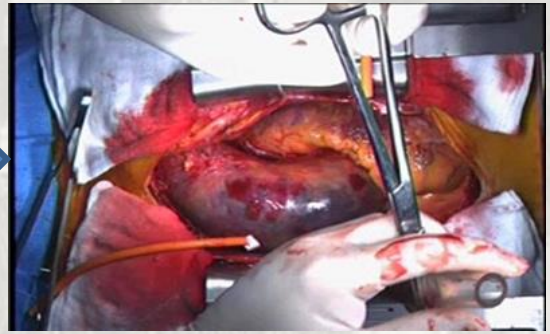
From top to bottom: 2-dimensional transversal and coronal display of ascending (type A) aortic dissection before (left) and after stentgrafting (right) showing reconstruction and remodelling of the aorta. The lower panel demonstrates the successful intervention as a 3-dimensional reconstruction.



Evolution after successful proximal stent-grafting

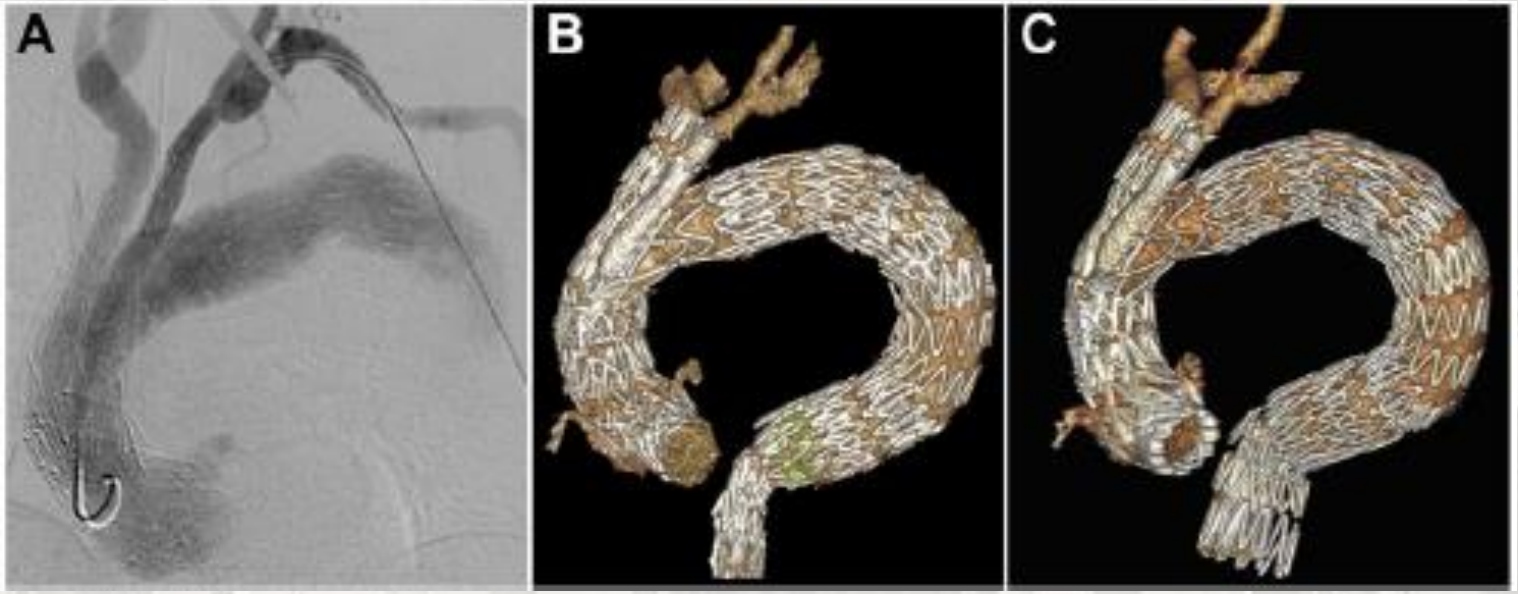
Pre-TEVAR At discharge 16 months F/U

2- and 3-dimensional images of proximal aortic dissection before (A) and after stent-graft (B) with successful remodelling, but later total erosion of distal stent-edge at 16 months (C).



Yuan X et al. Cath Cardiovasc Int 2018

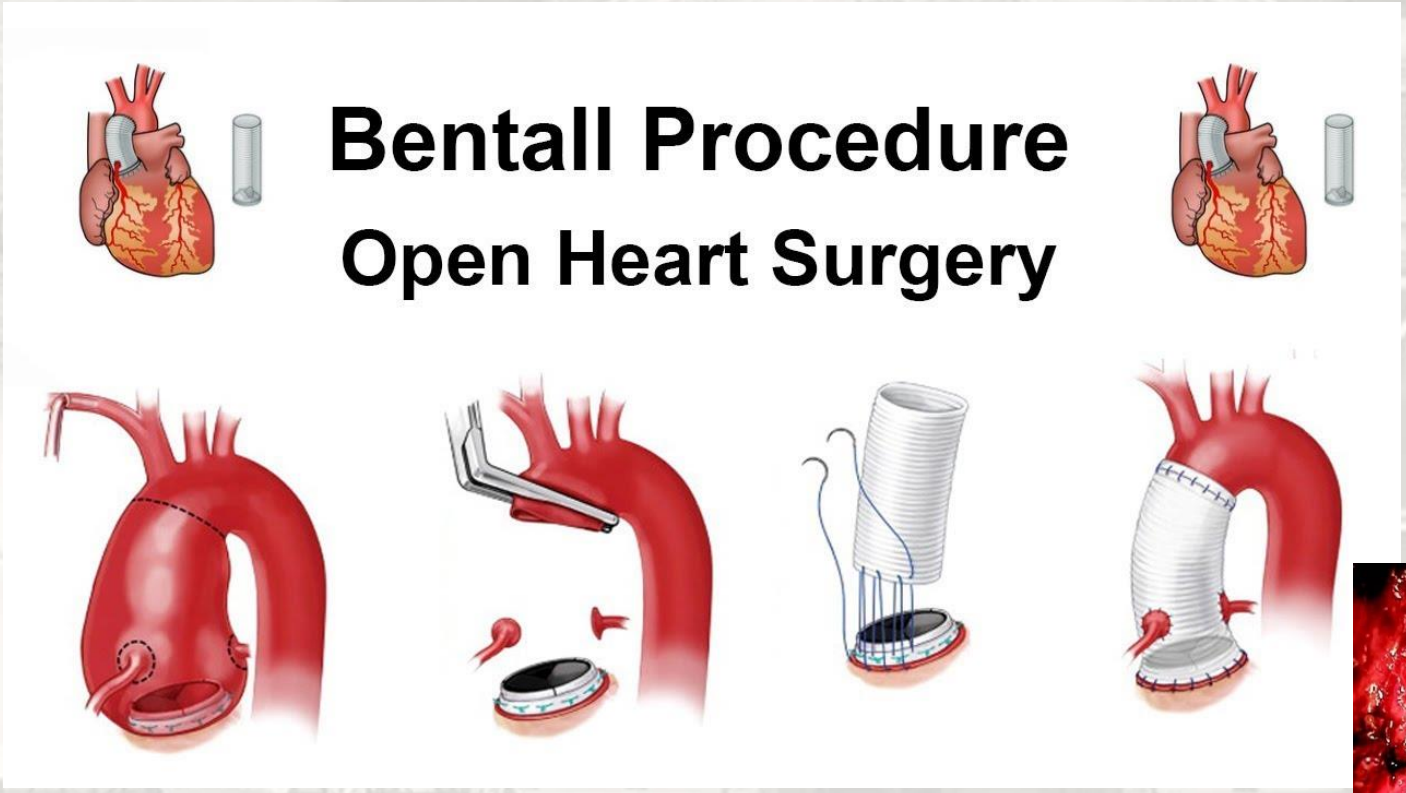
TEVAR combined with TAVI - Endobentall ?

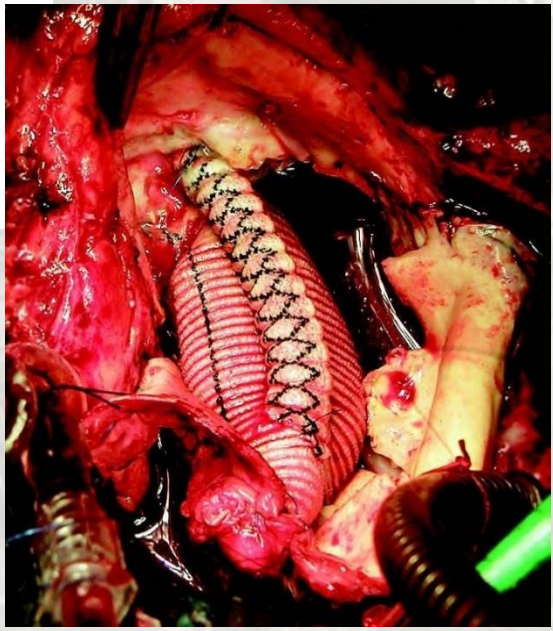


(A) Final angiography showing no aortic regurgitation or endoleak with patency of the coronary arteries and bridging stents perfusing the supra-aortic trunks. Results were confirmed on the postoperative 3-dimensional reconstruction (B) and maintained on the 7-month follow-up scan (C).

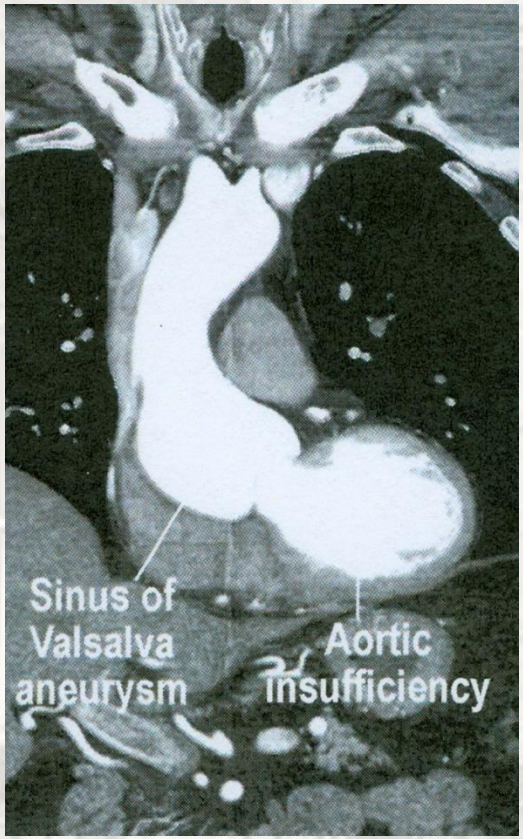
Hertault et al JEVT 2018

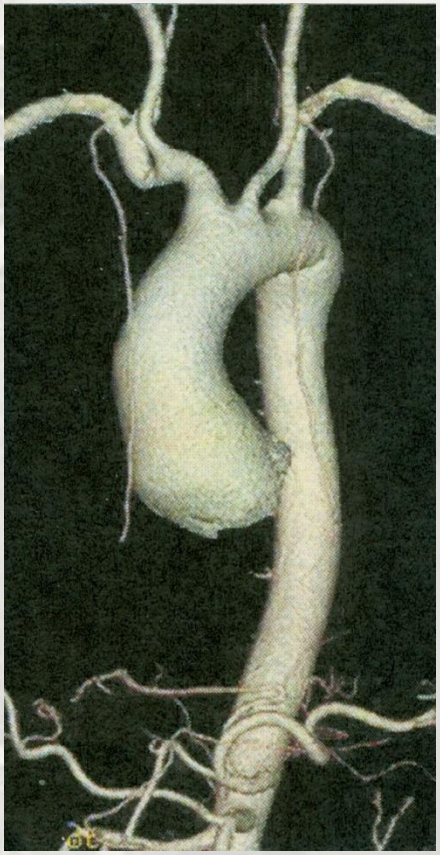
Can this be replaced by an Endovascular Procedure?

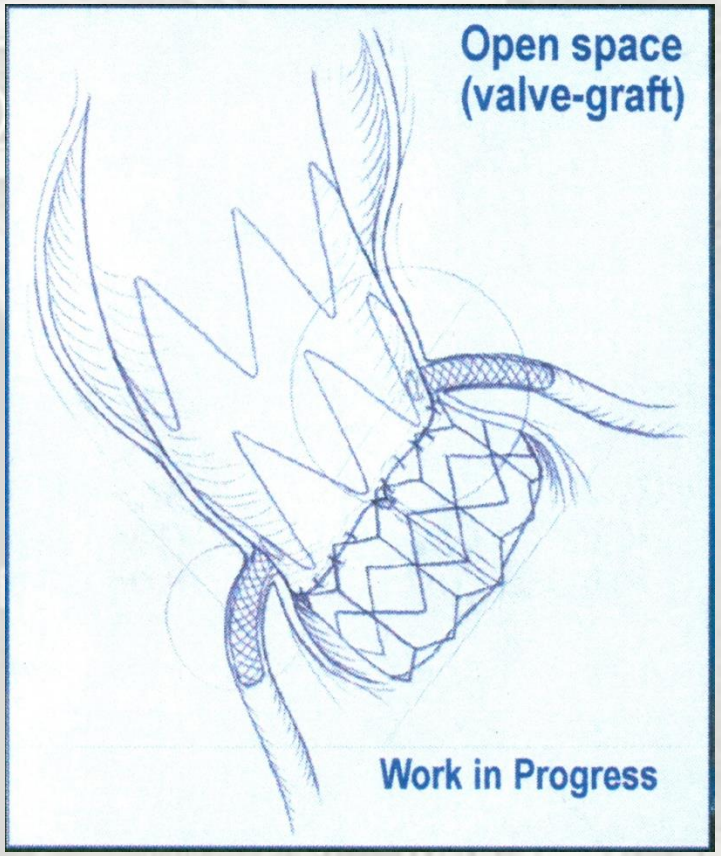




Final Challenge:
Is There a Potential for an Endovascular Bentall Procedure?







Covered stents (Jostent)
for Coroneries

Anatomic Feasibility of an Endovascular Valve-Carrying Conduit for the Treatment of Type A Aortic Dissection

167 patients

With high quality CT scans were screened for anatomic feasibility

3 landing zones

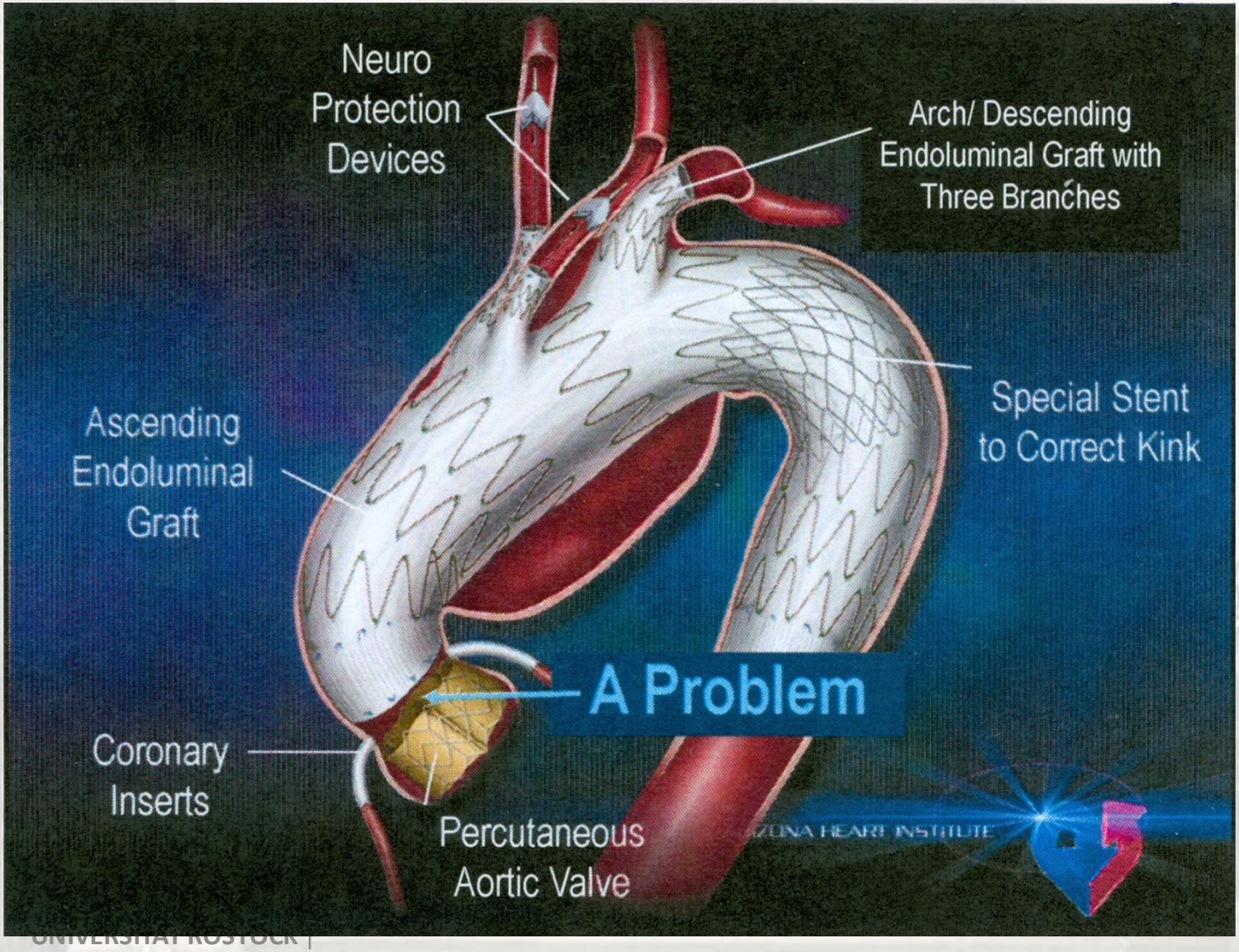
① distal sealing zone
② proximal sealing zone
③ transcatheter valve

113 patients (68 %)

Are potential candidates, but most would require tapered stent-grafts

Kreibich M et al., JTCVS 2018

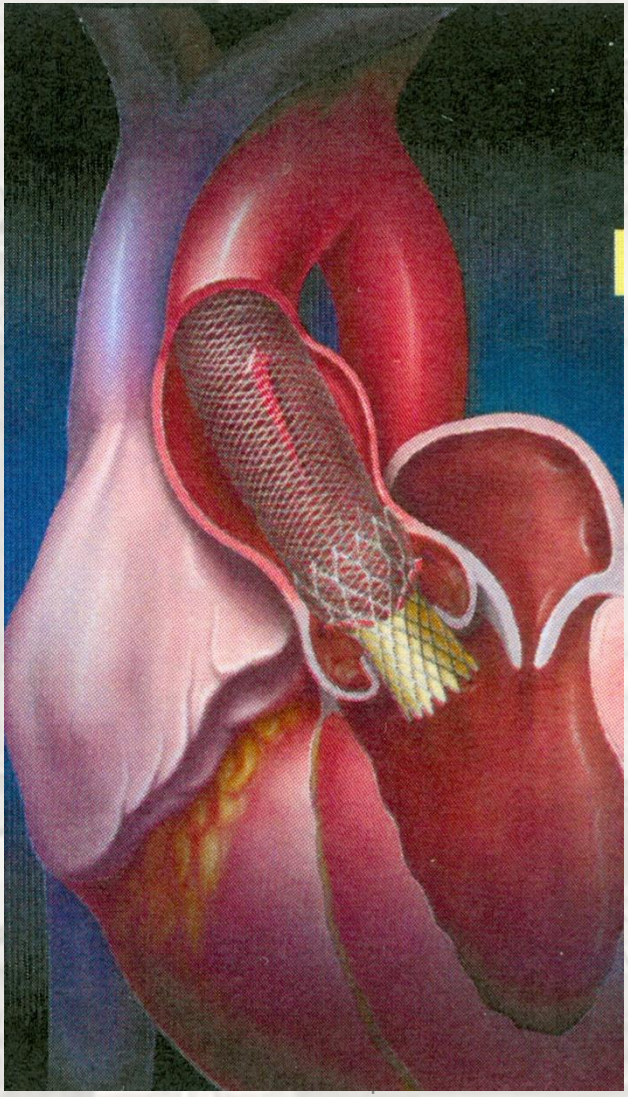
The future is approaching...but not close yet!



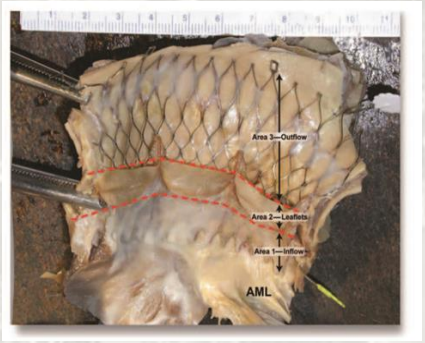
Slide by Ted Diethrich 2006

New Future ?

2006



Is an Endo - Bentall a Feasible Option soon?



Answer:

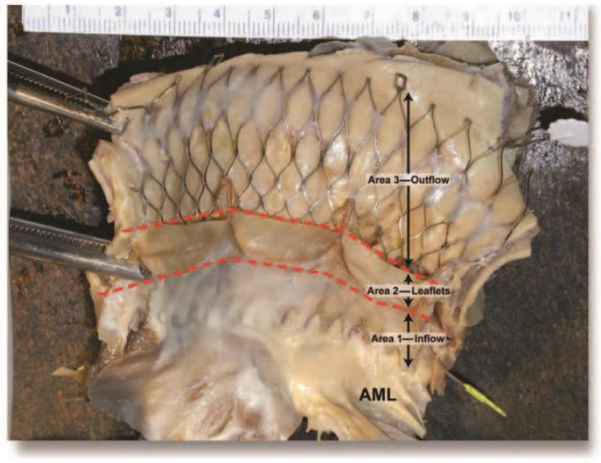
Almost Certainly, but not today & not tomorrow!

Conclusion and Outlook

- Endovascular management of proximal (type A, DeBakey II) dissection is feasible in selected cases, but requires improved technology (better conformability, fenestrated/branched grafts and individualized solutions).

- The use of coils and closure devices to manage the false lumen is a new efficient (minimalistic FLIRT) strategy likely to avoid some problems of stenting and open surgery in selected cases.

- The ultimate goal of a total endovascular solution for ascending aortic pathologies (endo-Bentall) is still way ahead of us.



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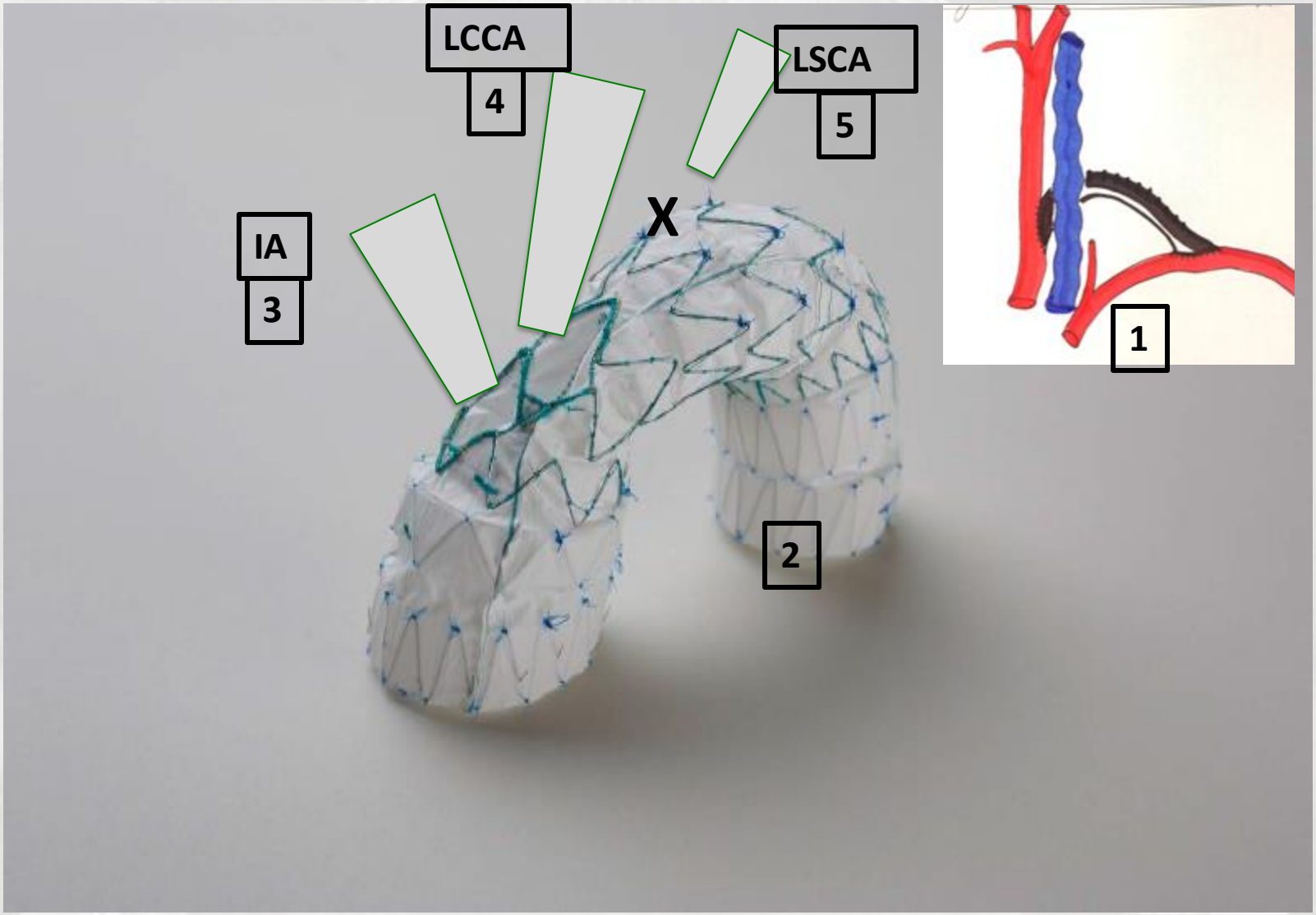
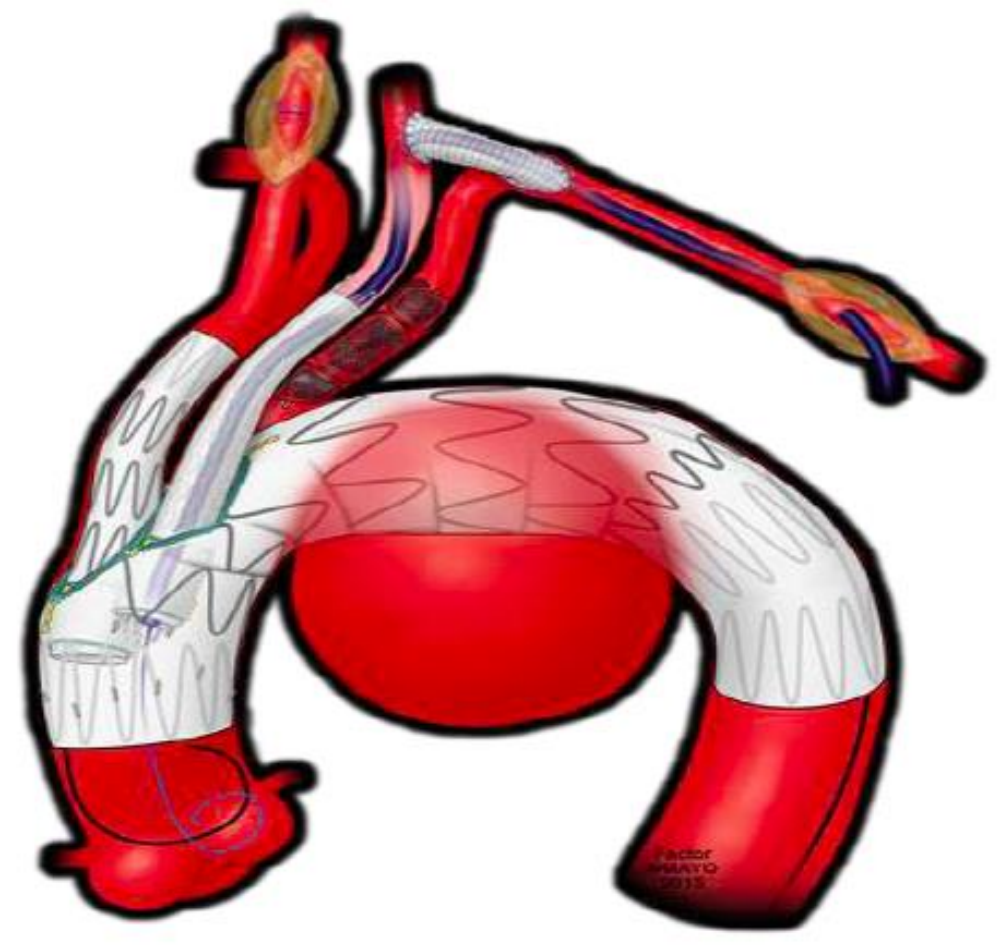
Brompton Aortic Centre 2018

The inner branch concept



The end product

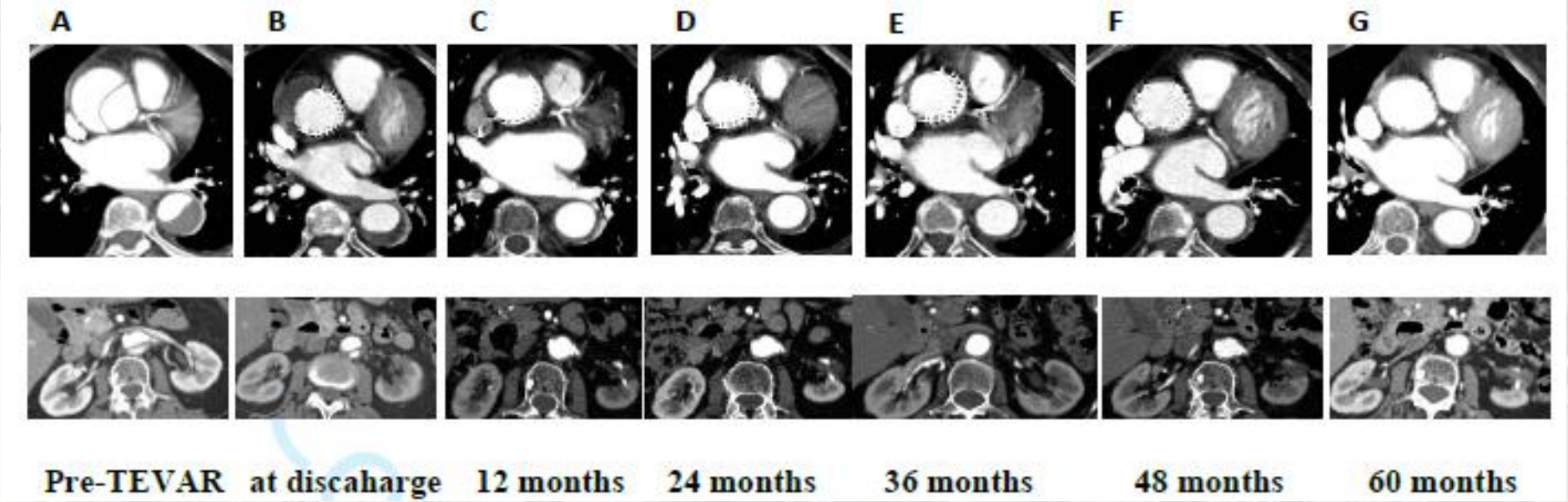


TEVAR In Acute Type A Dissection in 2006

Implantation under rapid RV pacing

Endovascular approach to proximal (ascending) aortic dissection

The concept of remodeling works!



Type A aortic dissection in 2012
77 yrs old lady
Euroscore 21
Refused open surgery for type A dissection

Ascending Aorta + TEVAR

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Published by Elsevier Inc.

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ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2012.08.994

Vascular Disease

Endovascular Repair of Ascending Aortic Dissection

A Novel Treatment Option for Patients Judged Unfit for Direct Surgical Repair

Qingsheng Lu, MD, Jiaxuan Feng, MD, Jian Zhou, MD, Zhiqing Zhao, MD, Junmin Bao, MD, Rui Feng, MD, Liangxi Yuan, MD, Xiang Feng, MD, Lefeng Qu, MD, Yifei Pei, MD, Zhijun Mei, MD, Zaiping Jing, MD, PHD

Shanghai, China

Objectives This paper sought to report the outcomes of patients who are considered unfit for urgent surgical repair of ascending aortic dissections (AADs) who were treated using a novel endovascular repair strategy.

Background AAD is best treated by direct surgical repair. Patients who are unable to undergo this form of treatment have poor prognoses. Previously, clinical case reports related to endovascular repair of AAD have been controversial.

Methods Between May 2009 and January 2011, 41 consecutive patients with AAD were treated in our institution. Fifteen patients were considered poor candidates for direct surgical repair and subsequently underwent the endovascular repair.

Results The nature of the referral process to our tertiary care facility made the median time from aortic dissection onset to treatment 25.5 days (range: 6 to 353 days). Dissections in 5 patients (33.3%) were considered acute, and those in 10 patients (66.7%) were considered chronic. The rate of successful stent-graft deployment was 100%, and there were no major morbidities or deaths in the perioperative period. Median follow-up was 26 months (range: 16 to 35 months). One new dissection occurred in the aortic arch at 3 months and was treated with a branched endograft. Significant enlargements of true lumens and decreases of false lumens and overall thoracic aorta were noted after the procedures.

Conclusions Endovascular repair of AAD was an appropriate treatment option in patients who were considered poor candidates for traditional direct surgical repair by the clinical criteria used in our institution. A larger series of cases with longer follow-up is needed to substantiate these results. (J Am Coll Cardiol 2013;61:1917–24)
© 2013 by the American College of Cardiology Foundation

Lu Q, et al. J Am Coll Cardiol 2013;61:1917–24

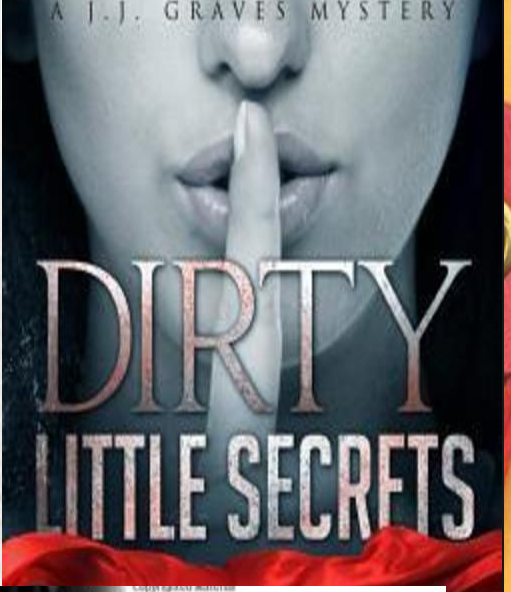
Emerging Therapy for the ascending Aorta

Figure 1 **Ascending Aortic Dissection with Compromised Branch Artery**

(A) Computed tomography angiography (CTA) image obtained before stent grafting showing that the primary stent reopened the left renal artery, which had been compromised by the dissection **(arrows)**. **(B)** Pre-operative aortography showing the aneurysmal expansion of the ascending aortic dissection. **(C)** Completion aortography showing that the entry tear was completely excluded. Comparison between **(D)** pre-operative CTA image and **(E)** CTA image obtained at the 24-month follow-up at the same level of maximal ascending aorta showing that the diameter of ascending aorta shrank and the true lumen expanded. **(F)** Follow-up CTA image confirming complete thrombosis of the false lumen along the ascending aorta and the patency of the coronary arteries and the supra-arch branch arteries.

IRAD (submitted)

Lu Q, et al. J Am Coll Cardiol 2013;61:1917–24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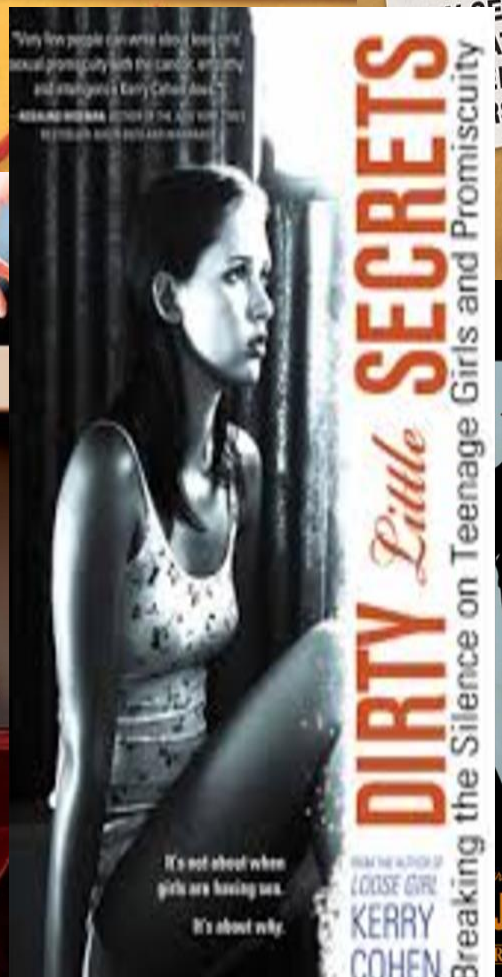
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Breaking the Silence on Teenage Girls and Promiscuity
It's not about when girls are having sex.
It's about why.
KERRY COHEN

An apartment building with nine tenants and one...
Dirty Little
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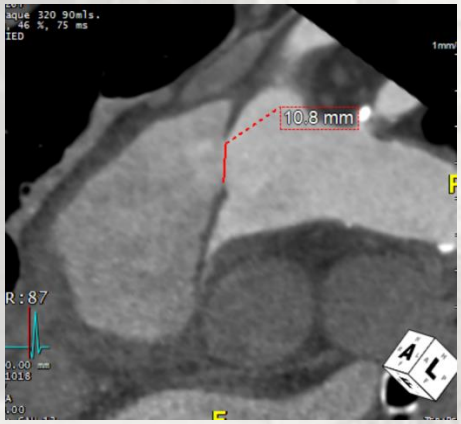
JACK CELI and SONIA LaDARE

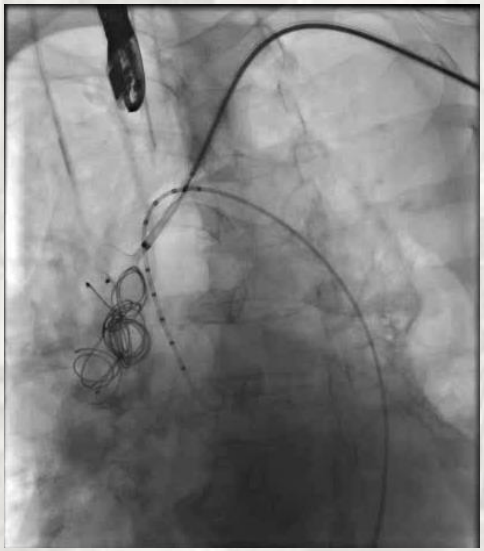
Same Problem – this time another strategy ?

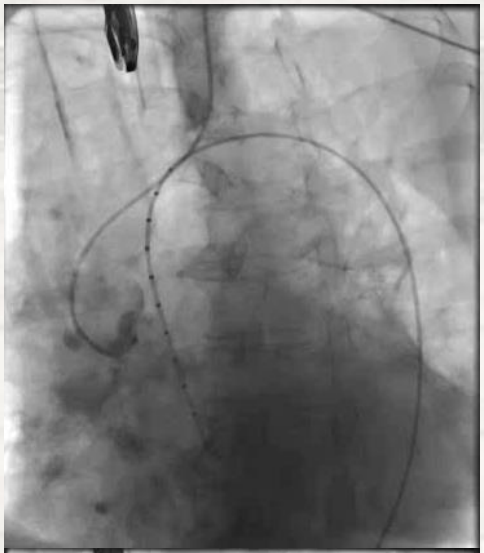


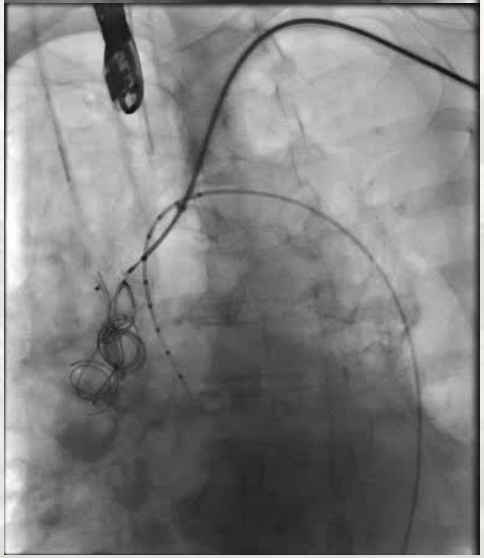
CASE M.P

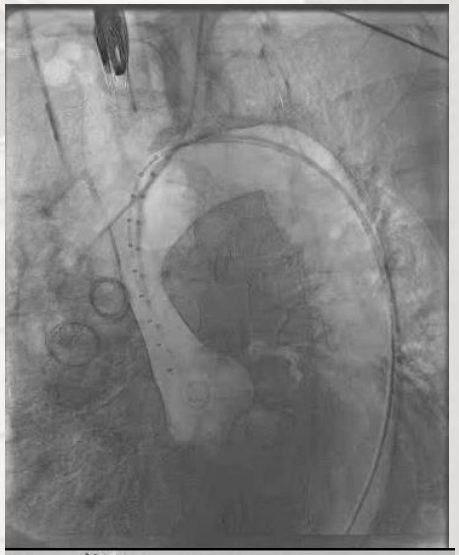
Inoperable
Euroscore II 21%

CASE M.P

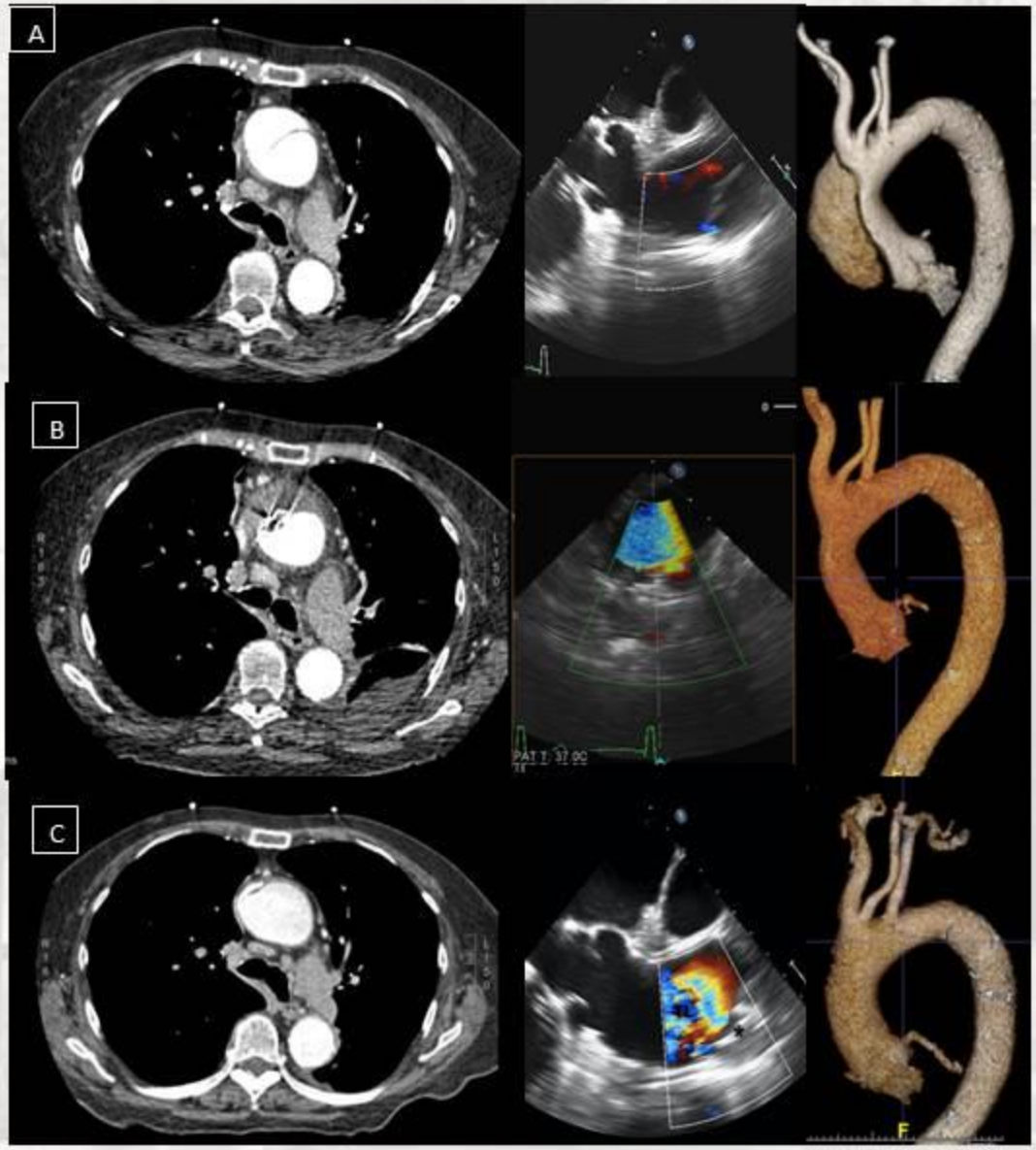








Interventional Repair of type a aortic dissection



pre procedure
(FLIRT)

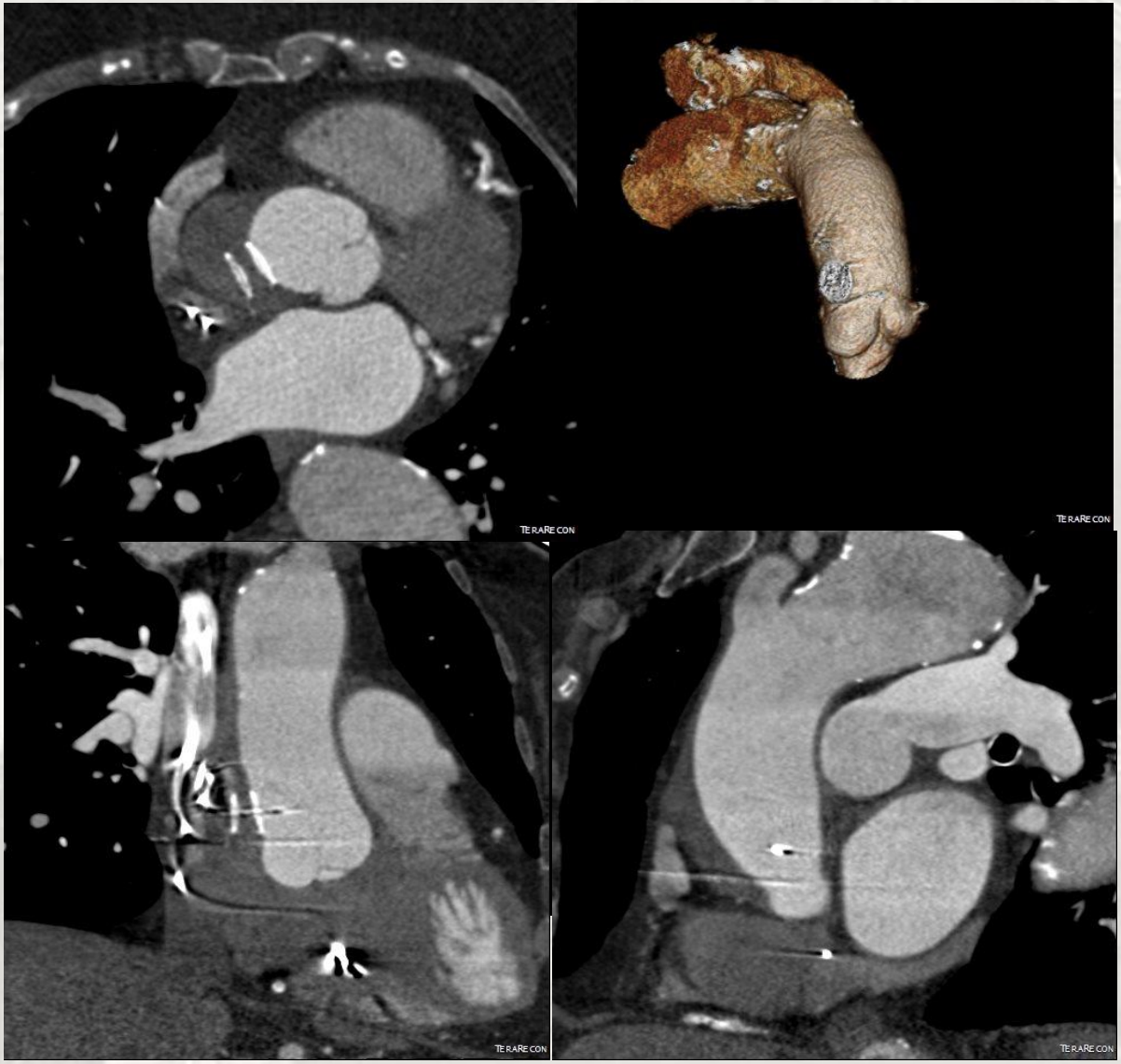
CT and echo images pre-procedure (A), at discharge (B) and 6-month follow-up (C) showing entry closure false lumen thrombus and shrinkage with true lumen expansion (remodelling) (patient no.2). Star shows the ASD occluder.

At discharge

6 months F/U

Yuan X et al under review 2017

Interventional false lumen management in proximal aortic dissection



Successful exclusion of false lumen in type A dissection;

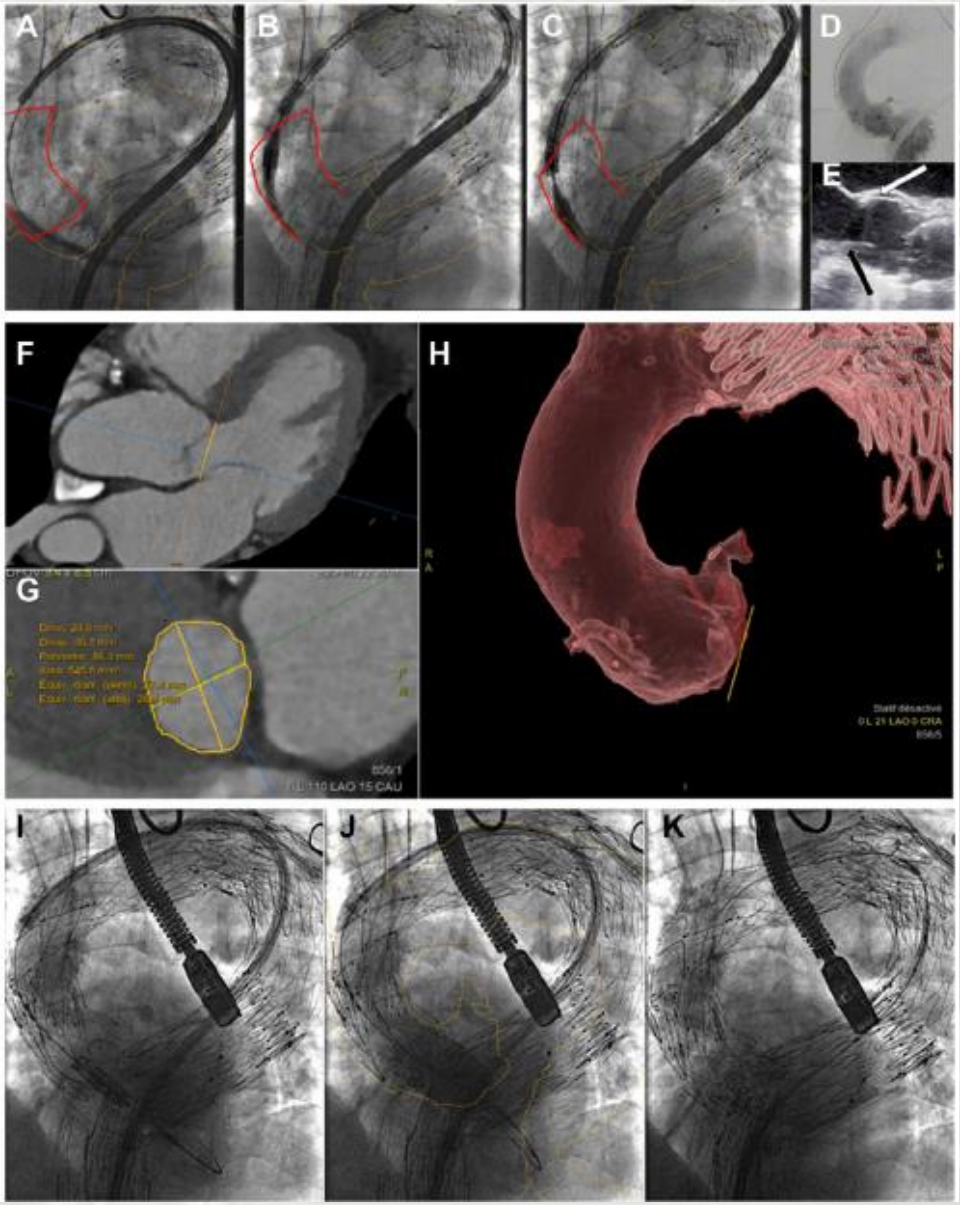
No contrast communication to the false lumen;

Patient discharged on 3 days post intervention.

Remodelling at 6 months

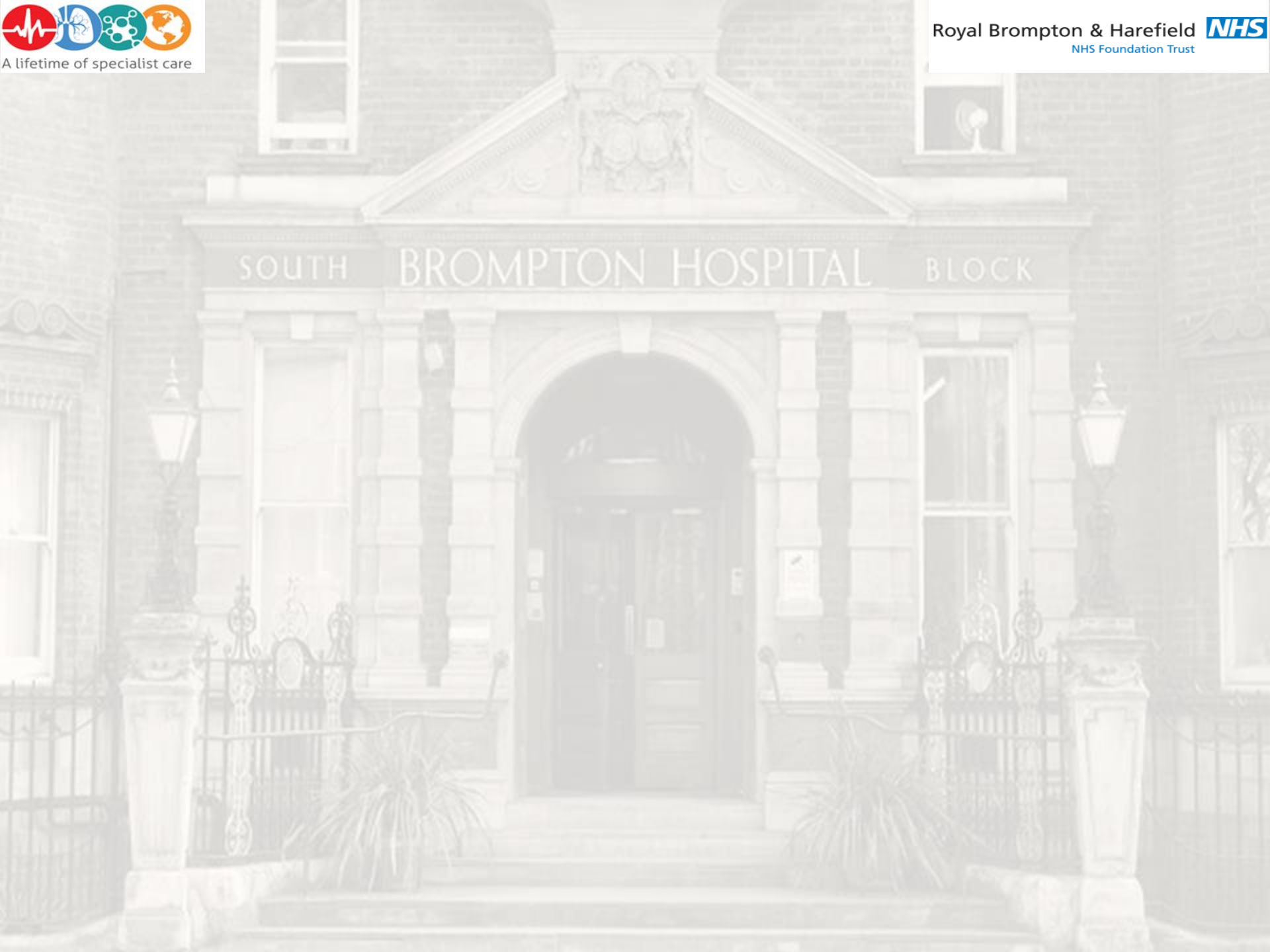
Yuan X et al JEVT 2017

TEVAR combined with TAVI – Endo-Bentall ?



(A) The ascending arch endograft was deployed as planned. During advancement of the branched endograft delivery system, (B, C) the ascending endograft was pushed toward the valve. (D) Aortography showed patent coronary arteries but severe aortic regurgitation. (E) Transesophageal echocardiography showed the left main trunk cusp pinned to the aortic wall by the endograft (white arrow). Black arrow shows a free cusp. (F, G) The aortic annulus was evaluated on the preoperative images to select the appropriate valve size. (H) Views perpendicular to the annulus plane were automatically defined by the software and sent to the C-arm to assist accurate valve deployment. (I) The balloon-expandable Sapien S3 prosthesis was positioned through the aortic valve. (J) Deployment was performed under rapid pacing. (K) The sheath and wire were then retrieved.

Hertault et al JEVT 2018



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