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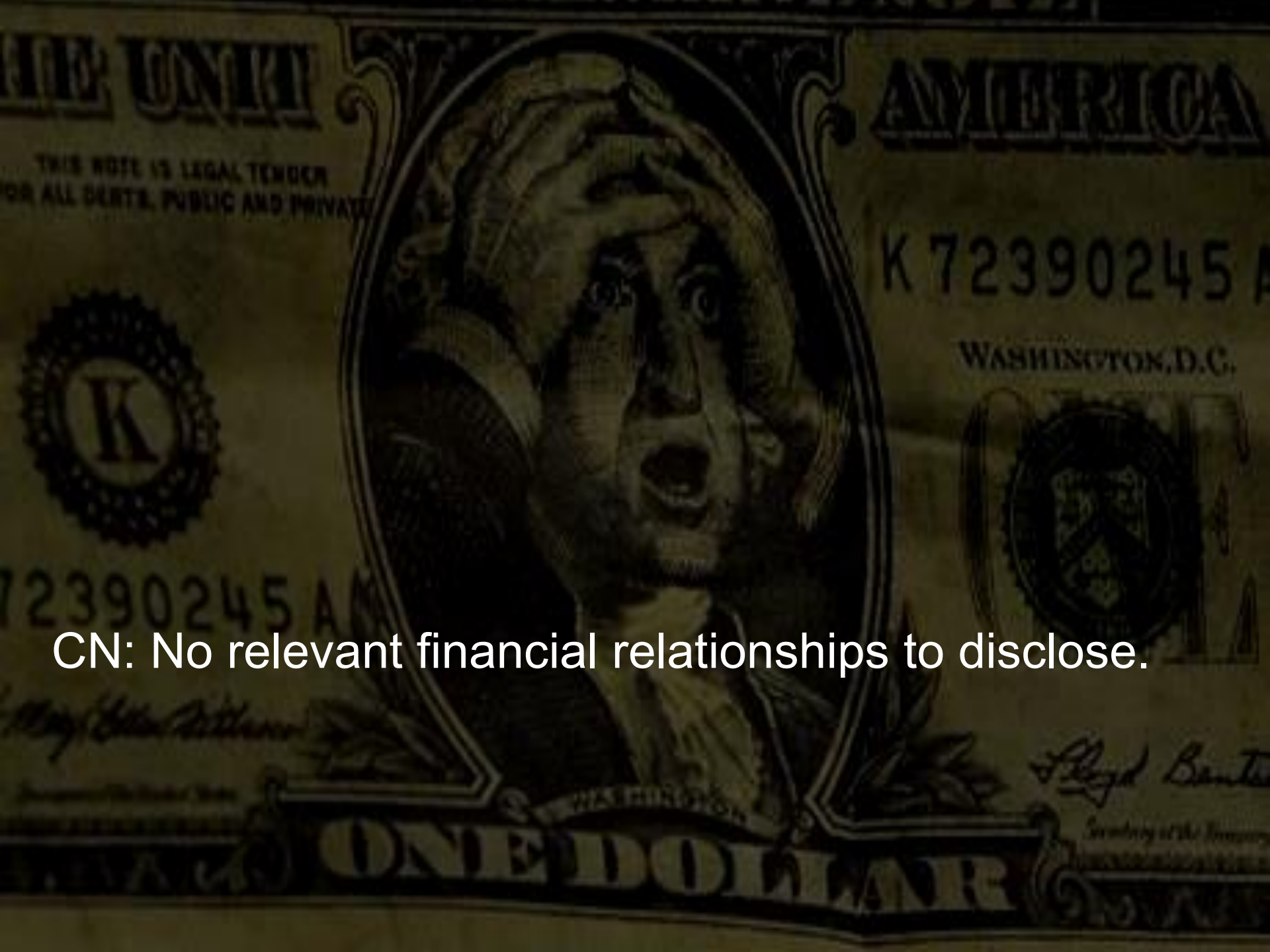
Shoot first or hold your fire in acute type B dissections? Team urgent repair

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.



My 1st TEVAR in type B dissection (1996)

N Engl J Med 1999;340:1546-52.

The New England Journal of Medicine

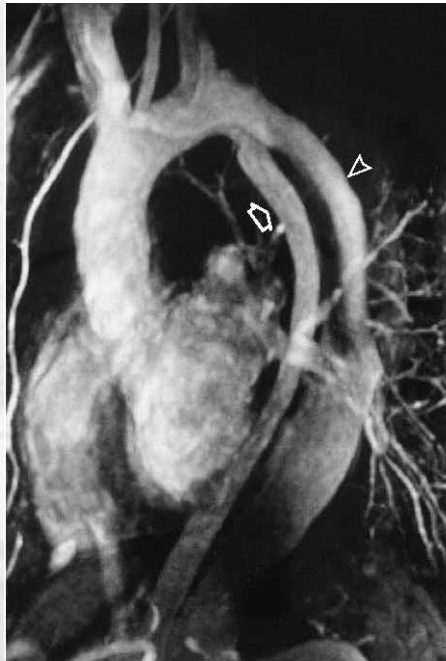
ENDOVASCULAR STENT-GRAFT PLACEMENT FOR THE TREATMENT OF ACUTE AORTIC DISSECTION

MICHAEL D. DAKE, M.D., NORIYUKI KATO, M.D., R. SCOTT MITCHELL, M.D., CHARLES P. SEMBA, M.D.,
MAHMOOD K. RAZAVI, M.D., TAKATSUGU SHIMONO, M.D., TADANORI HIRANO, M.D., KAN TAKEDA, M.D., ISAO YADA, M.D.,
AND D. CRAIG MILLER, M.D.

ABSTRACT

Background The standard treatment for acute aortic dissection is either surgical or medical therapy,

ACUTE aortic dissection is one of the most catastrophic diseases that can affect the aorta. There are 10 to 20 cases per million



- Feasible
- Safe
- Quick recovery
- Open surgery abandoned

Dake MD, et al. NEJM 1999; 340:1546-1552

Nienaber CA, Fattori R, Lund G, et al. NEJM 1999; 340:1539-1545



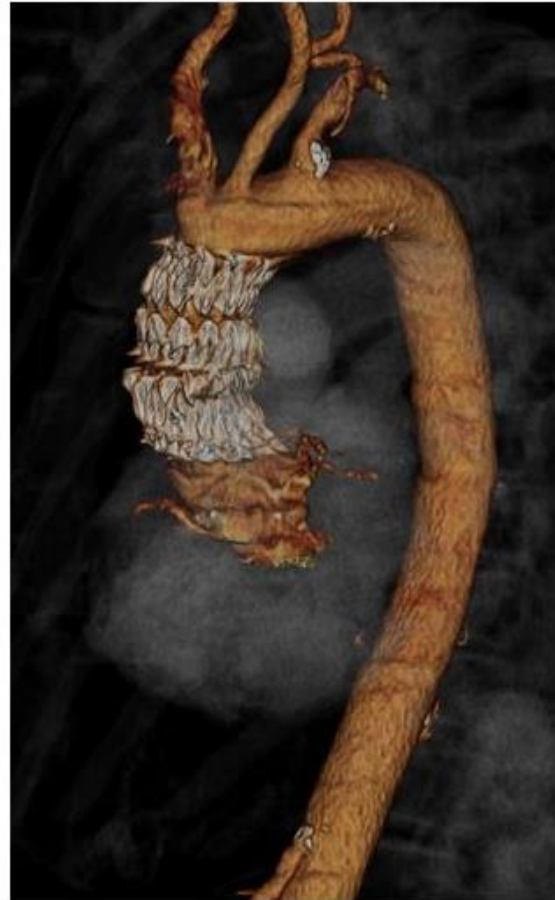
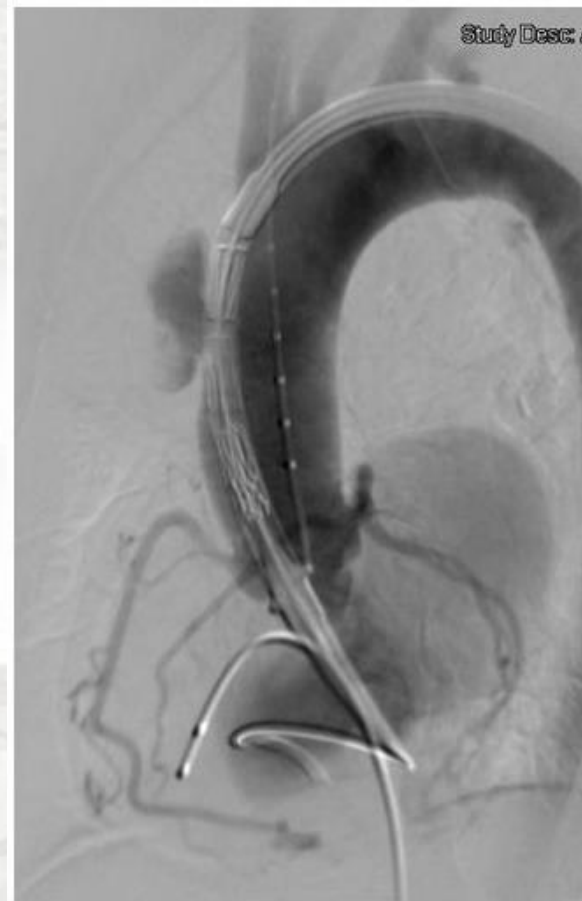
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My 1st TEVAR In acute type A dissection (2009)



Implantation under rapid RV pacing

Referral Network Service for aortic dissection (analogy: rAAA)

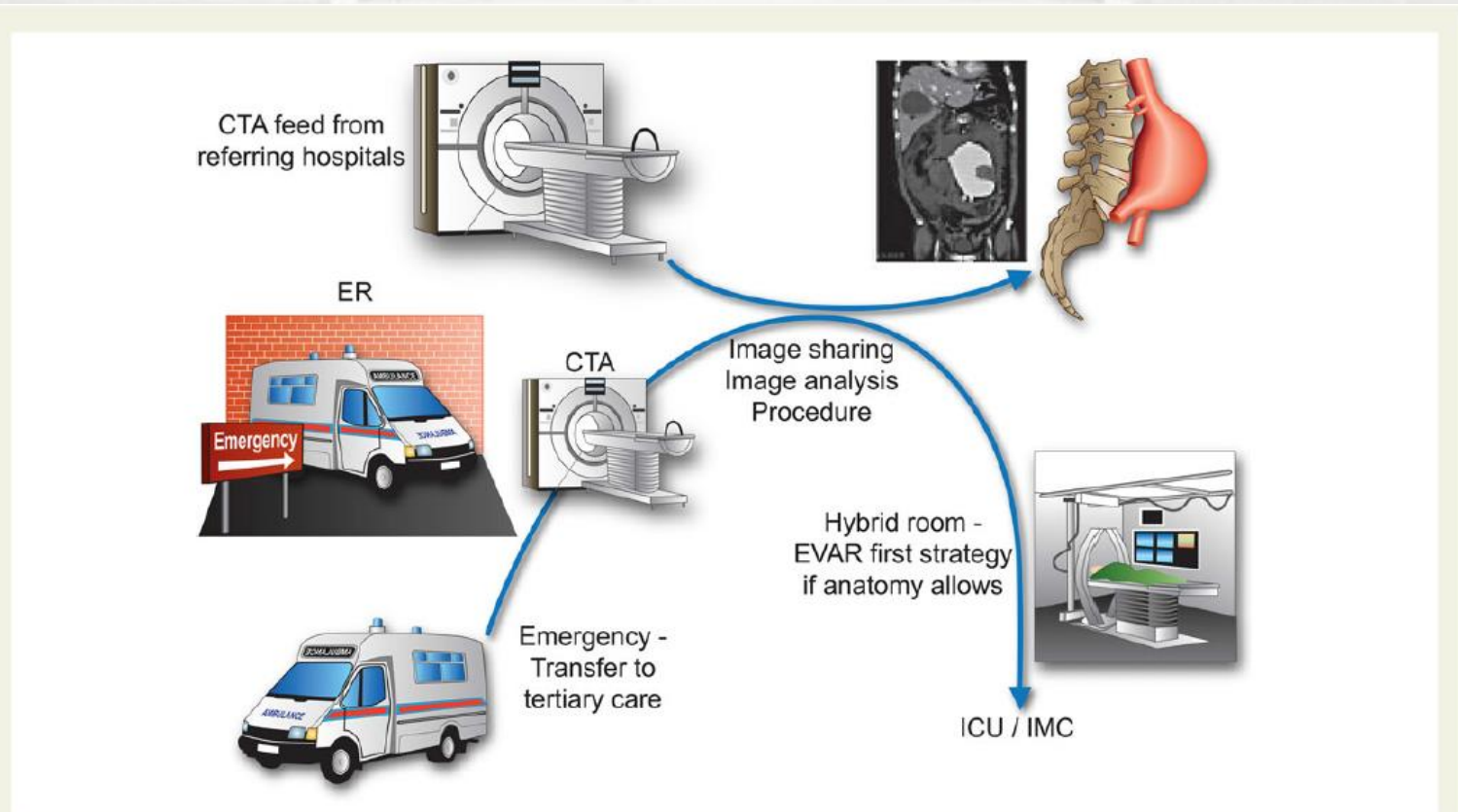
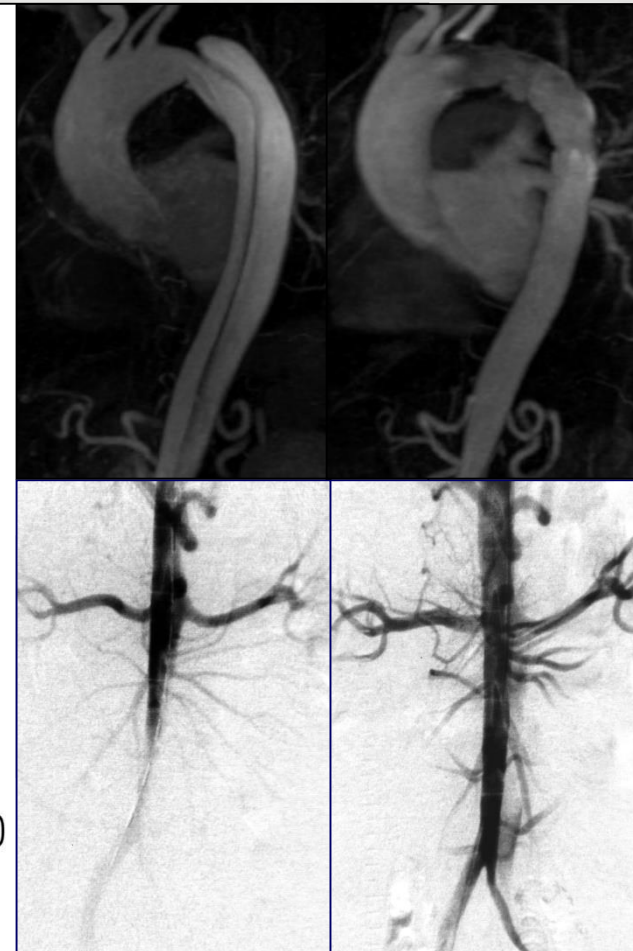
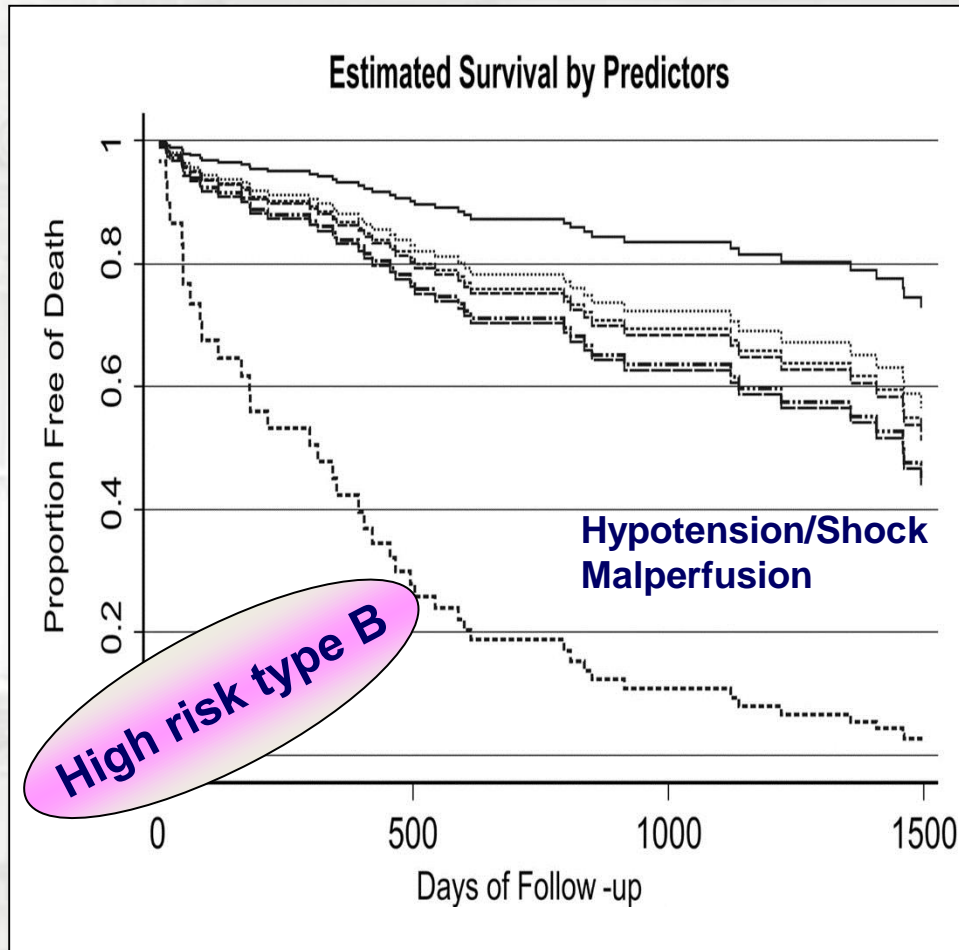


Figure 1 Streamlined care and swift management begins with rapid emergency transfer to a certified emergency care centre followed by diagnostic imaging. Diagnostic CT images may be shared with the surgical/interventional team in another hospital or directly fed into the hybrid theatre for optimal care e.g. an EVAR first strategy if anatomy allows.

Regionalized care offering all treatment options from ascending aorta to distal malperfusion



Type B aortic dissection: Survival and predictors



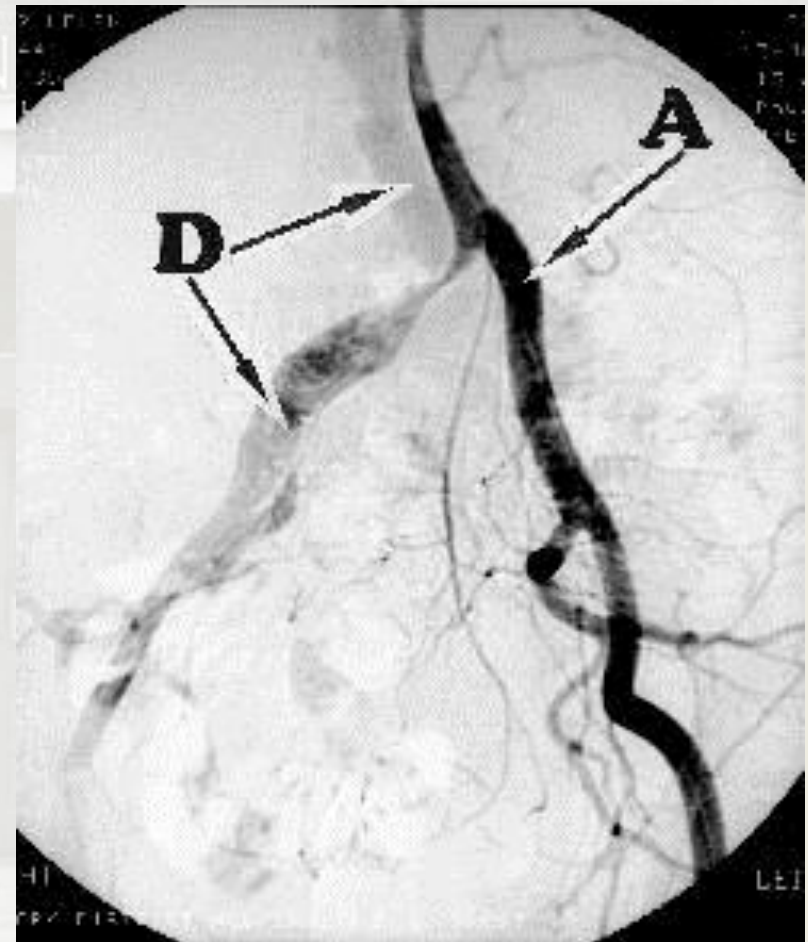


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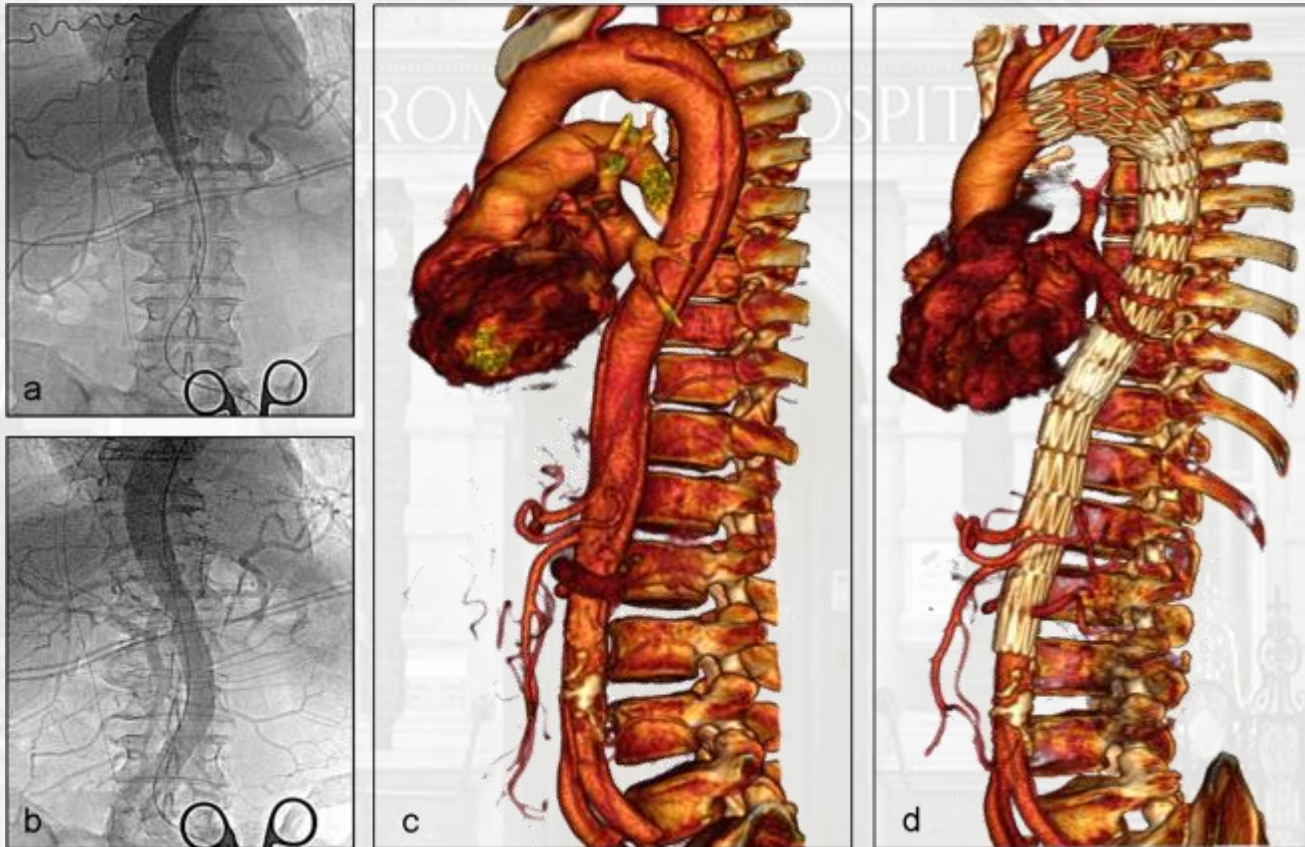
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High risk group: Complicated by malperfusion



High risk (complicated) group: Lower body malperfusion (ESC IC)



Malperfusion syndrome treated with endovascular stent-graft and PETTICOAT; a) angiography of lower body malperfusion; b) reperfusion after proximal stent-graft; c) 3D CT reconstruction of acute complicated dissection with malperfusion; d) reconstructed aorta and abolished malperfusion after stent-graft and PETTICOAT.



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PETTICOAT for malperfusion resolution





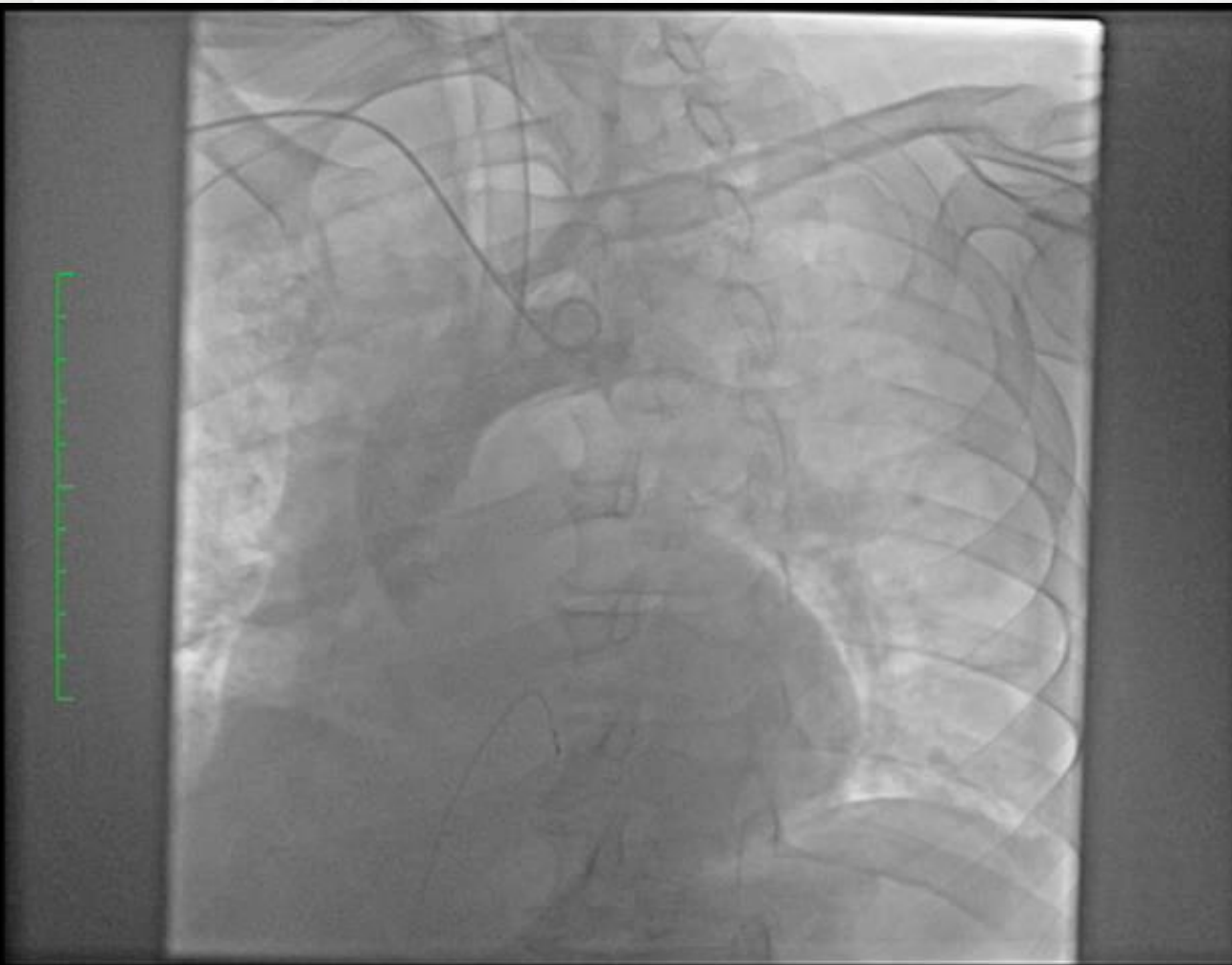
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A lifetime of commitment

Ruptured Type B dissection in shock - Before TEVAR



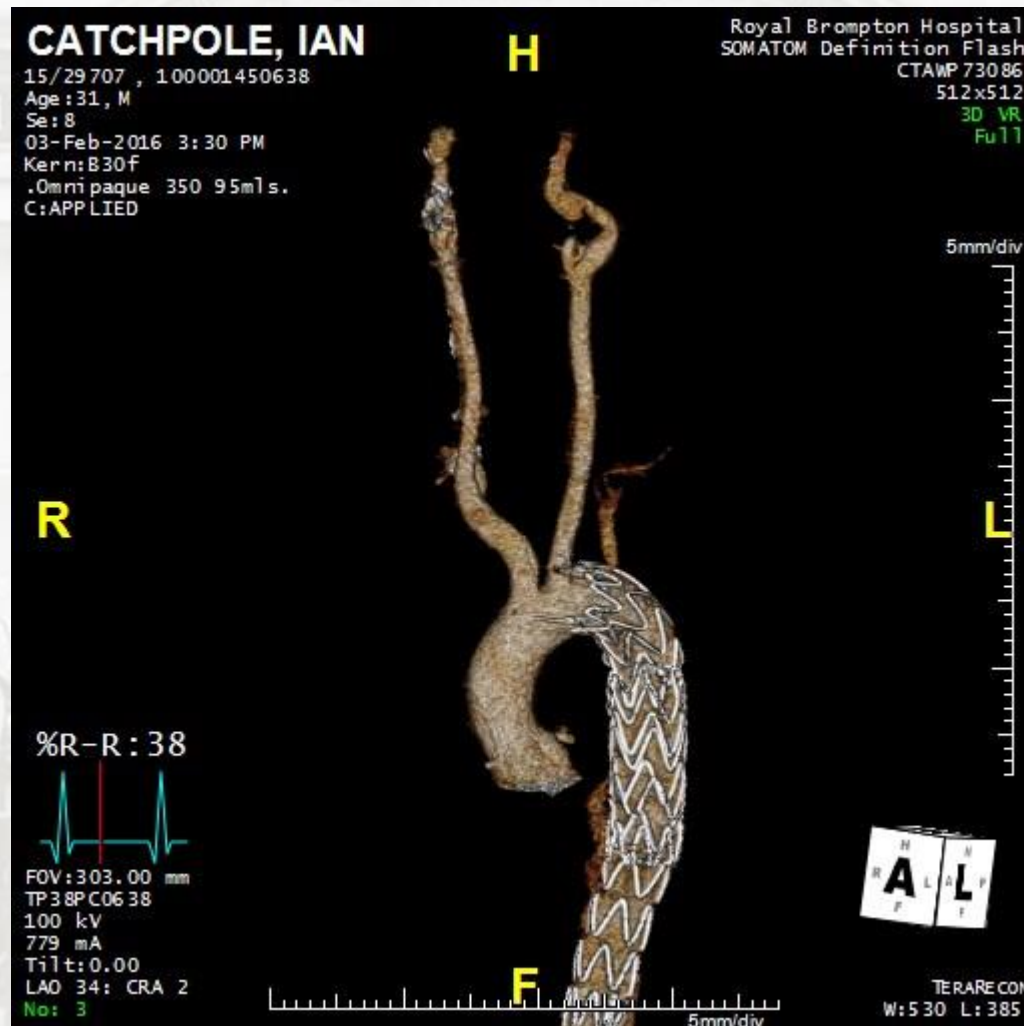


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A lifetime of special 3 months after TEVAR in hemorrhagic shock

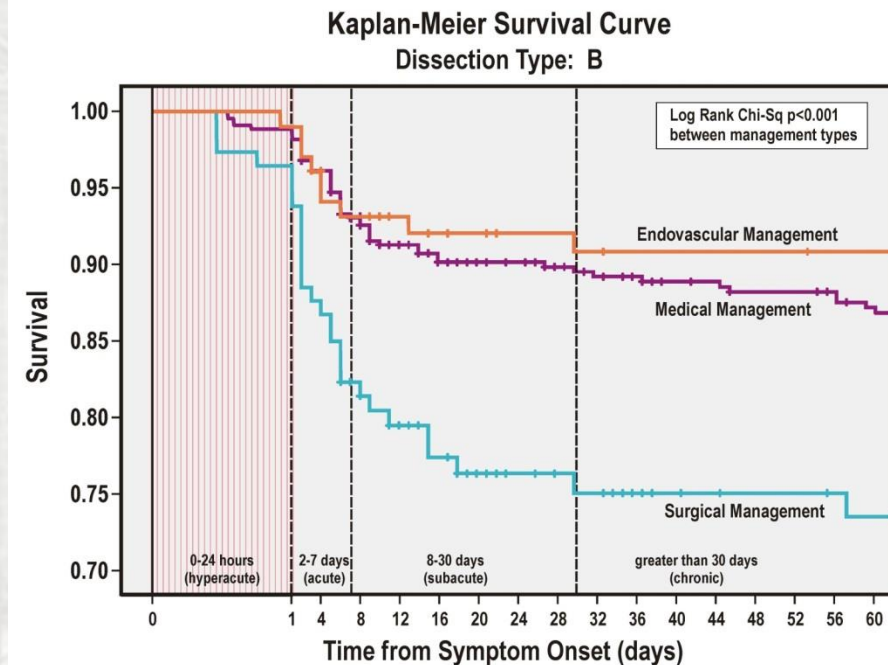




Current classification systems: Time domain

IRAD classification

Pros & Cons

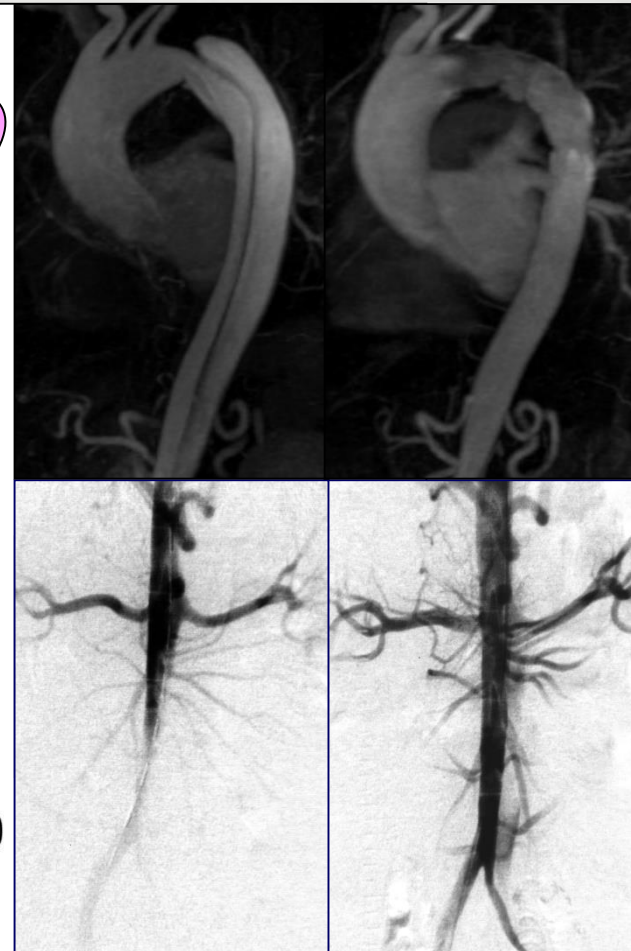
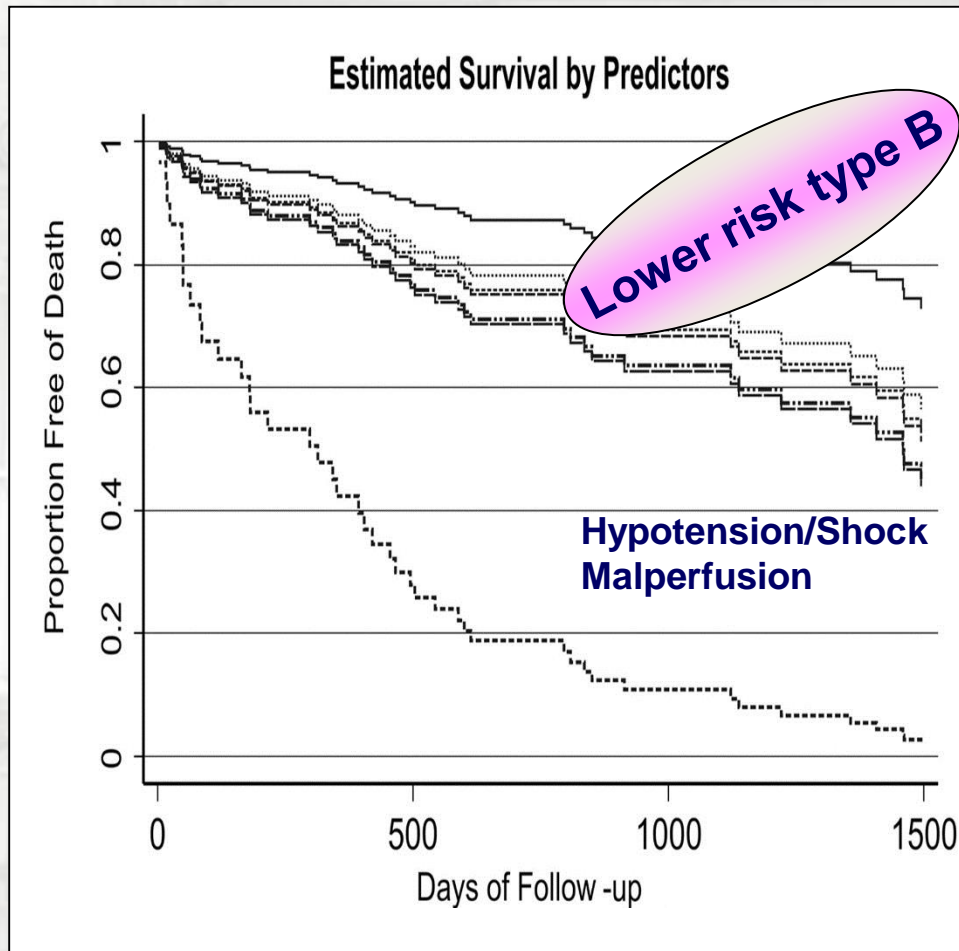


+ Time domain

- No anatomic information
- No prognostic element
- No complications addressed
- No therapeutic impact
- Descriptive after treatment
- Low clinical impact
- Be ready to shoot **fast**, but identify your target **first**!



Type B aortic dissection: Survival and predictors





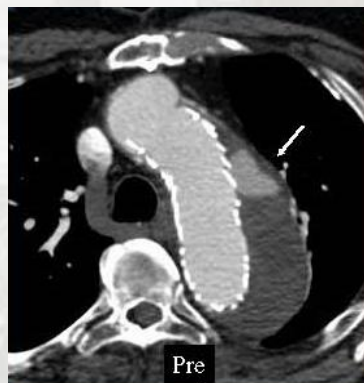
Current classification systems: Dynamic changes

DISSECT Mnemonic System

- D** Duration of disease
- I** Intimal tear location
- S** Size of dissected aorta
- S** Segmental
- E** Extent of dissected aorta
- C** Clinical complications
- T** Thrombus in false lumen

Pros & Cons

- + Detailed descriptive system
- + Complications addressed
- + **Suitability for endovascular treatment**
- + Dynamic changes addressed
- + Potential as a communication tool
- Cumbersome
- Unwieldy
- Not validated

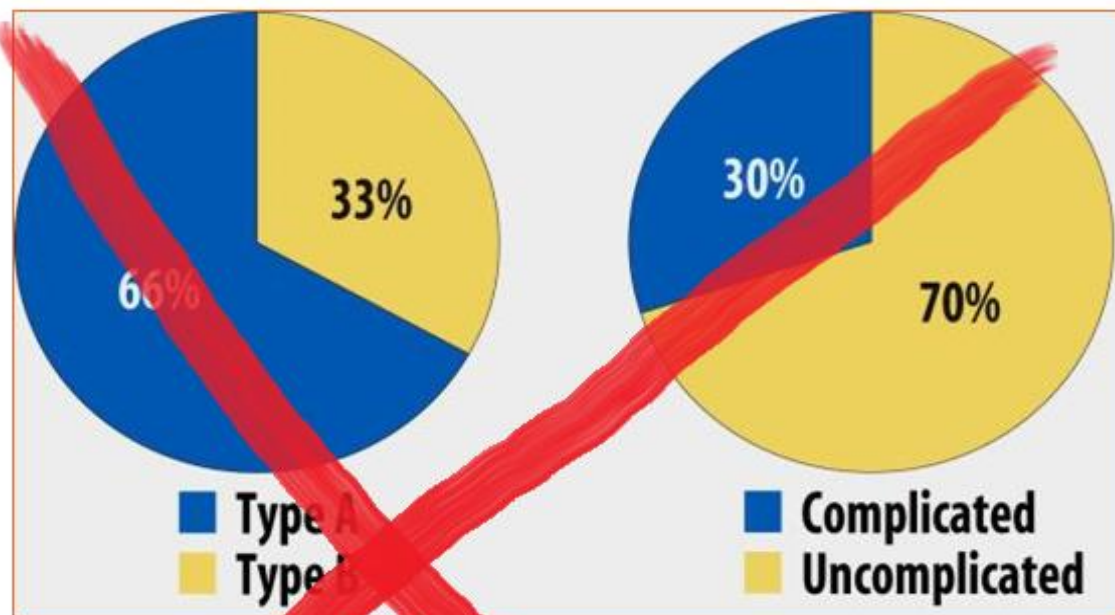




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Mortality

- uncomplicated 10%
- complicated **58%**

DISSECT consortium

„... Dissection is an ever changing disease and a continuum of anatomic involvement and risk constellation ...

...essentially nobody is at no risk! “



A lifetime of specialist care *IMH and PAU managed by TEVAR*



Expansion

nach Stent-Graft



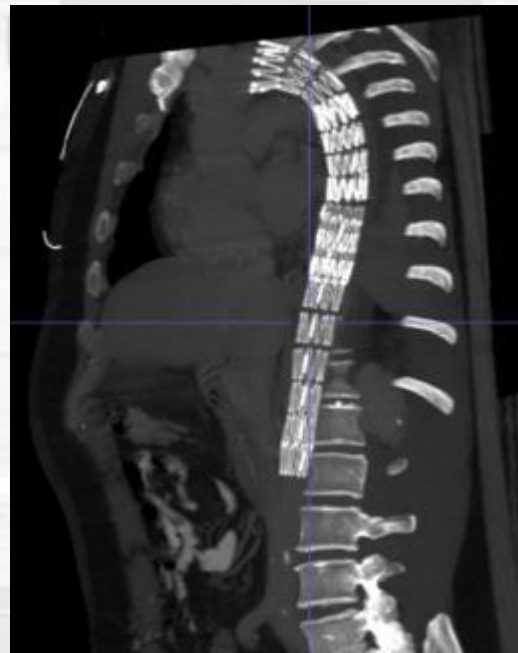
Progressive dissection forming from intramural
hematoma



Complete false lumen
thrombosis in the descending
thoracic aorta



Pre-procedure



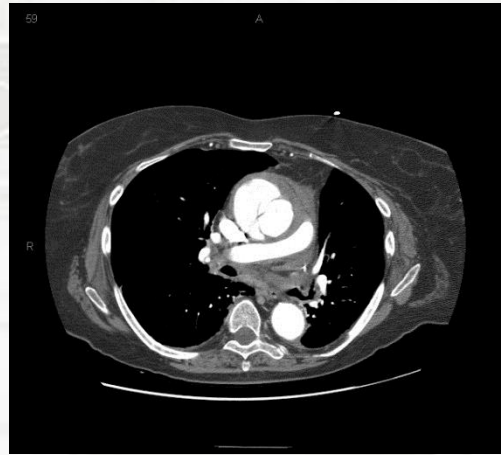
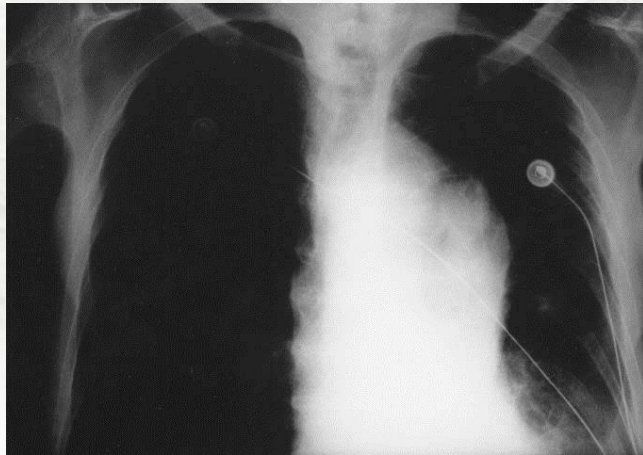
Post-procedure



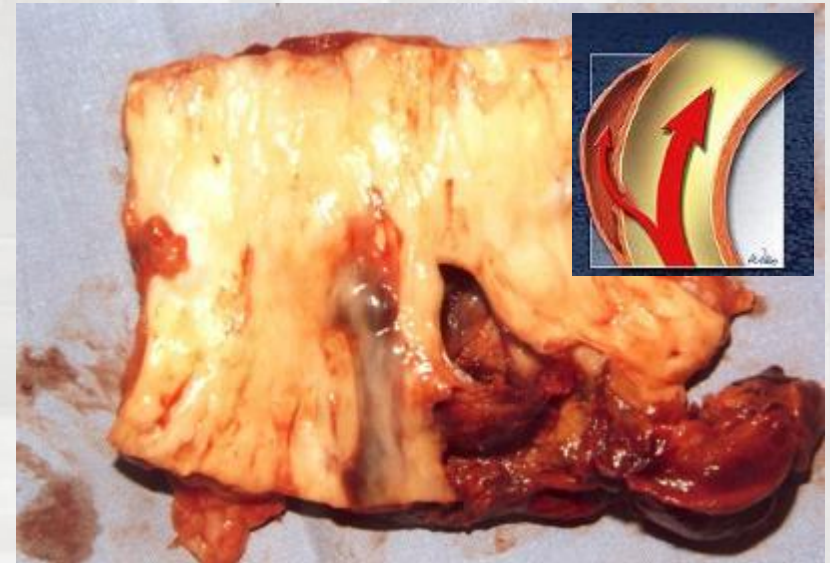
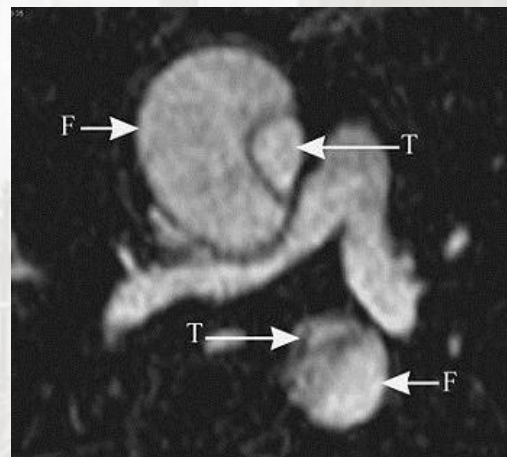
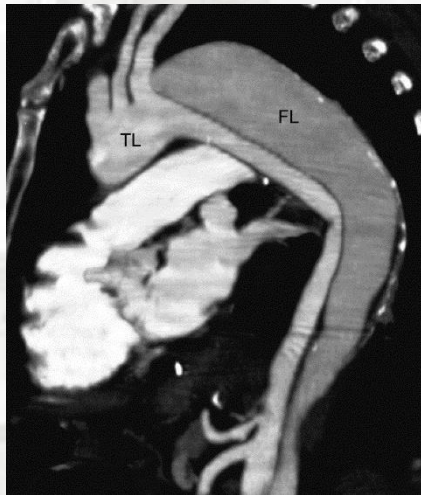
24 months



Remodeling...or rupture !



- FL open and no Isolation
- FL expansion
- TL compression
- Impending rupture





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ESC guidelines 2014

Recommended treatment of aortic dissection

Recommendations	Class	Level
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
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
In uncomplicated type-B AD , medical therapy should always be recommended.	I	C
In uncomplicated type-B AD , TEVAR should be considered !!!	IIa	B
In <u>complicated</u> type-B AD , TEVAR is recommended !!!	I	C
In <u>complicated</u> type-B AD , surgery may be considered.	IIa	C



A lifetime of *Current considerations in subacute/chronic dissection*

Useful tools:

+ Functional imaging

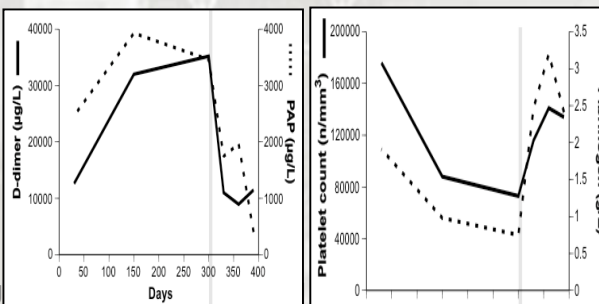
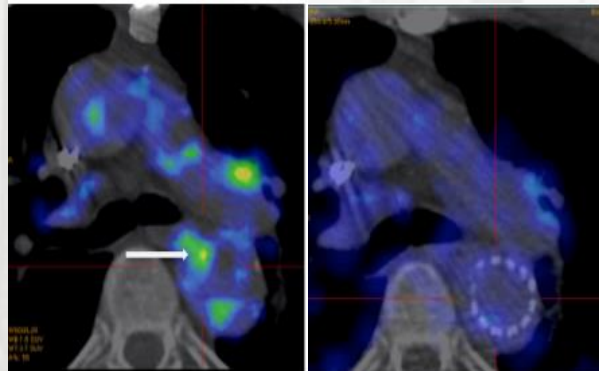
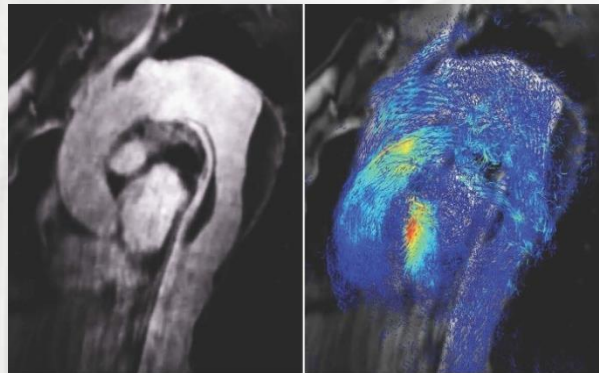
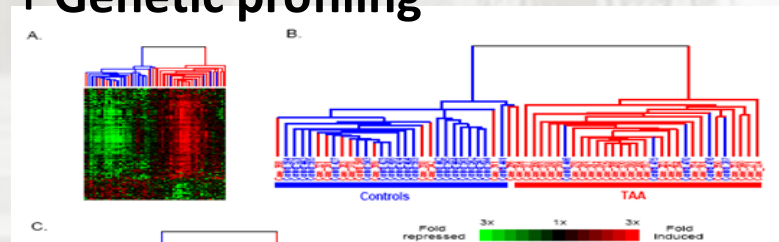
- TEE with color doppler interrogation
- TEE with contrast
- Dynamic 4D-MRI
- Hemodynamics

+ Inflammation (FDG-uptake on PET)

+ Integration of Biomarkers

- Serial d-Dimer ($>500 \mu\text{g/l}$)
- MMP-9
- SM myosin heavy chains

+ Genetic profiling





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- *“Dios creó la aorta con solo un canal...así debería quedarse...”*
- *Papa Francisco y Juan Parodi 2015*



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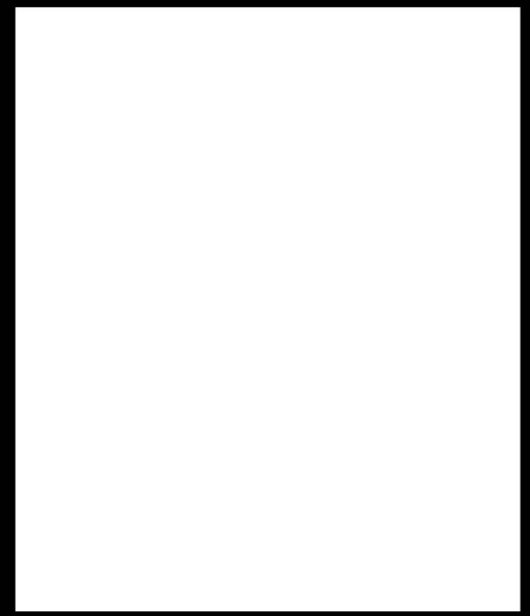
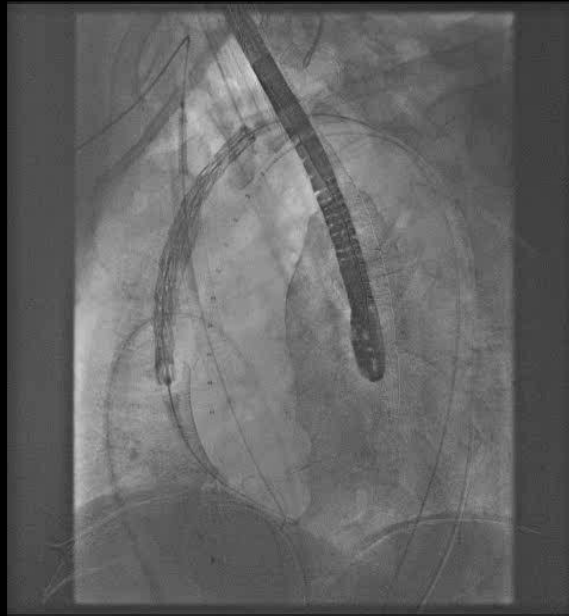
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A lifetime of... Dual stent-graft procedure in **type A** aortic dissection

SOUTH

BROMPTON HOSPITAL

BLOCK



TEVAR in Loeys-Dietz Syndrome Remodeling after Stentgraft

Type B dissection
(MVR, Aorta asc. Repair, E.T.)

Extreme surgical risk:
Endovascular reconstruction





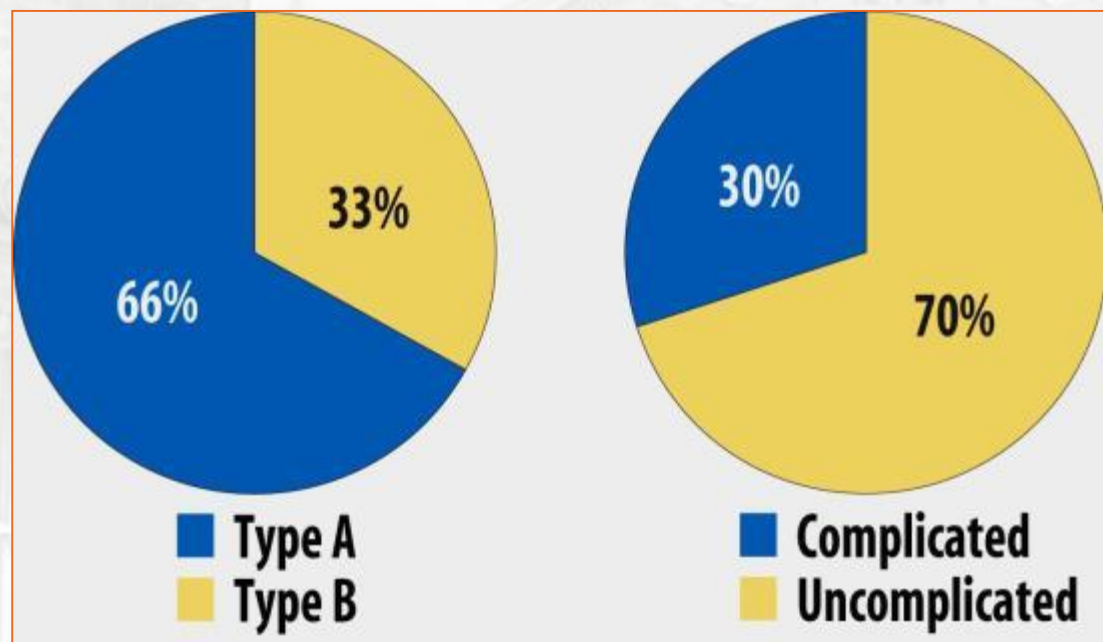
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Aortic Dissection revised...



DISSECT consortium

„... Dissection is an ever changing disease and a continuum of anatomic involvement and risk constellation ...

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Mortality

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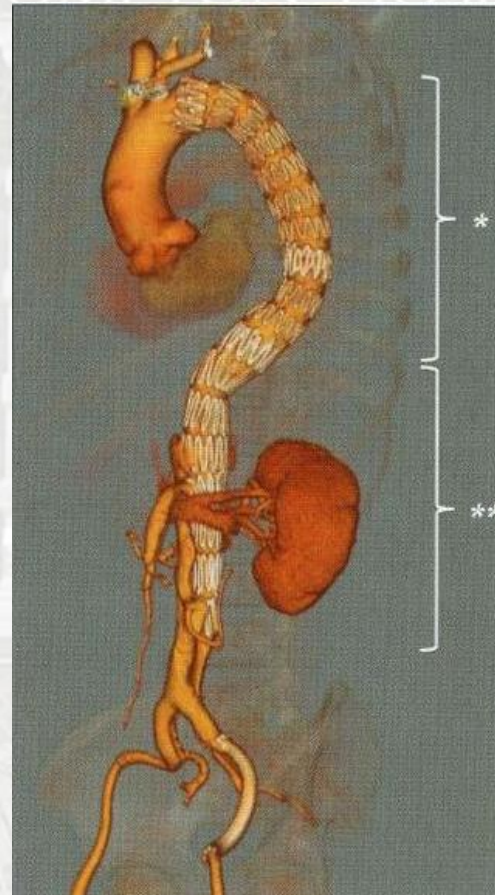


Complicated Type B dissection: Escalating complexity I-III

Simple Stentgraft



PETTICOAT



Complex branched



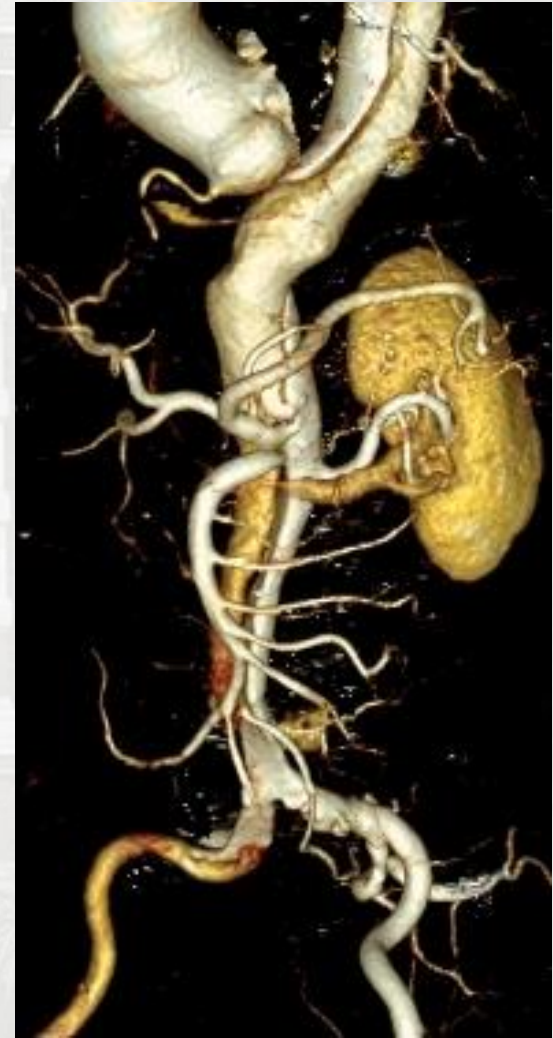


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Uncomplicated type B aortic dissection on drugs





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INSTEAD-XL

Peripheral Artery Disease

Endovascular Repair of Type B Aortic Dissection Long-term Results of the Randomized Investigation of Stent Grafts in Aortic Dissection Trial

Christoph A. Nienaber, MD, PhD; Stephan Kische, MD; Hervé Rousseau, MD, PhD;
Holger Eggebrecht, MD; Tim C. Rehders, MD; Guenther Kundt, MD, PhD; Aenne Glass, MA;
Dierk Scheinert, MD, PhD; Martin Czerny, MD, PhD; Tilo Kleinfeldt, MD;
Burkhardt Zipfel, MD; Louis Labrousse, MD; Rossella Fattori, MD, PhD; Hüseyin Ince, MD, PhD;
for the INSTEAD-XL trial

Background—Thoracic endovascular aortic repair (TEVAR) represents a therapeutic concept for type B aortic dissection. Long-term outcomes and morphology after TEVAR for uncomplicated dissection are unknown.

Methods and Results—A total of 140 patients with stable type B aortic dissection previously randomized to optimal medical treatment and TEVAR ($n=72$) versus optimal medical treatment alone ($n=68$) were analyzed retrospectively for aorta-specific, all-cause outcomes, and disease progression using landmark statistical analysis of years 2 to 5 after index procedure. Cox regression was used to compare outcomes between groups; all analyses are based on intention to treat. The risk of all-cause mortality (11.1% versus 19.3%; $P=0.13$), aorta-specific mortality (6.9% versus 19.3%; $P=0.04$), and progression (27.0% versus 46.1%; $P=0.04$) after 5 years was lower with TEVAR than with optimal medical treatment alone. Landmark analysis suggested a benefit of TEVAR for all end points between 2 and 5 years; for example, for all-cause mortality (0% versus 16.9%; $P=0.0003$), aorta-specific mortality (0% versus 16.9%; $P=0.0005$), and for progression (4.1% versus 28.1%; $P=0.004$); Landmarking at 1 year and 1 month revealed consistent findings. Both improved survival and less progression of disease at 5 years after elective TEVAR were associated with stent graft induced false lumen thrombosis in 90.6% of cases ($P<0.0001$).

Conclusions—In this study of survivors of type B aortic dissection, TEVAR in addition to optimal medical treatment is associated with improved 5-year aorta-specific survival and delayed disease progression. In stable type B dissection with suitable anatomy, preemptive TEVAR should be considered to improve late outcome.

Clinical Trial Registration—URL: <http://www.clinicaltrials.gov>. Unique identifier: NCT01415804. (*Circ Cardiovasc Interv.* 2013;6:407-416.)

Key Words: aortic dissection ■ aortic remodeling ■ prognosis ■ stent graft

IRAD experience with TEVAR

Survival After Endovascular Therapy in Patients With Type B Aortic Dissection

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

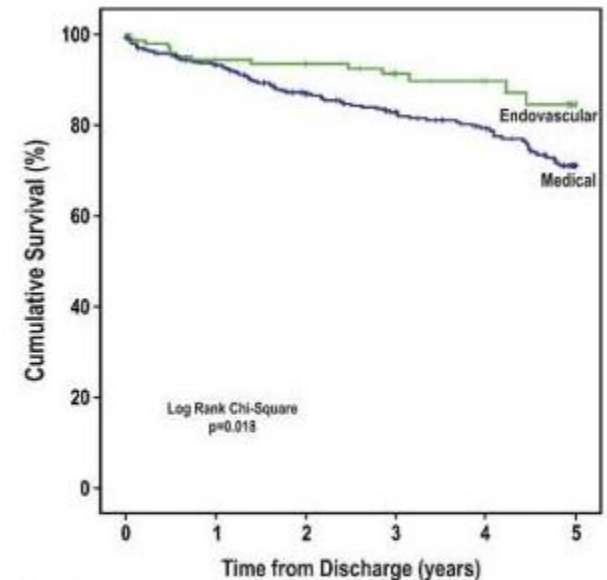
Rossella Fattori, MD,* Daniel Montgomery, BS,† Luigi Lovato, MD,‡ Stephan Kische, MD,§ Marco Di Eusanio, MD,‡ Hüseyin Ince, MD,§ Kim A. Eagle, MD,† Eric M. Isselbacher, MD,|| Christoph A. Nienaber, MD§

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

Objectives This study sought to evaluate long-term survival in type B aortic dissection patients treated with thoracic endovascular aortic repair (TEVAR) therapy.

Background Historical data have supported medical therapy in type B acute aortic dissection (TBAAD) patients. Recent advances in TEVAR appear to improve in-hospital mortality.

Methods We examined 1,129 consecutive patients with TBAAD enrolled in IRAD (International Registry of Acute Aortic Dissection) between 1995 and 2012 who received medical (n = 853, 75.6%) or TEVAR (n = 276, 24.4%) therapy.



No. at Risk						
Endovascular	146	129	107	78	53	25
Medical	434	384	284	218	177	78



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China: TEVAR for stable dissection

JACC: CARDIOVASCULAR INTERVENTIONS

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VOL. 6, NO. 2, 2013

ISSN 1936-8798/\$36.00

<http://dx.doi.org/10.1016/j.jcin.2012.11.004>

CLINICAL RESEARCH

Treatment of Acute Type-B Aortic Dissection

Thoracic Endovascular Aortic Repair or Medical Management Alone?

Yong-Lin Qin, MD,* Gang Deng, MD,* Tian-Xiao Li, MD,† Weiping Wang, MD,‡
Gao-Jun Teng, MD*

Nanjing and Zhengzhou, China; and Cleveland, Ohio

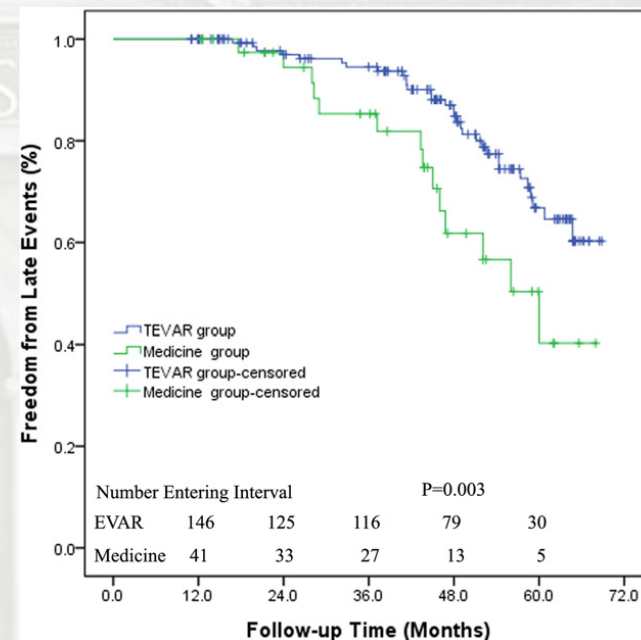
Objectives This study sought to evaluate the early and long-term effect of thoracic endovascular aortic repair (TEVAR) on type-B acute aortic dissection (AAD).

Background Uncomplicated type-B AAD is generally treated with medical management; complicated dissections require surgery or TEVAR. Studies have demonstrated that long-term outcomes with medical management are suboptimal. Therefore, we sought to determine the long-term effect of TEVAR compared with medical management alone on type-B AAD.

Methods From January 2004 to May 2008, 193 consecutive patients in 2 hospitals were treated and retrospectively placed into 1 of 2 groups: 1) the TEVAR group—type-B AAD treated with TEVAR and antihypertensive medications (n = 152); and the 2) medicine group—uncomplicated type-B AAD treated medically alone (n = 41). All TEVAR procedures were performed in the acute phase.

Results There were no significant differences in demographics, comorbidity profiles, or early events between groups. The cumulative freedom from all late adverse events at 1, 3, and 5 years was 97%, 89%, and 67% in the TEVAR group and 97%, 63%, and 34% in the medicine group. Log-rank tests showed that medically treated patients had more late adverse events than TEVAR-treated patients did (p = 0.003). The 5-year cumulative survival rate from all-cause death was not significantly different between the 2 groups.

Conclusions Patients with type-B AAD treated with TEVAR experienced fewer late adverse events than those treated with medical management, but there was no significant difference among the groups in 5-year mortality rates. Further studies of longer-term survival rates are needed to determine whether TEVAR could be an effective treatment for type-B AAD. (J Am Coll Cardiol Interv 2013; 6:185–91) © 2013 by the American College of Cardiology Foundation



Kaplan-Meier Curves of Freedom From Late Events After TEVAR of Type-B AAD Patients were subdivided into 2 groups (thoracic endovascular aortic repair [TEVAR] group vs. medicine group), and the cumulative freedom from all post-procedure events was analyzed. AAD acute aortic dissection



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Facts

Aortic dissection

- TEVAR is effective and safe in **complicated** type B dissection
- TEVAR improves 5-years survival in „**uncomplicated**“ type B dissection
- **W/o TEVAR no aortic remodeling**
- Case for Non-Believers....!



Courtesy of Dr. FJ Criado

Courtesy of M.M.Thompson – Mother registry



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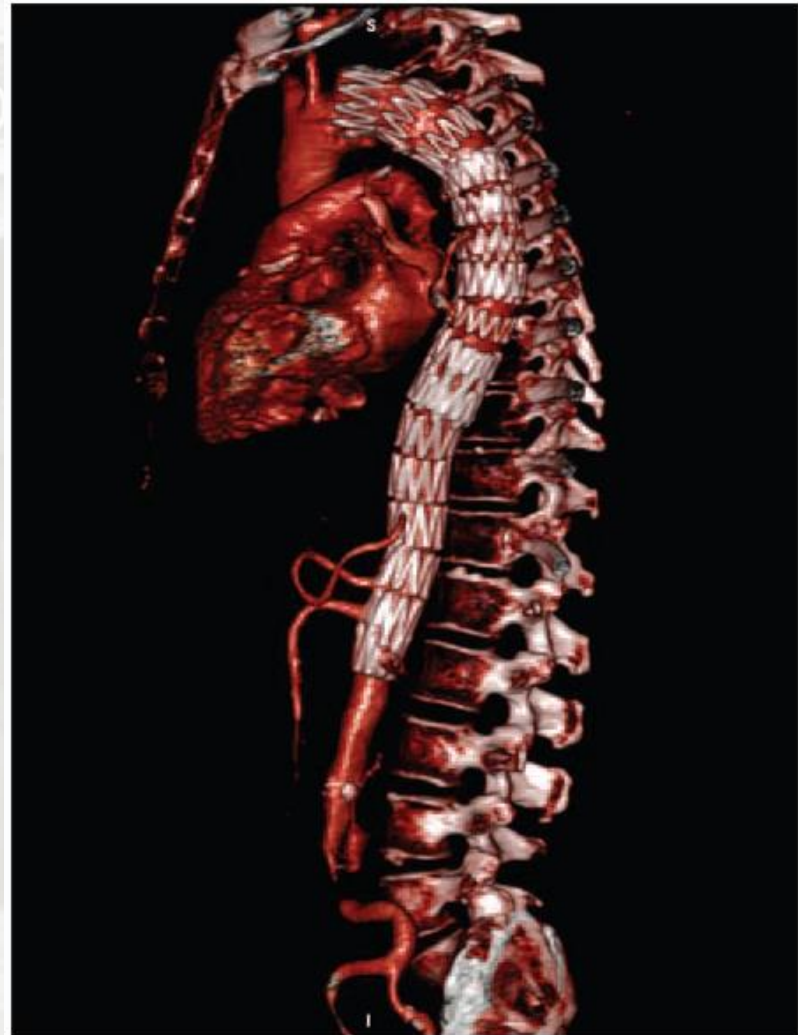
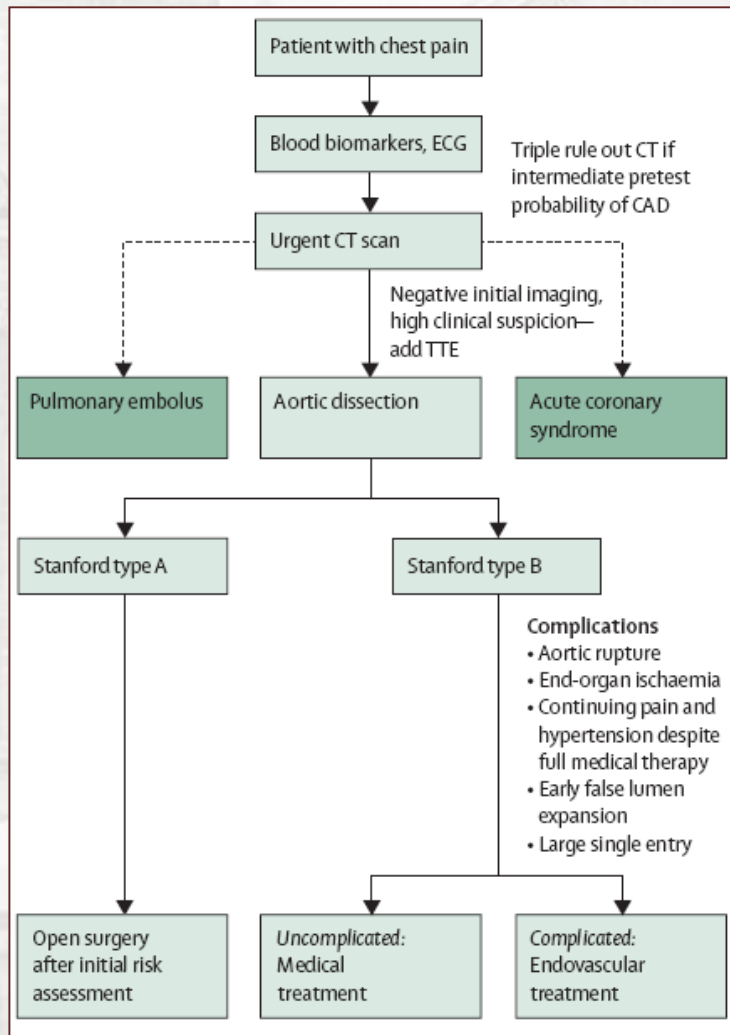
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CTA at 4-yr FU



Therapy 2016





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Royal Brompton Hospital
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CTAMP 73086

512x512

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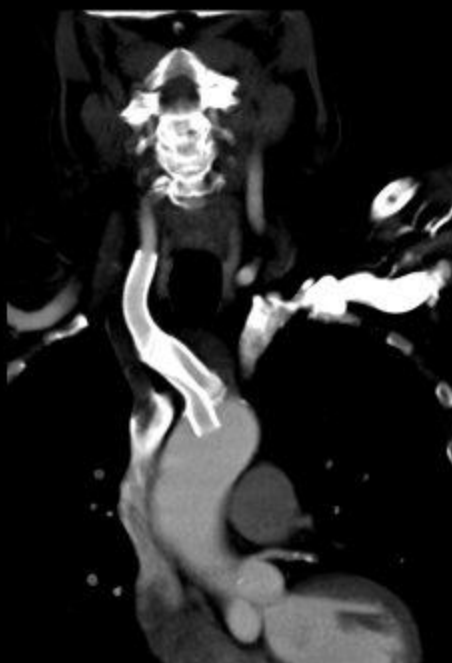
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Neobranching in IMH

Professor Christoph A. Nienaber

The Royal Brompton and Harefield NHS Trust

Cardiology and Aortic Centre

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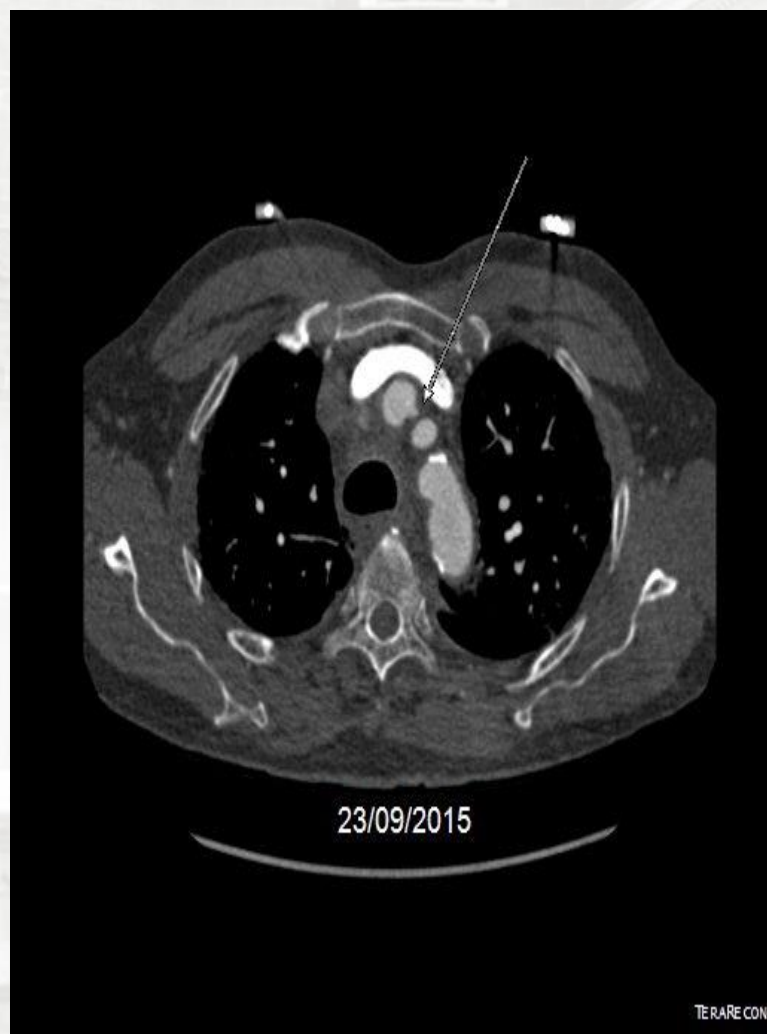


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67 Year old Indian malignant hypertension acute chest pain from AAS

- *IMH In Arch and bcA*
- *Secondary PAU*
- *Ongoing pain + HTN*

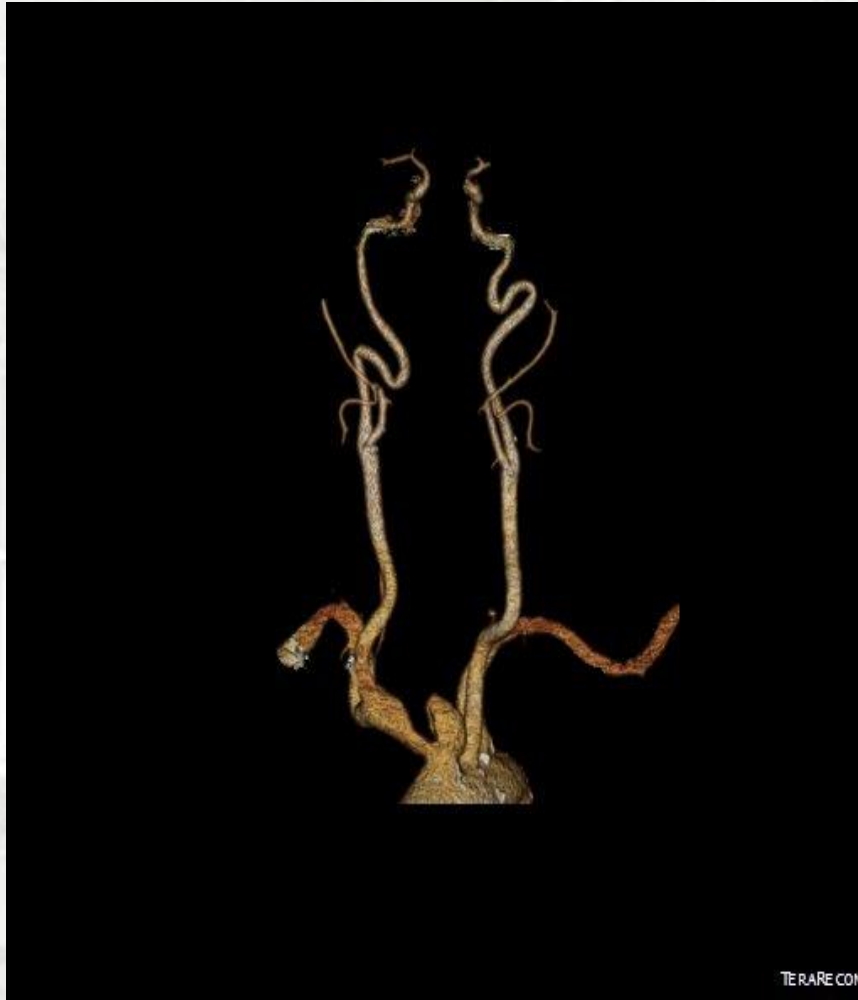
**IMH around arch and bcA; small
PAU in bcA**



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Procedure:

- *Bilateral femoral access*
- *2 simultaneous Viabahns in both branches of bcA*
- *Dual antiplatelet treatment for 3 months*



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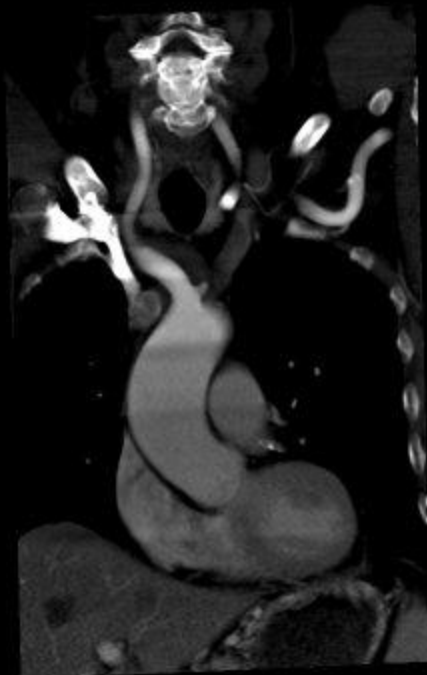


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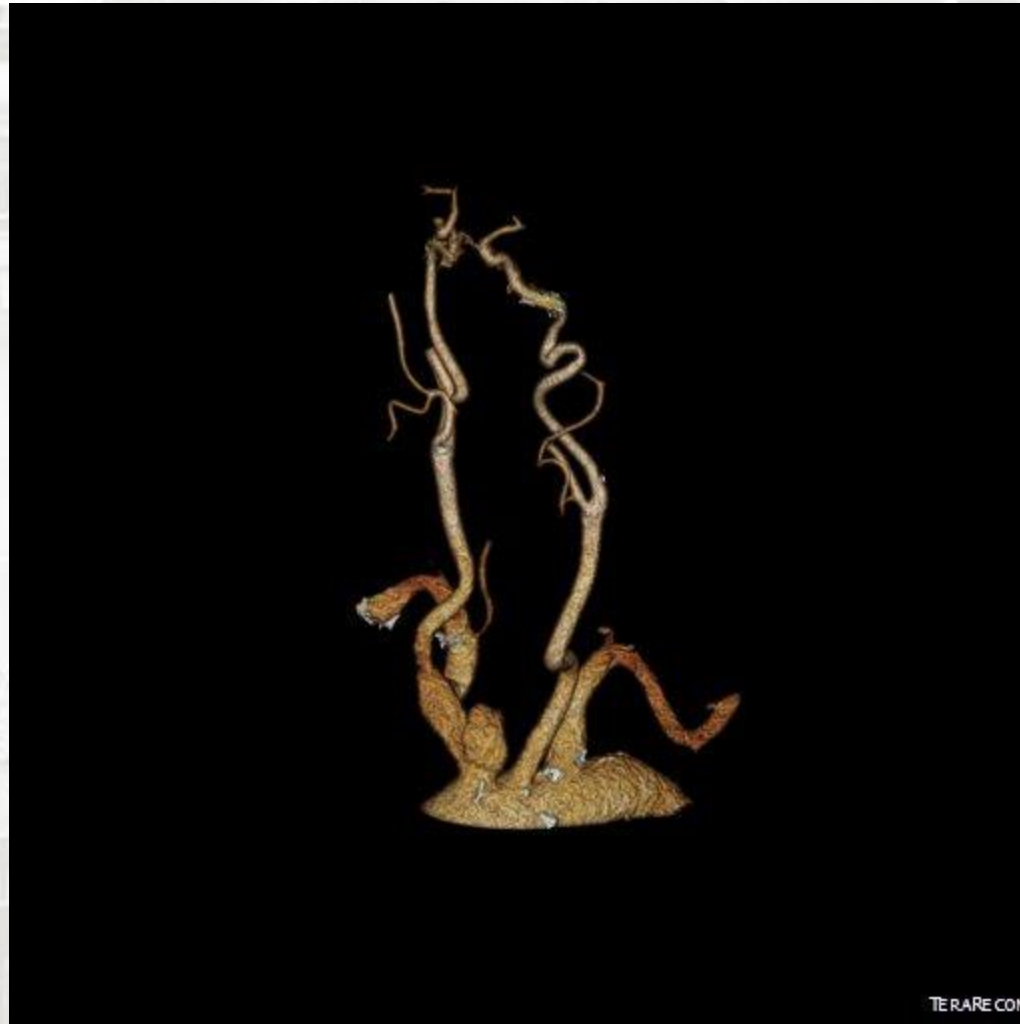
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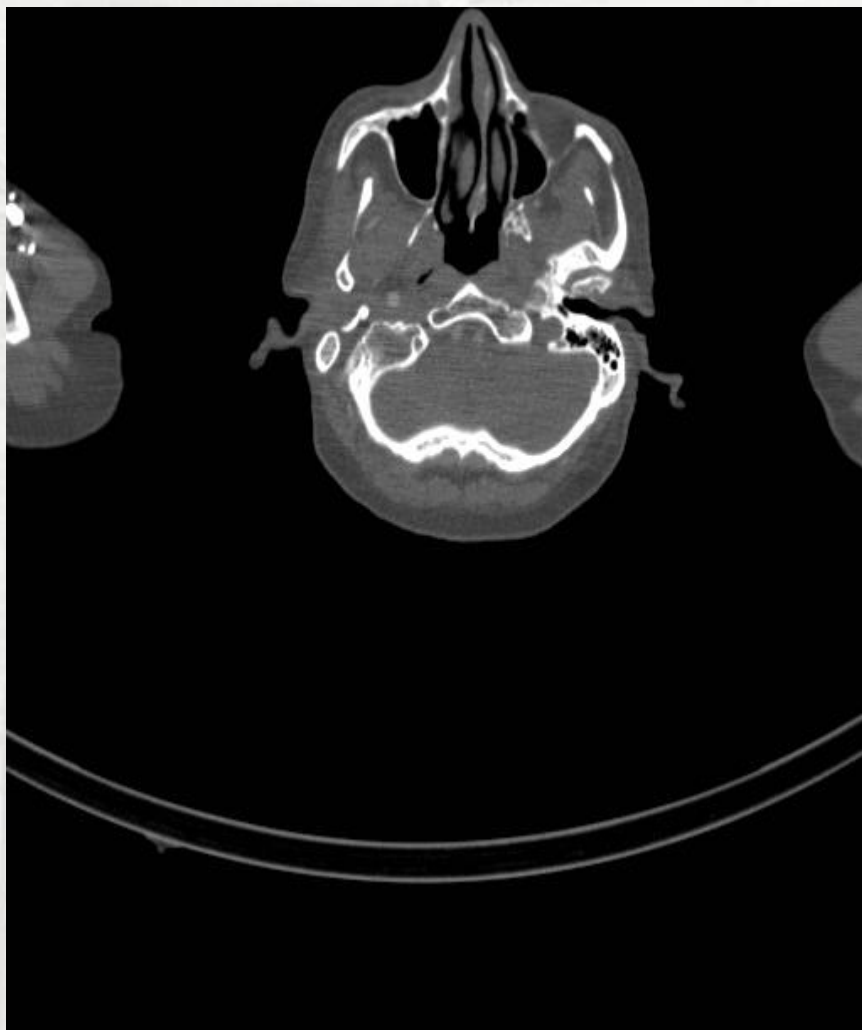
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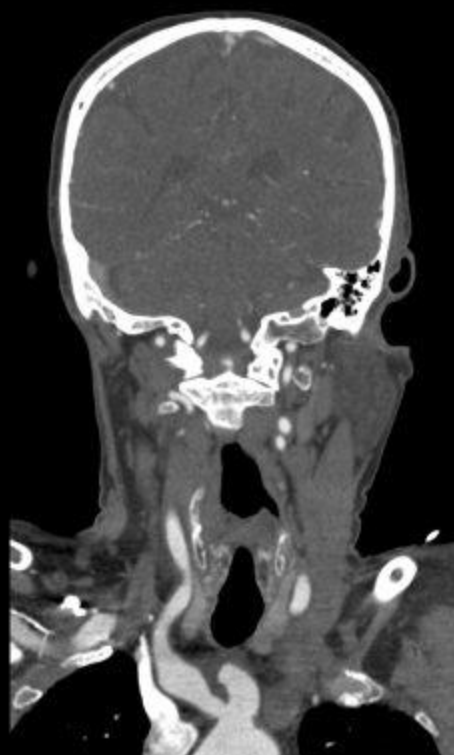




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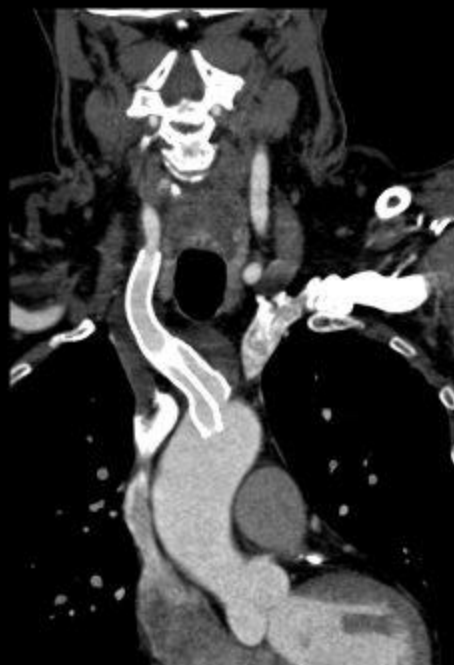
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Complicated Type B Dissection

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CATCHPOLE, IAN

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03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Full

R

H

L

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 0: CRA 0

No: 2

F



TE RARE CON
W: 530 L: 385

5mm/div

5mm/div



A lifetime of specialist care

Royal Brompton & Harefield

NHS Foundation Trust



CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipaque 350 95mls.

C: APPLIED

Royal Brompton Hospital

SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

R

H

L

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 0: CRA 0

No: 4

F



TE RARE CON
W: 530 L: 385

5mm/div

5mm/div



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CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

R

H

L

%R-R: 38



FOV: 303.00 mm

TP38PC0638

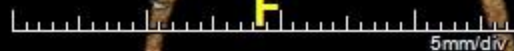
100 kV

779 mA

Tilt: 0.00

LAO 0: CRA 0

No: 5



F



TERARE CON
W: 530 L: 385



CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Full

P

H

A

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

RAO 53: CRA 14

No: 6



TERARE CON
W: 530 L: 385



CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Full

A

P

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 52: CAU 0

No: 7

F



5mm/div

5mm/div

TERARE CON
W: 530 L: 385



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CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Full

R

H

L

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 0: CRA 0

No: 8



F



TERARE CON
W: 490 L: 143



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CATCHPOLE, IAN

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Age: 31, M

Se: 8

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Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

R

H

L

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

RAO 36: CRA 1

No: 9



F

5mm/div



TERARE CON
W:490 L:143



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CATCHPOLE, IAN

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Age: 31, M

Se: 8

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Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

P

H

A

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

RAO 52: CRA 3

No: 10



F



TERARE CON
W:490 L:143

5mm/div

5mm/div



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CATCHPOLE, IAN

15/29707, 100001450638

Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipaque 350 95mls.

C: APPLIED

Royal Brompton Hospital

SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

H

P

A

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

RAO 79: CRA 2

No: 11

F



5mm/div

5mm/div

TE RARE CON
W: 490 L: 143



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CATCHPOLE, IAN

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Age: 31, M

Se: 8

03-Feb-2016 3:30 PM

Kern: B30f

.Omnipace 350 95mls.

C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 730 86

512x512

3D VR

Fu11

L

H

R

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 142: CRA 10

No: 13

F



TERARE CON
W: 490 L: 143

5mm/div

5mm/div



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NHS

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Age: 31, M

Se: 8

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Kern: B30f

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C: APPLIED

Royal Brompton Hospital
SOMATOM Definition Flash

CTAMP 73086

512x512

3D VR

Fu11

L

H

R

%R-R: 38



FOV: 303.00 mm

TP38PC0638

100 kV

779 mA

Tilt: 0.00

LAO 142: CRA 10

No: 13

F



TERARE CON
W: 490 L: 143

5mm/div

5mm/div