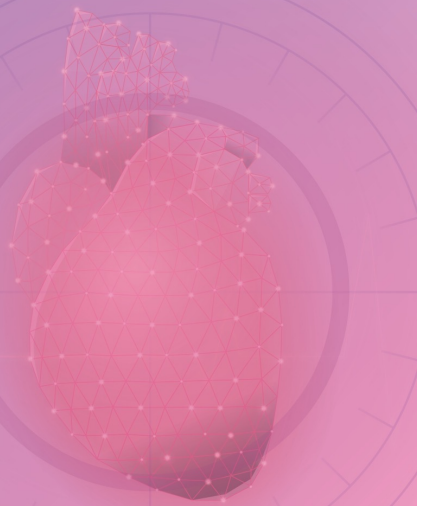
FET Technique for Arch Pathologies

Aung Y Oo

Professor and Clinical Lead

Aortovascular Service

St Bartholomew's Hospital, London



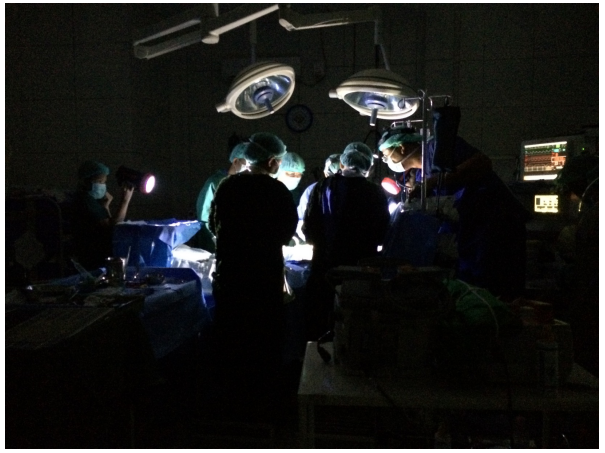
Disclosure

- Terumo Aortic - Educational grant, Research grant
- Artivion - Educational grant

Myanmar

ATCSA2023
Ho Chi Minh city, Vietnam

Limited resources but limitless creativity



Liverpool

Barts Aortic Team

Present Day St Bartholomew's Hospital

900 BARTS 1123 - 2023

Elephant Trunk (1983)

HOW TO DO IT

Thorac. cardiovasc. Surgeon 31 (1983) 37–40

Extensive Aortic Replacement using "Elephant Trunk" Prosthesis*

H.G. Borst, G. Walterbusch, and D. Schaps[1]

Division of Thoracic and Cardiovascular Surgery, Surgical Center, and
[1]Institute of Anesthesiology, Hannover Medical School, Hannover, FRG

Surgery of aneurysms of the thoracic aorta has made great

a 5th left intercostal incision, clamping the aorta well be-

HOW TO DO IT

Thorac. cardiovasc. Surgeon 31 (1983) 37–40

Extensive Aortic Replacement using "Elephant Trunk" Prosthesis*

H.G. Borst, G. Walterbusch, and D. Schaps[1]

Division of Thoracic and Cardiovascular Surgery, Surgical Center, and
[1]Institute of Anesthesiology, Hannover Medical School, Hannover, FRG

of the graft at this level. Its 10 cm long free end was pushed down into the distal aneurysm to float freely within its lumen. During the rewarming phase the aorta was perfused antegradely.

In both patients replacement of the descending thoracic aneurysm was performed in a second operation which simply involved anastomosing the "elephant trunk" to the distal descending aorta. The description of the procedure will be limited to the first of the 2 patients. Fig. 1 shows the extent of the aneurysm (a) and the diagrammatic appearance of the repair after ascending aortic and arch replacement (b). Note the "elephant trunk" protruding into the descending aortic aneurysm.

Ten weeks after the first operation, replacement of the descending thoracic aorta was performed (5–24–1982) via

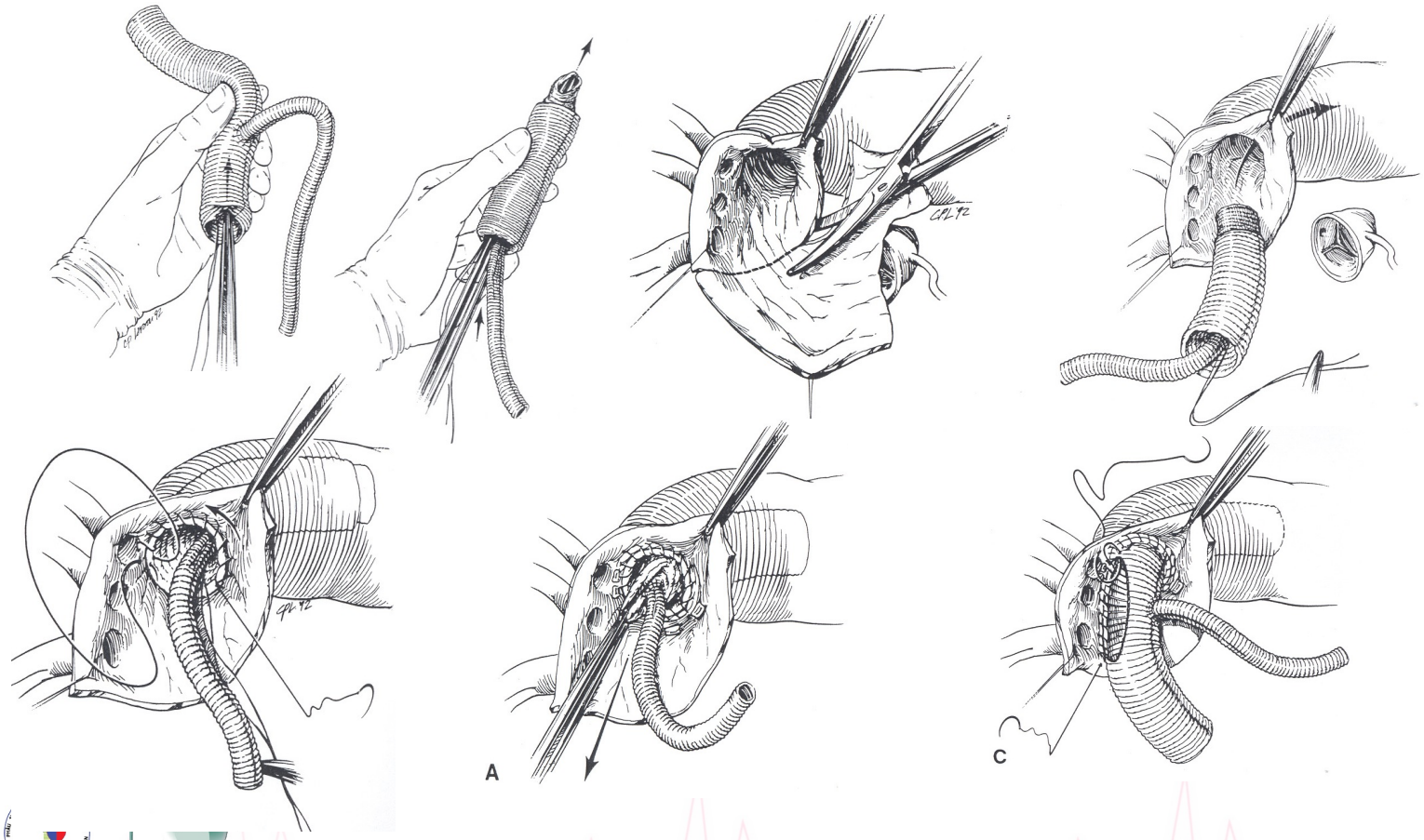
around an additional localized infrarenal aneurysm. Fig. 5 shows the final appearance of the aortic reconstruction.

Both patients survived these multiple-stage operations without major bleeding, neurological damage, embolization, or any other complications and were discharged home in good condition.

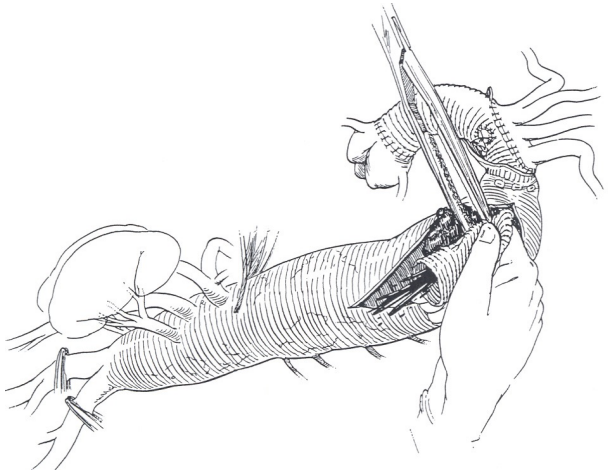
The advantages of this new technique appear self-evident in as much as the often difficult proximal aorta-to-graft anastomosis is eliminated, thus allowing an optimal approach for performance of the distal aortic connection. Likewise, the aortic cross-clamp time is reduced to the period required for completion of the distal anastomosis (42 and 38 minutes in the first, and 27 minutes in the second patient).

*Dedicated to Prof. Dr. *Rudolf Zenker* on the occasion of his 80th birthday

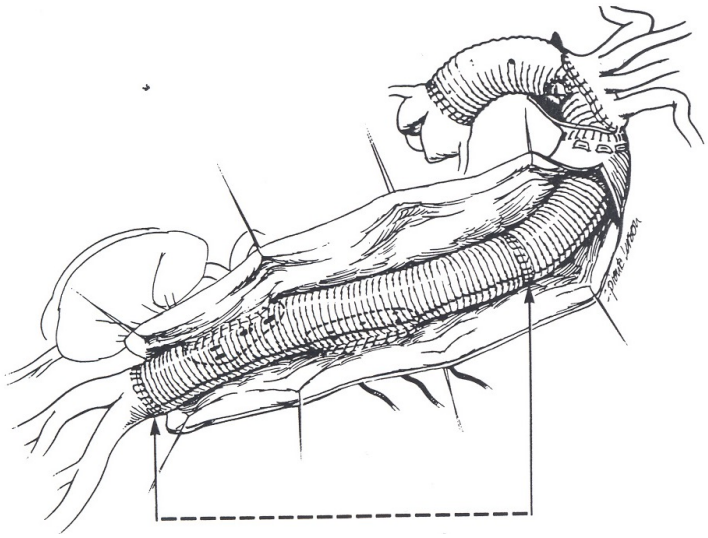
Elephant Trunk technique



Second stage total aorta replacement



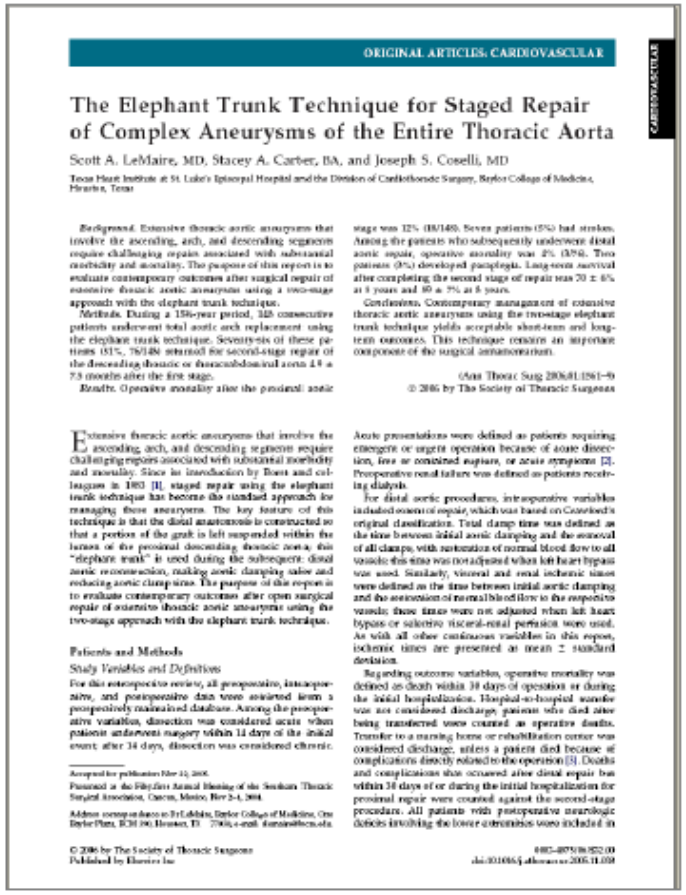
Clamping of the elephant trunk in the descending thoracic aorta



Completion of Thoraco-Abdominal segment repair

Elephant Trunk
Vascutek Siena Graft with Collar

Problems with Conventional ET Approach



ORIGINAL ARTICLES: CARDIOVASCULAR

CARDIOVASCULAR

The Elephant Trunk Technique for Staged Repair of Complex Aneurysms of the Entire Thoracic Aorta

Scott A. LeMaire, MD, Stacey A. Carter, BA, and Joseph S. Coselli, MD

Texas Heart Institute at St. Luke's Episcopal Hospital and the Division of Cardiothoracic Surgery, Baylor College of Medicine, Houston, Texas

Background. Extensive thoracic aortic aneurysms that involve the ascending, arch, and descending segments require challenging repairs associated with substantial morbidity and mortality. The purpose of this report is to evaluate contemporary outcomes after surgical repair of extensive thoracic aortic aneurysms using a two-stage approach with the elephant trunk technique.

Methods. During a 15½-year period, 348 consecutive patients underwent total aortic arch replacement using the elephant trunk technique. Seventy-six of these patients (81%, 76/148) returned for second-stage repair of the descending thoracic or thoracoabdominal aorta 4.9 ± 7.3 months after the first stage.

Results. Operative mortality after the proximal aortic stage was 12% (18/148). Seven patients (5%) had strokes. Among the patients who subsequently underwent distal aortic repair, operative mortality was 4% (3/76). Two patients (3%) developed paraplegia. Long-term survival after completing the second stage of repair was 70 ± 6% at 5 years and 60 ± 7% at 8 years.

Conclusions. Contemporary management of extensive thoracic aortic aneurysms using the two-stage elephant trunk technique yields acceptable short-term and long-term outcomes. This technique remains an important component of the surgical armamentarium.

(Ann Thorac Surg 2006;81:1861–9)

Extensive thoracic aortic aneurysms that involve the ascending, arch, and descending segments require challenging repairs associated with substantial morbidity and mortality. Since its introduction by Borst and colleagues in 1983 [1], staged repair using the elephant trunk technique has become the standard approach for managing these aneurysms. The key feature of this technique is that the distal anastomosis is constructed so that a portion of the graft is left suspended within the lumen of the proximal descending thoracic aorta; this "elephant trunk" is used during the subsequent distal aortic reconstruction, enabling aortic clamping sites and reducing aortic clamp times. The purpose of this report is to evaluate contemporary outcomes after open surgical repair of extensive thoracic aortic aneurysms using the two-stage approach with the elephant trunk technique.

Patients and Methods

Study Variables and Definitions

For this retrospective review, all preoperative, intraoperative, and postoperative data were abstracted from a prospectively maintained database. Among the preoperative variables, dissection was considered acute when patients underwent surgery within 14 days of the initial event; after 14 days, dissection was considered chronic. Acute presentations were defined as patients requiring emergent or urgent operation because of acute dissection, free or contained rupture, or acute symptoms [2]. Preoperative renal failure was defined as patients receiving dialysis.

For distal aortic procedures, intraoperative variables included extent of repair, which was based on Crawford's original classification. Total clamp time was defined as the time between initial aortic clamping and the removal of all clamps, with restoration of normal blood flow to all vessels; this time was not adjusted when left heart bypass was used. Similarly, visceral and renal ischemic times were defined as the time between initial aortic clamping and the restoration of normal blood flow to the respective vessels; these times were not adjusted when left heart bypass or selective visceral-renal perfusion were used. As with all other continuous variables in this report, ischemic times are presented as mean ± standard deviation.

Regarding outcome variables, operative mortality was defined as death within 30 days of operation or during the initial hospitalization. Hospital-to-hospital transfer was not considered discharge; patients who died after being transferred were counted as operative deaths. Transfer to a nursing home or rehabilitation center was considered discharge, unless a patient died because of complications directly related to the operation [3]. Deaths and complications that occurred after distal repair but within 30 days of or during the initial hospitalization for proximal repair were counted against the second-stage procedure. All patients with postoperative neurologic deficits involving the lower extremities were included in

Accepted for publication Nov 22, 2005.

Presented at the Fifty-first Annual Meeting of the Southern Thoracic Surgical Association, Cancun, Mexico, Nov 2–4, 2006.

Address correspondence to Dr Coselli, Baylor College of Medicine, One Baylor Plaza, BCM 390, Houston, TX 77030; e-mail: [redacted]

0003-4975/06/$32.00
doi:10.1016/j.athoracsur.2005.11.039

Despite acceptable outcomes, many patients fail to return for Stage 2 ET completion

- ***39% did not complete distal aortic repair***
- **Mortality Stage 1→12%**
- **Mortality Stage 2→4%**

LeMaire ATS 2006

Outcomes regarding 148 patients that underwent Stage 1 ET repair

Mortality of Elephant Trunk

Cumulative Mortality Table Summary

1st Stage Mortality	Interval or Nonreturning Mortality	2nd Stage Mortality	All Cause Total Mortality
2.3 – 13.9%	0 – 24.6%	0 – 10.0%	8.3 – 35.8%

Etz et al, 2008
LeMaire et al, 2006
Svensson et al, 2004
Heinemann et al, 1995
Safi et al, 2005
Sundt et al, 2004

Frozen Elephant Trunk

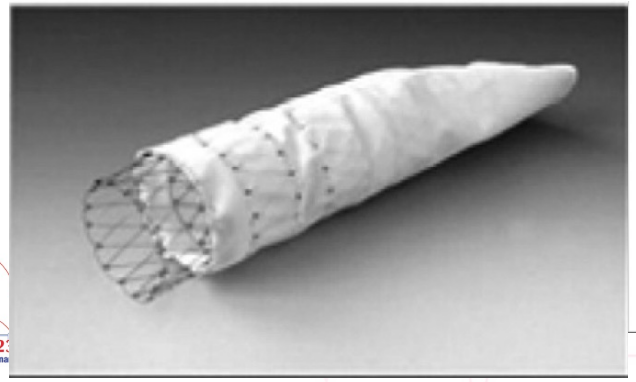
The Frozen Elephant Trunk Technique for Treatment of Thoracic Aortic Aneurysms

Hassina Baraki, MD, Christian Hagl, MD, PhD, Narwid Khaladj, MD,

The Frozen Elephant Trunk Technique for Treatment of Thoracic Aortic Aneurysms

Hassina Baraki, MD, Christian Hagl, MD, PhD, Narwid Khaladj, MD, Klaus Kallenbach, MD, PhD, Jürgen Weidemann, MD, Axel Haverich, MD, and Matthias Karck, MD

Departments of Thoracic and Cardiovascular Surgery and Radiology, Hannover Medical School, Hannover, Germany



mization of spinal cord injury and organ failure caused by prolonged circulatory arrest times.

In 1983, Borst and colleagues [2] introduced the elephant trunk procedure to facilitate staged surgery for the aortic arch and the distal aortic segments. The procedure involves the prosthetic replacement of the ascending aorta and the aortic arch with an elephant trunk extension of the arch graft into the descending aorta through a median sternotomy. In a second-stage operation, the elephant trunk can be extended to the desired level through a lateral thoracotomy; however, the cumulative risk for early mortality adds up to 15% after a stage-two repair. Furthermore, many patients fail to return for the second operation; they die owing to aortic rupture

Presented at Aortic Surgery Symposium X, New York, NY, April 27–28, 2006.

Address correspondence to Dr Baraki, Hannover Medical School, Department of Thoracic and Cardiovascular Surgery, Carl-Neuberg-Strasse 1, 30625 Hannover, Germany; e-mail: hassinabaraki@yahoo.com.

Published by Elsevier Inc

dograft, Curative Medical Devices GmbH, Dresden, Germany) is placed into the descending aorta in an antegrade fashion though the opened aortic arch, and the ascending aorta and the aortic arch are replaced conventionally [5]. In this article we briefly report our surgical experience with this novel combined surgical and interventional approach.

Material and Methods

Patients

The frozen elephant trunk procedure was approved by the Institutional Review Board of Hannover Medical School. Between September 2001 and March 2006, 39 patients with combined pathologies of the aortic arch and the descending aorta were operated on using the hybrid prosthesis. Informed consent was required in each case. Mean patient age was 62 years (range, 37 to 78 years), and 11 patients were older than 70 years; 15 (38.5%) were women.

0003-4975/07/$32.00
doi:10.1016/j.athoracsur.2006.10.083

SUPPLEMENT

ATCSA2023
Ho Chi Minh city, Vietnam

Frozen Elephant Trunk

The elephant trunk is freezing: The Hannover experience

Malakh Shrestha, MBBS, Erik Beckmann, MD, Heike Krueger, RN, Felix Fleissner, MD,
Tim Kaufeld, MD, Nurbol Koigeldiyev, MD, Julia Umminger, MD, Fabio Ius, MD, Axel Haverich, MD, and

European Journal of Cardio-Thoracic Surgery 43 (2013) 406–410
doi:10.1093/ejcts/ezs296 Advance Access publication 31 May 2012

ORIGINAL ARTICLE

Total aortic arch replacement with a novel four-branched frozen elephant trunk graft: first-in-man results†

Malakh Shrestha*, Maximilian Pichlmaier, Andreas Martens, Christian Hagl, Nawid Khaladj and Axel Haverich

Acquired Cardiovascular Disease: Aorta Shrestha et al

The elephant trunk is freezing: The Hannover experience

Malakh Shrestha, MBBS, Erik Beckmann, MD, Heike Krueger, RN, Felix Fleissner, MD,
Tim Kaufeld, MD, Nurbol Koigeldiyev, MD, Julia Umminger, MD, Fabio Ius, MD, Axel Haverich, MD, and
Andreas Martens, MD

publication Jan 24, 2015; available ahead of print March 24, 2015.
Address for reprints: Malakh Shrestha, MBBS, Department of Cardiothoracic, Transplantation and Vascular Surgery, Hannover Medical School, Carl-Neuberg Strasse 1, 30625 Hannover, Germany (E-mail: shrestha.malakh.lal@mh-hannover.de).
0022-5223/$36.00

http://dx.doi.org/10.1016/j.jtcvs.2015.01.044

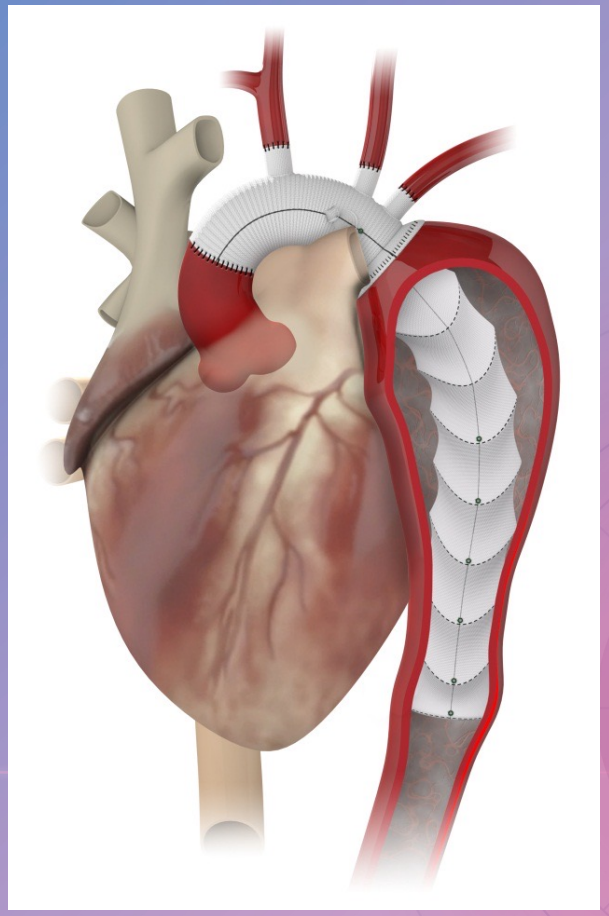
Surgical Technique

Classic ET technique. The early version of the ET technique was performed between 2001 and 2006. In this procedure, the ET part of the aortic graft was inserted per Svensson and colleagues' modification[3] of the original technique.[2] The supra-aortic vessels were reimplanted in the aortic arch prosthesis using the classic "island" technique.

ATCSA2023
Ho Chi Minh city, Vietnam

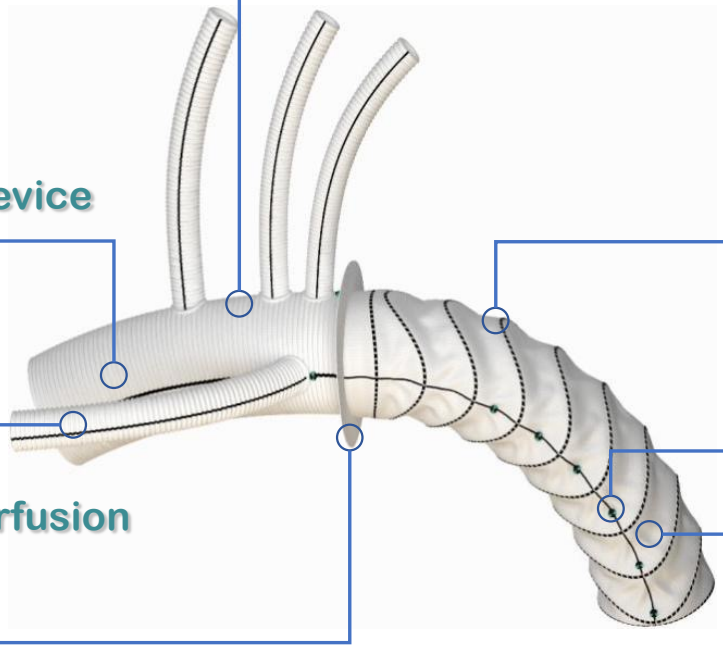
TERUMO
Aortic

thoraflex™ hybrid



Description of the Thoraflex™ Hybrid Device

Plexus 4 Gelweave section



Fully Sealed Device

Ante grade Perfusion Branch

Collar

- Aids anastomosis

Ring Stents

- Individual ring stents of varying strength, specific performance characteristics

Radiopaque Markers

- Visibility of stented section
- Aid for extension

Fabric based on Anaconda

Description of the Thoraflex™ Hybrid Device

Tip

•Provides side guide wire access

Splittable Sheath

•Completely removed from system after deployment

Malleable St/St Shaft

•Provides adequate stiffness during deployment

•Allow the surgeon to pre-curve the delivery system for particular anatomy

Handle

User Interface

Release Clip

•Attachment to release wire

Strap

•User interface

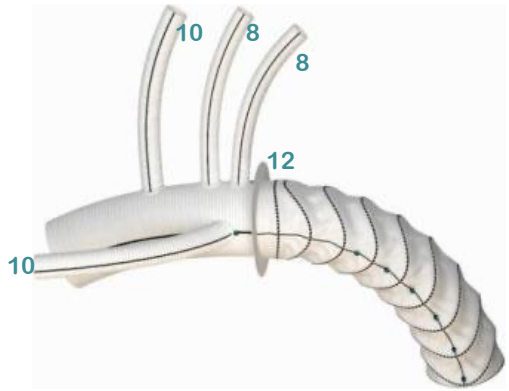
•Attachment to sheath

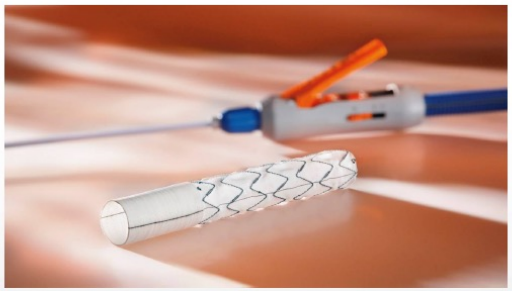
Splitter

•Provides rotational and axial attachment of device to delivery system

•Splits the sheath during retraction

Device Range

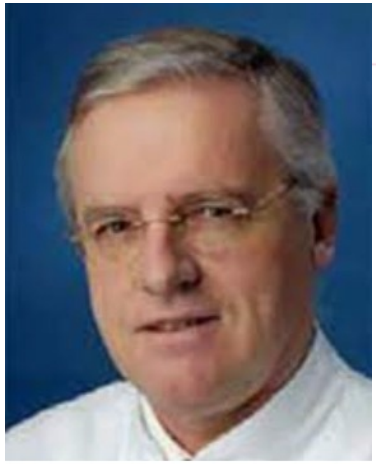
Polyester Graft Type	Polyester Graft Dia. (mm)	Stent Graft Dia. (mm)	Length (mm)
 4 Branch Plexus	26	28	100 &150
	28	30	100 &150
	30	32	100 &150
	30	34	100 &150
	30	36	100 &150
	32	38	100 &150
	32	40	100 &150



The New Endoluminal Stentgraft System for Open Heart Surgery

www.jotec.com

01/2012



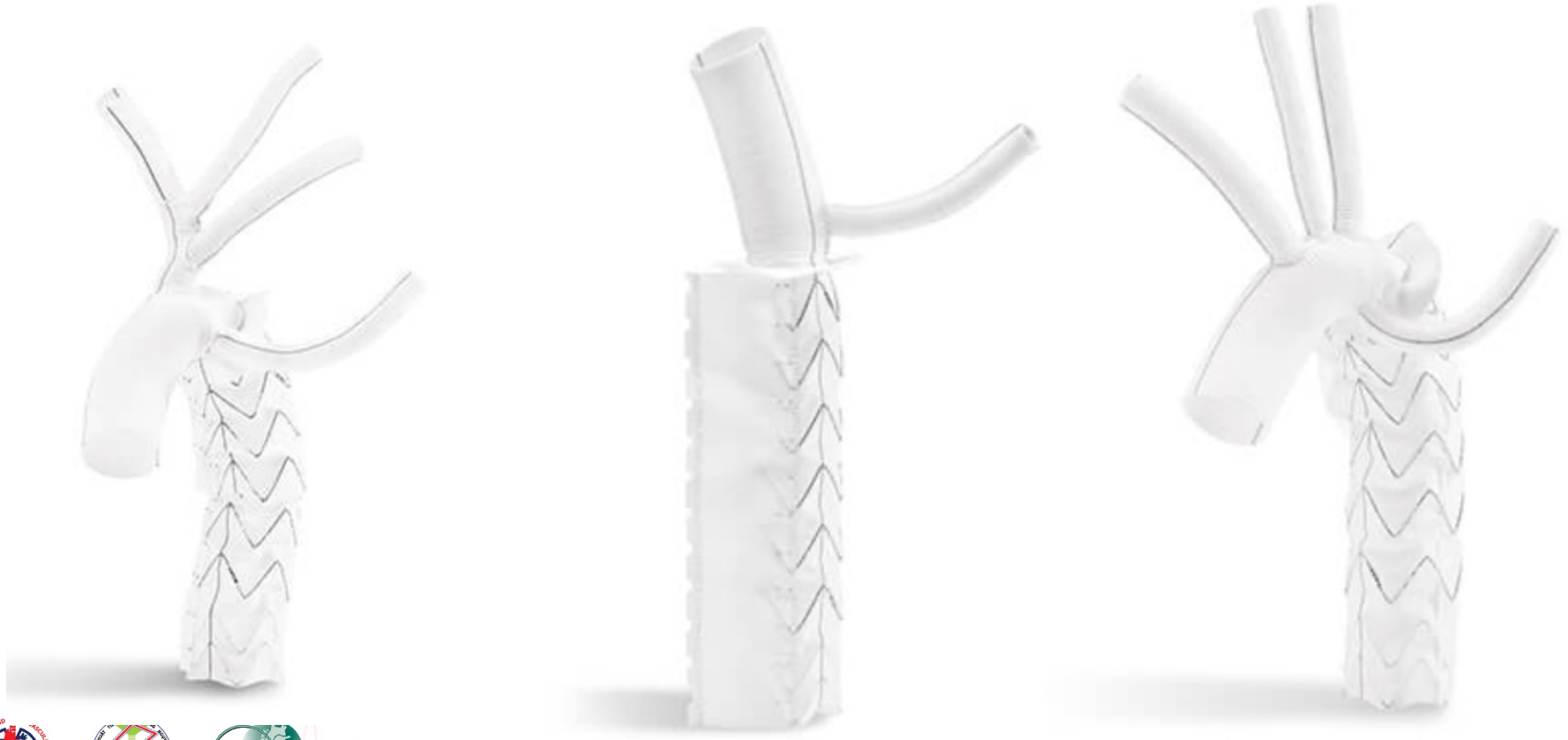
E-vita openplus

JOTEC®
SOLUTIONS FOR VASCULAR DISEASE

Configurations

Length Cuff [mm]	D Cuff [mm]	D_{prox} Stentgraft [mm]	D_{dist} Stentgraft [mm]	Length Stentgraft [mm]	Catalogue-No.
50	24	24	24	130	71AC2424S13-PL
50	28	28	28	130	71AC2828S13-PL
50	30	30	30	130	71AC3030S13-PL
50	33	33	33	130	71AC3333S13-PL
50	36	36	36	130	71AC3636S13-PL
50	40	40	40	130	71AC4040S13-PL

EVITA Open NEO



EVITA Open NEO

STRAIGHT

Island Technique

Collar Anastomosis in Zone 2/3

BRANCHED

Sequential Anastomoses

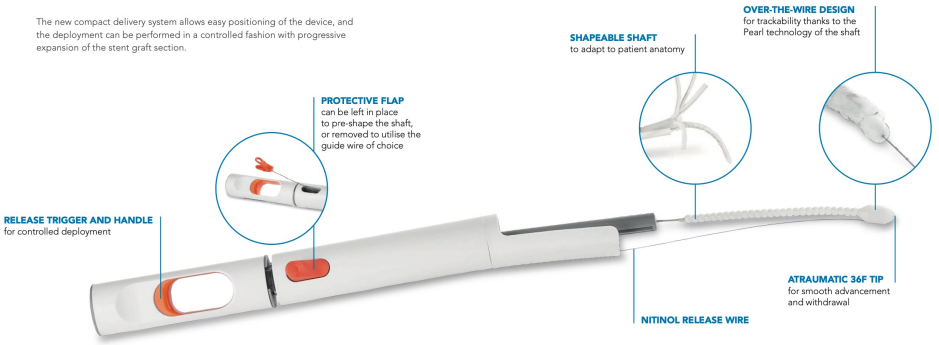
Collar Anastomosis in Zone 1/2/3

TRIFURCATED

Sequential Anastomoses

Collar Anastomosis in Zone 0/1

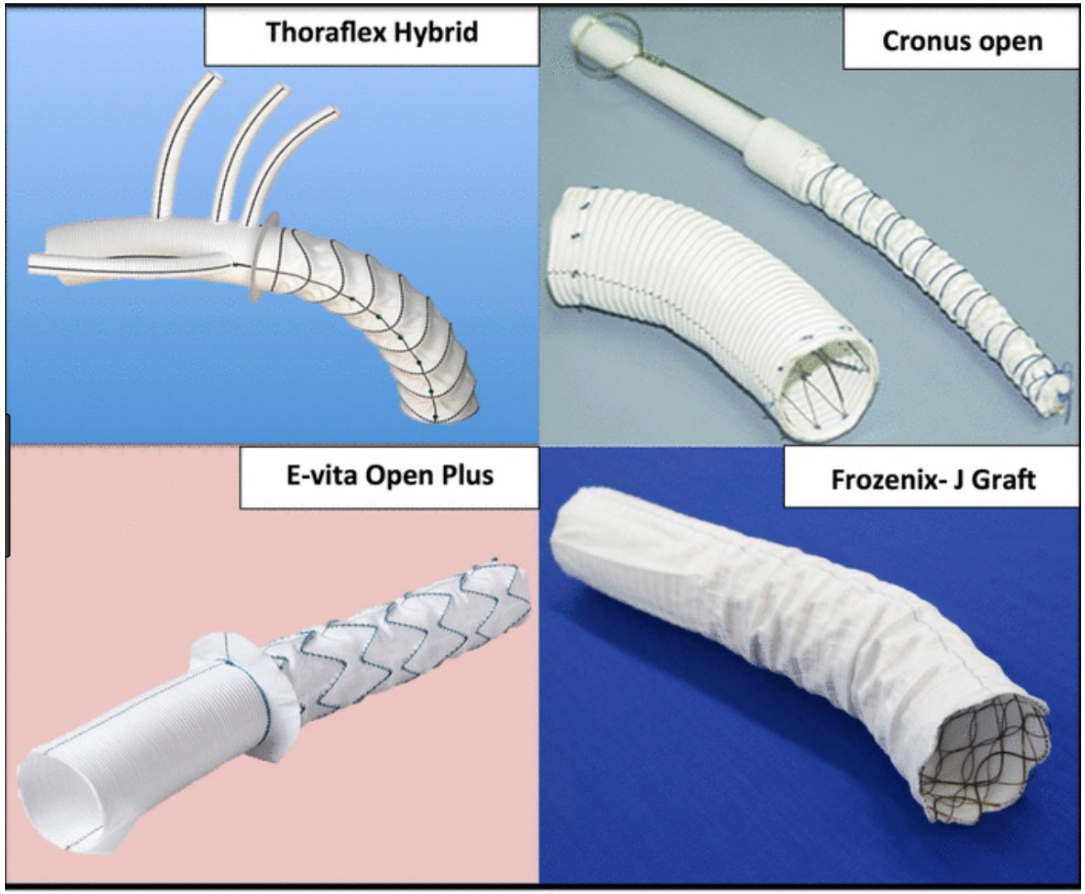
The new compact delivery system allows easy positioning of the device, and the deployment can be performed in a controlled fashion with progressive expansion of the stent graft section.



Branched Configuration

Catalog No.	Ø Vascular graft part (mm)	Ø Stent graft part (mm)	Length Stent graft (mm)
95HG2622L120-C02	26	22	120
95HG2624L120-C02	26	24	120
95HG2624L175-C02	26	24	175
95HG2626L120-C02	26	26	120
95HG2828L120-C02	28	28	120
95HG3030L120-C02	30	30	120
95HG3030L180-C02	30	30	180
95HG3033L130-C02	30	33	130
95HG3036L130-C02	30	36	130
95HG3040L180-C02	30	40	180

FET in Use

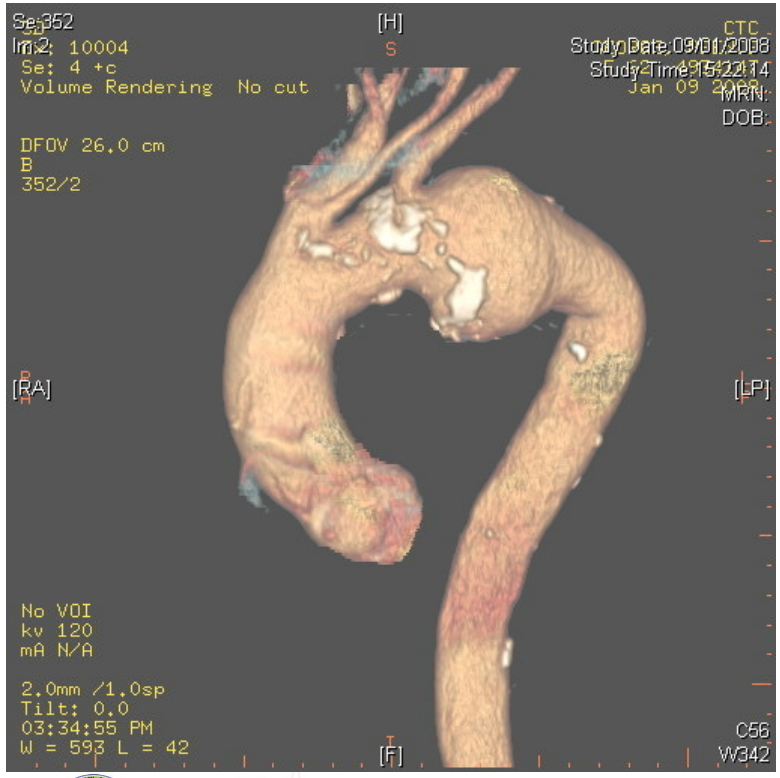

Thoraflex Hybrid
Cronus open
E-vita Open Plus
Frozenix- J Graft

Advantages of FET

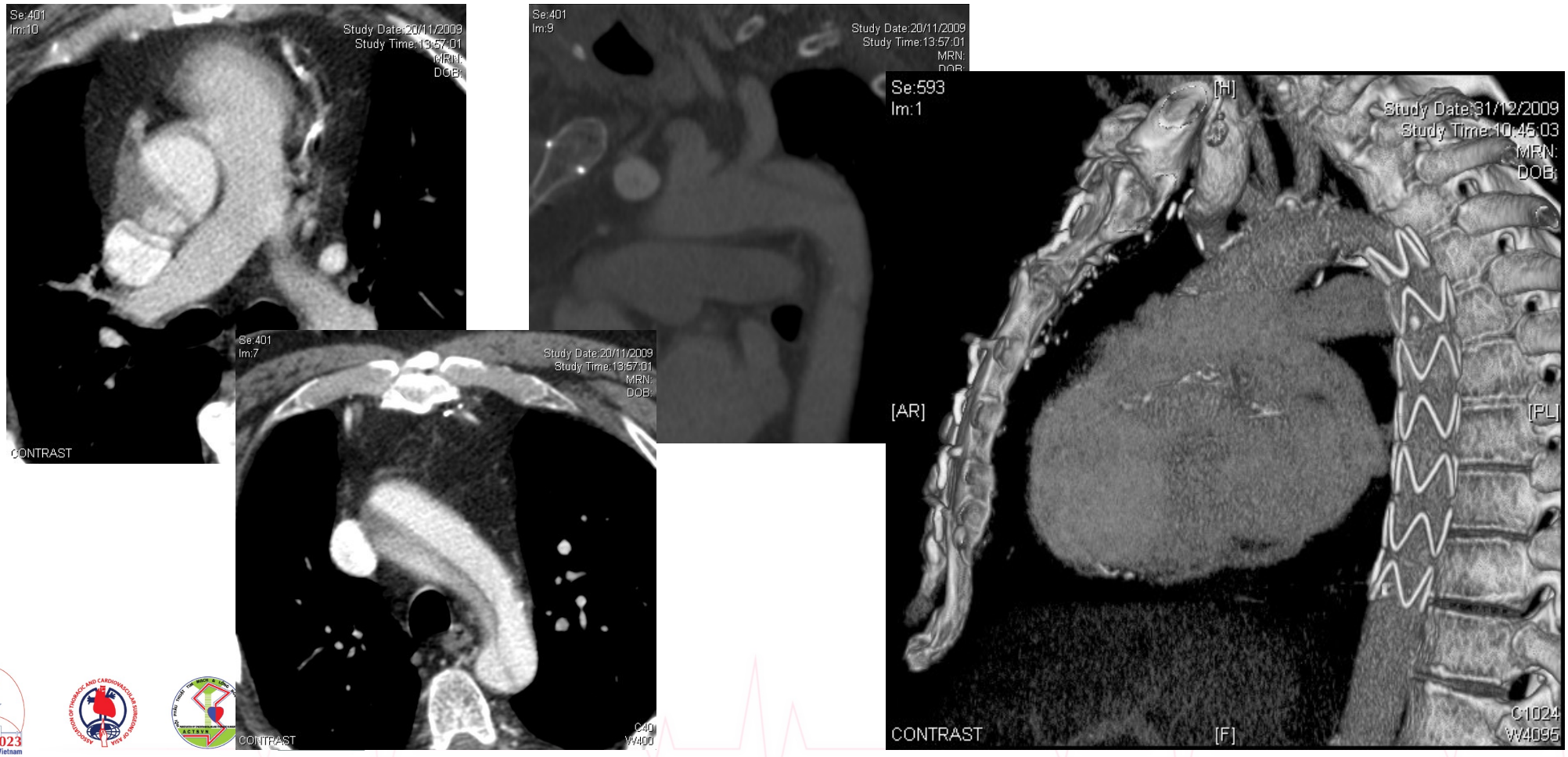
- Single stage repair of arch and DTA pathology
- Versatile – zone 0-3 distal anastomosis
- More hemostatic distal anastomosis in arch replacement in acute Type A Dissection
- Re-modelling of DTA in acute/subacute Type A and Type B Dissections
- Stable plateform for proximal landing zone for endovascular repair

Mini-Access FET

Proximal DTA aneurysm with complex proximal landing zones



Acute Type A with limited DTA involvement or malperfusion



Chronic Type A with proximal DTA aneurysm

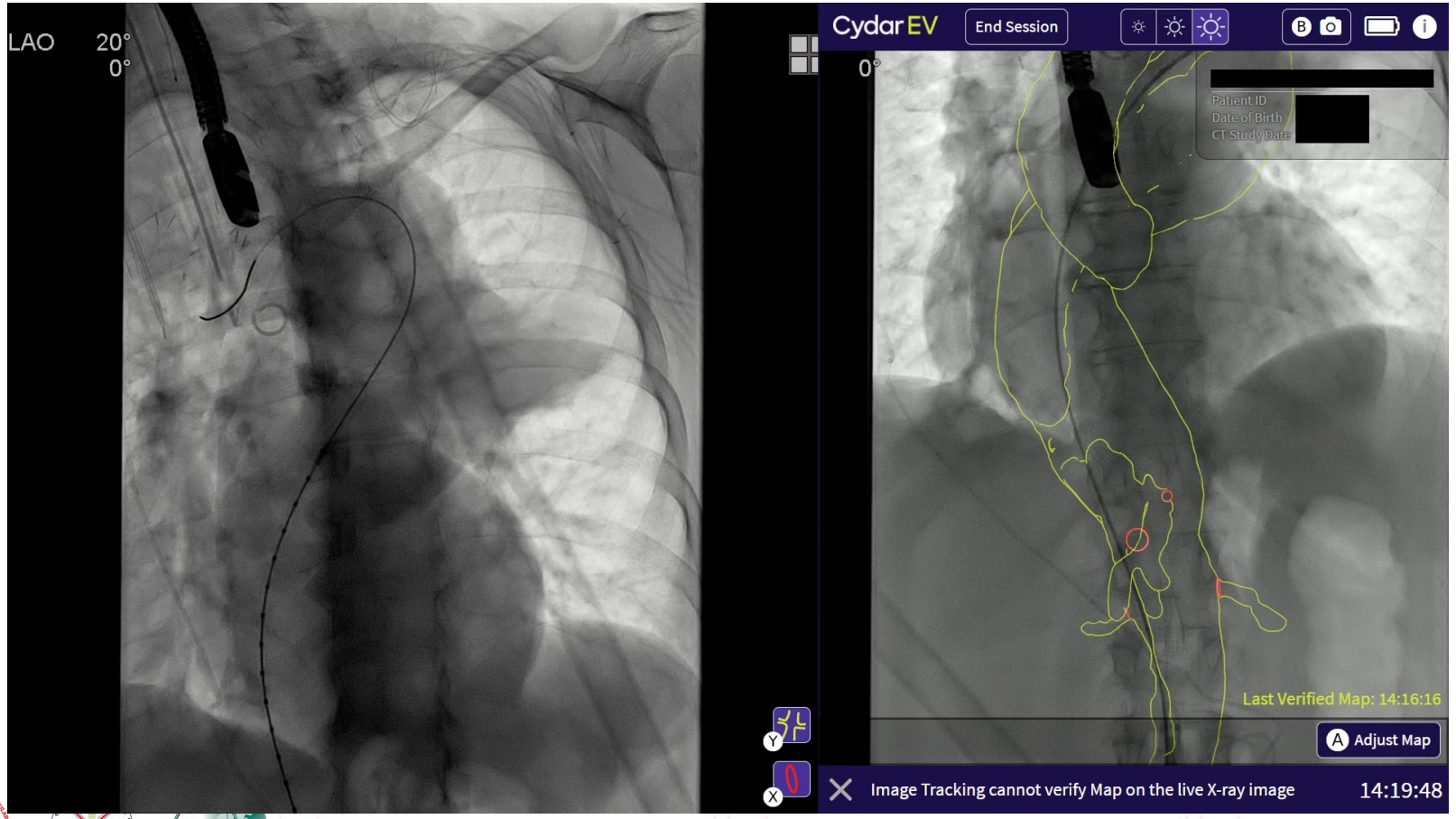
Postop


Se:402
Im:25
Study Date:15/11/2010
Study Time:15:21:58
MRN:
DOB:
AR
10 cm
A
L
CONTRAST
F
C128
W256

Case 1

50 yr old F
HT
Heavy smoker
Poor PFT
CKD3
Dilated DTA, AAA and ARSA
Type B Dissection with intermittent pain

Combined TEVAR + FET for Type B



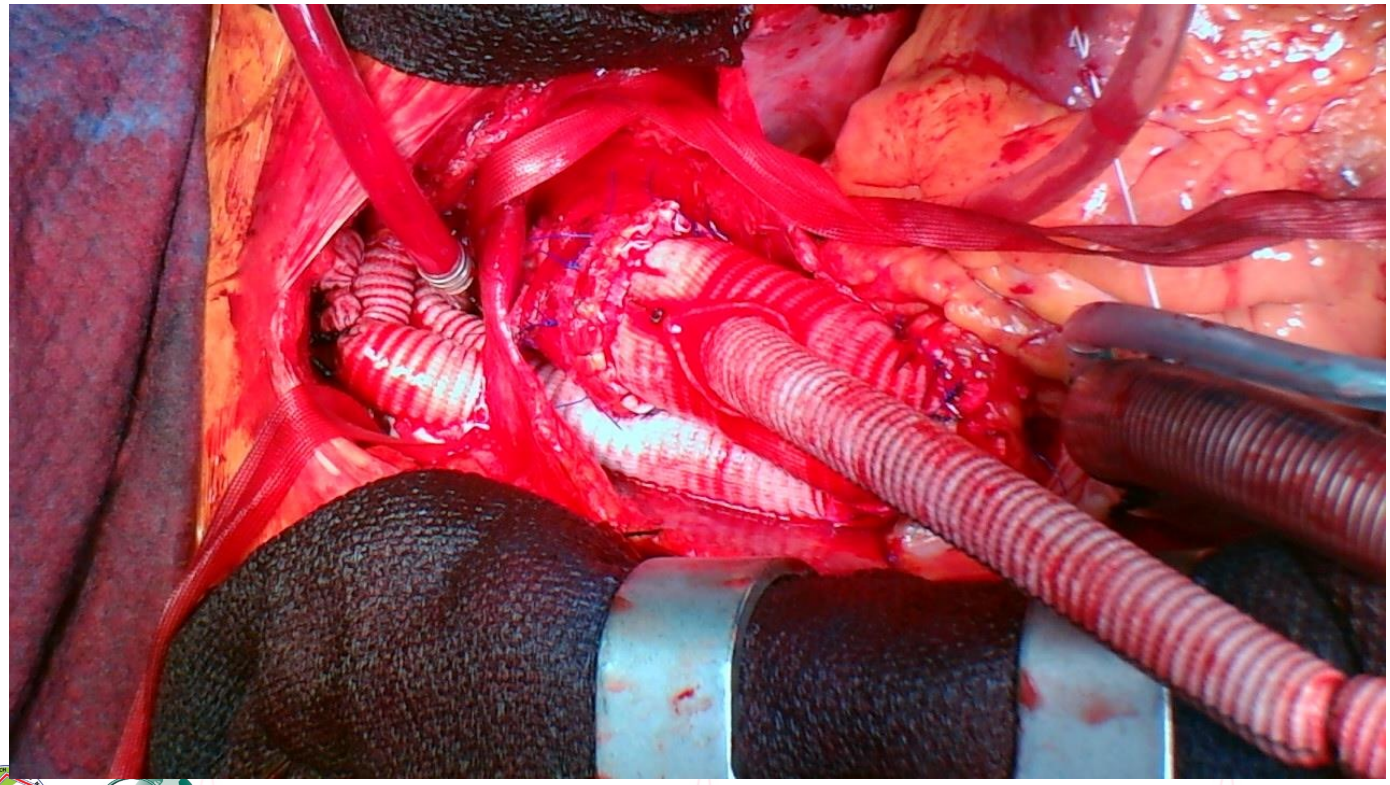
Case Study 2

- 51 F
- Marfan’s Syndrome
- Failed Pectus repair 1984
- Bilateral Pleurectomy for pneumothorax
- Bio-Root replacement 2002
- Severe AR due to tissue valve degeneration
- Type B Dissection Nov 2019
- Rapid expansion of DTA 6 mm in 2 months

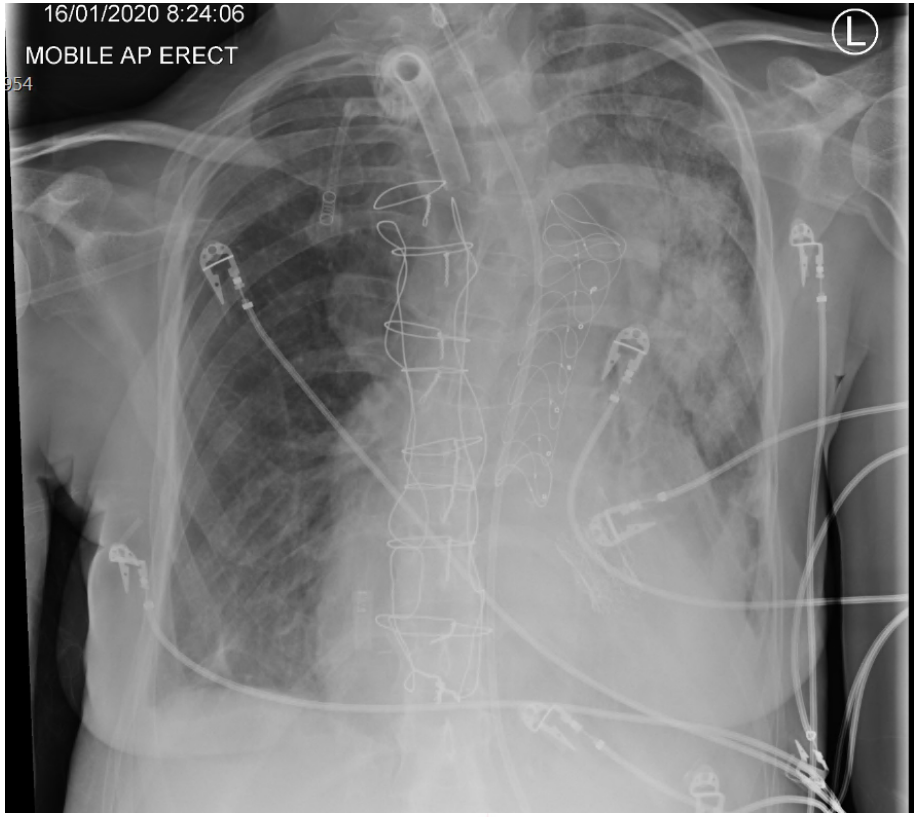
Procedure

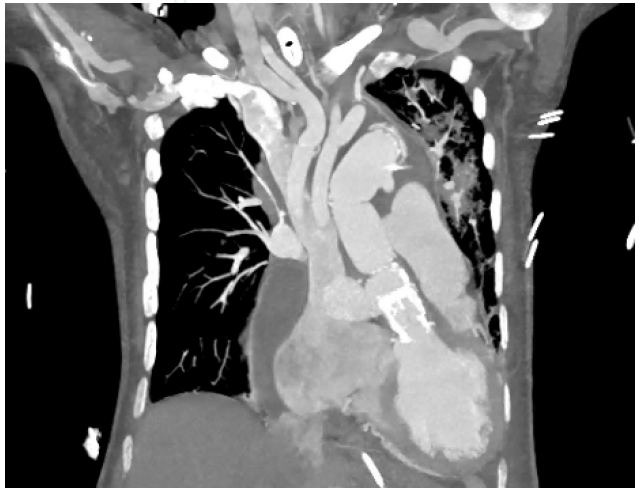
- Redo-sternotomy
- CPB – Arch and RA
- Cooled to 22^{o}C (Bilateral SACP)
- AV excised – Percival S Sutureless valve
- Debranched arch with Trifurcated graft
- Terumo Aortic Thoraflex 30mm 15 cm FET
- Zone 2 distal anastomosis

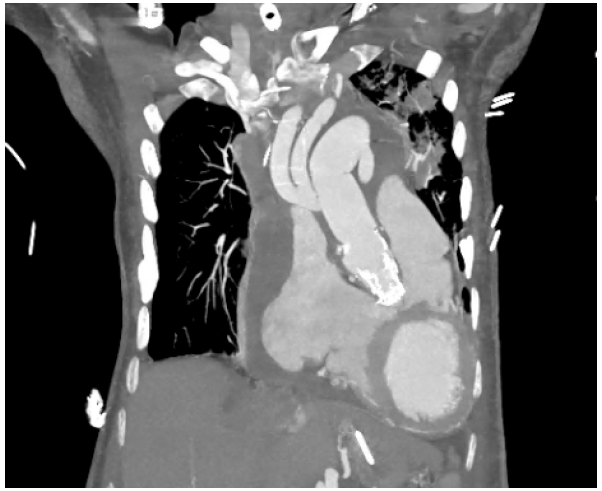
Anteflow FET + Trifurcated Graft

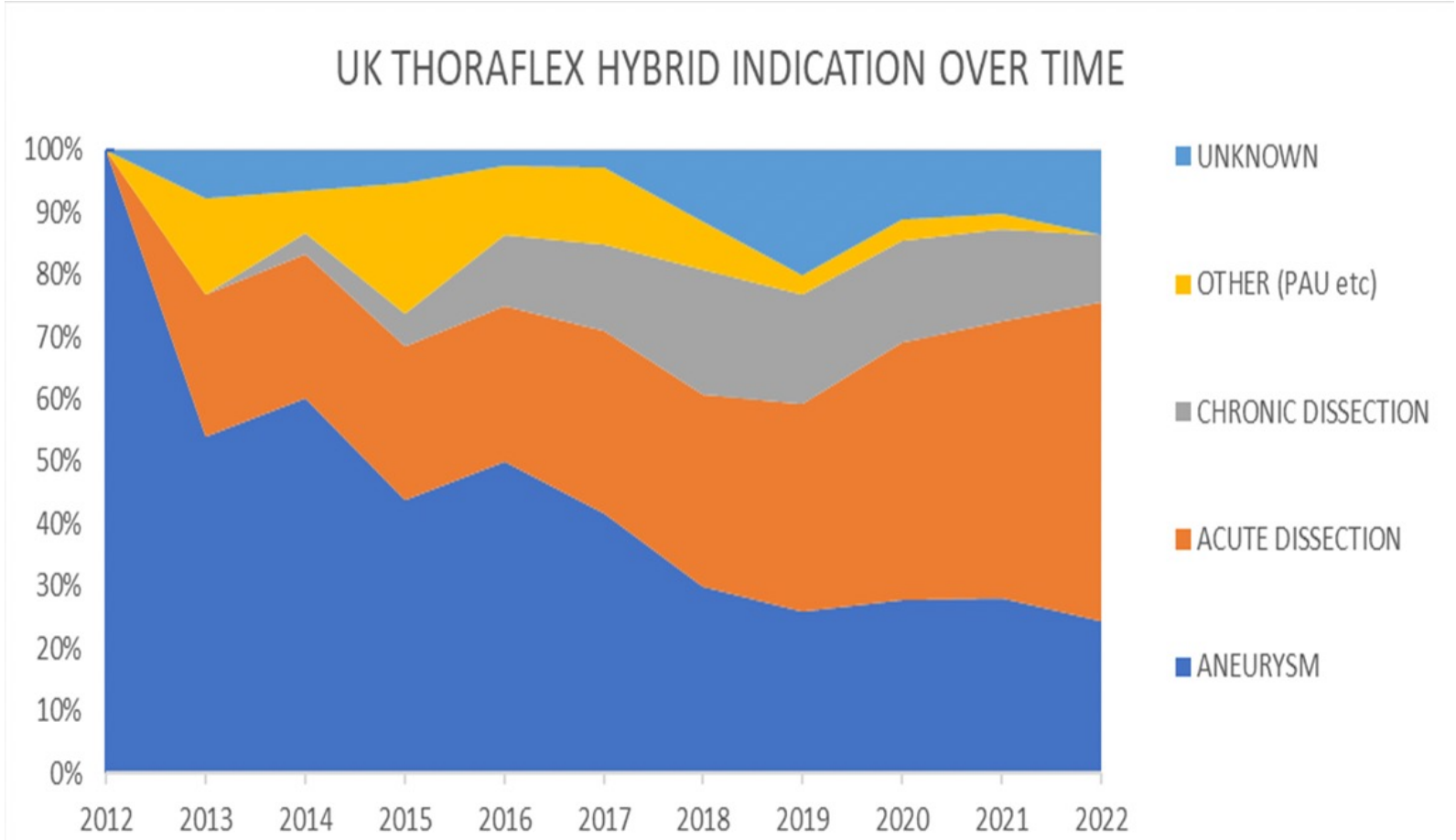


Postop

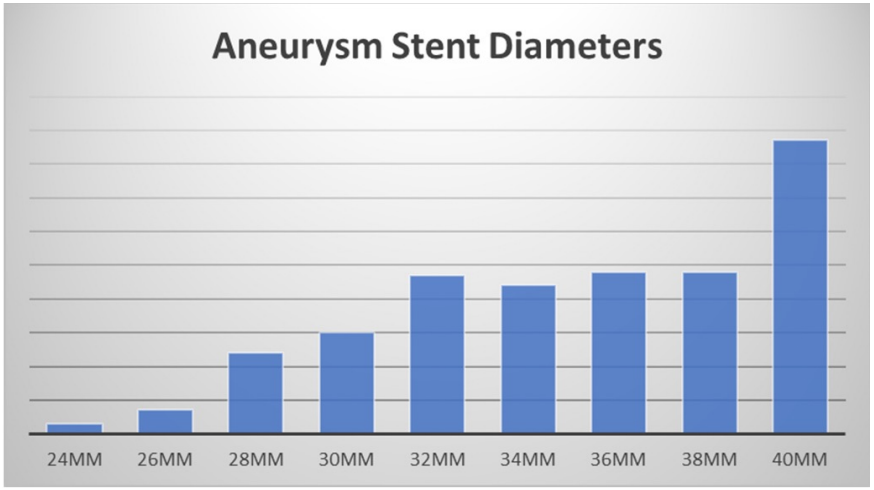


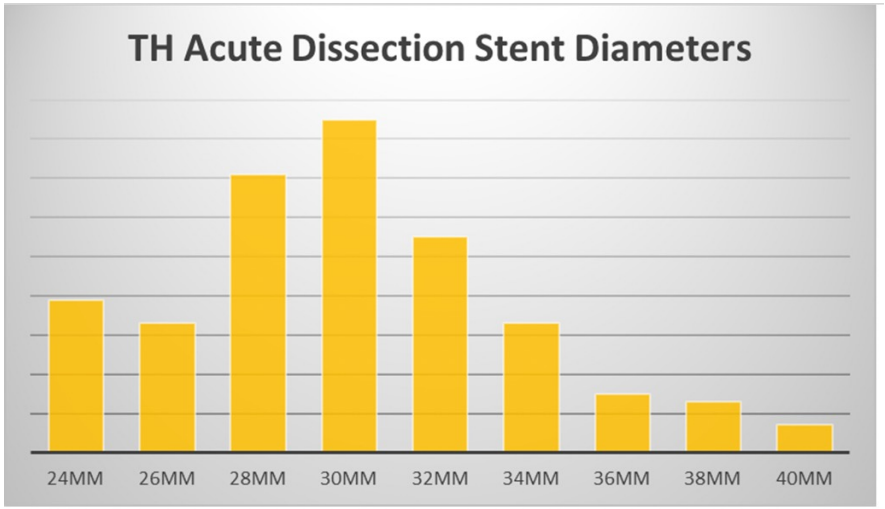


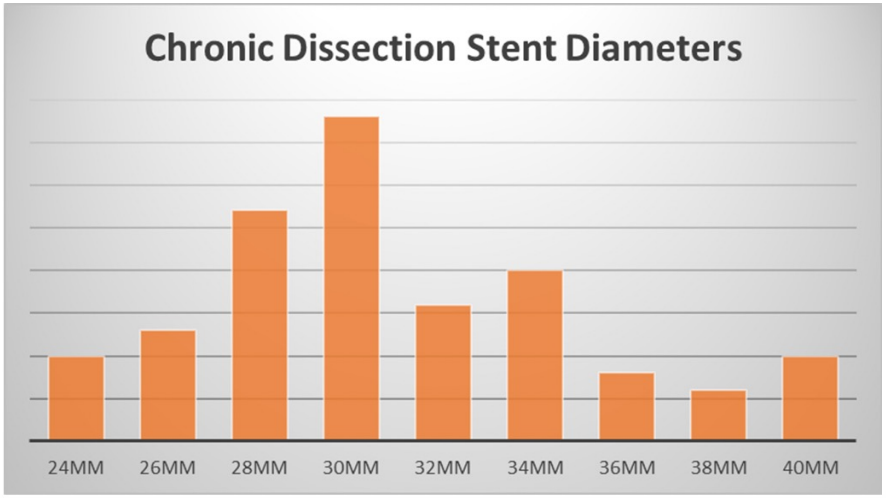



UK THORAFLEX HYBRID INDICATION OVER TIME
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
UNKNOWN
OTHER (PAU etc)
CHRONIC DISSECTION
ACUTE DISSECTION
ANEURYSM

Stent Diameter







UK FET (2012 – 2022)

- Thoraflex Hybrid 1007
- Evita Open/Open Plus/NEO 155

UK FET EXPERIENCE ON ATAAD - METHODOLOGY

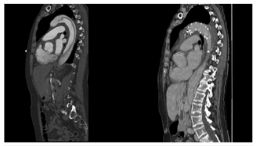
- Bart's
- Brompton
- Bristol
- Derriford
- Glenfield
- Harefield
- Liverpool
- Manchester
- Hull
- Papworth
- Southampton

- Observational study on FET/ATAAD
- 110 patients treated with FET (Thoraflex hybrid)
- 11 high-volume UK aortic centers
- Prior clinical experience with 66 pts

Reflection From UK Aortic Group: Frozen Elephant Trunk Technique as Optimal Solution in Type A Acute Aortic Dissection

Giovanni Mariscalco, MD, PhD,[*] Haris Bilal, FRCS (CTh),[†] Pedro Catarino, FRCS (CTh),[‡] Leonidas Hadjinikolaou, MD, FRCS (CTh),[*] Manoj Kuduvalli, MS, MCh, FRCS (CTh),[§] Mark Field, DPhil, FRCS (CTh),[§] Jorge Mascaro, FRCS (CTh),[‖] Aung Y. Oo, MD, FRCS (CTh),[¶] Cesare Quarto, PhD, FRCS (CTh),[#] James Kuo, FRCS (CTh),[**] and Geoff Tsang, MD, FRCS (CTh)[††] on behalf of the UK Aortic Group

Diseases of the thoracic aorta are increasing in prevalence worldwide. Recent data indicated wide regional variation in the volume and complexity of aortic cases undertaken in United Kingdom cardiac centers, especially in case of acute type A aortic dissection (ATAAD) conditions. Patients treated in high-volume centers with a specific multidisciplinary aortic program had a significant reduction in ATAAD mortality when compared with low-volume centers. Following the initial phase of a national aortic center reorganization, the current study reflects the initial experience of a national collective of cardiothoracic surgeons with expertise in complex aortic surgery, using frozen elephant trunk as standard technique for the surgical treatment of patients affected by ATAAD. Between June 2013 and October 2017, 66 ATAAD patients (45% women) underwent hybrid aortic arch and frozen elephant trunk repair with the Thoraflex hybrid graft at 8 UK high-volume aortic centers. The in-hospital mortality accounted for 8 patients (12%). Postoperative temporary or permanent neurologic events and temporary renal replacement therapy occurred in 17% and 20% of patients, respectively. No spinal cord injury events were documented. Our data were similar to those reported in literature in the 2 largest experiences with the use of frozen elephant technique in ATAAD condition (in-hospital/30-day mortality: 11–12%). This



Preoperative and postoperative computed tomography angiographies showing a type A acute aortic dissection case with its subsequent (final) treatment with a Thoraflex hybrid graft.

Central Message

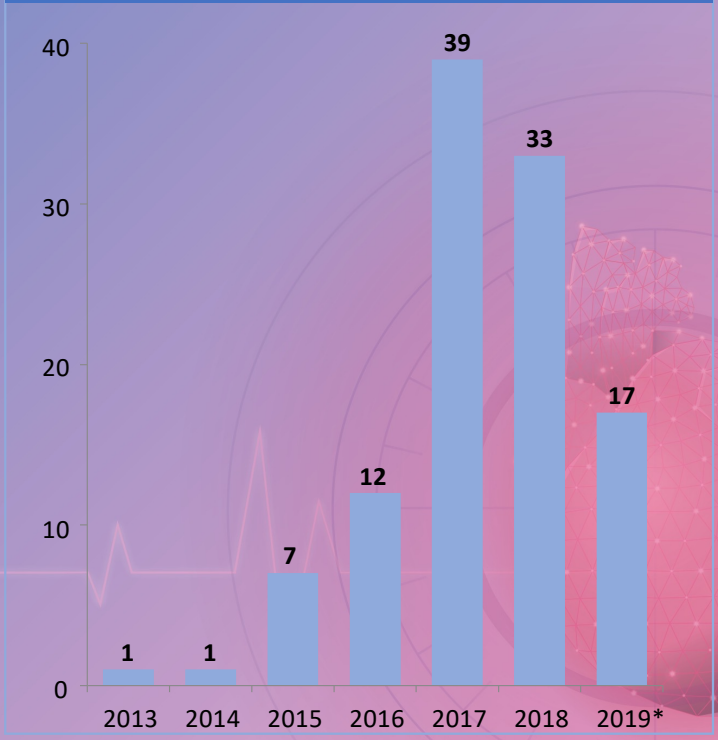
The "frozen elephant trunk technique" combining endovascular treatment with conventional surgery enables the single-stage treatment of the combined lesions of the thoracic aorta. In patients affected by type A acute aortic dissection, a national collective of UK cardiothoracic surgeons with expertise in complex aortic surgery, proved that to be an optimal surgical solution even in this high-risk population of patients.

Mariscalco et al. Semin Thorac Cardiovasc Surg. 2019;31(4):686-690

UK FET EXPERIENCE ON ATAAD - RESULTS

Table. 1 Preoperative data	
Age, yrs	60.9 ± 12.4
Female	38 (34.5)
BMI, Kg/m^2	28.9 ± 5.7
EuroSCORE II	9.3 ± 10.9
Critical preop state	40 (36.4)
Redo	5 (4.5)
LVEF, %	54.2 ± 6.9
Hypertension	77 (70)
Diabetes	8 (10)
COPD	5 (4.5)
PVD	16 (14.5)

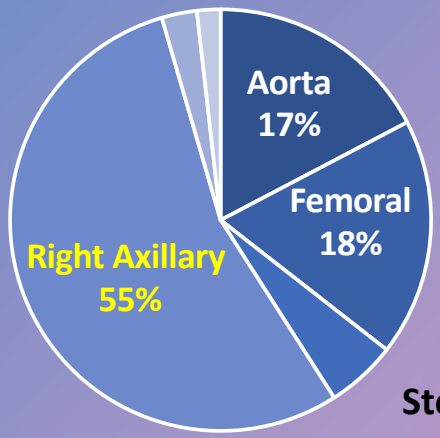
Figure 1. Number of cases



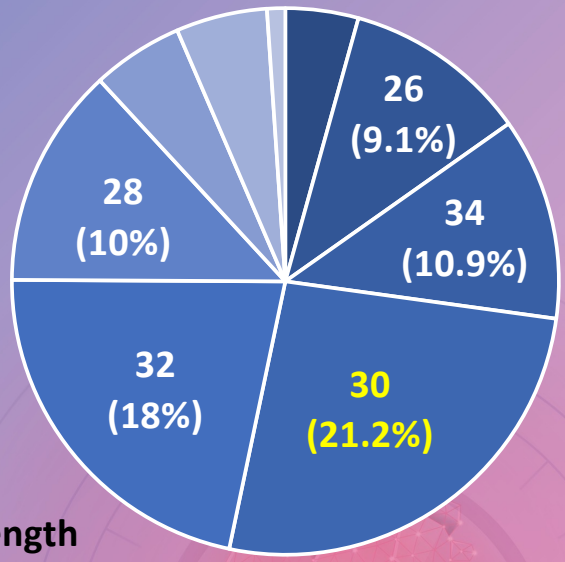
UK FET EXPERIENCE ON ATAAD - RESULTS

Table 2. Intraoperative data	
CPB, min	339.3 ± 103.7
ACC, min	182.9 ± 83.7
HCA, min	63.6 ± 39.9
HCA, ˚C	20.8 ± 2.0
Critical preop state	40 (36.4)
CSF drainage	2 (1.8)
ACP perfusion	78 (70.9)
Distal aorta perfusion	22 (20)
AV repair/replacement	(53) 48.2
Root surgery	36 (32.7)
TEVAR	1 (0.9)

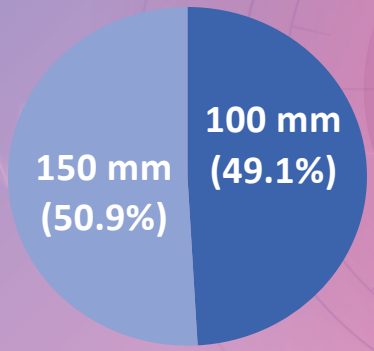
Arterial cannulation site



Stent size (diameter)

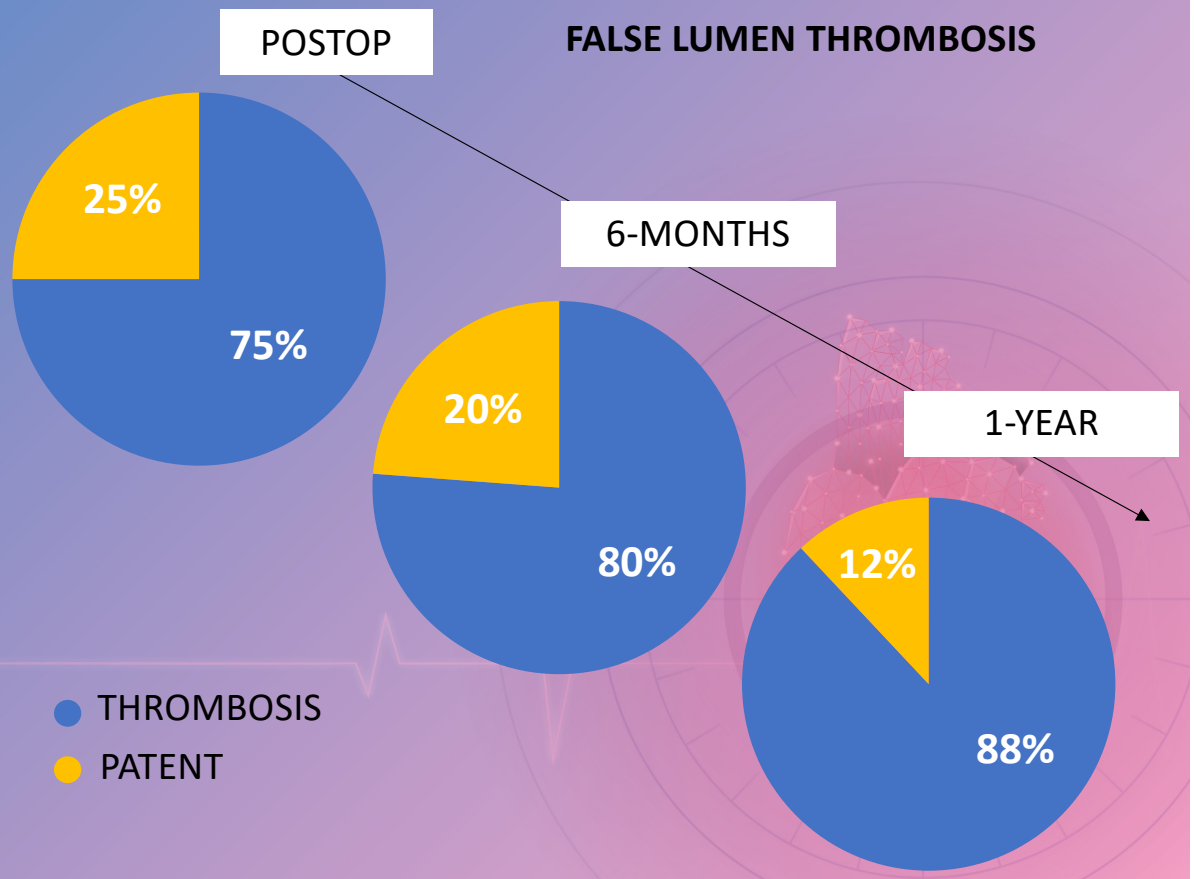


Stent length

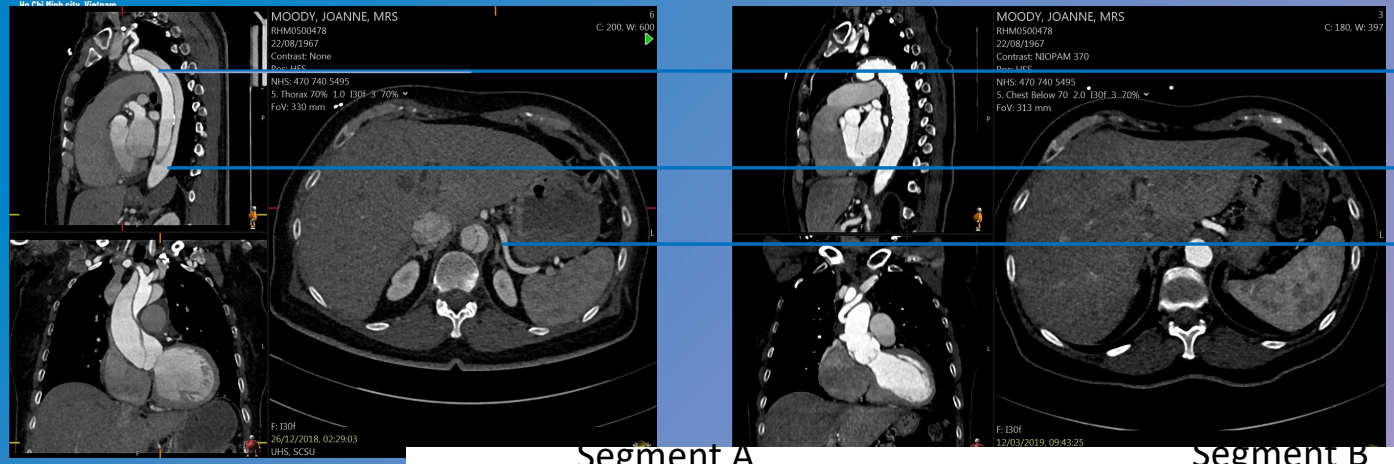


UK FET EXPERIENCE ON ATAAD - RESULTS

Table 3. Postoperative data	
Hospital mortality	**15 (13.6)**
Intraoperative death	1 (0.9)
Reexploration	20 (18.2)
Stroke	15 (13.6)
Paraplegia	2 (1.8)
Recurrent nerve palsy	4 (3.6)
Dialysis	28 (26.4)
VAD/ECMO postop	5 (4.5)
Tracheostomy	26 (23.6)
Reintubation	11 (10)
ITU stay, hrs	241 ± 298
Length of stay, d	24 ± 18



UK FET EXPERIENCE ON ATAAD - AORTIC REMODELLING



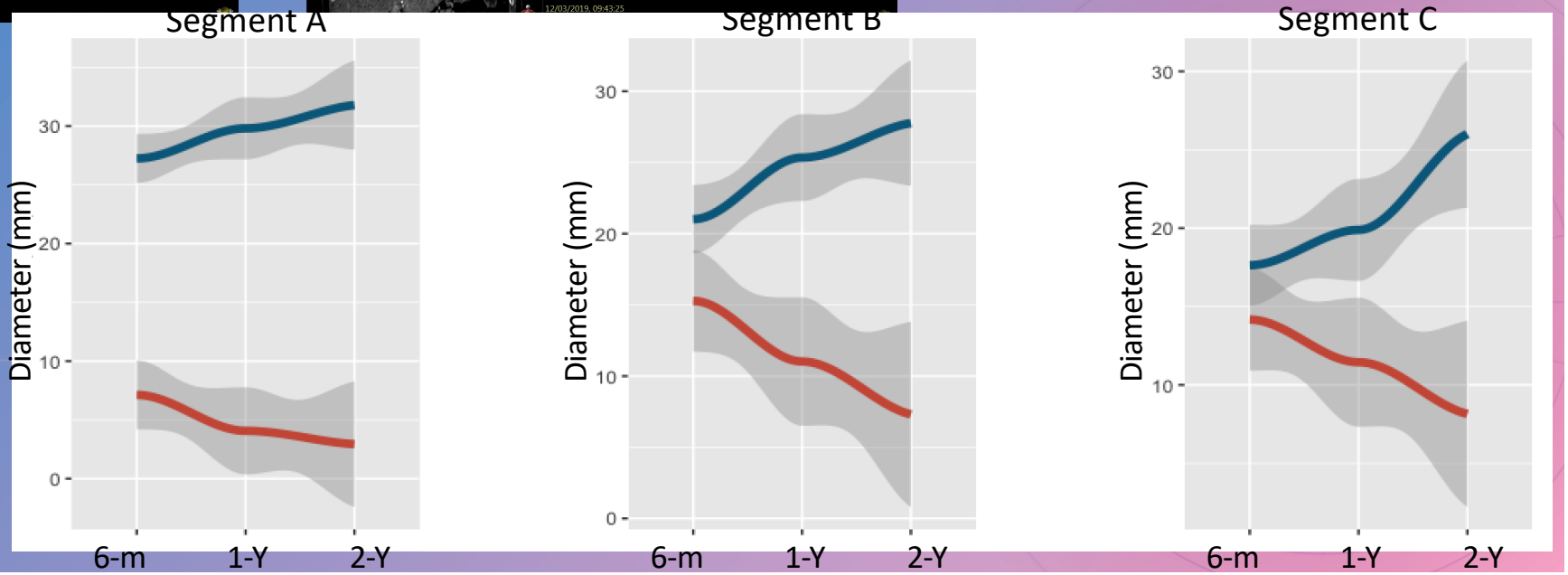
Segment A
(Stented aorta)

Segment B
(End of stent to coeliac axis)

Segment C
(Coeliac axis to bifircation)

True lumen

False lumen



FET in Chronic Dissection

The Frozen Elephant Trunk for the Treatment of Chronic Dissection of the Thoracic Aorta: A Multicenter Experience

Davide Pacini, MD,* Konstantinos Tsagakis, MD,* Heinz Jakob, MD
Carlos-A. Mestres, MD, Alessandro Armaro, MD, Gabriel Weiss, MD,
Martin Grabenwoger, MD, Michael A. Borger, MD, Friedrich W. Mohr, MD,
Robert Stuart Bonser, MD, and Roberto Di Bartolomeo, MD

Department of Cardiac Surgery, Sant'Orsola-Malpighi Hospital, Bologna, Italy; Department of Thoracic and Cardiovascular Surgery, West German Heart Center Essen, Essen, Germany; Department of Cardiovascular Surgery, Hospital Clínico, University of Barcelona, Barcelona, Spain; Department of Cardiovascular Surgery, Hospital Hietzing, Vienna, Austria; Department of Cardiac Surgery, Leipzig Heart Center, Leipzig, Germany; and Department of Cardiothoracic Surgery, University Hospital Birmingham NHS Foundation Trust, Birmingham, United Kingdom

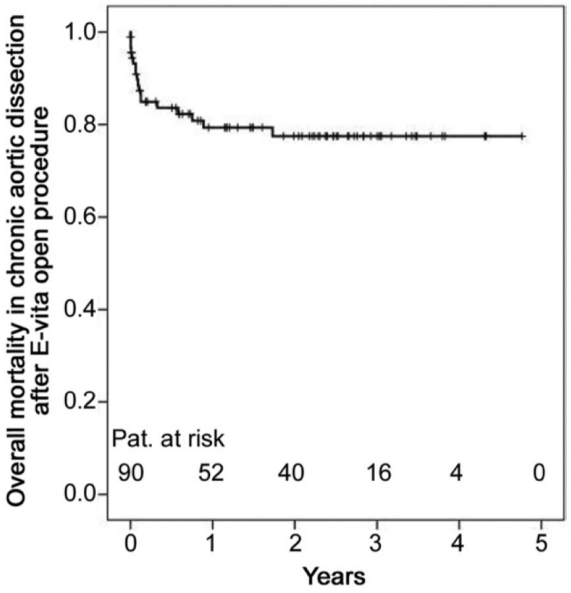


Table 1. Patient Characteristics

Variable	No. (%)
Number of patients	90 (100%)
Age (years), mean ± SD	57 ± 12
Age ≥ 70 years	13 (14)
Male	72 (80)
BMI, mean ± SD	27 ± 4
Emergency < 24 hours	2 (2)
Marfan syndrome	6 (7)
Aortic valve insufficiency ≥ 2	29 (32)
Malperfusion	7 (8)
CAD	8 (9)
EF < 60%	41 (46)
Previous aortic repair for AAD	62 (69)
Previous EVAR	
Thoracic	2 (2)
Abdominal	3 (3)
COPD	10 (11)
AD characteristics	
Stanford classification	
Type A	69 (77)
Type B	21 (23)
Extension of false lumen	
Thoracic aorta	6 (7)
Thoracic + abdominal	84 (93)
Descending aorta[a] (mm), mean ± SD	50 ± 12
TL collapse	12 (13)
Aortic calcification	26 (29)

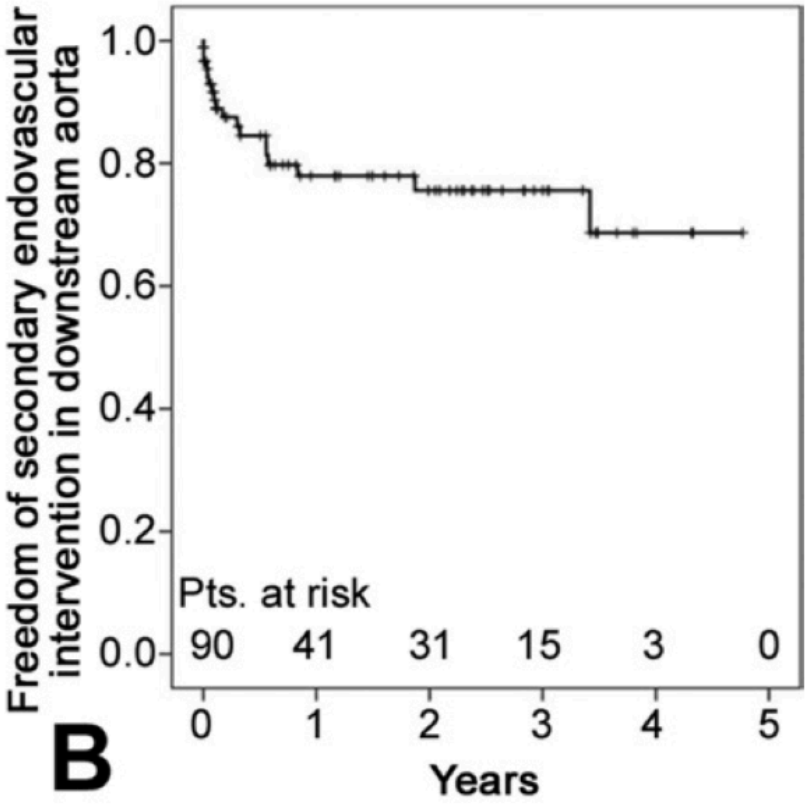
[a] Level of the pulmonary bifurcation.

FET in Chronic Dissection

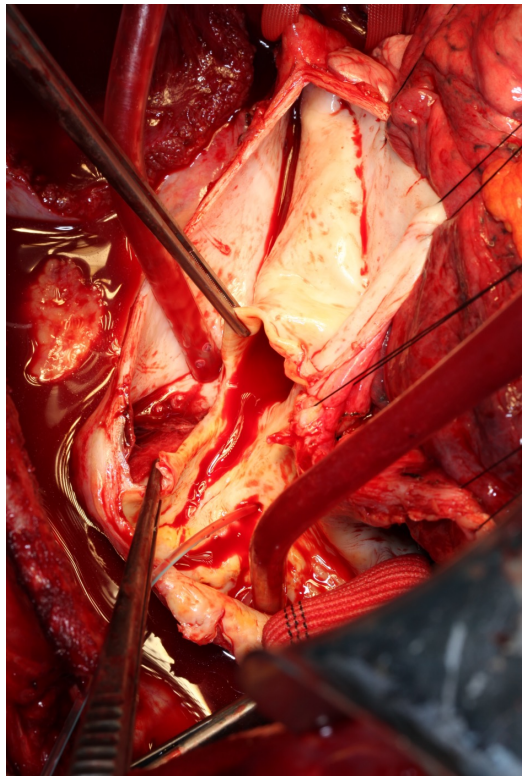
Table 3. Postoperative Data

Variable	No. (%)
In-hospital mortality	11 (12)
Low-output syndrome	7 (8)
Intubation >72 hours	28 (31)
Rethoracotomy for bleeding	12 (13)
Dialysis	
Permanent	4 (4)
Temporary	14 (16)
Gastrointestinal complications	4 (4)
Stroke	1 (1)
TND	6 (7)
Spinal cord injury	
Paraplegia	4 (4)
Paraparesis	4 (4)

TND = transient neurologic dysfunction.



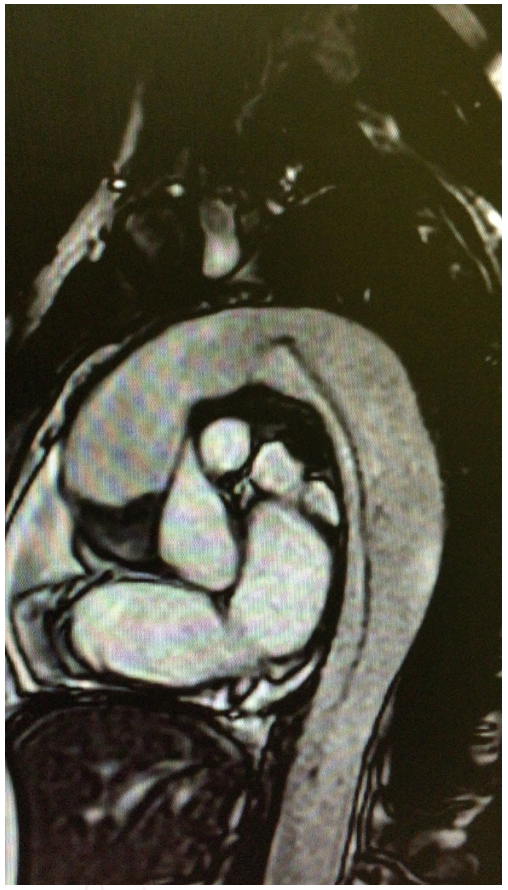
Chronic Dissection



Sizing of FET

Narrow True Lumen

Rigid Dissection Flap



Problems with FET in Chronic Dissection

- Not a single stage treatment most of the time
- Sizing of FET can be difficult
- Often not proceed to second completion procedure

Issues in FET

- Routine use in Acute Type A Dissection Justified?
- Use of FET in Chronic Type B Dissection
- Fate of FET in long term outcome
- Incidence of paraplegia in era of FET
- Cost effectiveness

Advances in Aortic Arch Surgery

Improved graft design

Advances in Aortic Arch Surgery

Improved Monitoring

ATCSA2023
Ho Chi Minh city, Vietnam

Monitored Brain Perfusion is a standard of care in arch surgery

BUT WHAT ABOUT SPINAL CORD?

European Journal of Cardio-Thoracic Surgery Advance Access published May 20, 2013

European Journal of Cardio-Thoracic Surgery 0 (2013) 1–8
doi:10.1093/ejcts/ezt252 Advance Access publication 00 Month 0000

ORIGINAL ARTICLE

Experience with the conventional and frozen elephant trunk techniques: a single-centre study†

Sergey Leontyev*†, Michael A. Borger†, Christian D. Etz, Monica Moz, Joerg Seeburger, Farhard Bakhtiary, Martin Misfeld and Friedrich W. Mohr

Department of Cardiac Surgery, Heart Center, University of Leipzig, Leipzig, Germany

The incidence of post-FET spinal cord injury in the present study was 21.4%, being on the higher end of those reported in the literature. Multivariate logistic analysis identified only one factor as an independent predictor for paraplegia within the FET subgroup: body core temperatures of >28°C during circulatory arrest times of >40 min. Half of the patients (5 of 10) who suffered ischaemic spinal cord injury had circulatory arrest times of >40 min

Plan for Total Aortic Care

EACTS Recommendation

European Journal of Cardio-Thoracic Surgery 47 (2015) 759–769
doi:10.1093/ejcts/ezv085 Advance Access publication 13 March 2015

POSITION STATEMENT

Cite this article as: Shrestha M, Bachet J, Bavaria J, Carrel TP, De Paulis R, Di Bartolomeo R *et al.* Current status and recommendations for use of the frozen elephant trunk technique: a position paper by the Vascular Domain of EACTS. Eur J Cardiothorac Surg 2015;47:759–69.

Current status and recommendations for use of the frozen elephant trunk technique: a position paper by the Vascular Domain of EACTS†

Malakh Shrestha[a], Jean Bachet[b], Joseph Bavaria[c], Thierry P. Carrel[d], Ruggero De Paulis[e], Roberto Di Bartolomeo[f], Christian D. Etz[g], Martin Grabenwöger[h], Michael Grimm[i], Axel Haverich[a], Heinz Jakob[j], Andreas Martens[a], Carlos A. Mestres[k,l], Davide Pacini[f], Tim Resch[m], Marc Schepens[n], Paul P. Urbanski[o] and Martin Czerny[p,q,*]

Recommendation for use

Based on the available literature and on the expert consensus opinion of the authors, the following recommendations can be made:

(i) The FET technique or an alternative method to close the primary entry tear should be considered in patients with acute type A aortic dissection with a primary entry in the distal aortic arch or in the proximal half of the descending aorta to treat associated malperfusion syndrome or to avoid its postoperative development. Class of recommendation IIa—Level of evidence C [23, 55]

(ii) The FET technique may be considered for use in patients undergoing surgery for acute type A aortic dissection to prevent mid-term aneurysmal formation in the downstream aorta. Class of recommendation IIb—Level of evidence C [19, 47–49]

(iii) The FET technique should be considered in patients with complicated acute type B aortic dissection when primary TEVAR is not feasible or the risk of retrograde type A aortic dissection is high. Class of recommendation IIa—Level of evidence C [50]

(iv) The FET technique should be considered in patients with extensive thoracic or thoraco-abdominal aortic disease when a second procedure, either open surgical or endovascular in downstream aortic segments, can be anticipated. Class of recommendation IIa—Level of evidence C [42, 64]

Training

Collaboration and friendship

Conclusion

- Frozen elephant trunk technique is a useful armamentarium for the management of complex aortic pathologies
- Multidisciplinary team discussion-based patient selection and knowledge of the devices available is important
- Training and shared learning of multidisciplinary team is essential for the optimal care of patients with aortic pathologies

Thank You

ATCSA2023
Ho Chi Minh city, Vietnam