

# Advanced concepts for EVAR of acute thoraco-abdominal aneurysms



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I have the following potential conflicts of interest to report:

**1. Grants to the University of Leipzig:**

BD Bard, Bentley Innomed

**2. Travel Grants:**

COOK Medical, Beyer Medical, Terumo Aortic

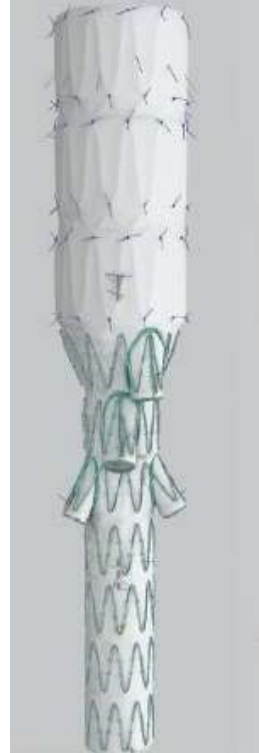
**1. Non-financial support:**

Medyria AG, LimFlow Medical, Vivasure Medical Ltd, Endologix

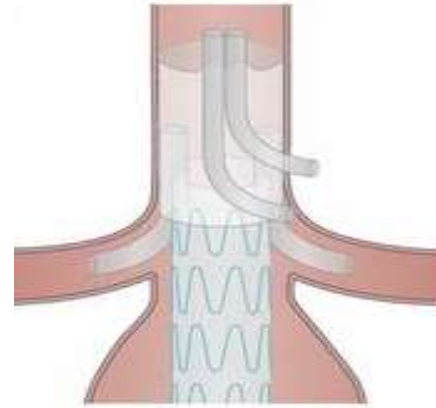
# Endovascular Treatment Options for TAAA



Custom-manufactured  
fenestrated and branched  
stentgrafts (CMD)



„Off the shelf“ fenestrated  
and branched devices



Parallel stenting  
approaches („chimney“,  
„sandwich“, etc.)



Physician modified  
stentgrafts (PMSG)

## Commercially Manufactured CMD Device

- ☛ Limited to elective situations due to planning and manufacturing delays (up to 15 weeks)



*Katsargyris et al. Eur J Vasc Endovasc Surg 2020*

## Parallel Techniques

- ☛ High risk of type IA endoleak up to 13.4% which could be fatal in case of AAA rupture



*Donas KP et al. Ann Surg 2015*

# “Off the shelf” Stentgrafts



## ☞ T-Branch (Cook Medical)

- Available since 2012
- Option for 49-69% of TAAA in elective settings
- Suitable for 33% of acute TAAA

*Mascoli C et al. Eur J Vasc Endovasc Surg 2017*



## ☞ E-nside TAAA Stentgraft System (JOTEC Cryolife)

- Available since July 2020
- Overall anatomical feasibility for TAAA 43%
- No data available for acute TAAA treatment

*Bilman V et al. Eur J Cardiothorac Surg Dec 2020*

- ☞ 2006: first description in a series of 3 patients

*Uflacker et al. JVIR Dec. 2006*

- ☞ Perform similarly to commercially manufactured grafts in terms of :

- Technical success
- Mortality/Morbidity
- ELs
- target vessel's patency @ short-term FU

- ☞ Safe and effective in both the elective and acute settings for the treatment of complex aortic aneurysms

*Georgiadis et al. JEVT Oct. 2015*



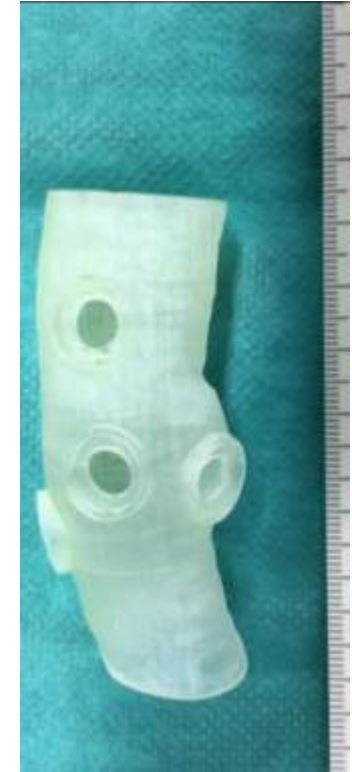
**Table 1.** Characteristics of patients with symptomatic or contained rupture of pararenal and thoraco-abdominal aneurysms treated with a physician modified stent graft for fenestrated endovascular aneurysm repair between 2015 and 2019

Variables	Patients (n = 19)
Male	17 (89.5)
Age – y	70 (51–88)
Hypertension	19 (100)
Diabetes mellitus	6 (31.6)
Coronary heart disease	1 (5.3)
Smoker	11 (57.9)
COPD	4 (21.1)
Peripheral arterial disease	3 (15.8)
Hyperlipoproteinaemia	13 (68.4)
Renal Insufficiency	6 (31.6)
Body mass index – kg/m <sup>2</sup>	27.4 (20.8–30)
<b>ASA classification</b>	
III	18 (94.7)
IV	1 (5.3)

**Table 2.** Indication for endovascular treatment of thoraco-abdominal aortic aneurysms with a physician modified stent graft for fenestrated endovascular aneurysm repair between 2015 and 2019

Aneurysm characteristics	Patients (n = 19)
Contained aortic rupture	6 (31.6)
Symptomatic aortic aneurysm	13 (68.4)
Aortic diameter – mm	72.1 ± 9.6
<i>Location of aortic pathology</i>	
<i>Thoraco-abdominal</i>	
Type III	1 (5.3)
Aneurysm	1 (5.3)
Type IV	10 (52.6)
Aneurysm	6 (31.6)
PAU	4 (21.1)
<i>Juxtarenal</i>	
Aneurysm	6 (31.6)
PAU	1 (5.3)
Suture aneurysm	1 (5.3)
Previous abdominal surgery	4 (21.1)

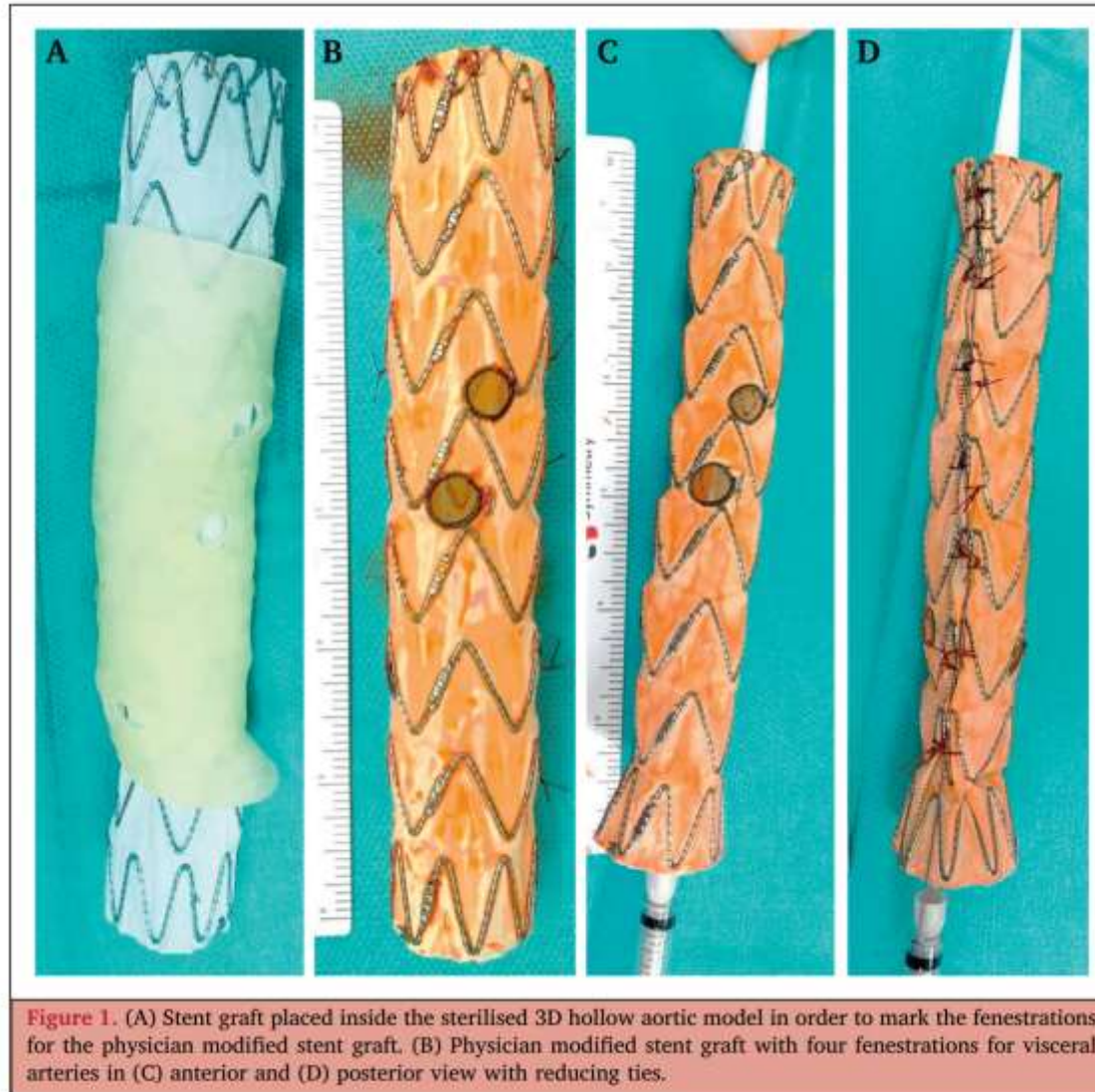
# 3-D Aortic Models



- ☛ Introduced in 2018 to facilitate and standardize the planing of PMSG

- ☛ Production time: 6h
- ☛ Sterilisation time: 1h





- **Valiant Captivia closed-web** thoracic Stentgraft (Medtronic, MN, USA)
- **Ethibond 6-0 sutures** (Ethicon Inc., Johnson and Johnson, USA)
- Radioopaque marker: Tip of a **V-18 guidance catheter** (Boston Scientific, MA, USA) for reinforcement of the fenestrations
- 10 min **Rifampicin solution**

# EVAR – Procedure: Implantation of PMSG

- Using alignment of the SMA and lowest RA
- Each branch was cannulated with a guidewire introduced from the left brachial artery
- Balloon-expandable covered bridging stents were placed in the fenestrations and their corresponding target artery

<b>Variables</b>		<b>N</b>
General anesthesia		19
Percutaneous access		17
Duration (min)	mean ± SD	174.6 ± 49.4
X Ray Time (min)	mean ± SD	54.7 ± 18.6



# Results @ 30 days

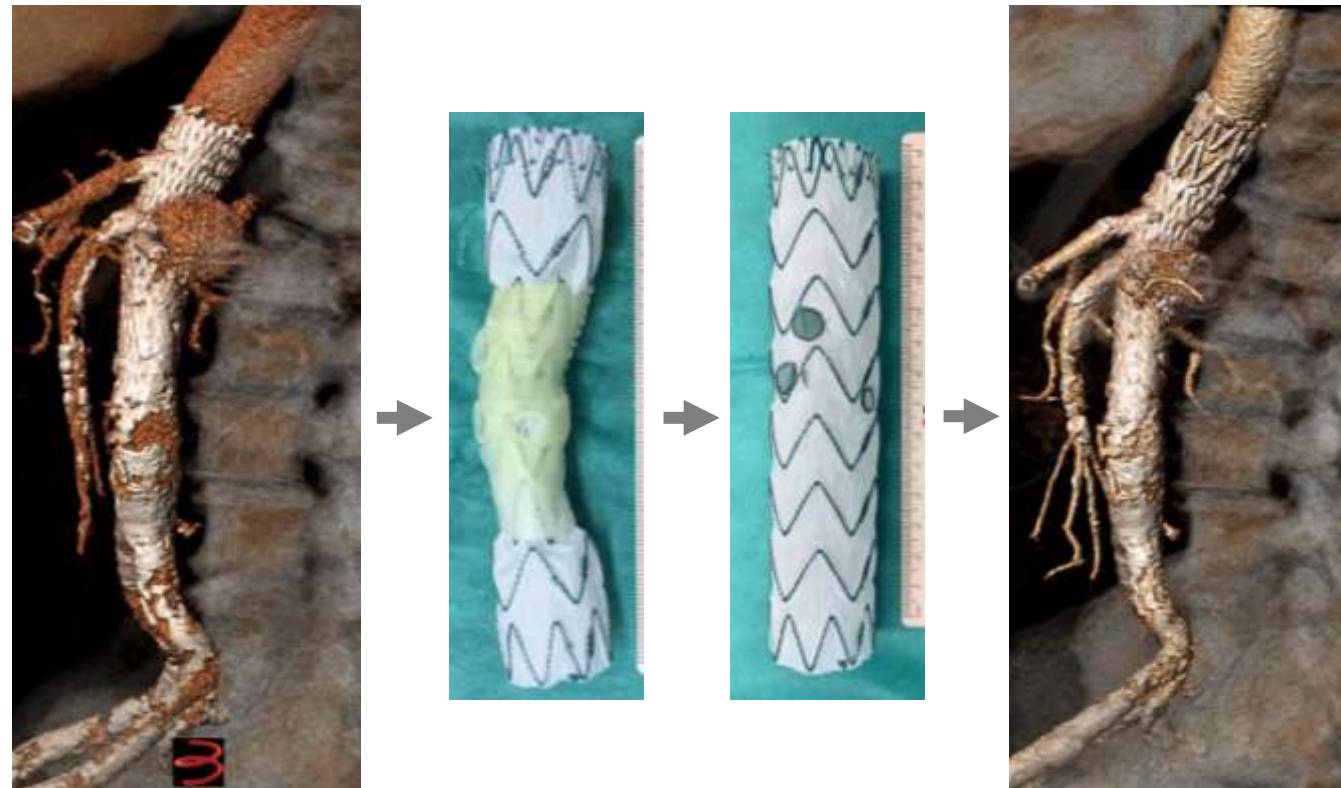
<b>Variables</b>		<b>N</b>	
Death		0	
Stroke		0	
SCI		2	→ Reversible
Acute renal failure		1	→ Reversible after RA Recanalization
Endoleaks	Type Ia	1	
	Type Ic	1	
Reintervention		2	→ Recanalization of RA → Coiling of aneurysm sac

- ☞ Mean Follow-Up: 14.4 (1 - 52) Mo
- ☞ Death: 1 @ 1year
  - Due to Bone-TBC
- ☞ Reinterventions:
  - 1 RA recanalization @ 361 POD
  - 1 bridging stent relining @ 76 POD for EL Type Ic
- ☞ No AAA sac enlargement



# Conclusions

- ☛ PMSGs are feasible and safe for the treatment of acute thoraco-abdominal aortic pathologies in high-risk patients unsuitable for open surgery and commercially available stent grafts
- ☛ 3D printing technology may improve urgent construction of patient specific devices for treatment of complex aortic pathologies and improve outcomes



# Thank you!



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