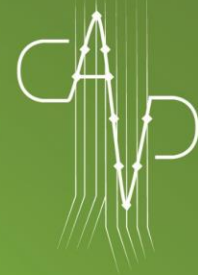


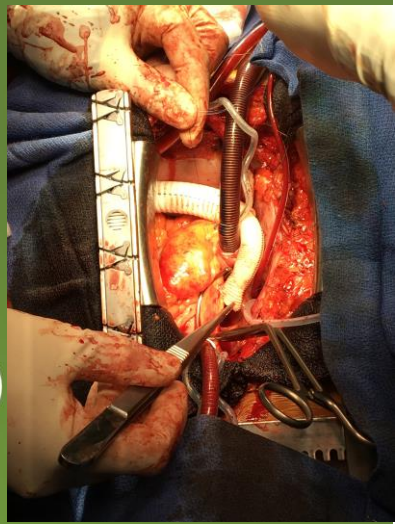


CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES IN VASCULAR SURGERY

JANUARY 23-25 2020



MARRIOTT RIVE GAUCHE & CONFERENCE CENTER | PARIS | FRANCE



Aorta and LVAD: Where do we stand?

Erwan Flécher, Rennes.

CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE

CONTROVERSIES & UPDATES
IN **VASCULAR SURGERY**



JANUARY 23-25 2020

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER | PARIS | FRANCE

WWW.CACVS.ORG

Disclosure

Speaker name:

...Erwan FLECHER.....

I do not have any potential conflict of interest

CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE
CONTROVERSIES & UPDATES
IN **VASCULAR SURGERY**



JAN
MARRIOTT RIVER



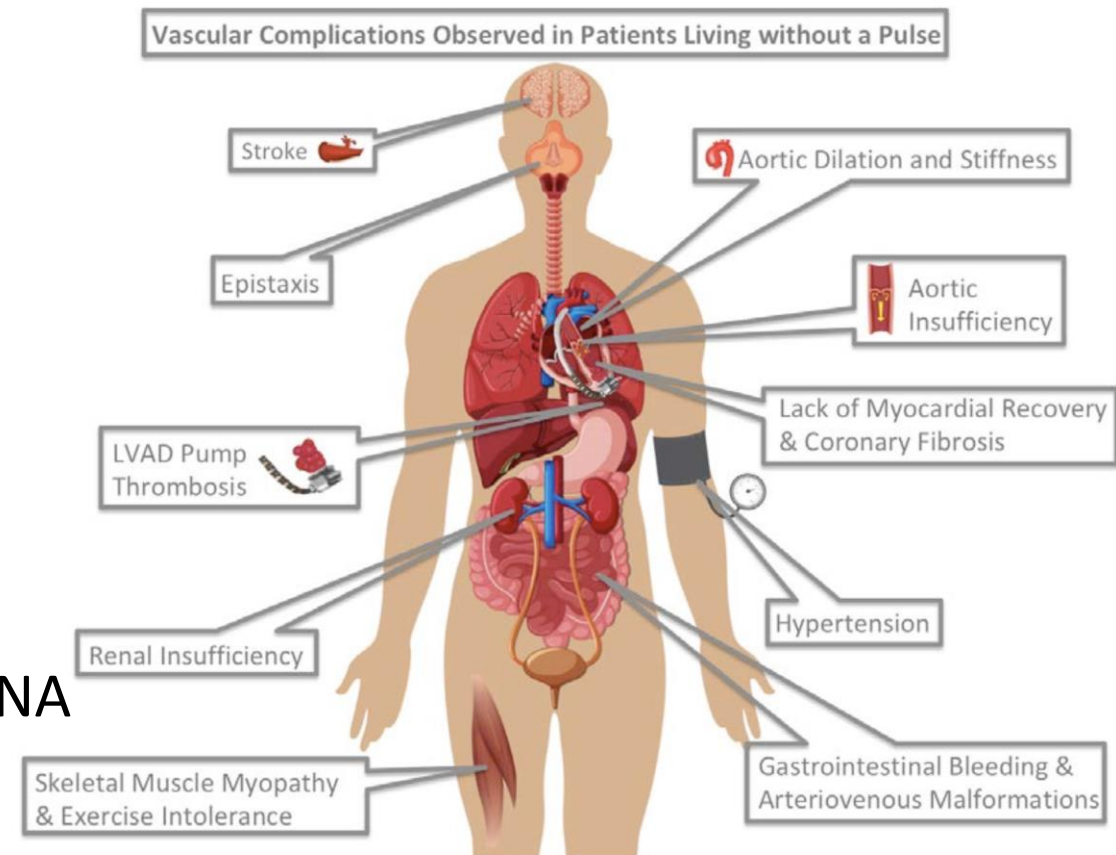
What are talking about?

ADVANCES IN MECHANICAL CIRCULATORY SUPPORT

Living Without a Pulse

The Vascular Implications of Continuous-Flow Left Ventricular Assist Devices

- SNA modulated by rhythmic pulsatile distension
- CF-LVAD have elevated levels of SNA
- Hypertension may be driven by these high level of SNA
- restoration of PF may reduce SNA
- Down regulation of adrenergic receptors in non-PF
- Alterations in the vascular smooth muscle
- Increased shear stress on the Ao V
- Increase the aortic root diameter
- Aortopathy on the aortic wall: increase in aortic stiffness
- Decrease aortic compliance



VAD and continuous flow: What are the problems?

CLINICAL RESEARCH

Dynamic Changes in Aortic Vascular Stiffness in Patients Bridged to Transplant With Continuous-Flow Left Ventricular Assist Devices



FIGURE 2 Pre- and Post-LVAD Comparisons of Aortic Vascular Properties Among LVAD No Pulse Patients Compared With LVAD With Pulse Patients

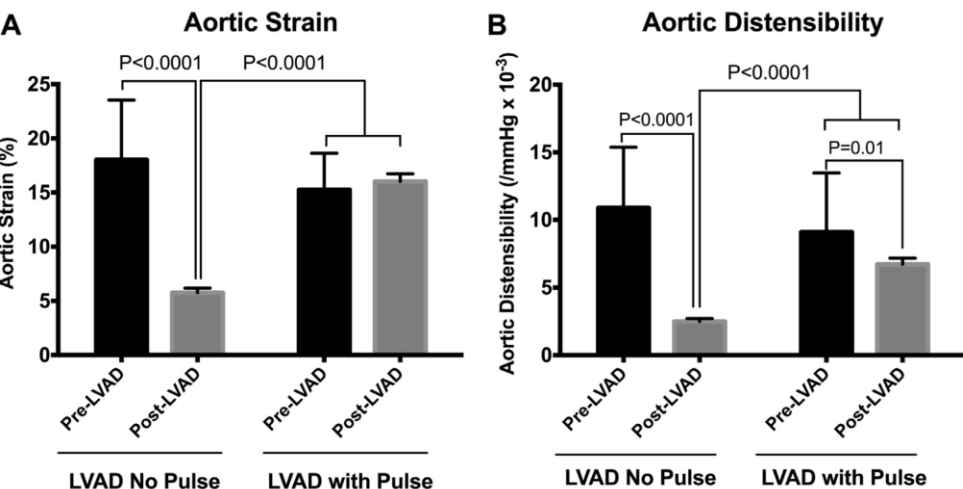
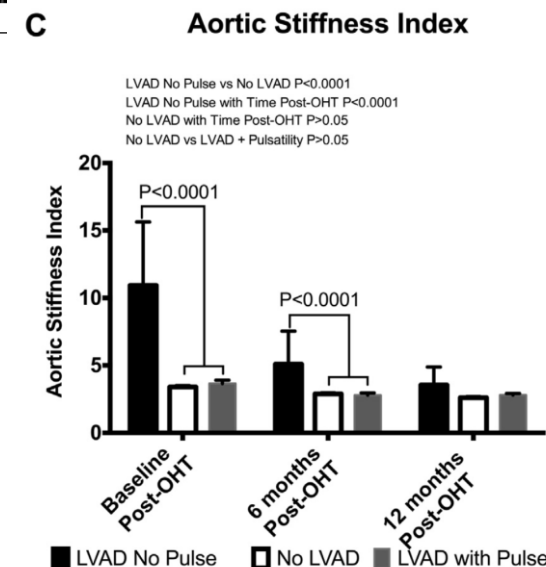
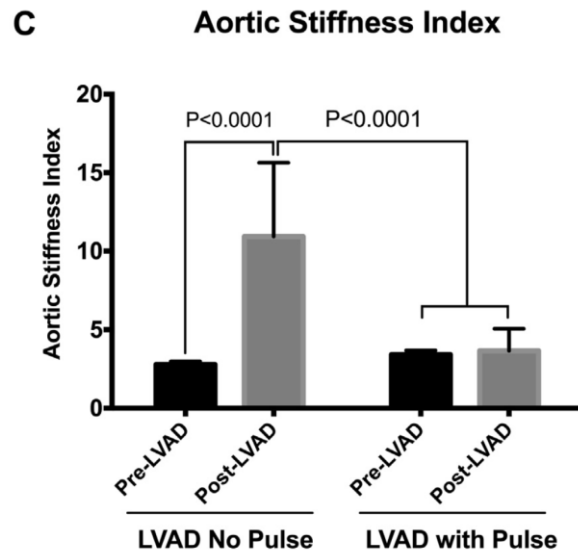
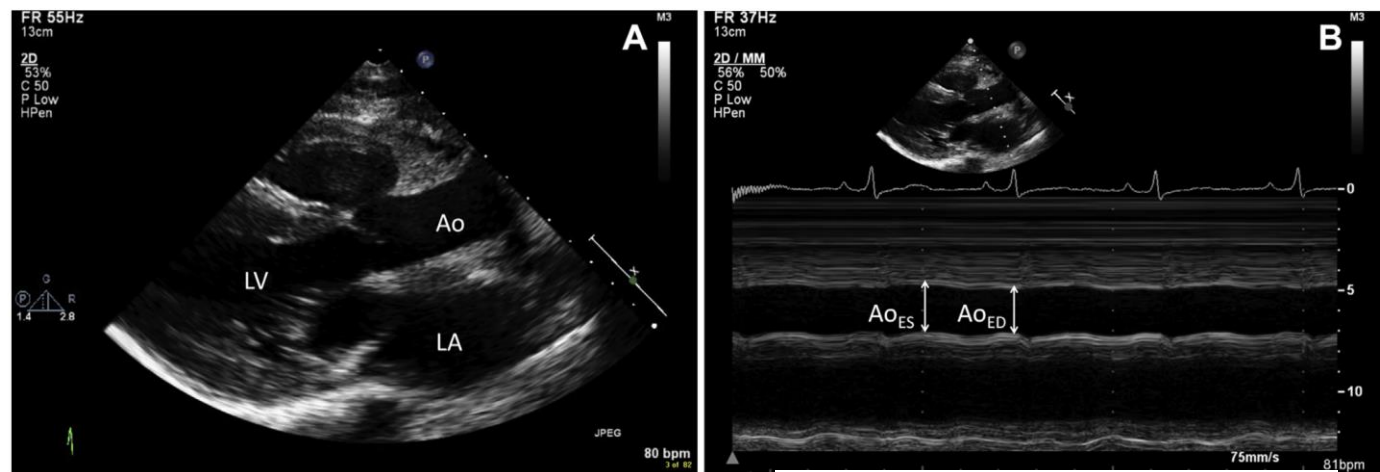


FIGURE 1 Echocardiographic Measurement of Aortic Vessel Properties

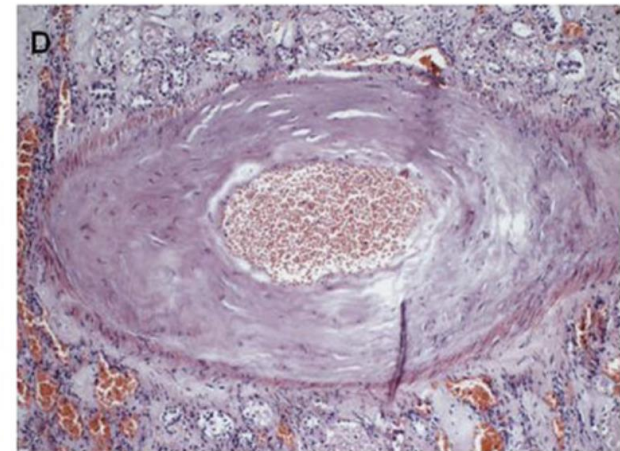
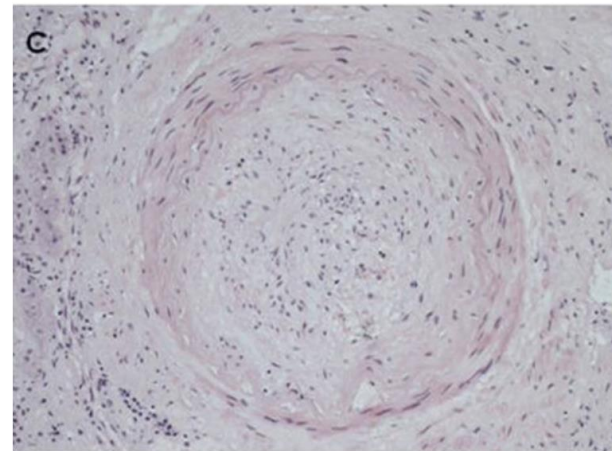
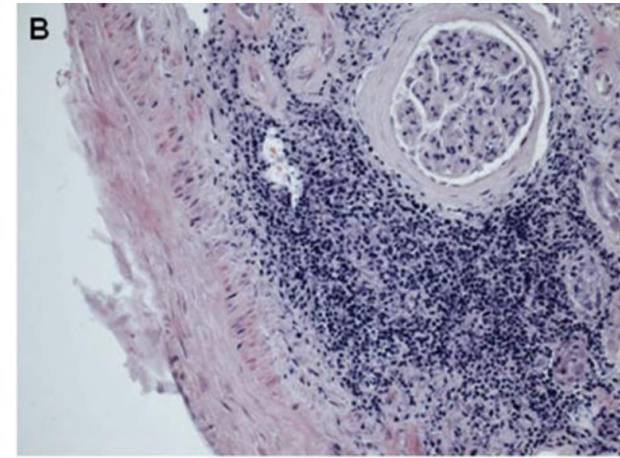
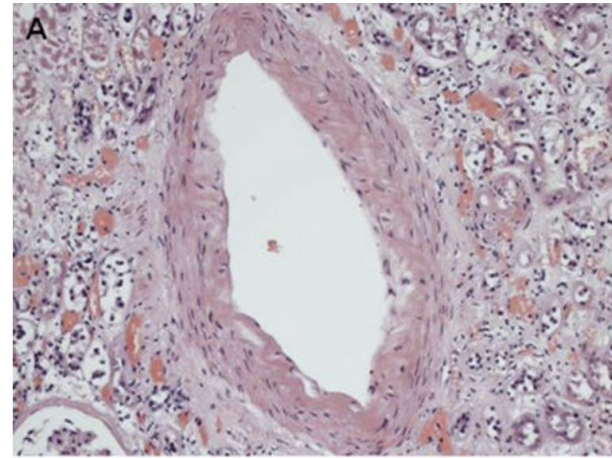


CONCLUSIONS Aortic stiffness is markedly increased immediately post-OHT among patients bridged with CF-LVADs, with attenuation of this increased stiffness over the first year after transplant. These results suggest that aortic vascular properties are dynamic and may be influenced by alterations in flow pulsatility. As more patients are supported with

Pulsatile or non pulsatile flow: Myth or **reality?**

Arterial wall histology in chronic pulsatile-flow and continuous-flow device circulatory support

Evgenij V. Potapov, MD, PhD,^{a*} Nikolay Dranishnikov, MD,^{a*} Lars Morawietz, MD, PhD,^{a*} Alexander Stepanenko, MD,^a Sajjad Rezaei,^a Cristiane Blechschmidt, MD,^b Hans B. Lehmkuhl, MD, PhD,^a Yuguo Weng, MD, PhD,^a Miralem Pasic, MD, PhD,^a Michael Hübler, MD,^a Roland Hetzer, MD, PhD,^a and Thomas Krabatsch, MD, PhD^a



In conclusion, long-term mechanical circulatory support with CF devices seems not to adversely influence arterial wall properties of the end-organ vasculature. Further

Pulsatile or non pulsatile flow: **Myth** or reality?

CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE

CONTROVERSIES & UPDATES
IN **VASCULAR SURGERY**



JANUARY 23-25 2020

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER | PARIS | FRANCE

WWW.CACVS.ORG

Message 1

CF-LVAD= concomitant vascular changes

Variations in physiological blood flow = key factor to understand common complications

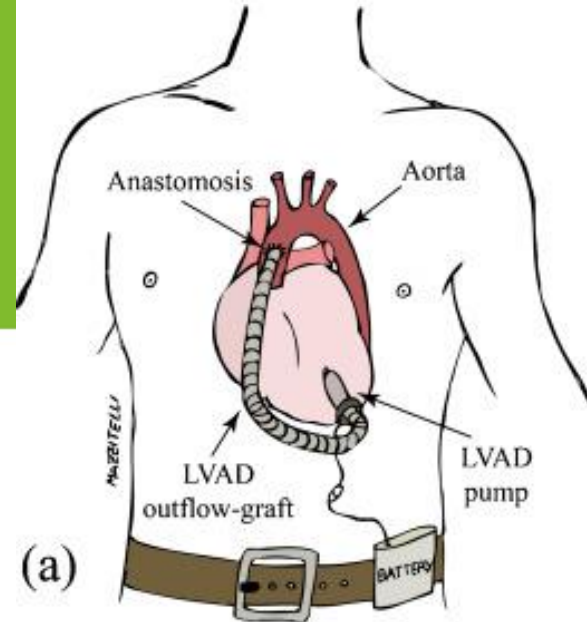
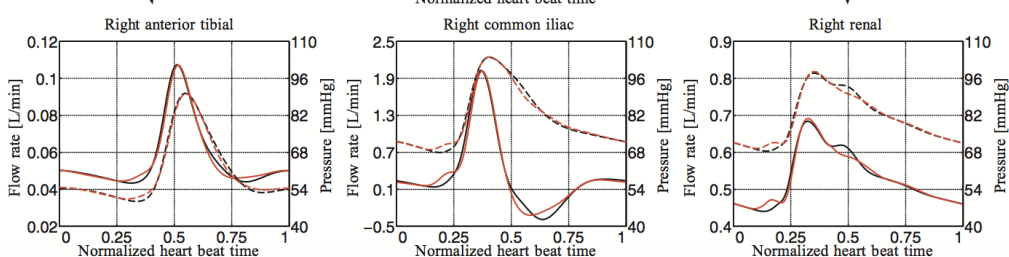
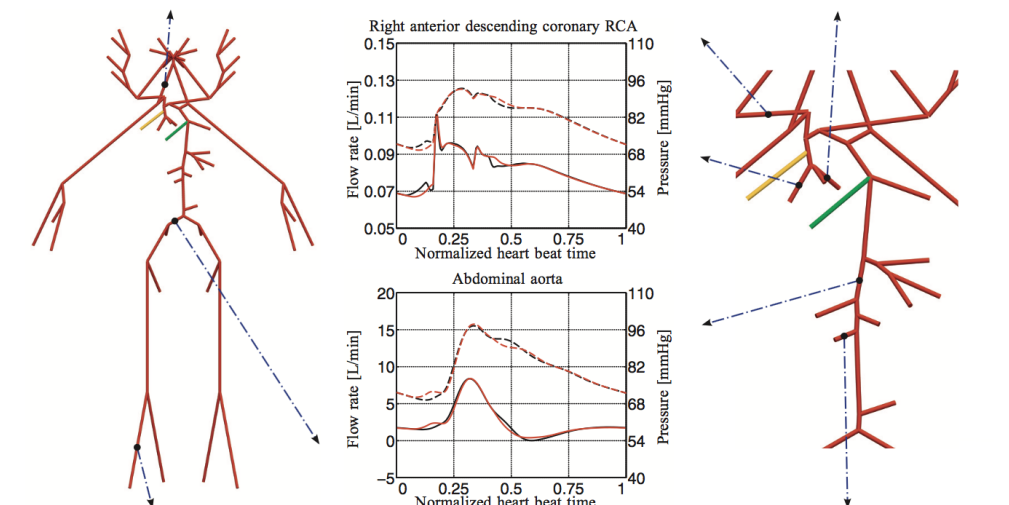
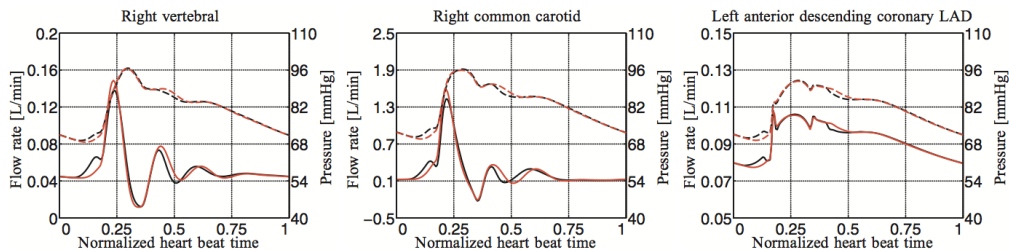
Beneficial effects of pulsatility

Potential for dynamic remodeling within the aorta in alterations of blood flow patterns

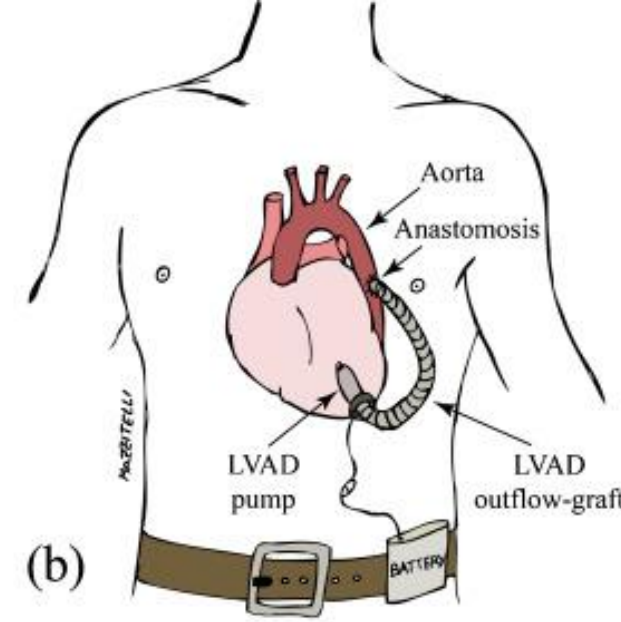
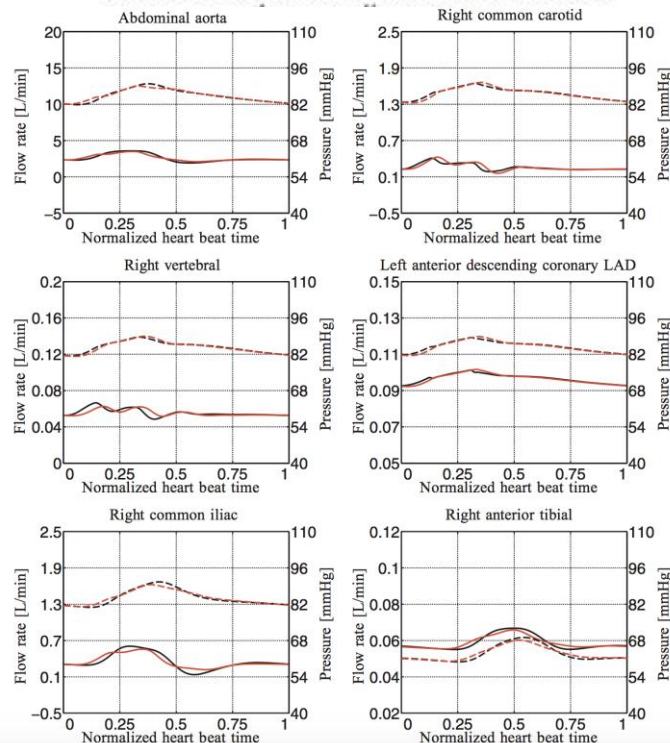


Numerical simulation of left ventricular assist device implantations: Comparing the ascending and the descending aorta cannulations

Jean Bonnemain^{a,b,*}, A. Cristiano I. Malossi^a, Matteo Lesinigo^a, Simone DeParis^a, Alfio Quarteroni^{a,c}, Ludwig K. von Segesser^b



LVAD outflow-graft anastomosis location in



LVAD outflow-graft anastomosis location in the descending aorta

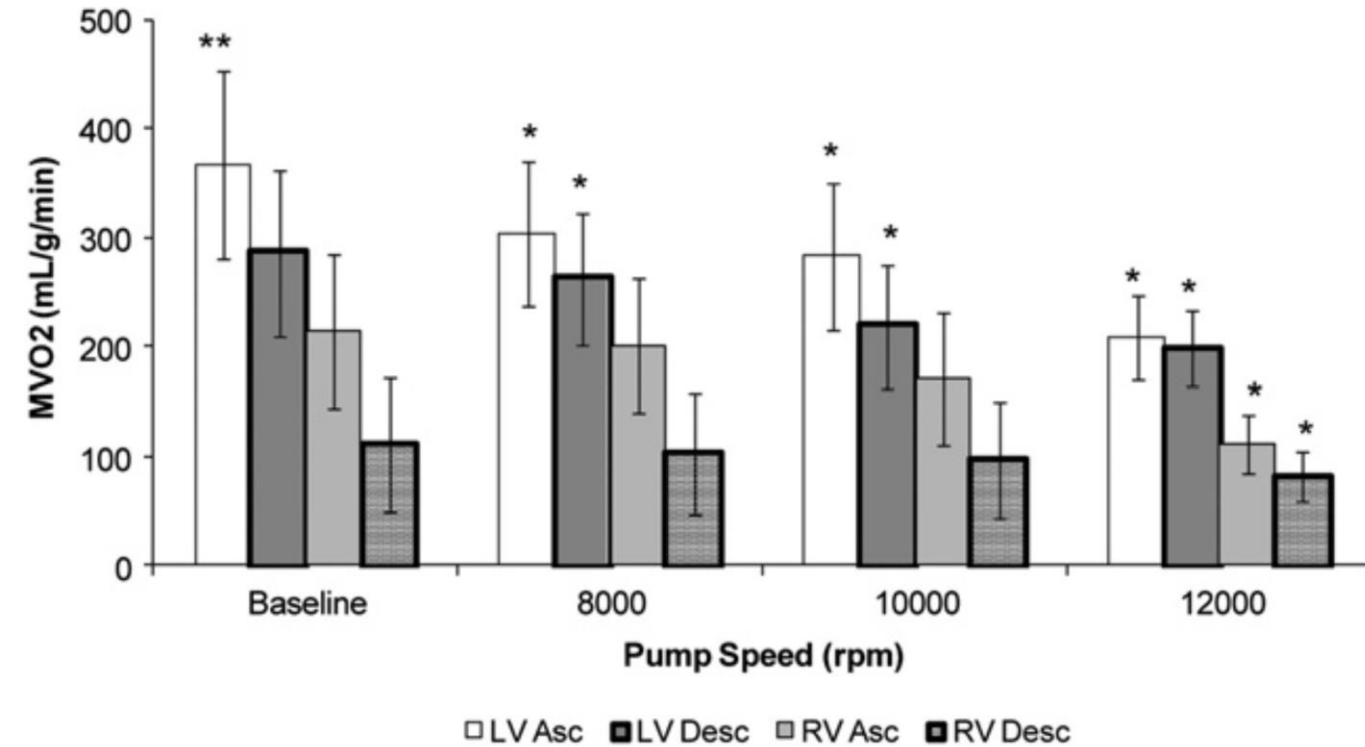


Ventricular Assist Device Outflow-Graft Site: Effect on Myocardial Blood Flow

Egemen Tuzun, M.D.,¹ Cuneyt Narin, M.D., Igor D. Gregoric, M.D., William E. Cohn, M.D., and O. H. Frazier, M.D.

Conclusion

Our data suggest that regional myocardial blood flow was not adversely affected by the location of the outflow-graft anastomosis (ascending *versus* descending aorta) in healthy calves implanted with



Cite this article as: Ozbaran M, Yagdi T, Engin C, Nalbantgil S, Ozturk P. Left ventricular assist device implantation with left lateral thoracotomy with anastomosis to the descending aorta. *Interact CardioVasc Thorac Surg* 2018;27:186–90.

Left ventricular assist device implantation with left lateral thoracotomy with anastomosis to the descending aorta

Mustafa Ozbaran^a, Tahir Yagdi^a, Cagatay Engin^{a,*}, Sanem Nalbantgil^b and Pelin Ozturk^a

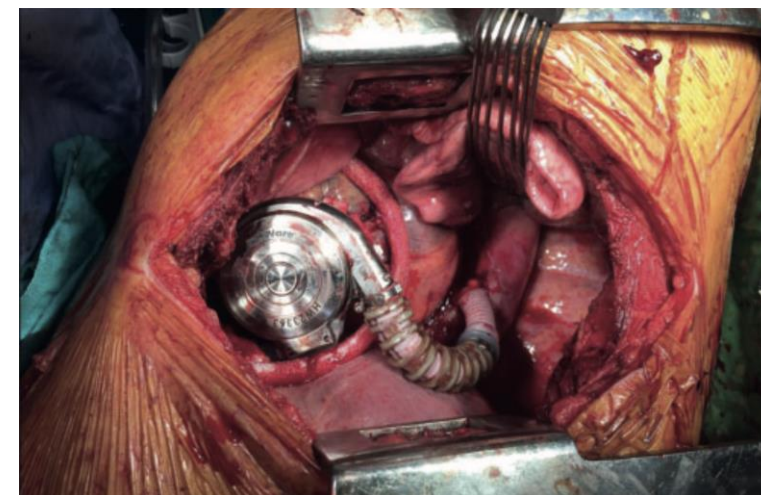
Table 1: Propensity matching statistics

Parameters	Thoracotomy	Sternotomy	P-value
Patients	30	30	
Age (years), mean ± SD	57.2 ± 9.4	56.4 ± 6.7	0.7163
BMI (kg/m ²), mean ± SD	26.0 ± 5.2	27.0 ± 4.3	0.4331
RAP (mmHg), mean ± SD	16.3 ± 6.9	14.6 ± 6.4	0.3387
BUN (mg/dl), mean ± SD	65.1 ± 28.8	63.6 ± 38.6	0.8622
Creatinine (mg/dl), mean ± SD	1.37 ± 0.45	1.29 ± 0.78	0.6216
Ischaemic (vs dilated), n (%)	25 (90.0)	25 (83.3)	0.7065
INTERMACS Profile 3, n (%)	18 (60.0)	21 (70.0)	0.2728

In this study, we could not show any statistically significant difference in outcomes between the standard sternotomy and lateral thoracotomy with outflow graft anastomosis to the descending aorta approach. In our single-centre experience, we found lateral

MARR

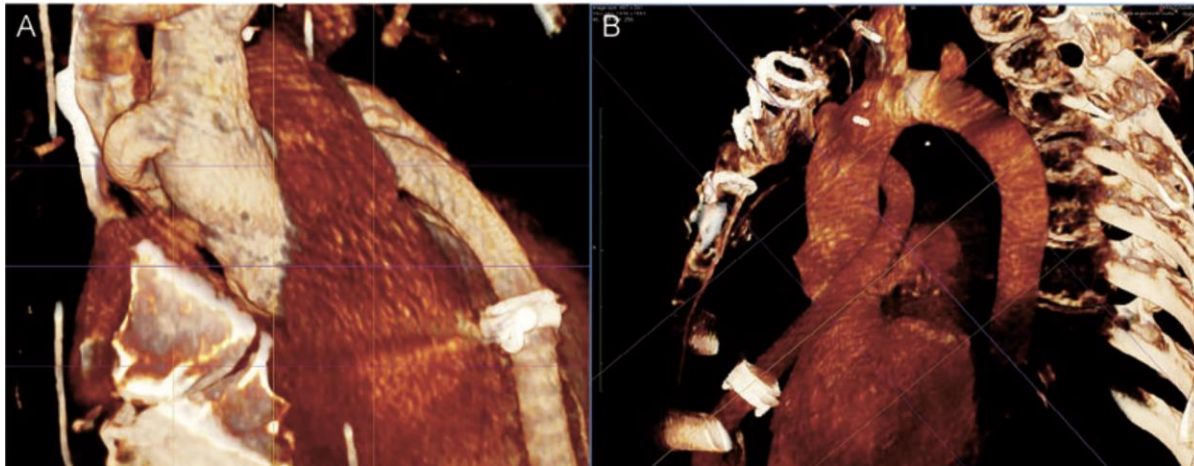
	Thoracotomy (N = 30)	Sternotomy (N = 30)	P-value
Perioperative outcomes (≤30 days), n			
<30-day mortality	2	2	>0.99
Mechanical ventilation >48 h	7	6	>0.99
6-Month safety outcomes, n			
Gastrointestinal bleeding	3	6	0.47
Cerebrovascular accident			
Ischaemic	2	1	>0.99
Haemorrhagic	1	2	>0.99
TIA	2	4	0.67
Reoperation for bleeding	3	3	>0.99
Pump thrombus	3	1	0.61
Driveline infection	1	4	0.35
Right ventricular failure			
Inotropes required >14 days	5	2	0.42
Temporary RVAD placement	0	0	NE
Late RHF	4	3	>0.99
De novo severe aortic regurgitation	2	2	>0.99
Survival outcomes, n (%)			
30-Day mortality	2 (6.7)	2 (6.7)	>0.99
6-Month mortality	8 (26.7)	5 (16.7)	0.53



Cite this article as: Hanke JS, Rojas SV, Cvitkovic T, Wiegmann B, Horke A, Warnecke G *et al.* First results of HeartWare left ventricular assist device implantation with tunnelling of the outflow graft through the transverse sinus. *Interact CardioVasc Thorac Surg* 2017;25:503–8.

First results of HeartWare left ventricular assist device implantation with tunnelling of the outflow graft through the transverse sinus

Jasmin S. Hanke, Sebastian V. Rojas, Tomislav Cvitkovic, Bettina Wiegmann, Alexander Horke, Gregor Warnecke, Axel Haverich and Jan D. Schmitto*



CONCLUSION

LVAD implants with tunnelling of the outflow graft through the transverse sinus is practicable and associated with positive features providing equivalent results compared with standard outflow graft anastomosis via less invasive LVAD implants. Especially, the protection of the outflow graft in redo cases is the major advantage of this technique. Therefore, this procedure may be particularly suitable for younger patients who follow a bridge-to-transplant strategy.

	Transverse sinus (Group A)	Conventional (Group B)	P-value
Total cohort study	17	85	
Adverse events			
Death after LVAD implantation, n (%)	3 (17.7)	15 (17.64)	0.875
LVAD thrombosis, n (%)	2 (11)	4 (4.7)	0.570
Ischaemic stroke, n (%)	3 (17.65)	5 (5.88)	0.023
Blood product administration			
RBC received in OR, mean ± SD	1.4 ± 2.0	2.6 ± 3.6	0.171
FFP received in OR, mean ± SD	1.3 ± 1.7	2.6 ± 2.0	0.049
PC received in OR, mean ± SD	1.3 ± 1.0	1.5 ± 1.0	0.496
RBC postoperatively, mean ± SD	4.4 ± 5.0	4.4 ± 6.9	0.522
FFP postoperatively, mean ± SD	4.7 ± 4.5	2.4 ± 3.5	0.023
PC postoperatively, mean ± SD	0.5 ± 1.1	1.3 ± 5.0	0.860





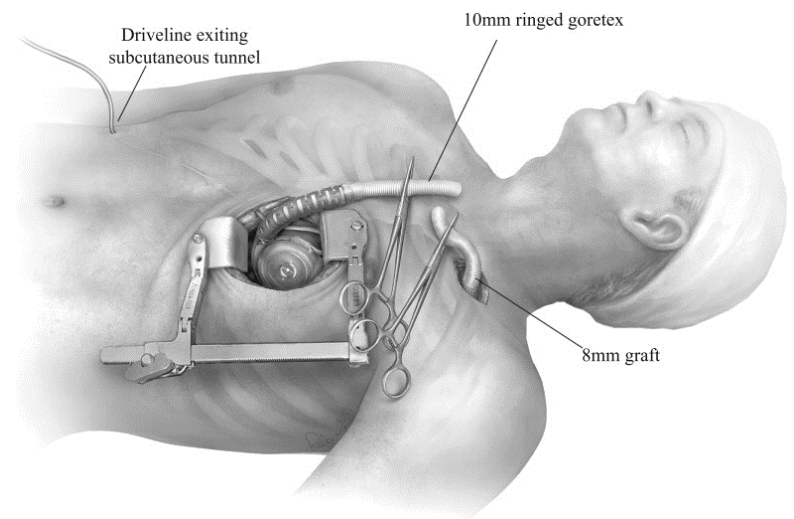
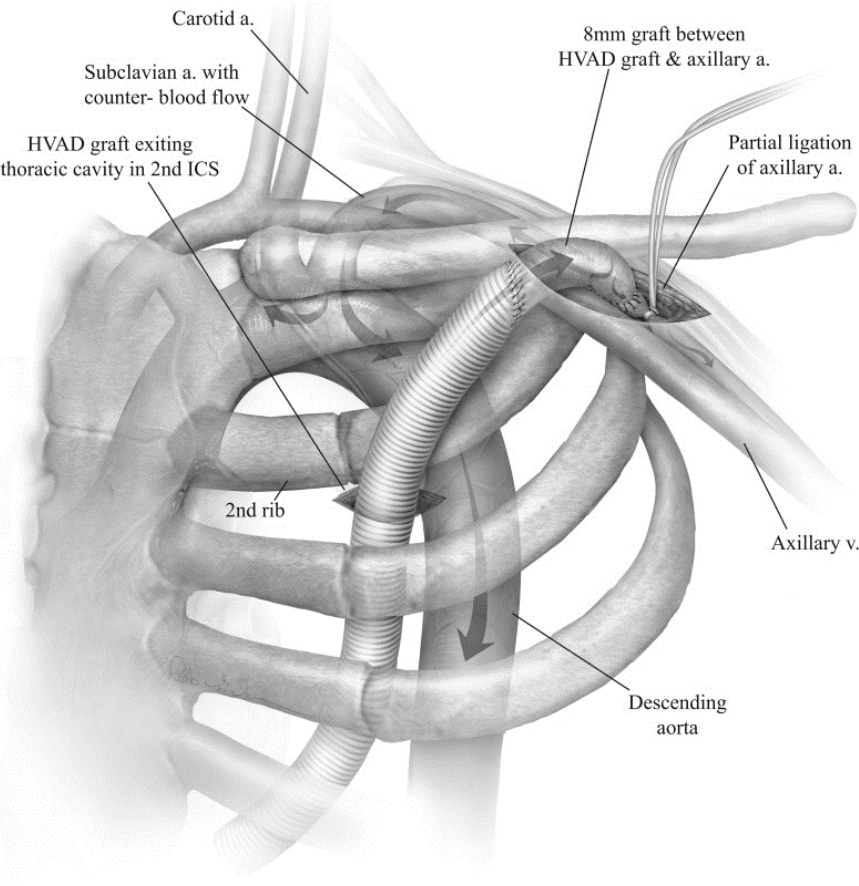
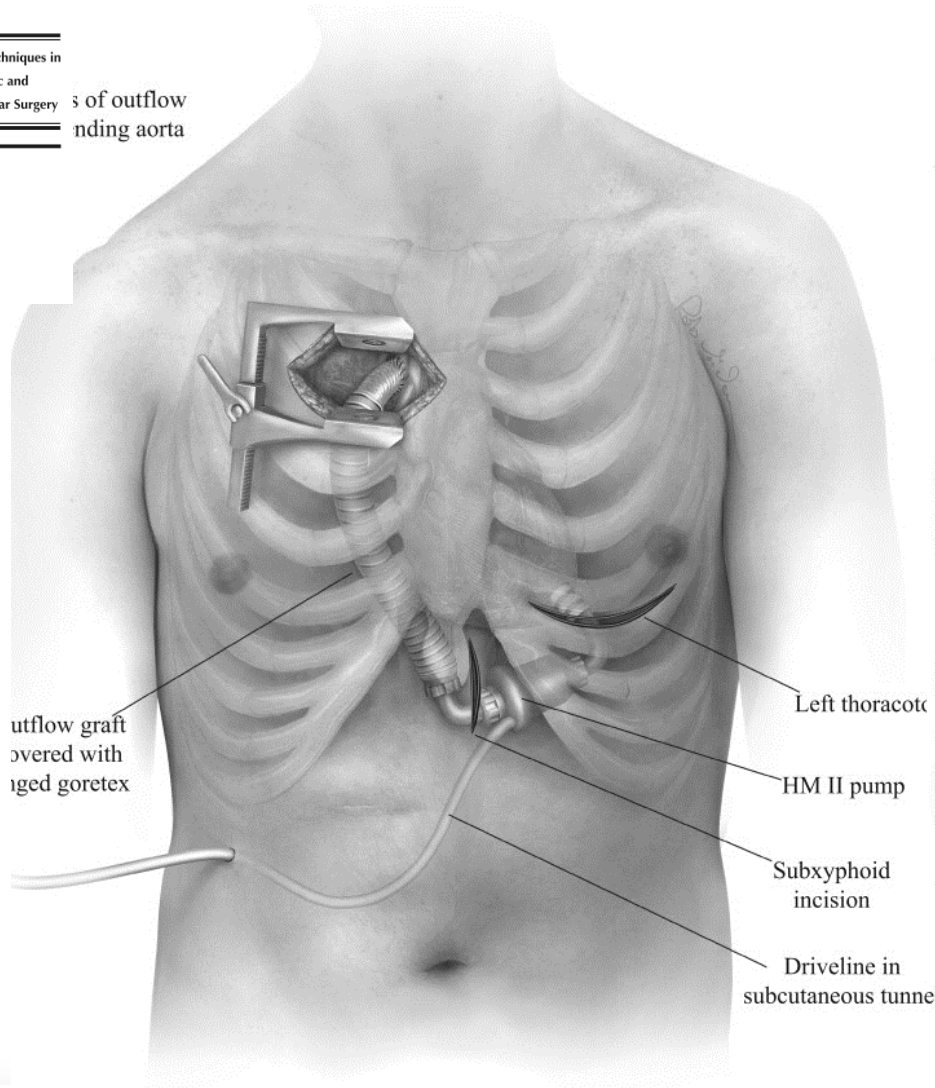
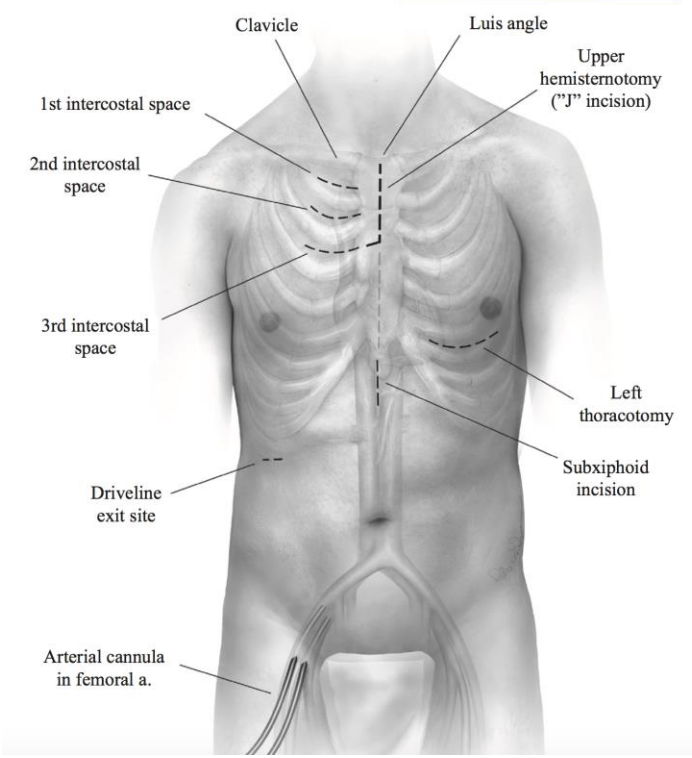
Message 2

LVAD anastomosis to ascending or descending aorta
No evident difference
No robust data either...

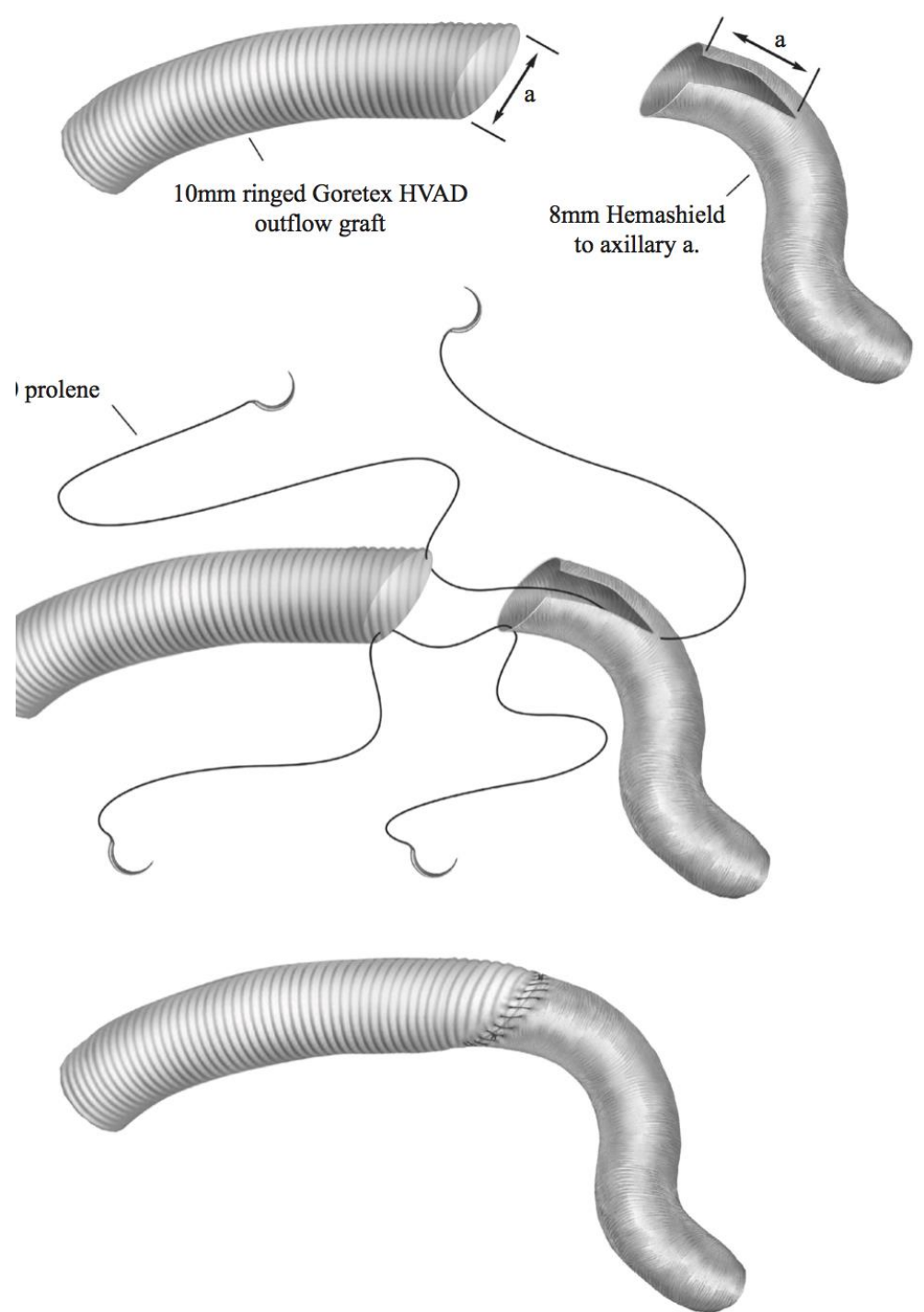
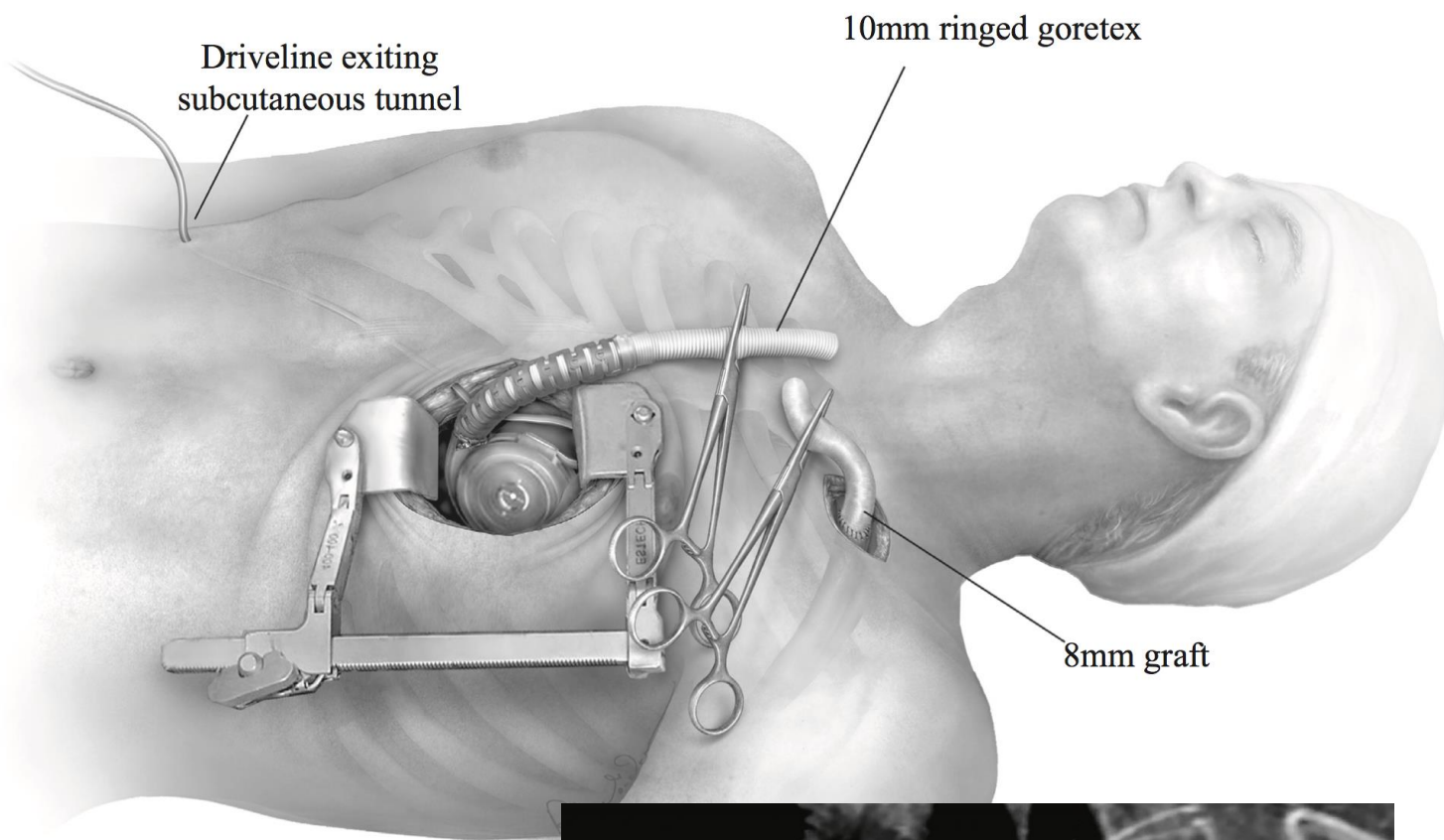


Nonsternotomy Approaches for Left Ventricular Assist Device Placement

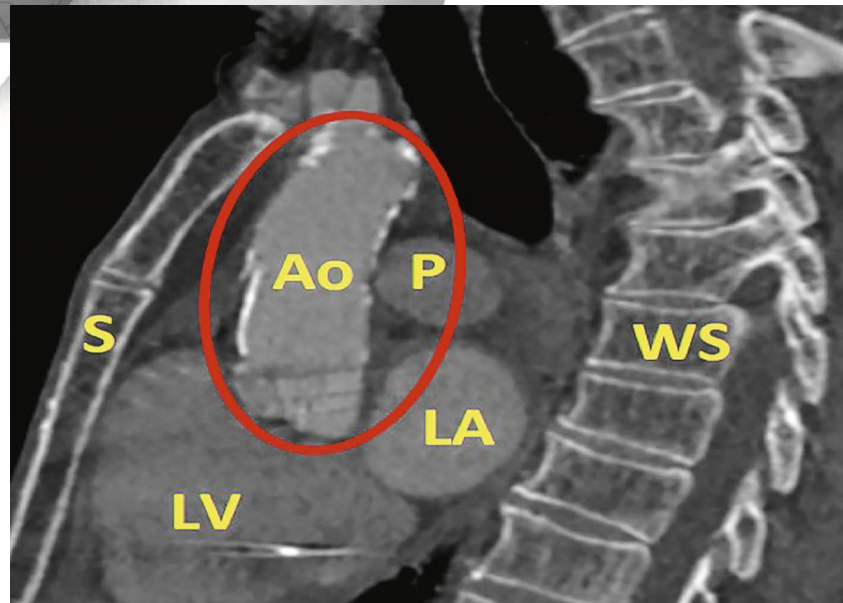
Simon Maltais, MD, PhD^{*}, Matthew R. Danter, MD[†], Nicholas A. Haglund, MD[†],
Dan D. Schmitto, MD[‡], and John M. Stulak, MD[§]



What else?

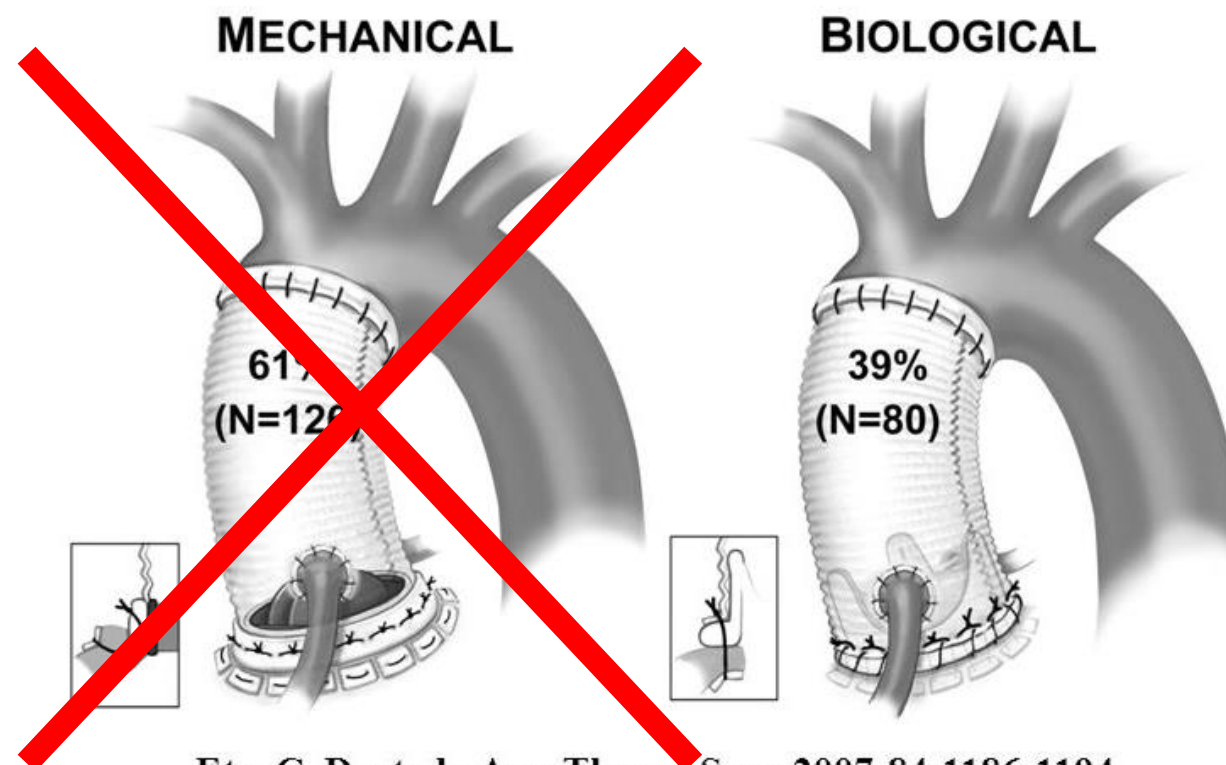
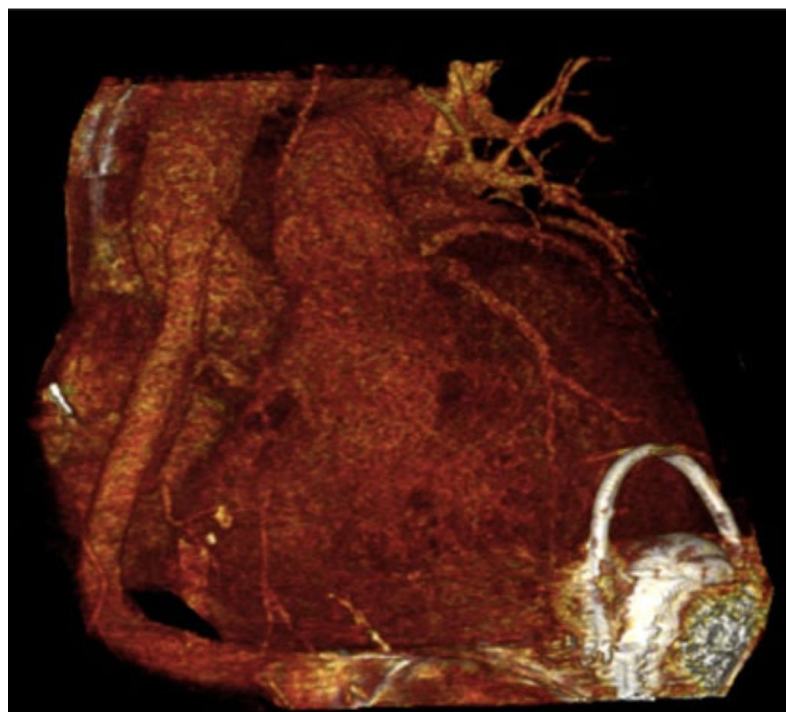


Aorte porcelaine



CASE REPORT

Successful implantation of HeartWare HVAD left ventricular assist device with concomitant ascending and sinus of valsalva aneurysms repair



Etz C. D. et al.; Ann Thorac Surg 2007;84:1186-1194



WHICH
ONE?

Message 3

Multiple possibilities to perform the outflow anastomosis
Aortic root associated procedures are feasible
Which approach is the best ?

Keynote Lecture Series

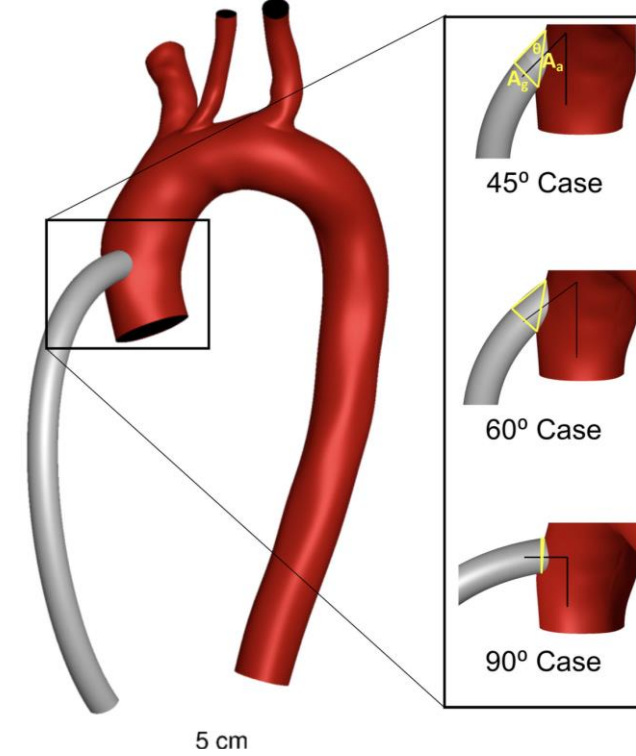
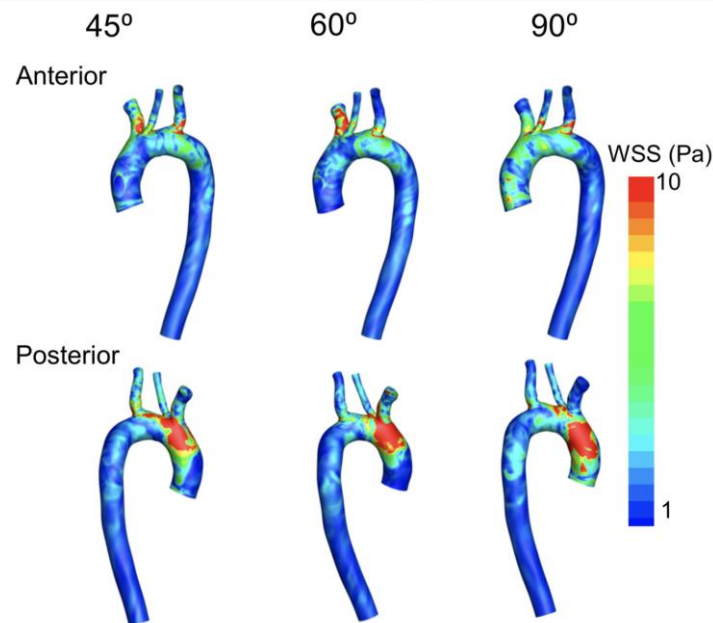
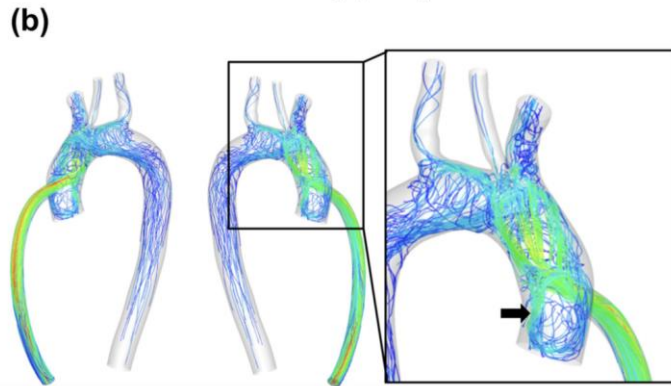
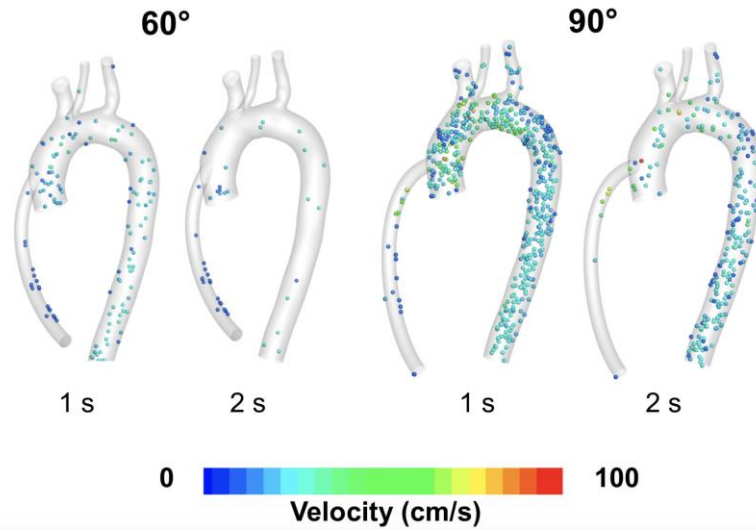
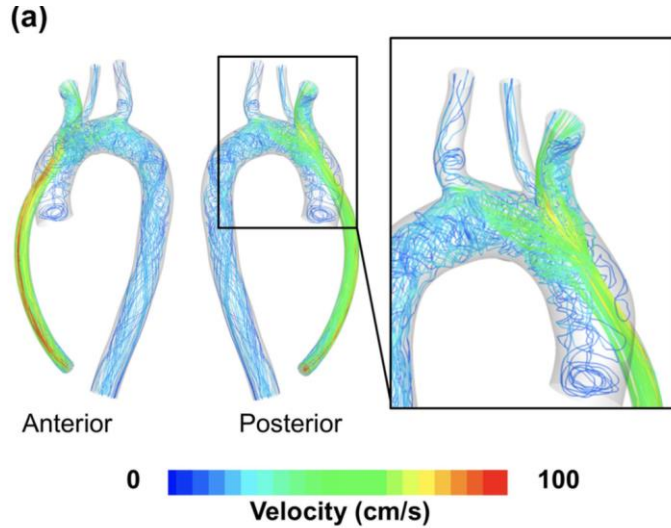
**Different surgical strategies for implantation of continuous-flow
VADs—Experience from Deutsches Herzzentrum Berlin**

Thomas Krabatsch, Thorsten Drews, Evgenij Potapov, Yugo Weng, Miralem Pasic, Roland Hetzer

LVAD Outflow Graft Angle and Thrombosis Risk

Alberto Aliseda¹, Venkat Keshav Chivukula¹, Patrick McGah¹, Anthony R. Prisco², Jennifer A. Beckman³, Guilherme J.M. Garcia², Nahush A Mokadam⁴, and Claudius Mahr³

ASAIO J. 2017 ; 63(1): 14–23



Journal of Biomechanics 49 (2016) 2718–2725



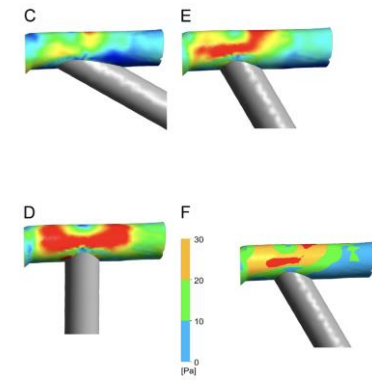
Contents lists available at ScienceDirect

Journal of Biomechanics

journal homepage: www.elsevier.com/locate/jbiomech
www.JBiomech.com



Hemodynamic analysis of outflow grafting positions of a ventricular assist device using closed-loop multiscale CFD simulations: Preliminary results



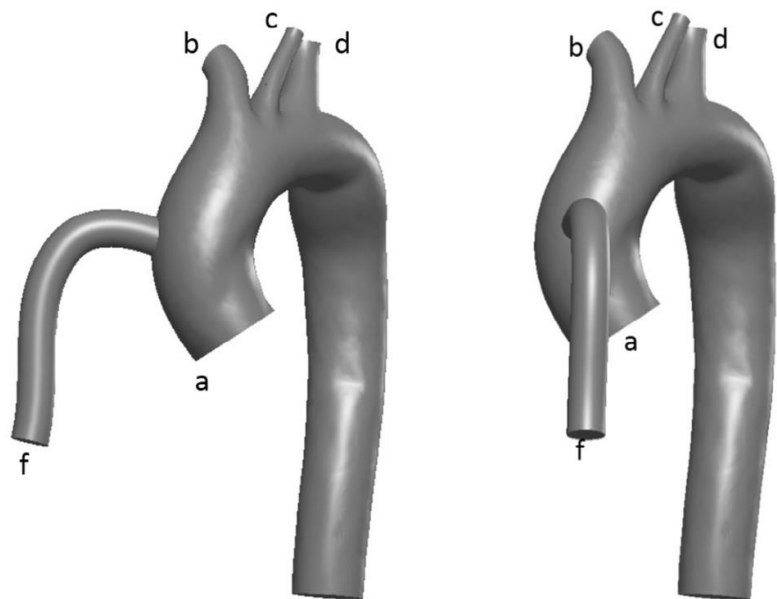
The Devil
is in the
Details

5 2020
TER | PARIS | FRANCE

The hemodynamic effects of the LVAD outflow cannula location on the thrombi distribution in the aorta: A primary numerical study

Yage Zhang, Bin Gao, Chang Yu *

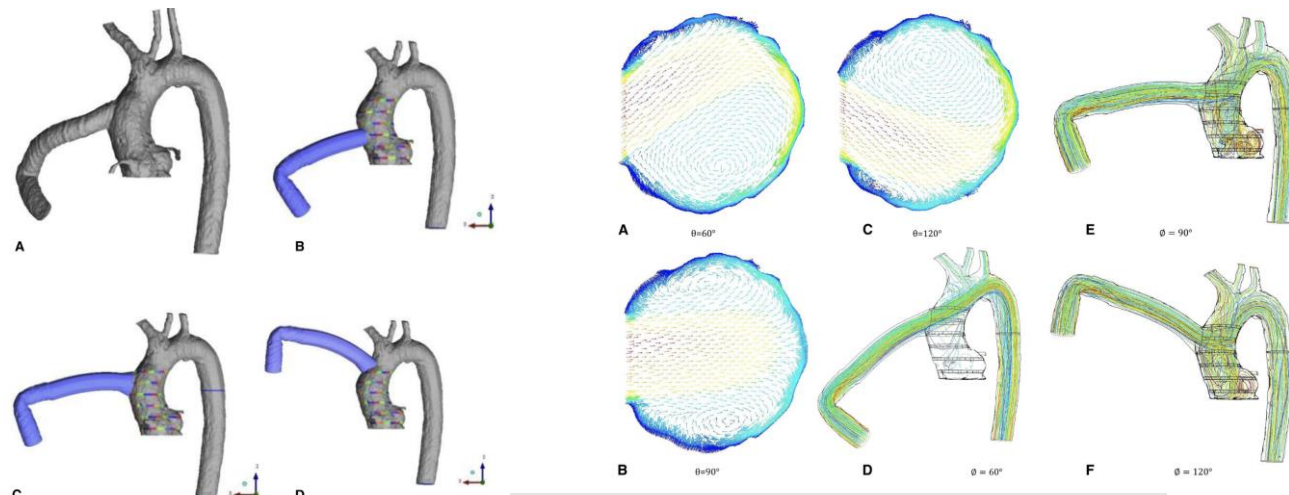
School of Life Science and BioEngineering, Beijing University of Technology, Beijing 100124, China



In brief, the LVAD outflow cannula location could significantly change the hemodynamic states and the distribution of thrombi in the aorta. In the anterior configuration, the thrombi have lower probability to cause stroke than that in the lateral configuration. Hence, besides improving the structure

Computational fluid dynamic study of hemodynamic effects on aortic root blood flow of systematically varied left ventricular assist device graft anastomosis design

Andrew Callington, BS,^a Quan Long, PhD,^a Prashant Mohite, MD,^b Andre Simon, MD,^b and Tarun Kumar Mittal, MD^b



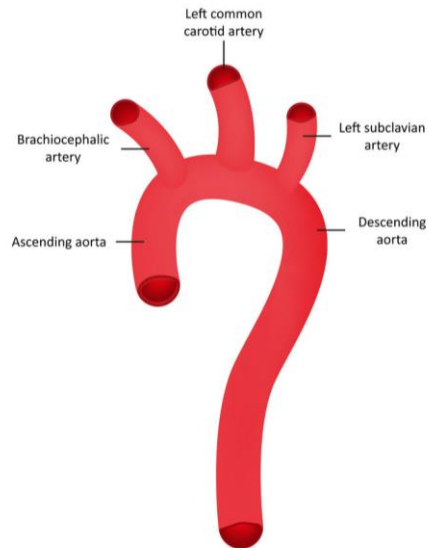
Perspective

A systematic haemodynamic study demonstrated that the design of LVAD anastomosis to the aortic wall will have significant influence to the blood flow in ascending aorta.

Not only the angle of the anastomosis...

Fortuity or Causality in Minimally Invasive LVAD Implantation: Relation Between Outflow Graft Height of Implantation Along the Ascending Aorta and Cerebral Ischemic Events

J. Bejko, T. Bottio, G. Bortolussi, M. Gallo, R. Bianco, V. Tarzia, A. Guariento, G. Gerosa. Cardiac Surgery, Padova, Italy.



INVITED COMMENTARY

Strokes are the achilles heel of LVAD therapy

Harold L. Lazar MD

J Card Surg. 2018;33:584.

Division of Cardiac Surgery, The Boston University School of Medicine, Boston, Massachusetts

WILEY JOURNAL OF Cardiac Surgery



Conclusion: The highest outflow vascular graft implantation along the ascending aorta, nearby the supra-aortic vessels, was the most common location associated to the ischemic stroke events.



Message 4

LVAD implantation technique is important for outcome!





Conclusions

CF-LVAD have an impact on sympathetic regulation of the cardiovascular system

Vascular changes under CF-LVAD remain unclear

Various techniques and sites to perform the outflow tract anastomosis

Surgical technique may be important to consider to improve outcome!

More randomized studies are needed!



Toward a specific patient LVAD implantation!

CONTROVERSES ET ACTUALITES EN CHIRURGIE VASCULAIRE

CONTROVERSIES & UPDATES
IN **VASCULAR SURGERY**



JANUARY 23-25 2020

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER | PARIS | FRANCE

WWW.CACVS.ORG

Thank you! Questions?

