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Transesophageal echocardiographic control at the stages of performing endoscopically assisted coronary bypass graphing

Madina Kadyrova, Vadim Popov, Elizaveta Strebkova, Julia Stepanova,

Amiran Revishvili

Relevance

- ✓ Coronary heart disease occupies a leading place in the structure of morbidity and mortality of the population worldwide[1]
- ✓ Atherosclerosis of the ADA is characterized by the severity and consequences of coronary circulatory disorders[2]
- ✓ Optimization of minimally invasive surgical methods of myocardial revascularization[3]

1. A. G. Thomas, Curr Probl Cardiol, 2010
2. Fang J., 2011; Passamani E, 1985
3. Y. Aladdin 2015

ESC European Society of Cardiology
European Heart Journal (2018) **00**, 1–96
doi:10.1093/eurheartj/ehy394

2018 ESC/EACTS Guidelines on myocardial revascularization

The Task Force on myocardial revascularization of the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS)

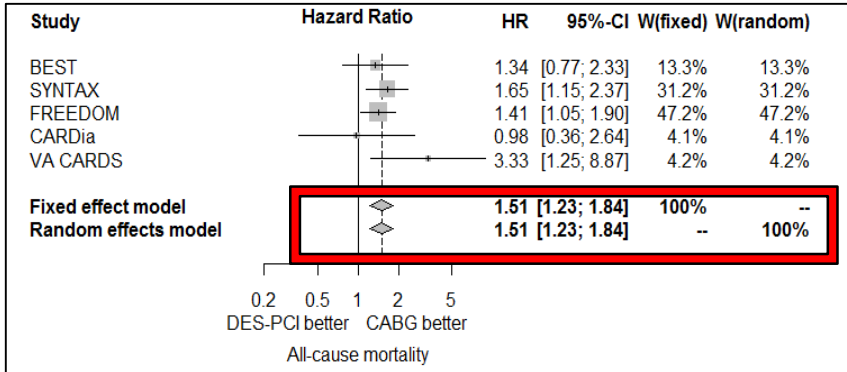
Developed with the special contribution of the European Association for Percutaneous Cardiovascular Interventions (EAPCI)

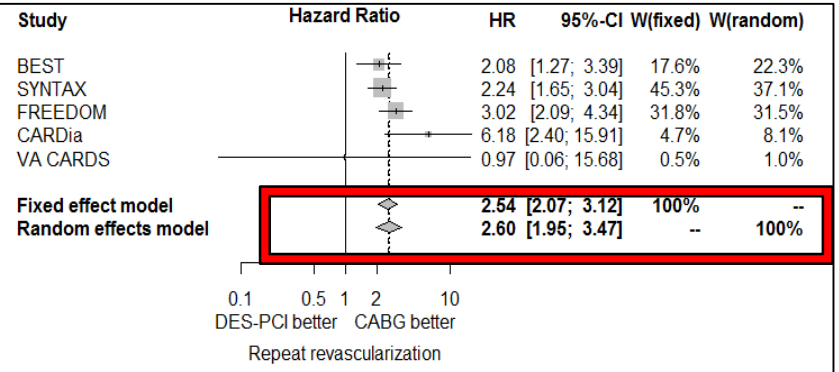
Recommendations according to extent of CAD	CABG		PCI	
	Class[a]	Level[b]	Class[a]	Level[b]
One or two-vessel disease without proximal LAD stenosis.	IIb	C	I	C
One-vessel disease with proximal LAD stenosis.	I	A	I	A
Two-vessel disease with proximal LAD stenosis.	I	B	I	C
Left main disease with a SYNTAX score ≤ 22.	I	B	I	B
Left main disease with a SYNTAX score 23–32.	I	B	IIa	B
Left main disease with a SYNTAX score >32.	I	B	III	B
Three-vessel disease with a SYNTAX score ≤ 22.	I	A	I	B
Three-vessel disease with a SYNTAX score 23–32.	I	A	III	B
Three-vessel disease with a SYNTAX score >32.	I	A	III	B

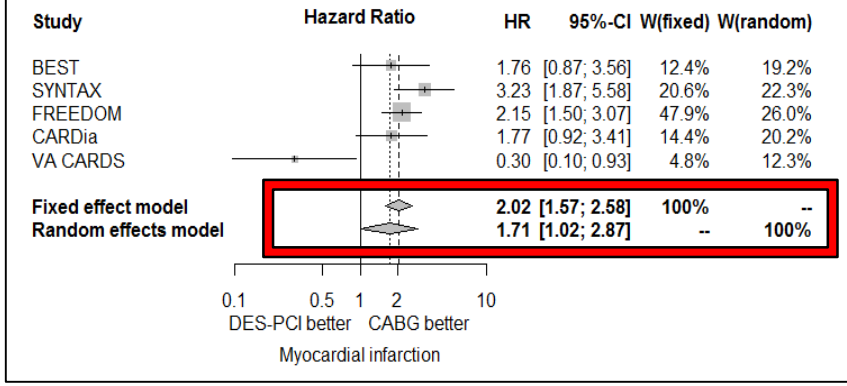
79%

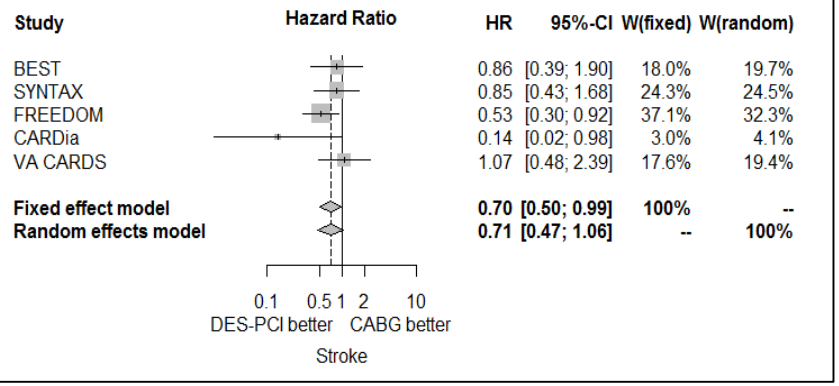
[ESC/EACTS Guidelines on Myocardial Revascularization, 2018]

PCI or CABG









Mortality HR 1.51; 95%CI 1.23-1.84; P<0.001

MI HR 2.02; 95%CI 1.57-2.58; P<0.001

Repeat revascularization HR 2.54; 95%CI 2.07-3.11; P=<0.001

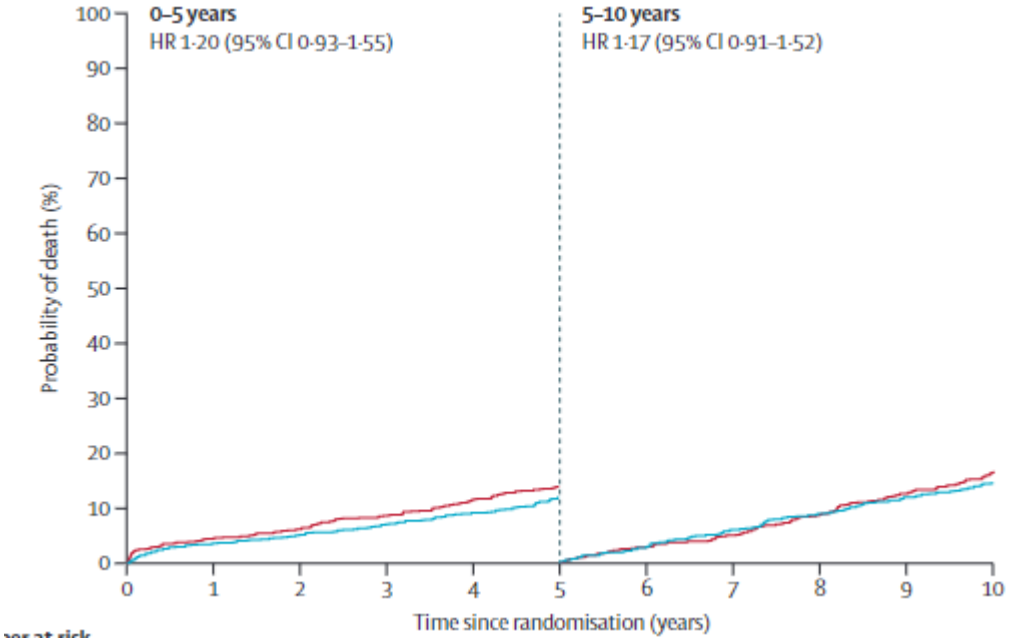
Stroke HR 0.70; 5%CI 0.50-0.98; P=0.04

Benedetto et al International J Cardiology 2016; 210: 19-24

SYNTAX

Percutaneous coronary intervention versus coronary artery bypass grafting in patients with three-vessel or left main coronary artery disease: 10-year follow-up of the multicentre randomised controlled SYNTAX trial

*Daniel J F M Thuijs, A Pieter Kappetein, Patrick W Serruys, Friedrich-Wilhelm Mohr, Marie-Claude Morice, Michael J Mack, David R Holmes Jr, Nick Curzen, Piroze Davierwala, Thilo Noack, Milan Milojevic, Keith D Dawkins, Bruno R da Costa, Peter Jüni, Stuart J Head, for the SYNTAX Extended Survival Investigators**



"The final five-year results of the SYNTAX study not only confirm that coronary artery bypass grafting (CABG) in comparison with stenting is accompanied by a lower frequency of repeated revascularization, but also demonstrate a significant role of CABG in reducing cardiac mortality"

Piroze Davierwala and Friedrich W Mohr

Purpose MIRM

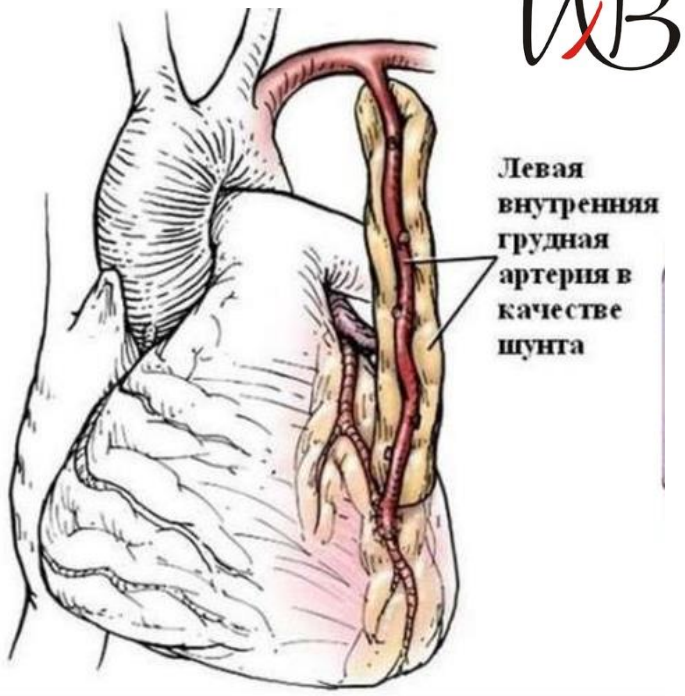
According to the conclusionThe **First World Congress on Minimally Invasive Heart Surgery (Paris, May 1997)**, the main goal of MIRM is to reduce the number of predicted complications and accelerate the patient's recovery, provided that the effectiveness of coronary operations and the duration of the therapeutic effect are preserved

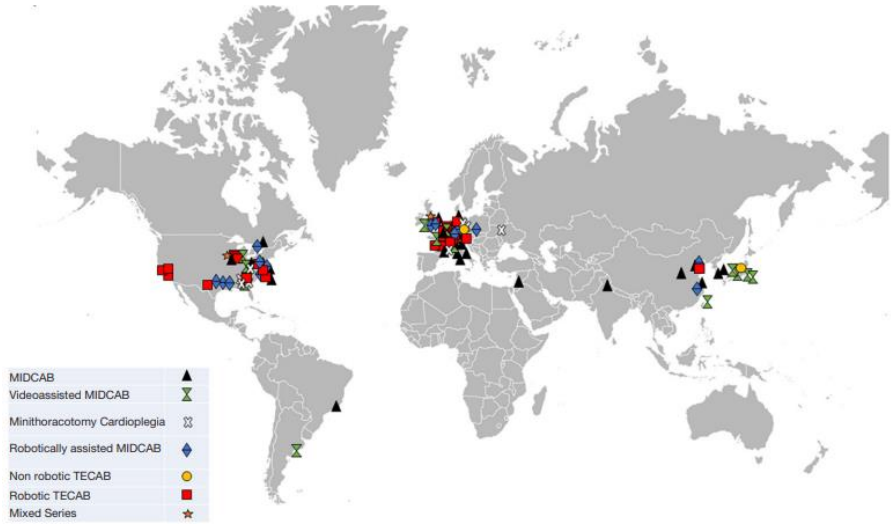
EndoCAB

Endoscopic Coronary Artery Bypass Graft

Combines a fully endoscopic isolation of the a internal mammary artery using the thoracoscopic technology VATS (Video-assisted thoracoscopic surgery) and the formation of a distal anastomosis with ADA Therefore, this method of myocardial revascularization is promising

[Y. Aladdin 2015]





Minimally invasive and robotic coronary artery bypass grafting—a 25-year review

Johannes Bonatti[1], Stephanie Wallner[1], Ingo Crailsheim[1], Martin Grabenwöger[1,2], Bernhard Winkler[1,3]

[1]Department of Cardiac and Vascular Surgery, Vienna Health Network, Clinic Floridsdorf and Karl Landsteiner Institute of Cardiovascular Surgical Research, Vienna, Austria; [2]Medical Faculty, Sigmund Freud University, Vienna, Austria; [3]Center for Biomedical Research, Medical University of Vienna, Vienna, Austria

Intraoperative transesophageal echocardiography

Society of Cardiovascular Anesthesiologists

Cardiovascular Anesthesiology Section Editor: **Charles W. Hogue, Jr.**
Perioperative Echocardiography and Cardiovascular Education Section Editor: **Martin J. London**
Hemostasis and Transfusion Medicine Section Editor: **Jerrold H. Levy**

SPECIAL ARTICLE

Guidelines for Performing a Comprehensive Transesophageal Echocardiographic Examination: Recommendations from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists

bioengineering

MDPI

Technical Note

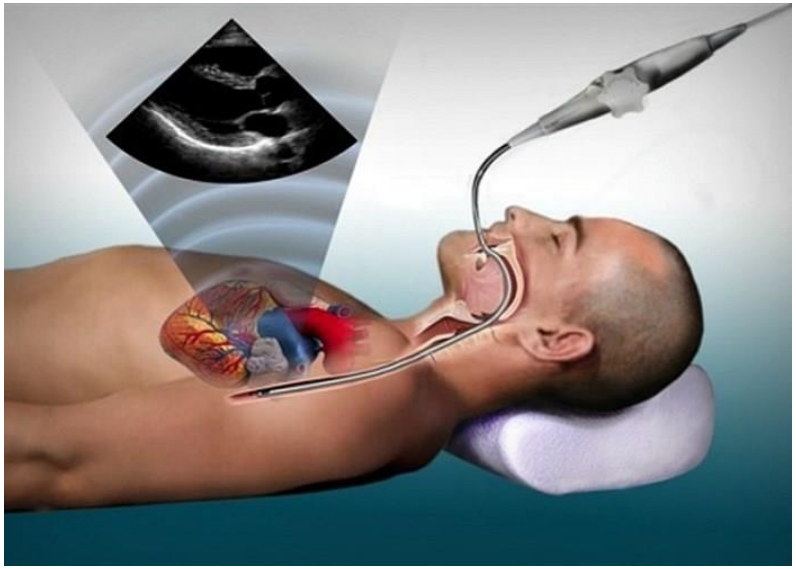
A Wireless Wearable Doppler Ultrasound Detects Changing Stroke Volume: Proof-of-Principle Comparison with Trans-Esophageal Echocardiography during Coronary Bypass Surgery

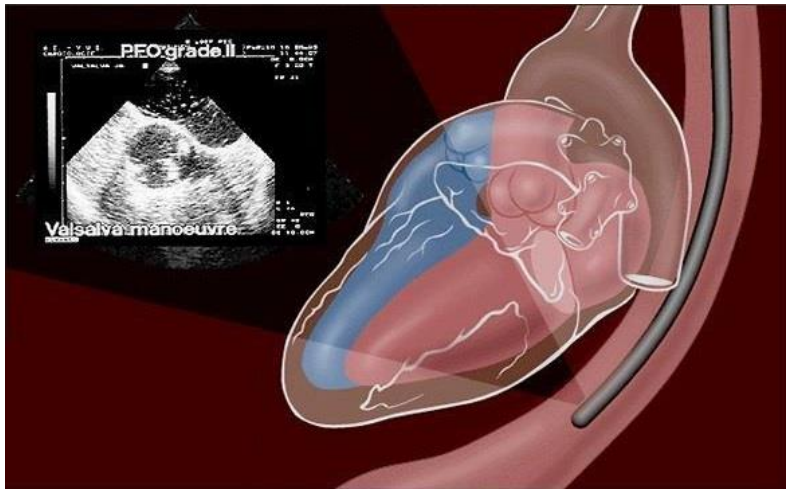
Jon-Émile Stuart Kenny [1,2,*], Geoffrey Clarke [1,2], Matt Myers [2], Mai Elfarnawany [2], Andrew M. Eibl [1,2], Joseph K. Eibl [1,2,3], Bhanu Nalla [1,3] and Rony Atoui [1,3]

Purpose

to evaluate the possibilities of intraoperative TEE

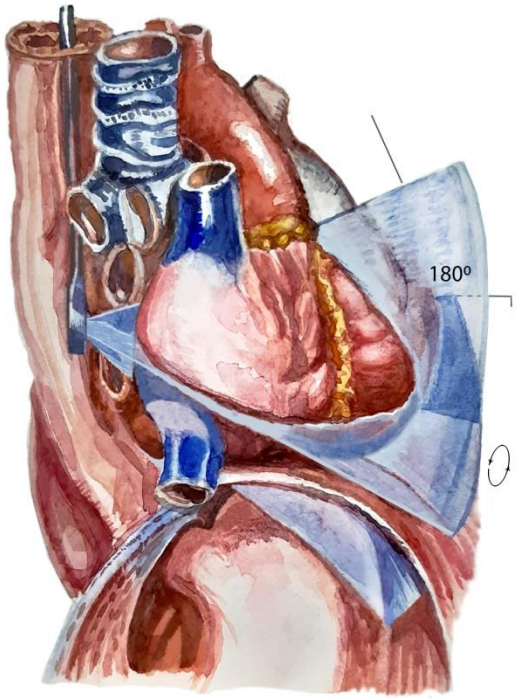
at the stages of performing endoscopically video-assisted CABG





Problem

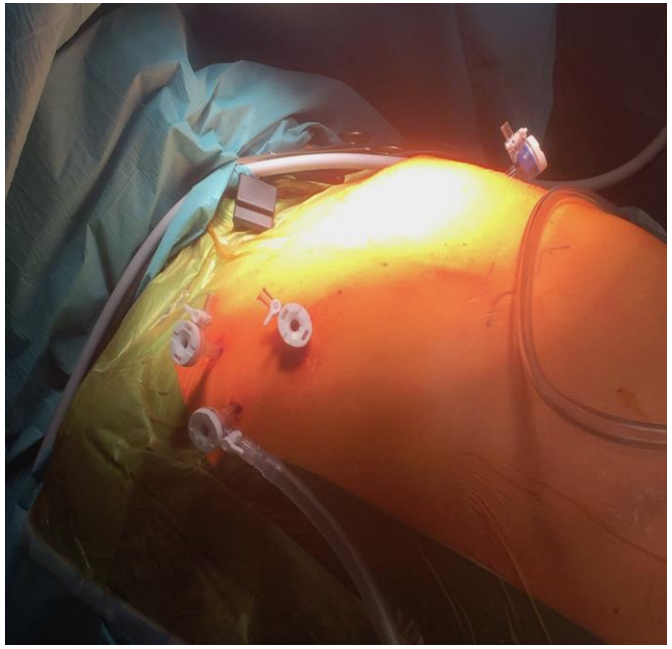
1. Assessment of anatomical structures of the heart cavities
2. Detection of myocardial and valvular pathology
3. Assessment of myocardial function before and after surgery

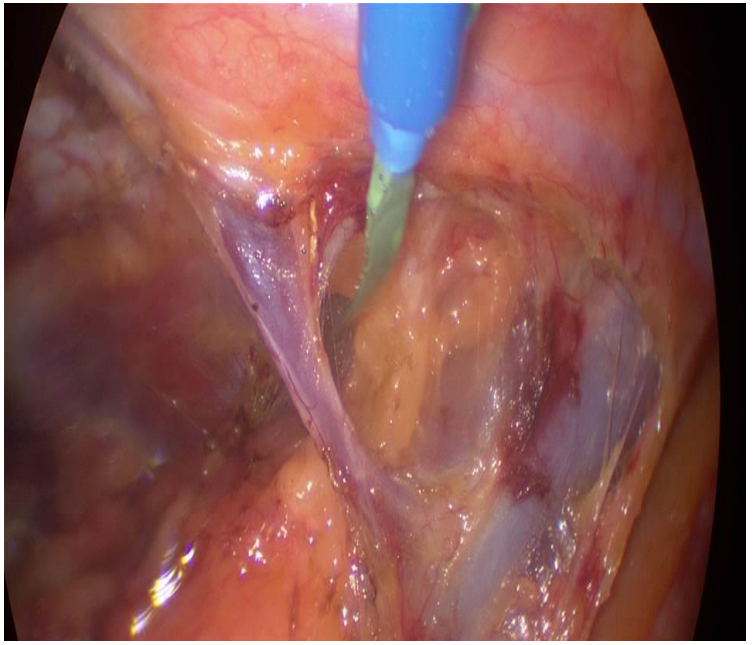


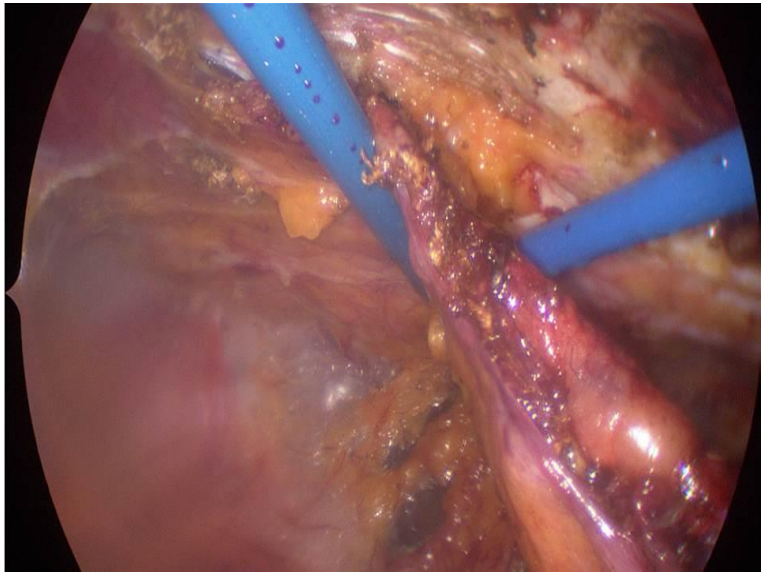
Technology EndoCAB

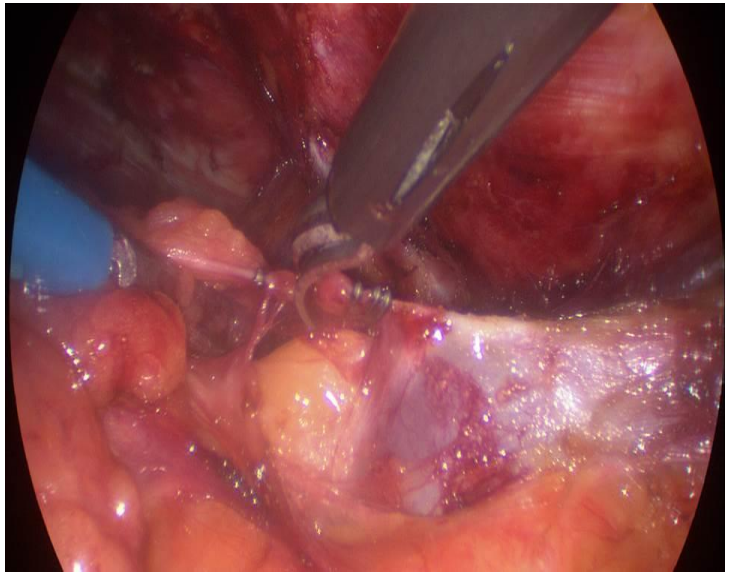
- Safety and effectiveness
- **Complete revascularization**
- Application of well-known technologies
  - reproducibility and a relatively small learning curve
  - relatively low price
- Minimal surgical trauma, rapid recovery and return to work
- Cosmetic result
- Control of bleeding
- Alternative to robotic surgery
- Combination with PCI (**Hybrid procedure –Endo-CAB and PCI)**

Technology EndoCAB



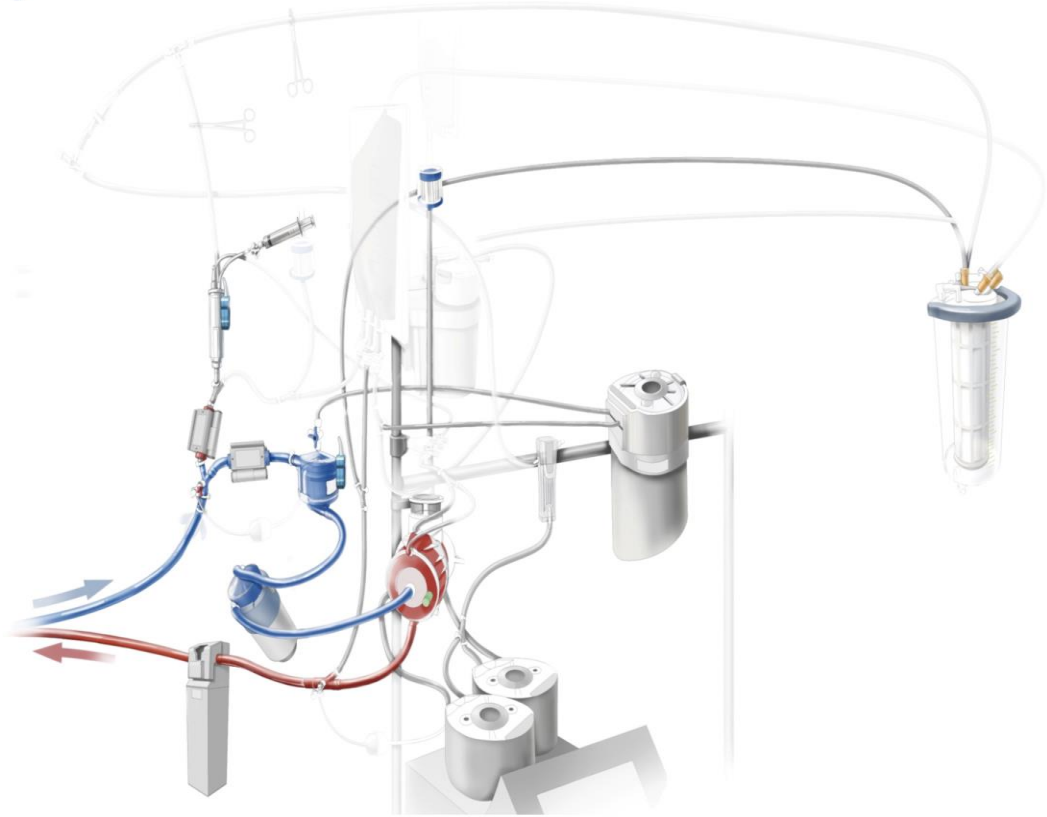


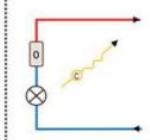
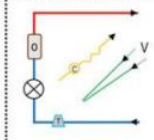
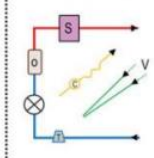
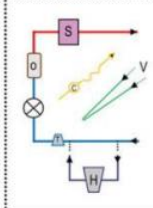


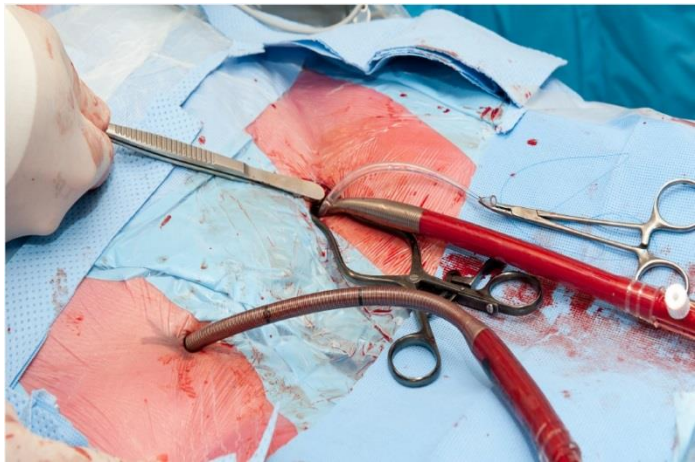


MiECC

Air handling



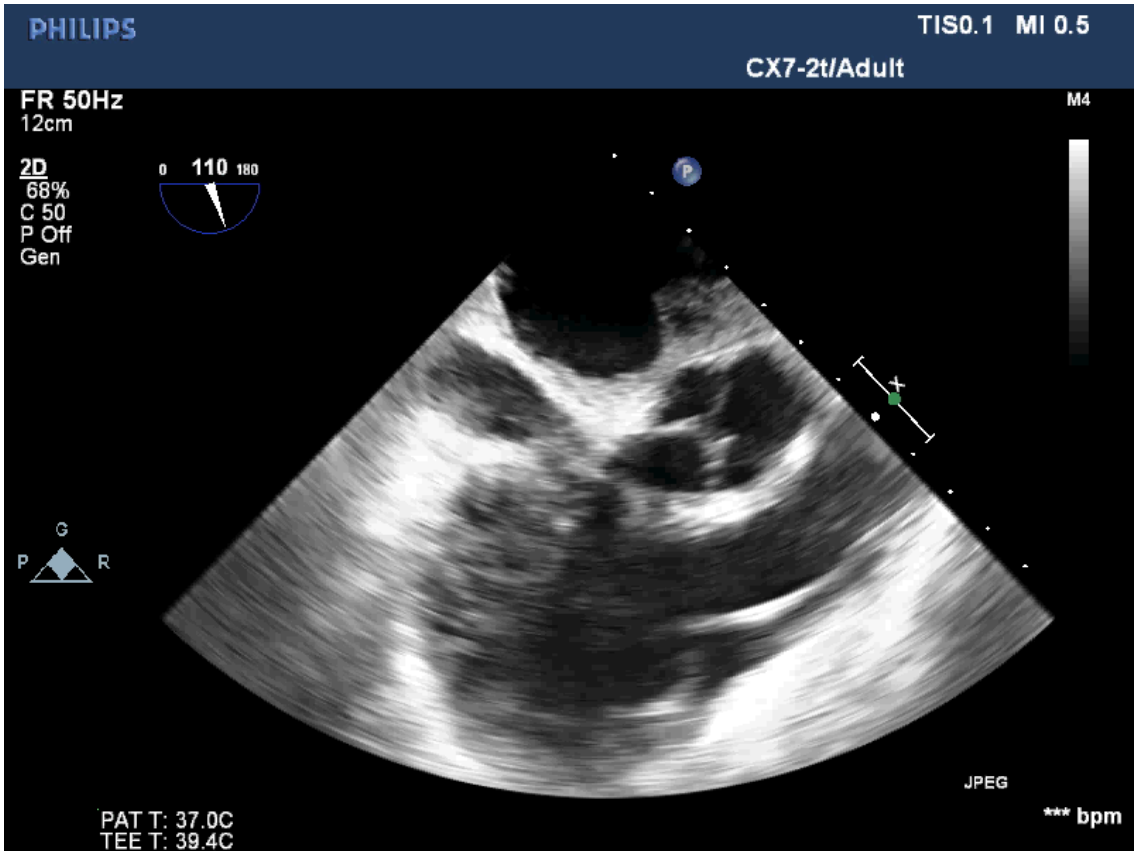
Type I		Standard	This closed circuit comprises of an afferent tube (blue line) which drains blood from the right atrium to the pump (⊗), then to the oxygenator (O) and returns it to the arterial circulation with the efferent tube (red line). The oblique arrow indicates cardiopledgia line with its pump (©).
Type II		Air handling	A venous bubble trap/air removing device (T)is added to the standard MiECC circuit so as to facilitate air handling and avoid air entrainment to the venous line. Venting (green) lines (V) drain blood from the aortic root and/or pulmonary artery/vein.
Type III		Volume management	A soft shell reservoir (S) is added to the circuit to collect blood volume from the patient and return it back during perfusion according to the needs.
Type IV		Blood management	A hard shell reservoir (H) is added as an extra component integrated to the venous line, so as to convert the system to an open circuit that could facilitate blood management as well as overcome any other intraoperative issue (modular configuration).



type II

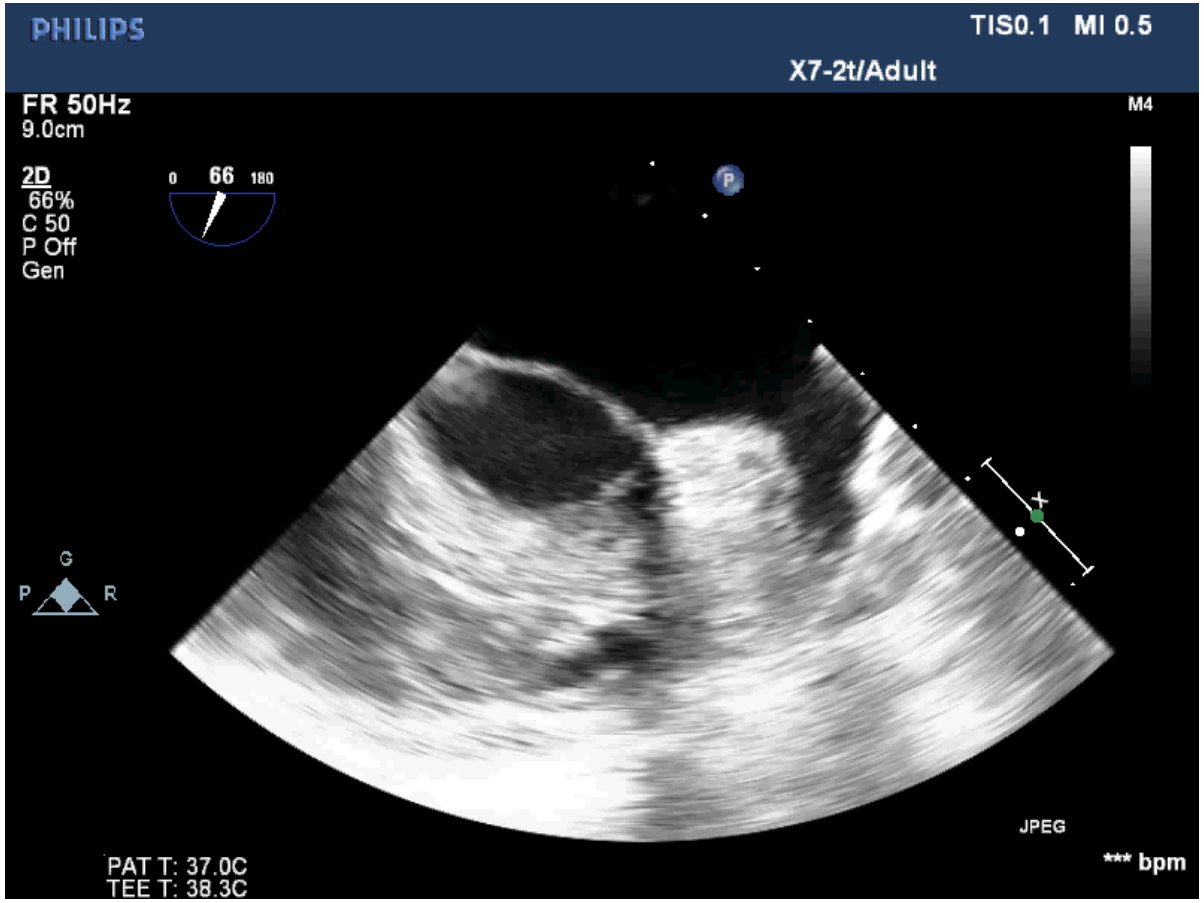
Anastadiadis et al. *Perfusion* 2015

Intraoperative TEE



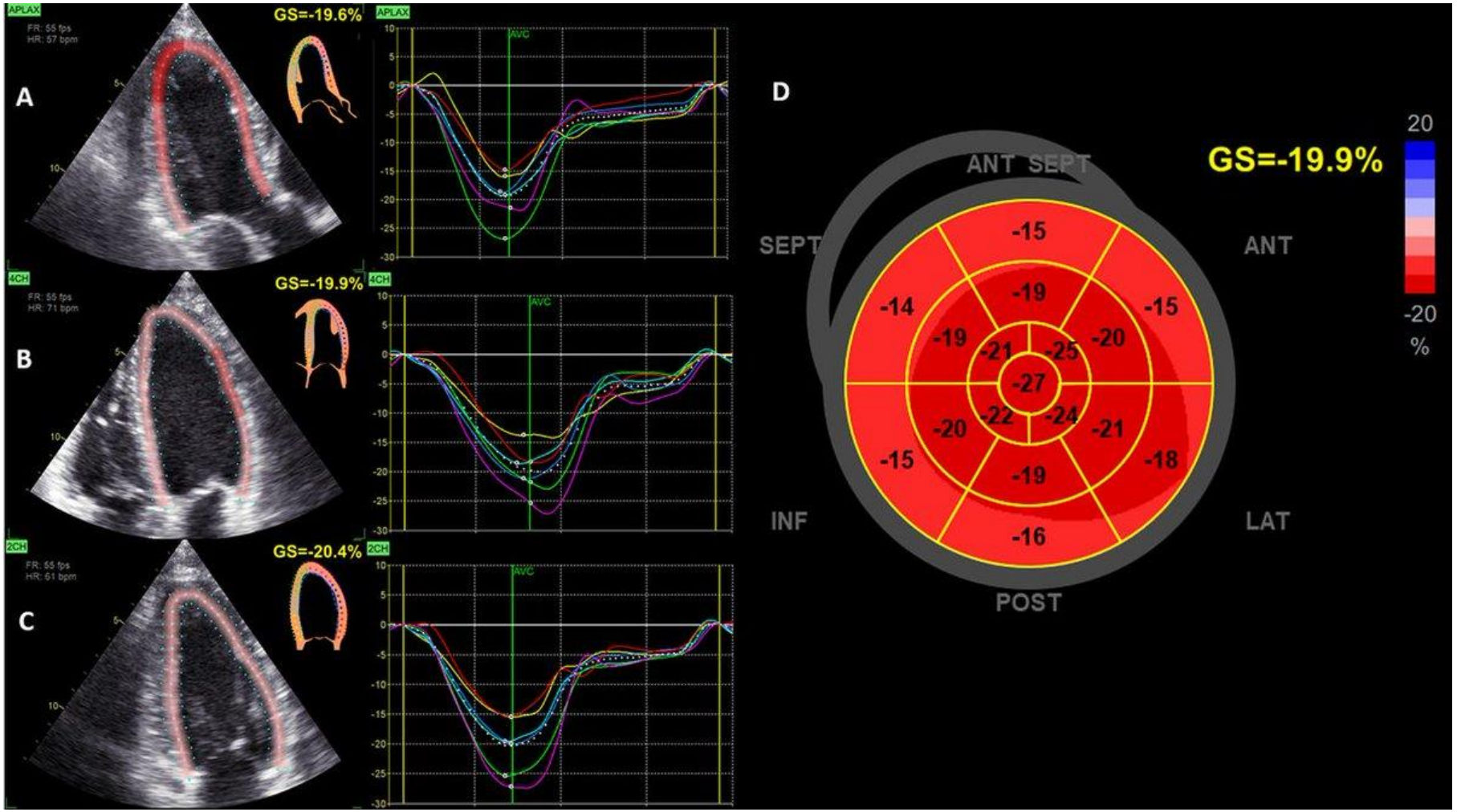
Venous cannula positioning

Intraoperative TEE



Visualization of the left chambers of the heart

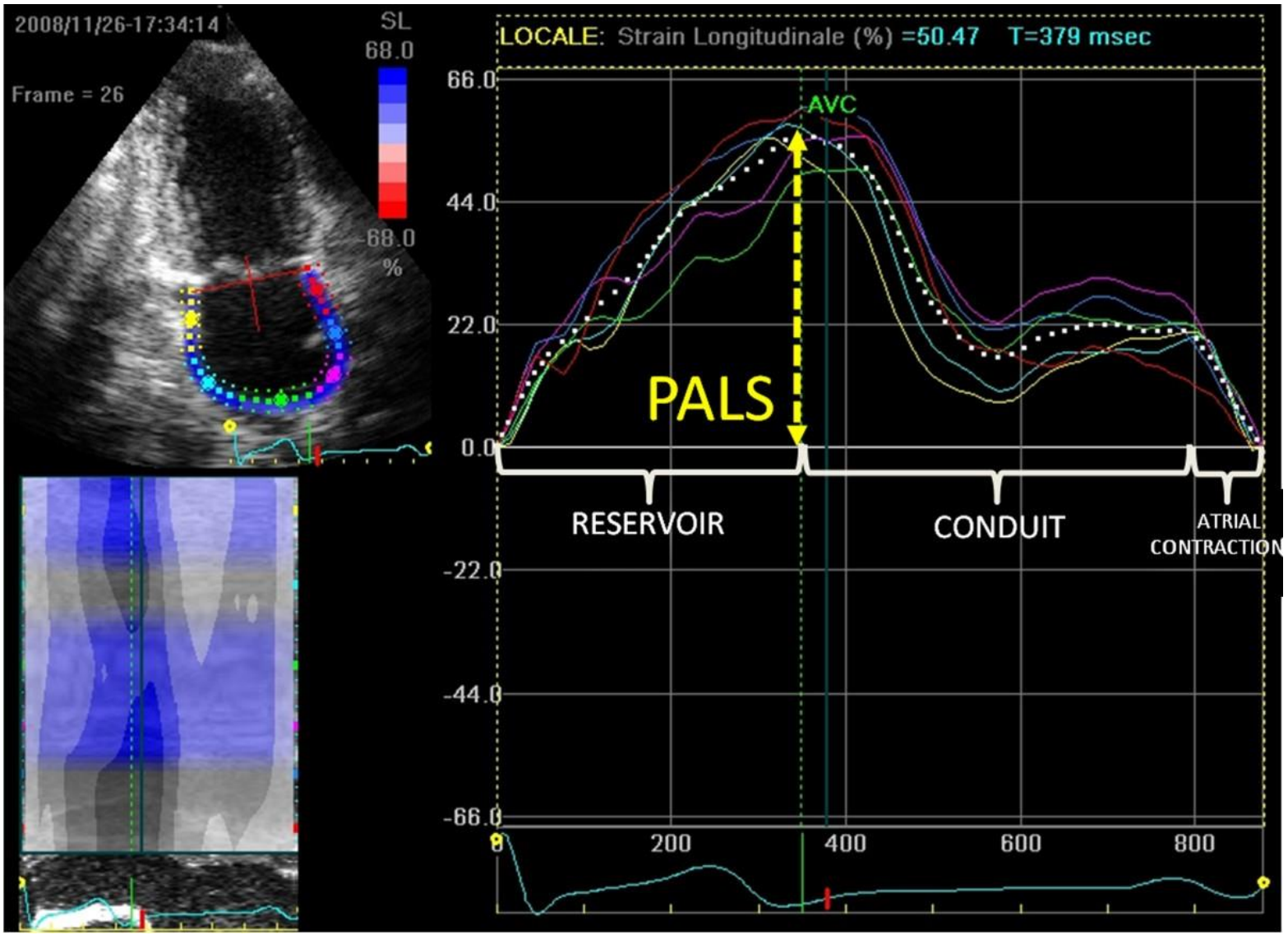
STRAIN LV


APLAX
FR: 55 fps
HR: 57 bpm
A
GS=-19.6%
APLAX
AVC
4CH
FR: 55 fps
HR: 71 bpm
B
GS=-19.9%
4CH
AVC
2CH
FR: 55 fps
HR: 61 bpm
C
GS=-20.4%
2CH
AVC
D
GS=-19.9%
ANT SEPT
SEPT
ANT
INF
LAT
POST
-15
-19
-14
-15
-19
-21
-25
-20
-27
-20
-22
-24
-21
-15
-18
-19
-16
20
-20
%

STRAIN ЭХОКГ ЛП

Preoperative left atrial strain abnormalities are associated with the development of postoperative atrial fibrillation following isolated coronary artery bypass surgery

Olga N. Kislitsina, MD, PhD,[a,b] James L. Cox, MD,[b] Sanjiv J. Shah, MD,[a] S. Chris Malaisrie, MD,[b] Jane Kruse, BSN,[b] Menghan Liu, MS,[c] Adin-Cristian Andrei, PhD,[c] and Patrick M. McCarthy, MD[b]



Characteristics of patients

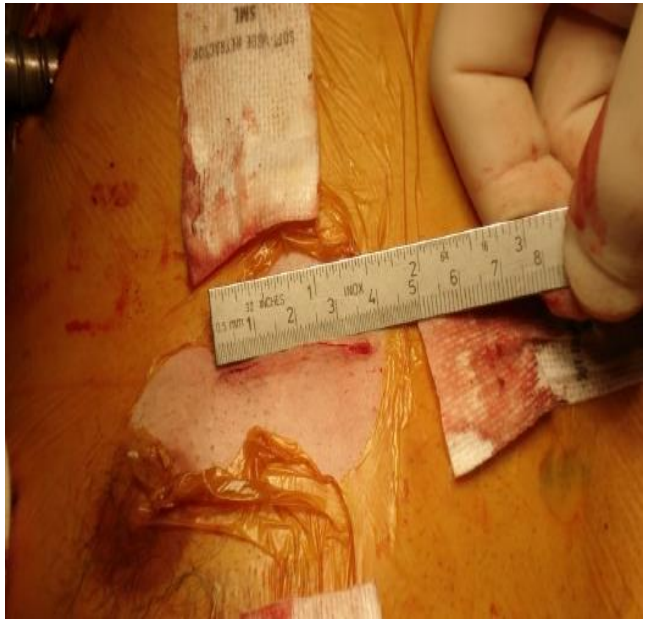
35 minimally invasive video-assisted myocardial revascularization was performed

Средний возраст, лет (M±m)	**46,72±4,08**
Sex (male/female)	65,7% / 34,3%
BMI, kg/m2 (M±m)	27,51±1,04
Atherosclerosis of the coronary arteries **ADA** **ADA+CA**	 91,4% 8,6%
Acute myocardial infarction in the anamnesis	23%
Diabetes mellitus	37,2%
LV EF, %	43,51±12,01

All patients undergo a comprehensive clinical and instrumental examination in the perioperative period

Technology EndoCAB in our center

- Total operations: 35
- Conversions: 2 (5,7%)
- Hybrid: 3 (8,6%)
- Bleeding: 0 (0%)
- Mortality: 0 (0%)
- Time of hospitalization 7,1



Practical significance

1. Provides intraoperative control of adequate positioning of the cannulas of CAB
2. Monitoring the effectiveness of antegrade cardioplegia
3. Assessment of myocardial contractility at the end of surgery
4. Assessment of the volemic status of a patient with direct myocardial revascularization

Conclusion

Intraoperative TEE is a fundamental imaging method in the accurate assessment of hemodynamics and geometry of cardiac chambers.

TEE helps to ensure accurate positioning of cannulas of CAB, as well as monitoring of adequate antegrade cardioplegia when other control methods are not possible


Thank you for
the attention!