# Emergency Intraoperative Echocardiography





Justiaan Swanevelder Department of Anaesthesia, Glenfield Hospital University Hospitals of Leicester NHS Trust, UK

# Carl Gustav Jung (1875-1961)

### "Your vision will become clear only when you can look into your heart!"





# ASA/SCA Task Force TOE guidelines Category I indications

- Haemodynamic lifethreatening intraop / ICU disturbances, unstable patient, evaluate LV
- Valve repair procedures
- Congenital heart surgery
- Hypertrophic obstructive cardiomyopathy repair
- Endocarditis
- Suspected thoracic aortic aneurysm, dissection in unstable patient
- Aortic dissection repair, AV involvement
- Pericardial window procedures

Thys DM, et al. Practice Guidelines for Perioperative Transesophageal Echocardiography. A report by the ASA and the SCA Task Force on TOE. Anesthesiology 1996;84:986-1006

Cheitlin MD, et al. ACC/AHA guidelines for the clinical application of echocardiography. Circulation 1997;95:1686-1744

Cheitlin MD, et al. ACC/AHA/ASE 2003 guideline update for the clinical application of echocardiography. J Am Soc Cardiol 2003;2(5):954-70

# 60 yrs old lady for MV repair



Easy separation from CPB 5 minutes post CPB - IABP Unstable – REASON?



Tingleff J, et al. Intraoperative echocardiographic study of air embolism during cardiac operations. Ann Thorac Surg 1995;673-7

# ASA/SCA Task Force TOE guidelines Update

Thys DM, et al. Anesthesiology 2010;112(5)

Practice Guidelines for Perioperative Transesophageal Echocardiography: An updated report by the ASA and the SCA Task Force on TEE.

"for adult patients without contraindications, TEE should be used in all open heart (e.g. valvular procedures) and all thoracic aortic surgical procedures, and should be considered in CABG surgeries as well"

# Recommendations for transoesophageal echocardiography: update 2010

Flachskampf FA, et al. Eur J Echocardiogr 2010;11:557–76 The European Association of Echocardiography; endorsed by the Echo Committee of the European Association of Cardiothoracic Anaesthesiologists

'.....to confirm or further define the preoperative diagnosis, exclude any new deterioration or unsuspected pathology, facilitate the intra-operative management of the patient, including where necessary to aid in surgical planning, and to evaluate the results of surgery and provide information for the postoperative care"

"we concur that TOE is reasonable for use in all adult patients who are undergoing either cardiac surgery or thoracic aortic surgical procedures under general anaesthesia."

## **Assessing ventricular performance**



Ng A, Swanevelder J. Perioperative monitoring of left ventricular function: what is the role of recent developments in echocardiography? Br J Anaesth 2010:104:669-72

# **Preload – wedge pressure/LVEDV correlation**





ventricular pressure

- normal LV PAFC correlates well with TOE
- LV dysfunction/extremes of preload, poorly assessed without echo – UNCOUPLING P / V
- assessment with PAFC bad in those who need it most!



Fontes, et al. - J Cardiothorac & Vasc Anesth 1999;13:521-7

# LV function - Quantitative Assessment LV volume reduction surgery



Picard M H, Popp RL, Weyman AE. Assessment of Left Ventricular Function by Echocardiography: a technique in evolution. JASE 2008;21:14-21

# LV function - Quantitative Assessment LV volume reduction surgery 3 D volumes and EF



 Picard M H, Popp RL, Weyman AE. Assessment of Left Ventricular Function by Echocardiography: a technique in evolution. JASE 2008;21:14-21
Turner MS, et al. Electrical and mechanical components of dyssynchrony in heart failure patients with normal QRS duration and left bundle-branch block. Circulation 2004;109:2544-2549

# And by the way!



# 78 yr. frail gentleman – for CABG ±MVR

poor general health cardiac catheter: 3-VD and mild MR



#### CABG only - Cx, LAD, small RCA technical difficulties try to come off CPB with IABP



- Inotropes!
- GTN

CABG only - Cx, LAD, small RCA technical difficulties try to come off CPB with IABP



• Inotropes!

• GTN





- RCA graft
- Regrafted Cx

# 63 yrs old male – post MV repair



Why hypotensive?

Treatment options?

poor LV following surgery high dose inotropes increase in inotropes



# 63 yrs old male – post MV repair



IABP difficult to advance

Volume

**Decrease inotropes** 

**IABP!** 



Should it be advanced any further?

## 60 yrs old male with severe AR, asc aorta 36 mm

Stented bioprosthetic valve Immediate postop – TOE not performed Concerns about left radial arterial line 2hrs post surgery – anuric on CICU, hemodynamically unstable





Intra-operative TOE not strongly indicated (Class II indication-2003 ACC/AHA/ASE guidelines)

# 61 yr old female, severe MR for repair



# 61 yr old female, severe MR for repair Separation from CPB!



# 65 yr old male, routine CABG Separation from CPB!

#### PAT T: 37.0C TEE T <37.0C in (hp) TIS:0.8 T6210 PAT T: 37.0C TEE T <37.0C 4.4MHZ 210 36 MAY 02 MAY 02 PROC 2/0/E/12/A 2/0/E/F3 ELD ELD М <u>86 18</u>0 / 5 TH3/MP3/JS/AWS GAIN 46 COMP 47 14CM TH3/MP3/JS/AWS 36 GAIN 46 COMP 47 658PM 90 180 Р 15HZ10CM 65HZ

Intra-operative TOE not strongly indicated (Class II indication-2003 ACC/AHA/ASE guidelines)

## 60 yr old female, severe AR for AVR



#### Intra-operative TOE not strongly indicated (Class II indication-2003 ACC/AHA/ASE guidelines)

Ionescu AA, et al. Prospective study of routine perioperative transesophageal echocardiography for elective valve replacement: clinical impact and cost-saving implications. J Am Soc Echocardiogr 2001;14:659-67

# 21mm stented bioprosthetic valve Separation from CPB



Ionescu AA, et al. Prospective study of routine perioperative transesophageal echocardiography for elective valve replacement: clinical impact and cost-saving implications. J Am Soc Echocardiogr 2001;14:659-67

# Vein graft to RCA!





Skidmore KL, London MJ. Myocardial ischemia. Monitoring to diagnose ischemia: how do I monitor therapy? Anesthesiol Clin North America 2001;19(4):651-72

# **MV regurgitation**

#### Excision P3 scallop, rigid annuloplasty ring



Kronzon I, et al. Real-time 3-D transesophageal echocardiography in the evaluation of postoperative mitral annuloplasty ring and prosthetic valve dehiscence. J Am Coll Cardiol 2009;53:1543-47

# **MV regurgitation**

#### Calcified annulus, para-prosthesis leak



Kronzon I, et al. Real-time 3-D transesophageal echocardiography in the evaluation of postoperative mitral annuloplasty ring and prosthetic valve dehiscence. J Am Coll Cardiol 2009;53:1543-47

# **Aortic stenosis - AVR**

### Calcified annulus – 19 bioprosthesis



# **Aortic stenosis - AVR**

#### Calcified annulus, 19 bioprosthesis, para-prosthesis leak



Scohy TV, et al. Usefulness of intraoperative real-time 3D transesophageal echocardiography in cardiac surgery. J Card Surg 2008;23:784-6

# **Aortic stenosis - AVR**

#### Calcified annulus, 19 bioprosthesis, para-prosthesis leak



Scohy TV, et al. Usefulness of intraoperative real-time 3D transesophageal echocardiography in cardiac surgery. J Card Surg 2008;23:784-6

# 80 yr old female urgent CABG, MVR

- From peripheral hospital
- MS,MR, critical LAD stenosis recent deterioration
- permanent pacemaker complete heart block





#### **PRE-OPERATIVE ECHO IN REFERRING HOSPITAL**

# **Intraoperative TOE findings - ALSO**

- Calcified aortic valve severe AS (mean PG 40 mm Hg), mild AR
- Severe TR
- Biventricular hypertrophy
- Impaired LV function





# **Intraoperative TOE findings**

- Left atrial size > 5 cm
- Large thrombus in left atrial appendage



# **Cannulation for bypass - unexpected event**

- sudden appearance of dislodged thrombus in LA
- passed through MV, LVOT and AV
- located in ascending aorta





# **Cannulation for bypass - unexpected event**

- Disappearance of thrombus from ascending aorta
- Patient became unstable
- Immediately on CPB



# **Surgical procedure**

- MVR, TV repair
- Single venous graft to LAD
- Difficulty off CPB unstable
- IABP, inotropic support, pacing
- All pulses palpable

#### Vascular scan - right common carotid artery!





Cholley BP, et al. Echocardiography in the ICU: time for widespread use! Intensive Care Med 2005;32:9-10

Swanevelder J, et al. Accreditation in transoesophageal echocardiography: statement from the Association of Cardiothoracic Anaesthetists and the British Society of Echocardiography Joint TOE Accreditation Committee. Br J Anaesth 2003;91:469-72

# Future: peri/intraoperative echocardiography for all high-risk surgical patients?





Ng A, Swanevelder J. Perioperative echocardiography for non-cardiac surgery: what is its role in routine haemodynamic monitoring?

Br J Anaesth 2009;102:731-4

#### If we don't look, we won't see, we won't understand!



# Assisting/Guiding the surgeon Improving patient care



# University Hospitals of Leicester MHS

**NHS Trust** 

# Thank you



#### Uni∨ersity Hospitals of Leicester <mark>NHS</mark> NHS Trust