Breakout Session:
Transesophageal Echocardiography

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Objectives

• Discuss indications/contraindications to TEE
• Understand TEE probe manipulation
• Review 11 basic views
  • Anatomic structures
  • Basic diagnostic uses
• Obtain basic TEE images

Indications

• Unexplained hypotension
• Hypovolemia, LV dysfunction, low SVR
• Aortic dissection, tamponade, pulmonary embolus
• Cardiac surgery
  • CABG, valve, thoracic aorta, heart and lung transplantation, congenital HD
• Anticipated hemodynamic instability

ASA practice guidelines for perioperative transesophageal echocardiography, Anesthesiology 2010
### Contraindications

- **Textbook:**
  - Esophageal pathology
  - Prior esophageal surgery
  - Patient refusal

- **Guidelines:**
  - “TEE may be used for patients with oral, esophageal, or gastric disease, if the expected benefit outweighs the potential risk, provided the appropriate precautions are applied.”

ASA practice guidelines for perioperative transesophageal echocardiography, Anesthesiology 2010; 112:1

### Indications

- A practical approach:
  - Screen for risks
  - Document your screening questions and answers
  - Assess risk vs. benefit
  - Consider other imaging modalities
  - Consider GI consult
  - Minimize risk
    - Experienced echocardiographer
    - Limited the exam and avoid unnecessary probe manipulations
    - Pediatric probe

### Risks

- Morbidity 2-5:1,000
  - Dental damage
  - Dysphagia
  - GI bleeding
  - Hemodynamic changes
  - Dislodged ETT

- Mortality 1:10,000
  - Esophageal perforation

Reeves et al, JASE 2013

### Probe Placement

- Muscle relaxant
- Suction stomach to remove air
- Ultrasound gel
- Mouth guard
- Direct laryngoscopy or blind insertion
  - Jaw thrust, slight anteflexion, advance gently into esophagus

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5 6 7 8
Prepare the Machine

- On button
- Enter patient information
- Connect probe
- Connect EKG
- Choose mode
- Adjust gain and depth

Probe Manipulation

- Advance/Withdraw
- Turn Left/Right
- Omniplane (0°-180°)
- Anteflexion/Retroflexion
- Lateral flexion (Left/Right)

GI Stations

- Relative positions of esophagus and stomach to heart and aorta

Mid Esophageal

Modified from Reeves et al., JASE 2013 and HeartWorks
Transgastric

Indications

Contraindications

Risks

Placement

Machine

Manipulation

GI Stations

View Exam

Artifacts

Modified from Reeves et al, JASE 2013 and HeartWorks

Deep Transgastric

Indications

Contraindications

Risks

Placement

Machine

Manipulation

GI Stations

View Exam

Artifacts

Modified from Reeves et al, JASE 2013 and HeartWorks

Upper Esophageal

Indications

Contraindications

Risks

Placement

Machine

Manipulation

GI Stations

View Exam

Artifacts

Modified from Reeves et al, JASE 2013 and HeartWorks
11 View Basic Exam

**Indications**

**Contraindications**

**Risks**

**Placement**

**Machine**

**Manipulation**

**GI Stations**

12 View Exam

**Artifacts**

Image from: Reeves et al, JASE 2013

Midesophageal 4 Chamber

**Key Structures:**
- Left atrium (LA)
- Left ventricle (LV)
- Septal wall
- Lateral wall
- Mitral valve (MV)

**Diagnostic Uses:**
- Chamber size
- LV systolic function
- LV regional wall motion
- RV systolic function
- MV pathology
- TV pathology
- Pericardial effusion
- ASD/VSVD

Modified from HeartWorks

Midesophageal 2 Chamber

**Key Structures:**
- Left atrium (LA)
- Left ventricle (LV)
- Anterior wall
- Inferior wall
- Mitral valve (MV)
- Coronary sinus (CS)
- Left atrial appendage
- (LAA, not shown)

**Diagnostic Uses:**
- LV systolic function
- LV regional wall motion
- MV pathology
- LAA thrombus

Modified from HeartWorks

Midesophageal Long Axis

**Key Structures:**
- Left atrium (LA)
- Left ventricle (LV)
- Anteroseptal wall
- Inferolateral wall
- Mitral valve (MV)
- Left ventricular outflow tract (LVOT)
- Aortic valve (AV)
- Aortic root and ascending aorta
- Interventricular septum (IVS)

**Diagnostic Uses:**
- LV systolic function
- LV regional wall motion
- MV pathology
- TV pathology
- Aortic dissection
- VSD
- Dynamic LVOT obstruction

Modified from HeartWorks
Midesophageal Ascending Aorta Long Axis

Key Structures:
- Ascending aorta (Ao)
- Right pulmonary artery (RPA)

Diagnostic Uses:
- Aortic dissection
- Aortic aneurysm
- Aortic atheroma
- PAC in RPA

Midesophageal Ascending Aorta Short Axis

Key Structures:
- Ascending aorta (Ao)
- Main pulmonary artery (PA)
- Right pulmonary artery (RPA)
- Pulmonic valve (PV)
- Superior vena cava (SVC)

Diagnostic Uses:
- Aortic dissection
- Aortic aneurysm
- Aortic atheroma
- Pulmonary embolism

Midesophageal Aortic Valve Short Axis

Key Structures:
- Left atrium (LA)
- Right atrium (RA)
- Interatrial septum (IAS)
- Aortic valve
- Non (N), right (R), and left (L) cusps

Diagnostic Uses:
- AV pathology
- AV morphology
- LA size
- ASD

Midesophageal Right Ventricular Inflow-Outflow

Key Structures:
- Left atrium (LA)
- Interatrial septum (IAS)
- Right atrium (RA)
- Tricuspid valve (TV)
- Right ventricle (RV)
- Pulmonic valve (PV)
- Main pulmonary artery (PA)
- Aortic valve (AV)

Diagnostic Uses:
- TV pathology
- PV pathology
- RV systolic function
- ASD
Midesophageal Bicaval

Key Structures:
- Left atrium (LA)
- Interatrial septum (IAS)
- Right atrium (RA)
- Superior vena cava (SVC)
- Inferior vena cava (IVC)

Diagnostic Uses:
- ASD
- Confirm central venous line/cannula placement

Transgastric Midpapillary Short Axis

Key Structures:
- Left ventricle (LV)
- Right ventricle (RV)
- Interventricular septum (IVS)
- Papillary muscles

Diagnostic Uses:
- LV size
- LV systolic function
- LV regional wall motion
- LV preload
- LV hypertrophy
- Septal motion
- RV size
- RV volume
- RV pressure
- RV overload
- VSD

Descending Aortic Short Axis

Key Structures:
- Descending aorta (Ao)
- Left lung and pleura (not shown)

Diagnostic Uses:
- Aortic dissection
- Aortic aneurysm
- Aortic athrombosis
- Confirm aortic wire/cannula/IABP placement
- Pleural effusion

Descending Aortic Long Axis

Key Structures:
- Descending aorta (Ao)

Diagnostic Uses:
- Aortic dissection
- Aortic aneurysm
- Aortic athrombosis
- Confirm aortic wire/cannula/IABP placement
- Grade aortic insufficiency
Artifacts

- Degraded images
  - electrical interference
  - too much gain
  - too little gain
  - air artifact
  - reverberation
  - comet tail
- Errorously perceived structures
  - mirror image
- Misplaced structures
  - side lobes
  - beam width
- Missing structures
  - acoustic shadow
  - dropout
  - poor focus

References