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RESUSCITATIVE TEE TRANSESOPHAGEAL ULTRASOUND (TEU)

Quick Guide

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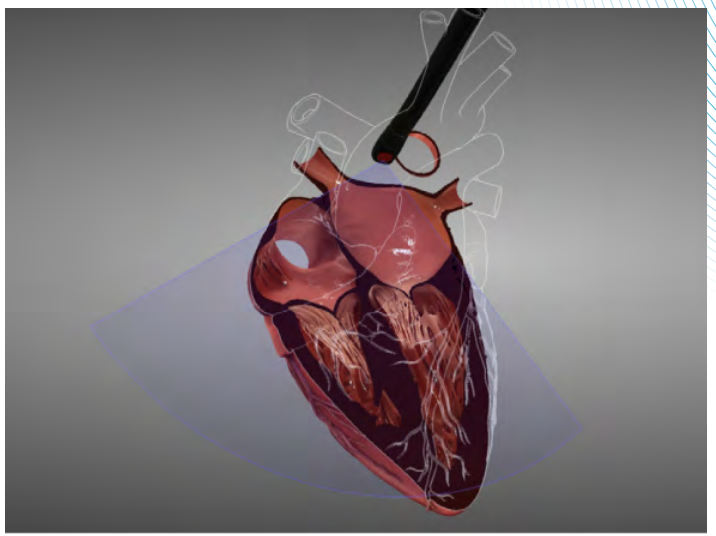
MID-ESOPHAGEAL 4 CHAMBER VIEW (ME4CH)



There are four basic views when conducting goal-directed, point-of-care Transesophageal Echocardiography (TEE). These four views provide the ability for users to mimic the views and clinical scope they are accustomed to when using Transthoracic Echocardiography (TTE) protocols for emergency medicine or critical care. Additionally, these basic views provide the foundational understanding to incrementally learn and make use of additional transesophageal views as the complexity and cognitive ability of users grows with time and experience.

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Mid-esophageal 4 chamber view

Objective:

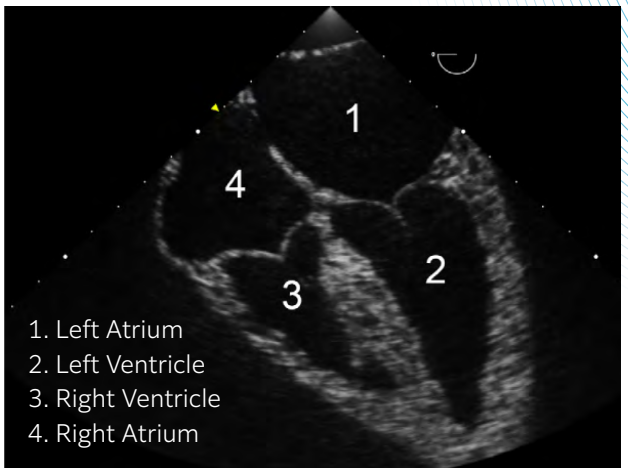
The ME4CH view is the starting point of any transesophageal examination. It is readily acquired upon successful transducer insertion to the mid-esophagus without significant transducer adjustment. In addition to being technically easy to acquire, this foundational view provides an ideal starting point for goal-directed TEE given the insight offered to all 4 chambers, atrio-ventricular valves, and the pericardial space. This allows the clinician to form immediate impressions and hypotheses related to the clinical question(s) related to left ventricular function, right ventricular size and function, the presence and size of pericardial effusion, and any obvious 2D mitral or tricuspid valve pathology.

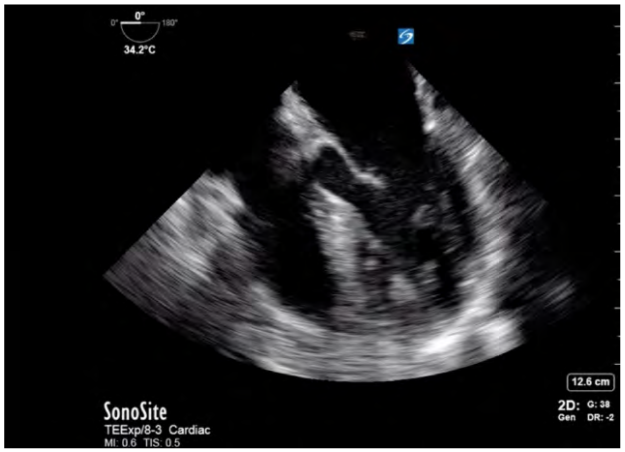
General Advice:

- Use a transesophageal transducer and the Cardiac or Cardiac Resuscitation (available on Sonosite PX/LX) exam type.
- Position the patient as they are. The best views may be obtained by using the left lateral decubitus position, however, patients may be positioned supine or pronet.

Clinical Pearls:

- The mid-esophageal level is approximately 35 cm from the incisors.
- The omni-plane controls may require adjustment that ranges between 0 and 10 degrees.
- Slight retroflexion (big wheel, counter clockwise) may optimize the view by reducing foreshortening and bringing out the left ventricular apex.
- If the aortic valve or left-ventricular outflow tract is seen, the transducer should be advanced slightly.
- If the left atrium is not seen, the transducer is too deep and should be withdrawn slightly.
- When both atria, the tricuspid and mitral valves, and both ventricles are seen, the mid-esophageal 4 chamber view has been obtained.





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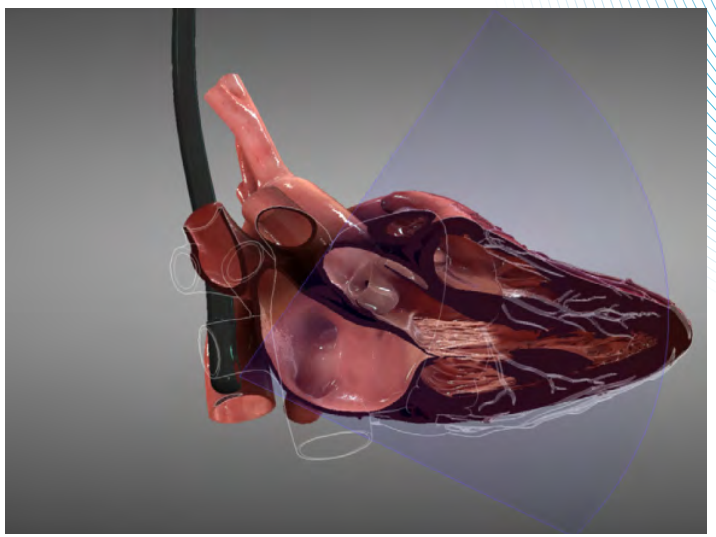
MID-ESOPHAGEAL LONG AXIS VIEW (MELAX)



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Mid-esophageal long axis view

Objective:

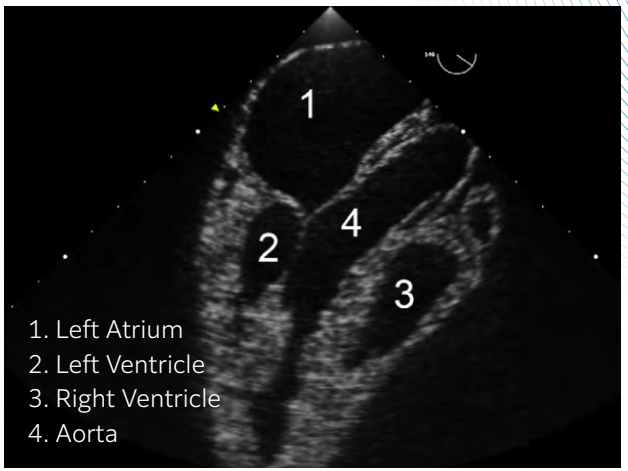
The MELAX view is a TEE equivalent to the parasternal long axis view in TTE. In this view, clinicians will have the ability to comment on left ventricular function, the presence and size of pericardial effusion and the presence of any obvious aortic valve and mitral valve pathology. Additionally, in the case of intra-cardiac arrest TEE, this view is preferred by many clinicians for its ability to ensure the left ventricular outflow tract is not being compressed during CPR.

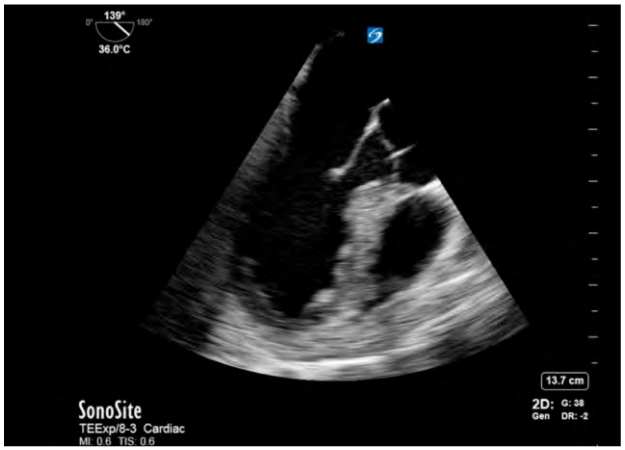
General Advice:

- Use a transesophageal transducer and the Cardiac or Cardiac Resuscitation (available on Sonosite PX/LX) exam type.
- Position the patient as they are. The best views may be obtained by using the left lateral decubitus position, however, patients may be positioned supine or prone.

Clinical Pearls:

- To image the heart in the long axis, the transesophageal transducer beam angle should be adjusted using omni-plane controls between 120-140 degrees (at the same mid-esophageal level 35 cm from the incisors).
  The exact beam angle will vary across patients. However, when the aortic valve and mitral valve are both in plane the long axis has been achieved.
- You will see the left atrium, left ventricle, aortic valve, mitral valve, inferolateral wall, and anterior septum.
- Just as in the ME4CH view, some retroflexion of the transducer may permit improved visualization of the left ventricle.





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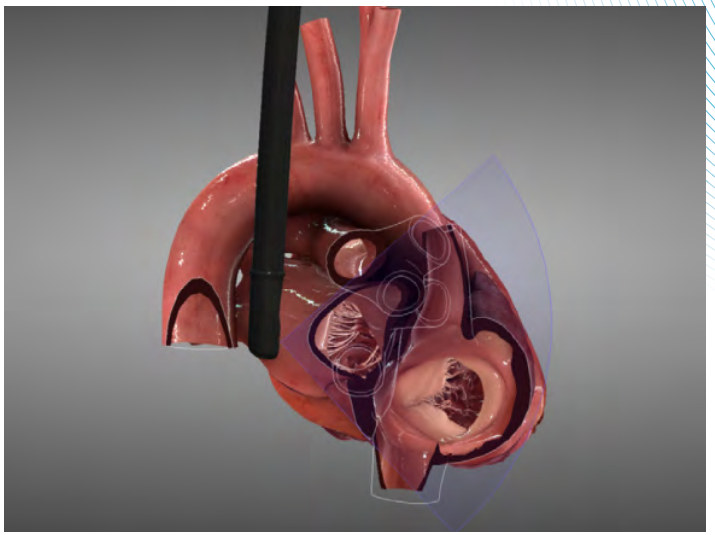
MID-ESOPHAGEAL BICAVAL VIEW

There are four basic views when conducting goal-directed, point-of-care Transesophageal Echocardiography (TEE). These four views provide the ability for users to mimic the views and clinical scope they are accustomed to when using Transthoracic Echocardiography (TTE) protocols for emergency medicine or critical care. Additionally, these basic views provide the foundational understanding to incrementally learn and make use of additional transesophageal views as the complexity and cognitive ability of users grows with time and experience.



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Mid-esophageal bicaval view

Objective:

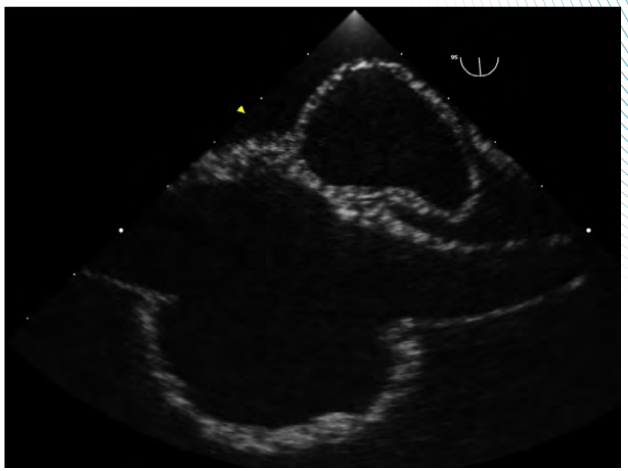
The objective for obtaining a mid-esophageal bicaval view of the heart is to assess for the junction of the Superior Vena Cava (SVC), Inferior Vena Cava (IVC), and the right atrium. This view permits the clinician to evaluate the SVC for compression with mechanical ventilation that supports volume responsiveness. Further, this view may be extremely helpful in guiding invasive procedures such as Extracorporeal Membrane Oxygenation (ECMO) by visualizing guidewires or cannulae as they traverse the vena cava. More advanced users may use this view to evaluate for intra-atrial shunts.

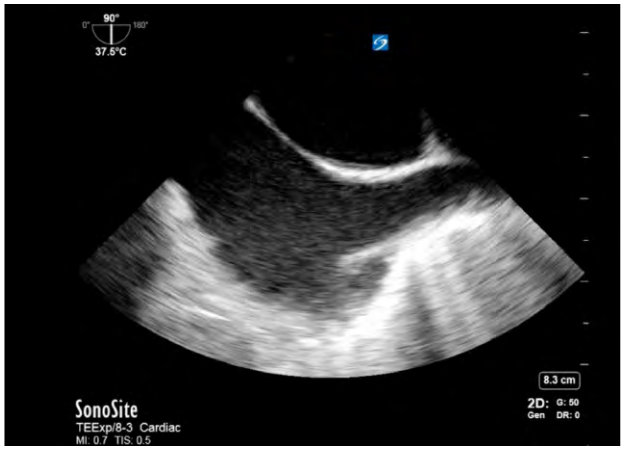
General Advice:

- Use a transesophageal transducer and the Cardiac or Cardiac Resuscitation (available on Sonosite PX/LX) exam type.
- Position the patient as they are. The best views may be obtained by using the left lateral decubitus position, however, patients may be positioned supine or prone.

Clinical Pearls:

- The transducer is in the same mid-esophageal depth of 35 cm from the incisors as the ME4CH and long axis views.
- The omni-plane beam angle should be between 90 and 110 degrees to capture the inferior vena cava in its long axis.
- Physical rotation of the transesophageal transducer toward the patient's right is then required.
- Once the view is obtained, some mild torque on the transducer is typically required to preserve the view.
- You will see the SVC in its long axis to the right of the image as it enters the right atrium. The left atrium, as with all mid-esophageal views, is the near field chamber.
- When evaluating for respiratory variation of the SVC, it is valuable to remember that as an intra-thoracic structure, the SVC compresses with mechanical ventilation (opposite of the IVC which distends in this situation).
- If visualizing the IVC is desired, advancing the transducer and some minor omni-plane adjustments may be necessary.





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TRANSGASTRIC MID-SHORT AXIS – PAPILLARY MUSCLE LEVEL VIEW

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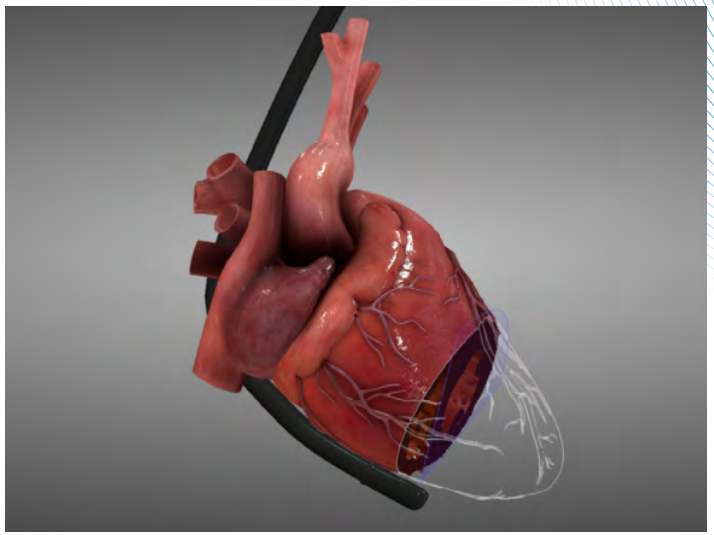

Reference:
Hahn R. T. et. al. Guidelines for Performing a Comprehensive Transesophageal Echocardiographic Examination: Recommendations from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists website. September, 2013. https://www.asecho.org/wp-content/uploads/2014/05/2013_Performing-Comprehensive-TEE.pdf

Melgarejo, S., Schaub, A., Noble, V.E. Point of Care Ultrasound: An Overview. October 31, 2017. https://www.acc.org/latest-in-cardiology/articles/2017/10/31/09/57/point-of-care-ultrasound

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Transgastric mid-short axis – Papillary muscle level view

Objective:

The objective for obtaining a TG Mid SAX view is primarily for a global view of left ventricular function. Seeing all 4 walls allows for more confident subjective interpretation as well as for the evaluation for large-territory, regional wall motion abnormalities that might suggest coronary artery disease. The interventricular septum is also seen and, if flattened, suggests important right ventricular pathology. The pericardial space is also well appreciated in this view.

General Advice:

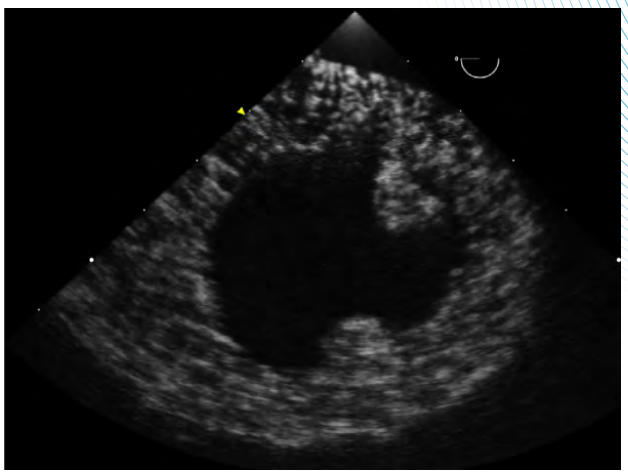
- Use a transesophageal transducer and the Cardiac or Cardiac Resuscitation (available on Sonosite PX/LX) exam type.
- Position the patient as they are. The best views may be obtained by using the left lateral decubitus position, however, patients may be positioned supine or prone.

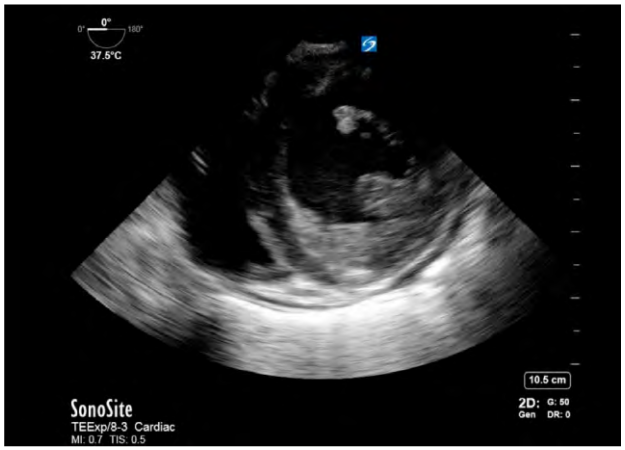
Clinical Pearls:

- To obtain the transgastric views, straighten the probe from the ME level and advance to the 40-50 cm markers from the incisors. Once in the correct location, anteflex to obtain the gastric SAX views.
- The omni-plane imaging is approximately 0-20 degrees for the transgastric short axis view.
- Adjusting either the amount of anteflexion or transducer depth allows for more apical or basal plane of imaging until the papillary muscle level is achieved.
- You will see the left ventricle in a short axis (circular) plane with the papillary muscles. An oblique view of the right ventricle and pericardium are also seen in this view.

  Note: the image is flipped compared to TTE; the inferolateral wall of the left ventricle is in the near field, and the anterior wall is in the far field.

- This view is very helpful in the evaluation of volume status and ventricular function. It is a standard view used for monitoring in surgery and the ICU. It is also used in resuscitation efforts.





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