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# Ecocardiografía transesofágica en cirugía NO cardíaca

*Alejandro Madrid Crespo (FEA)*  
*Jorge González Gómez (MIR3)*

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- Introducción: generalidades.
- Ecocardiografía transesofágica (ETE): utilización en la práctica clínica.
- ETE perioperatorio.
- ETE área fuera de quirófano.
- Complicaciones.
- Desventajas.
- Conclusiones.
- Bibliografía.

# Introducción

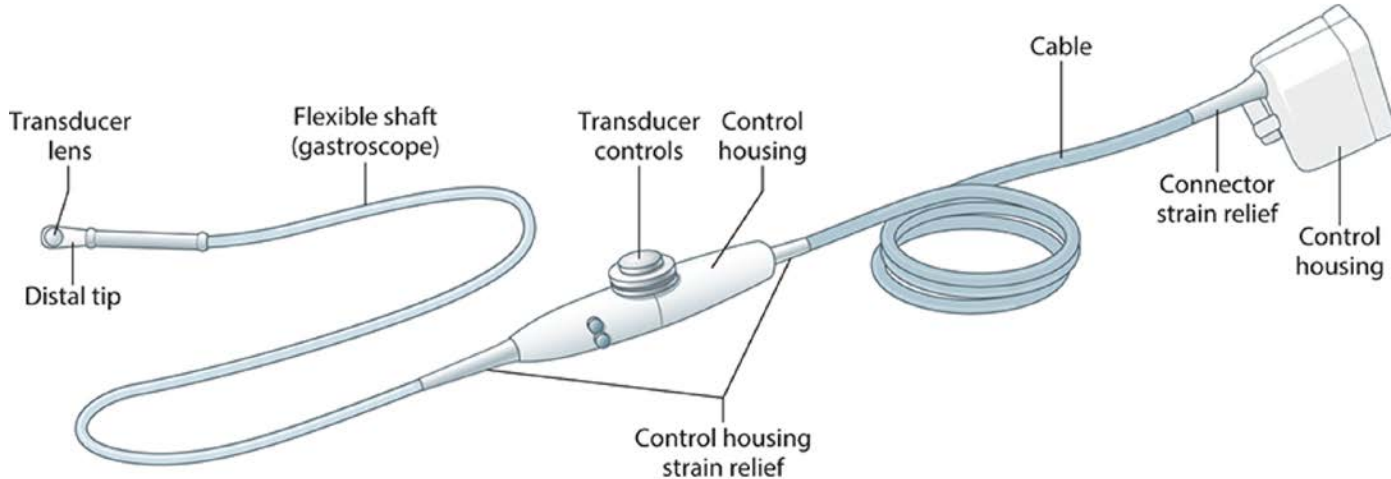
- ✓ Se introdujo clínicamente en los EE.UU en 1987, tras los estudios de Matsumoto en 1980.
- ✓ Ha cambiado la estrategia diagnóstica y terapéutica en múltiples enfermedades, por la calidad de sus imágenes y la baja tasa de complicaciones asociadas a su utilización.
- ✓ En la década de los 90s presenta numerosos avances en cuanto al la tecnología del transductor, llegando al mercado la primera sonda 3D ETE en 2006.
- ✓ En la última década ha venido a incorporarse al POCUS en la UCI y PACU.



# Generalidades

- ✓ Permite visualizar en tiempo real la dinámica cardíaca.
- ✓ Método directo para obtener tamaño de cavidades cardíacas y grandes vasos.
- ✓ Precaución “INVASIVO”.

# Generalidades



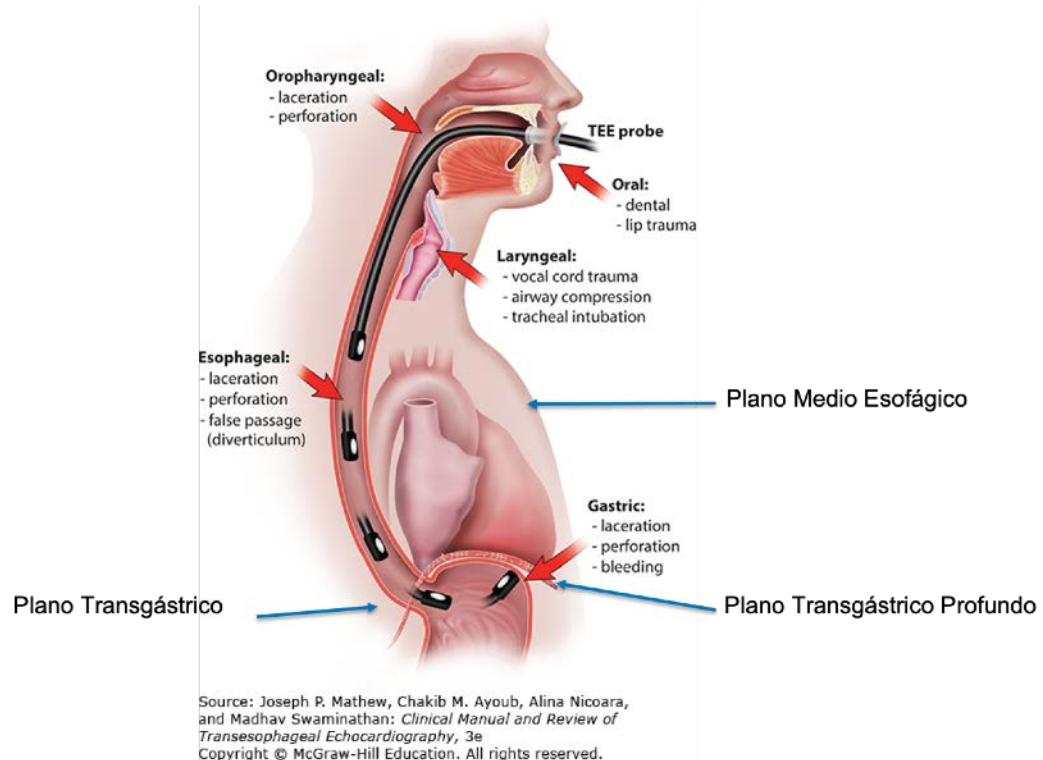
Source: Joseph P. Mathew, Chakib M. Ayoub, Alina Nicoara, and Madhav Swaminathan: *Clinical Manual and Review of Transesophageal Echocardiography*, 3e  
Copyright © McGraw-Hill Education. All rights reserved.

# Generalidades

Sonda multiplanar ETE



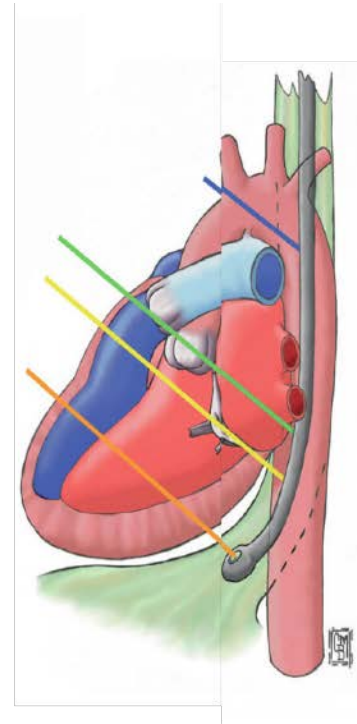
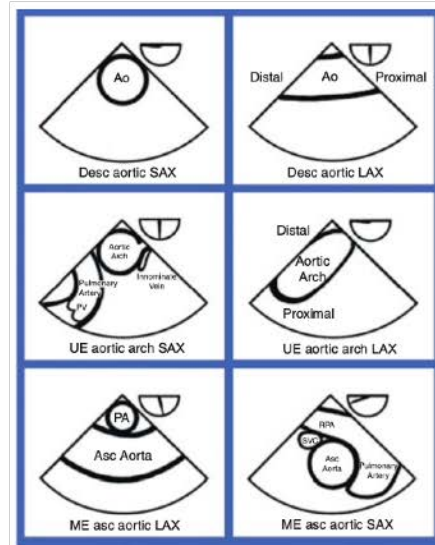
# Generalidades



# Generalidades

## PLANOS

- Esofágico Alto



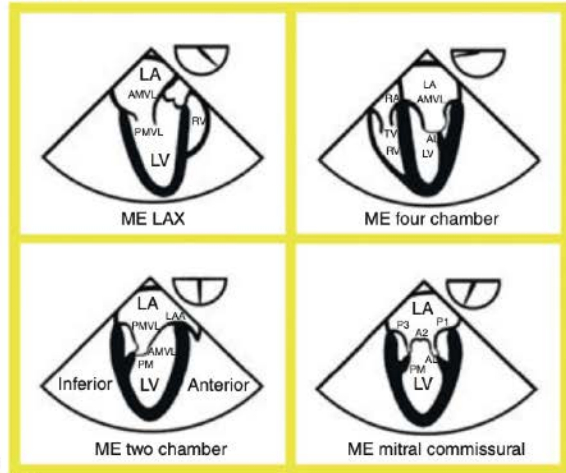
Cortesía  
Perioperative Two-Dimensional  
Transesophageal Echocardiography  
Annette Vegas U. Toronto



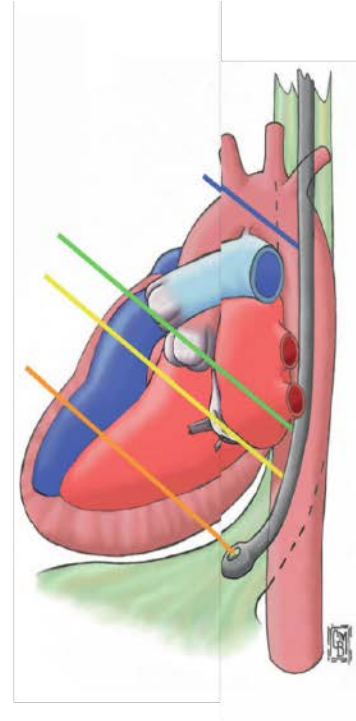
# Generalidades

## PLANOS

- Medio Esofágico



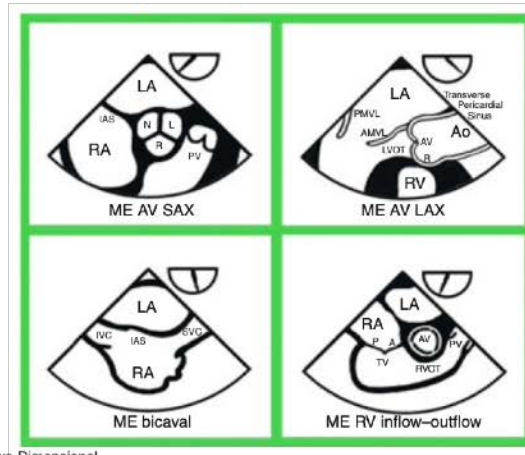
Cortesía  
Perioperative Two-Dimensional  
Transesophageal Echocardiography  
Annette Vegas U. Toronto



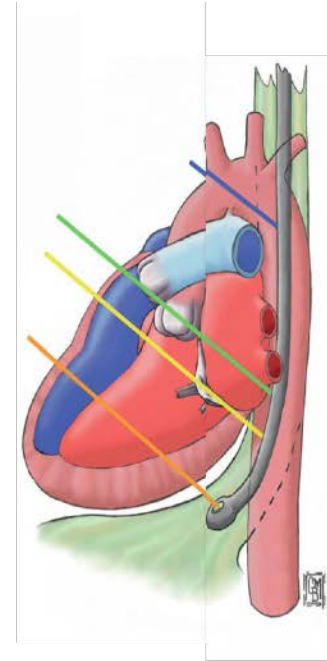
# Generalidades

## PLANOS

- Medio esofágicos complementarios



Cortesía  
Perioperative Two-Dimensional  
Transesophageal Echocardiography  
Annette Vegas U. Toronto



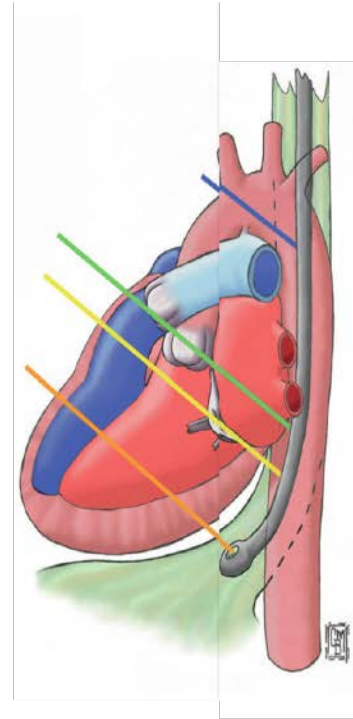
# Generalidades

## PLANOS

- Transgástrico

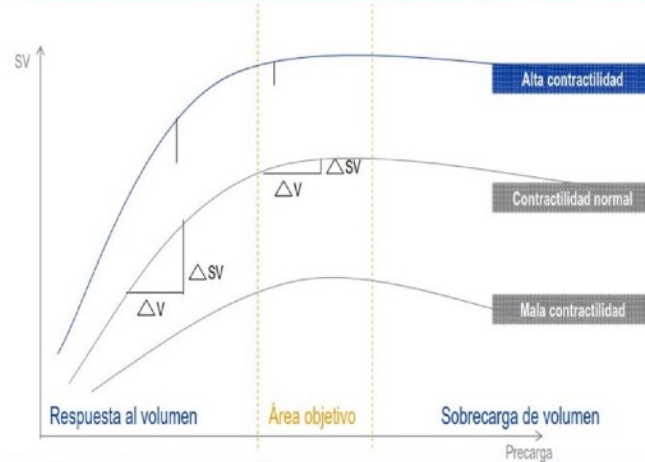


Cortesía  
Perioperative Two-Dimensional  
Transesophageal Echocardiography  
Annette Vegas U. Toronto



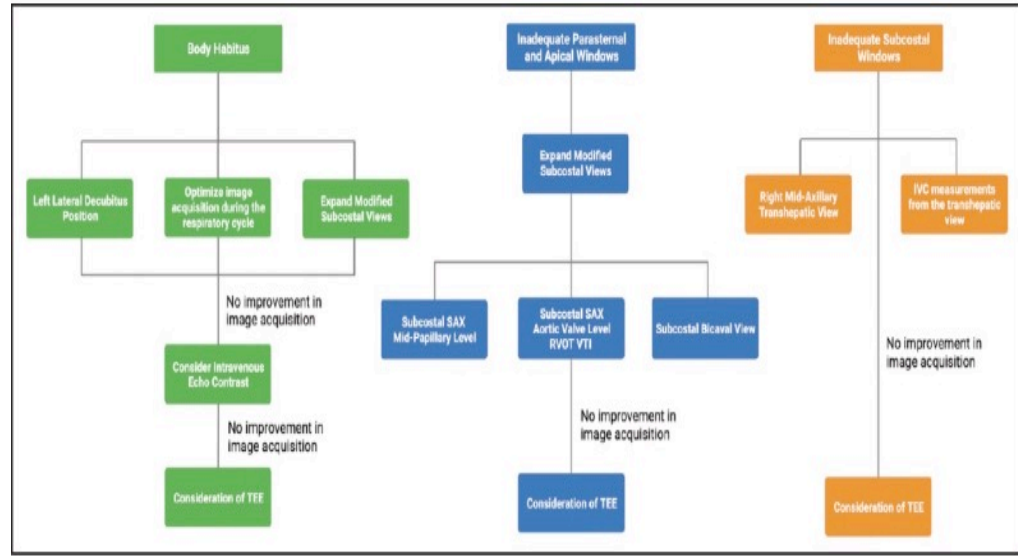
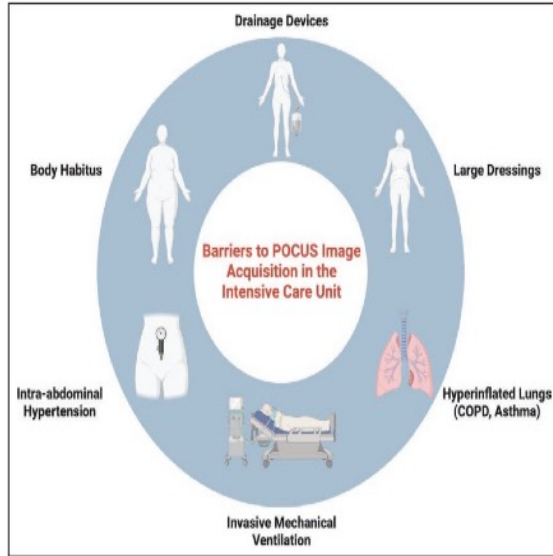
# Generalidades

## Precarga, GC y Ley de Frank - Starling



Para optimizar el gasto cardiaco se debe medir y conocer la precarga

# ETE: utilización en la práctica clínica



Grotberg JC, McDonald RK, Co IN. Point-of-Care Echocardiography in the Difficult-to-Image Patient in the ICU: A Narrative Review. Crit Care Explor. 2024 Jan 11;6(1):e1035.

# ETE: utilización en la práctica clínica

## **Masas ocupantes/trombos auriculares**

- Coágulo en el apéndice de la aurícula izquierda
- Contraste espontáneo en el apéndice de la aurícula izquierda
- Coágulo en el cuerpo de la aurícula izquierda
- Trombo en la aurícula derecha
- Masa ocupante/trombo sobre el cable de un marcapasos transitorio o el cable de un marcapasos definitivo

## **Válvula mitral**

- Mecanismo exacto de la regurgitación mitral
- Estimación refinada de la conveniencia de una valvulotomía en la estenosis mitral grave
- Caracterización de los jets excéntricos
- Funcionamiento de la prótesis valvular

## **Aorta**

- Detección / caracterización de una disección
- Detección de un ateroma

## **Traumatismo aórtico / disección**

### **Cámaras**

- Refinamiento de las características de un foramen oval permeable menor

### **Monitorización en línea**

- Tamaño y función del ventrículo izquierdo durante la cirugía
- Monitorización de procedimientos de intervención
  - Septostomía auricular
  - Valvuloplastia con balón
- Intervenciones en la vena pulmonar o la aurícula izquierda

### **Endocarditis**

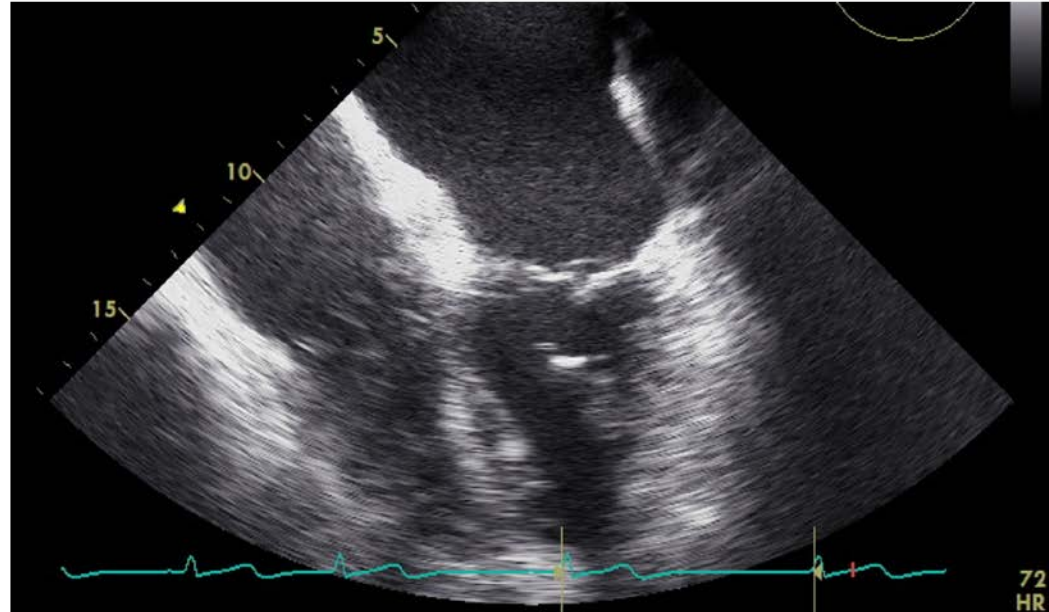
- Detección de abscesos aórticos
- Identificación de vegetaciones pequeñas

# ETE: utilización en la práctica clínica

Standard exam views	Focused exam views
Midesophageal AV short-axis (rotation: 30°-45°)	Midesophageal 4-chamber (rotation: 0°)
Midesophageal AV long-axis (rotation: 120°-135°)	Midesophageal AV long-axis (rotation: 120°-135°)
Midesophageal bicaval (rotation: 0° and 90°)	Midesophageal bicaval (rotation: 0° and 90°)
SVC M mode (rotation: 90°)	Transgastric midpapillary short-axis (rotation: 0°)
Midesophageal 4-chamber (rotation: 0°)	
Midesophageal long-axis (rotation: 90-120°)	
Transgastric midpapillary short-axis (rotation: 0°)	
Transgastric long-axis (rotation: 120°)	
Midesophageal ascending aorta short-axis (rotation: 0°)	
Thoracic aorta (rotation 0-90°)	

# ETE: utilización en la práctica clínica

ME  
4 CÁMARAS

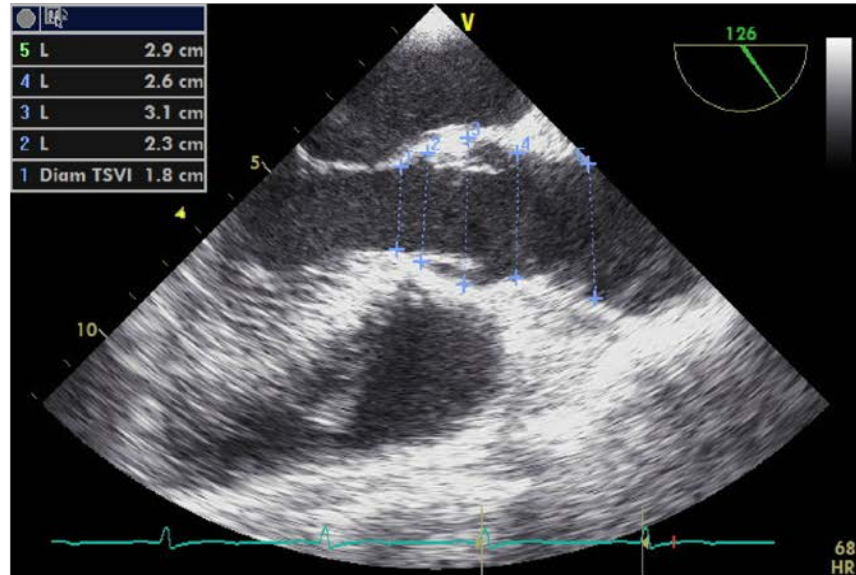




# ETE: utilización en la práctica clínica

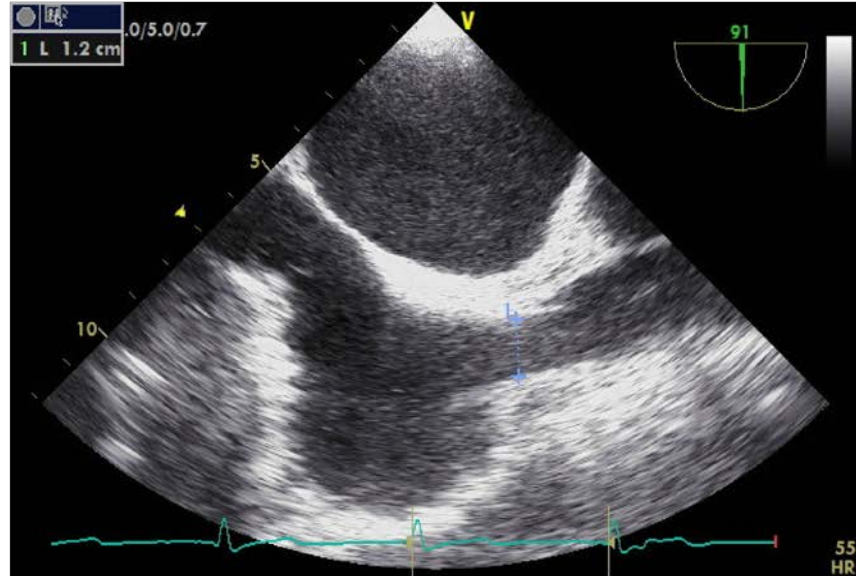
ME

PLANO LARGO



# ETE: utilización en la práctica clínica

## PLANO BICAVA



# ETE: utilización en la práctica clínica

PLANO  
TRANSGÁSTRICO

NIVEL M.  
PAPILARES



# ETE perioperatorio

## Preoperatoria

- ✓ Pacientes con alto riesgo cardiovascular.
- ✓ Sospecha de inestabilidad hemodinámica intraoperatoria.
- ✓ Procedimientos especiales. (TEVAR)
- ✓ Trauma abdominal y/o torácico severo.
- ✓ Disección aórtica.



# ETE perioperatorio

## Intraoperatoria y Postoperatoria

- ✓ Hipotension y/o hipoxemia persistentes inexplicadas.
- ✓ Bajo gasto cardiaco o insuficiencia cardiaca.
- ✓ Requerimientos elevados de DVA.
- ✓ Isquemia miocárdica.
- ✓ Parada cardiorrespiratoria.

Review > [Can J Anaesth.](#) 2018 Apr;65(4):381-398. doi: 10.1007/s12630-017-1017-7.  
Epub 2017 Nov 17.

**Perioperative transesophageal echocardiography for non-cardiac surgery**

Ashraf Fayed <sup>1</sup>, Sasha K Shillcutt <sup>2</sup>

Affiliations + expand

PMID: 29150779 PMCID: [PMC6071868](#) DOI: [10.1007/s12630-017-1017-7](#)

# ETE perioperatorio



**Debe ser realizado por personal  
entrenado, experto y certificado!!!**

## 3.14 When should intraoperative echocardiography be performed?

### Consensus recommendations

- Echocardiography should be performed in patients with haemodynamic instability not responding to initial treatment, especially when the cause of haemodynamic instability is unclear.
- Echocardiography may be considered to guide haemodynamic therapy.
- Echocardiography images and results should be saved in the patient's medical records.

# ETE perioperatorio


Review

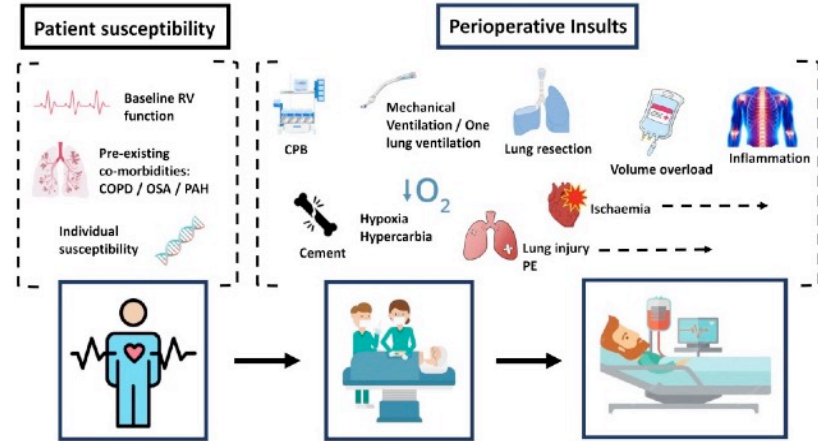
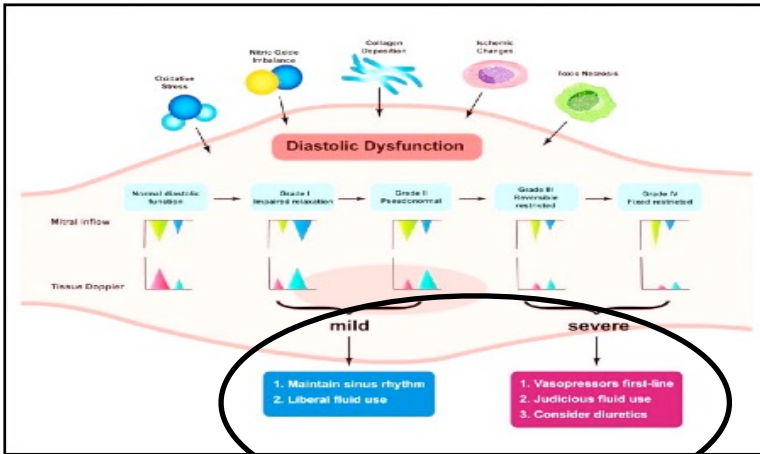
## Managing Diastolic Dysfunction Perioperatively

Theodore J. Cios, MD, MPH, FASA, FASE<sup>1</sup>,  
 John C. Klick, MD, FCCP, FASE, FCCM<sup>2</sup>, and  
 S. Michael Roberts, DO, FASE<sup>1</sup>

Seminars in Cardiothoracic and  
 Vascular Anesthesia  
 2023, Vol. 27(1) 42-50  
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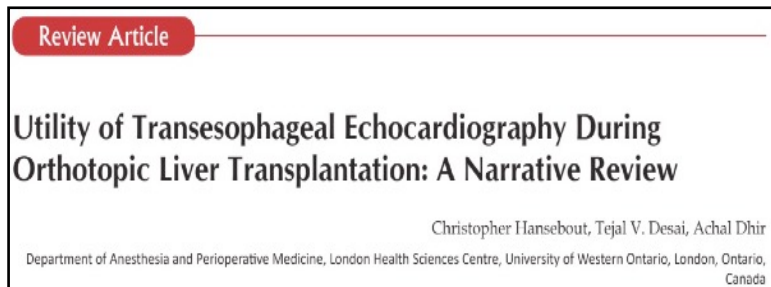




**Incidencia: 4-24%**

**Hazzard ratio: 1,78-3,58**

# ETE perioperatorio



- ✓ Desde los 80s se utiliza ETE para OLT.
- ✓ Encuesta en USA (2008) hasta en el 86% de los casos se realizó ETE y solo el 12% de los operadores estaban certificados.
- ✓ En 2018: miembros con certificado avanzado (54%) y básico (64%) de los hospitales.



- ✓ **Fase preanhepática:** función cardíaca basal (incluyendo GC), volemia, derrames y correcta posición de catéteres.
- ✓ **Fase anhepática:** volemia, resistencias vasculares y contractilidad miocárdica.
- ✓ **Fase neohepática:** síndrome de reperfusión, posibles embolismos aéreos y disfunción diastólica.



# ETE perioperatorio

Review > Clin Transplant. 2022 Oct;36(10):e14643. doi: 10.1111/ctr.14643.

## What is the optimal anesthetic monitoring regarding immediate and short-term outcomes after liver transplantation?—A systematic review of the literature and expert panel recommendations

Thomas M A Fernandez <sup>1, 2</sup>, Nick Schofield <sup>3</sup>, Claus G Krenn <sup>4</sup>, Nicole Rizkalla <sup>5</sup>, Michael Spiro <sup>3, 6</sup>, Dimitri Aristotle Raptis <sup>6, 7</sup>, Andre M De Wolf <sup>8</sup>, William T Merritt <sup>5, 9</sup>; ERAS4OLT.org Working Group <sup>1</sup>

Collaborators, Affiliations + expand

PMID: 35262975 PMCID: [PMCID: PMC10077907](https://pubmed.ncbi.nlm.nih.gov/35262975/) DOI: [10.1111/ctr.14643](https://doi.org/10.1111/ctr.14643)

- ✓ 16 estudios de baja calidad.
- ✓ ETE herramienta diagnostica efectiva.
- ✓ ETE se puede utilizar en varices esofágicas tratadas.

(Quality of Evidence Low, Grade of Recommendation Strong)

Abbreviated TEE protocol adapted for liver transplantation <sup>40</sup>	
Diagnosis	OLT TEE protocol (five views)
LV or RV dysfunction	Mid-esophageal 4-Chamber
Hypovolemia	
Tamponade	
SAM/LV outflow tract obstruction	Mid-esophageal LV Long-Axis
Patent Foramen Ovale	Mid-esophageal Bicaval
Pulmonary Embolism	
RV Dysfunction	Mid-esophageal RV inflow/outflow
Intracardiac Thrombus	
Pulmonary Embolism	
Hepatic Vein Stenosis	Hepatic Vein

# ETE perioperatorio



- ✓ ETE para correcta colocación de catéter de ECMO.
- ✓ ETE para evaluación hemodinámica.
- ✓ **ETE para evaluación de venas y arterias pulmonares.**



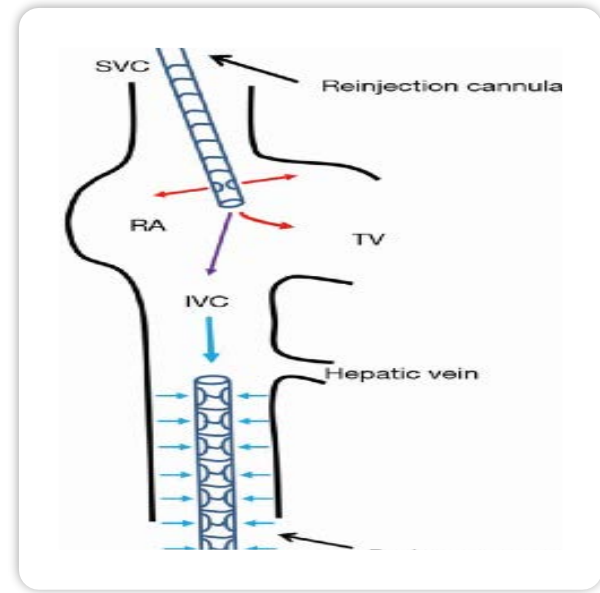
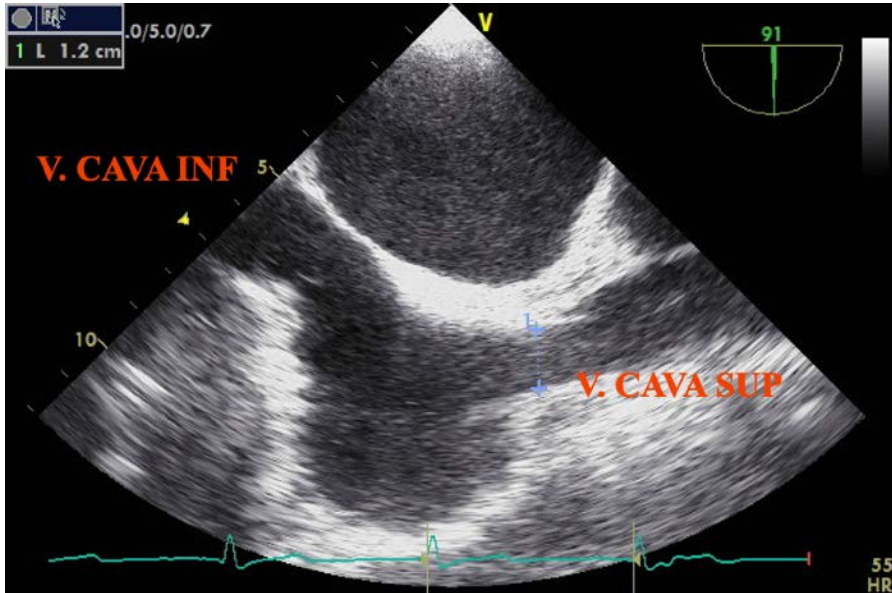
- ✓ 41 estudios, 2022.
- ✓ ETE intraoperatorio para guiar el reposicionamiento mediastinal, mediante prótesis.

# ETE perioperatorio

ETE esencial para comprobar correcta posición de la cánula!!!



# ETE perioperatorio



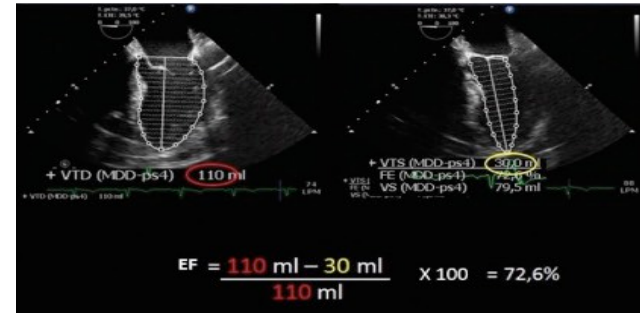
# ETE perioperatorio

Anesth Pain Med. 2023 June; 13(3):e136524. <https://doi.org/10.5812/aapm-136524>  
Published online 2023 June 14. Review Article



Veno-venous Extracorporeal Membrane Oxygenation: Anesthetic Considerations in Clinical Practice

Kimberly L. Skidmore <sup>1</sup>, Alireza Rajabi <sup>2, \*\*</sup>, Angela Nguyen <sup>3</sup>, Farnad Imani <sup>4</sup> and Alan D. Kaye <sup>1</sup>



- ✓ ETE util para determinar el correcto llenado del VI, así como la contractilidad.

# ETE perioperatorio

## Preoperatorio

- ✓ Función sistólica del ventrículo derecho.
- ✓ Regurgitación tricúspidea.

## Intraoperatorio

- ✓ Estatus cardíaco y presiones pulmonares.
- ✓ Llenado del VI y posición de la cánula del dispositivo.
- ✓ Adecuada des-aireación del VI.
- ✓ Exclusión de regurgitación aórtica.

Review > [Ann Transl Med.](#) 2020 Jul;8(13):830. doi: 10.21037/atm-20-2527.

## Perioperative management of patients with undergoing durable mechanical circulatory support

[Nikolai Hulde](#)<sup>1</sup>, [Andreas Koster](#)<sup>1</sup>, [Vera von Dossow](#)<sup>1</sup>

Affiliations + expand

PMID: 32793675 PMID: [PMC7396234](#) DOI: [10.21037/atm-20-2527](#)

**Evaluación dinámica!!!**

# ETE perioperatorio

Current Anesthesiology Reports (2022) 12:210–216  
<https://doi.org/10.1007/s40140-022-00526-0>

ANESTHESIA FOR TRAUMA (TE GRISSOM, SECTION EDITOR)



## Is There a Role for Transesophageal Echocardiography in the Perioperative Trauma Patient?

Laura Girón-Arango<sup>1,2</sup> · Pablo Pérez D'Empaire<sup>3</sup>

- ✓ Shock hemorrágico.
- ✓ Trauma torácico.
- ✓ Grandes quemados.
- ✓ PCR.

TEE Views		Clinical Application
Mid-esophageal 4 chamber 0–10°		LV/RV function, wall motion abnormalities, pericardium
Mid-esophageal long axis 120–140°		LV function, wall motion abnormalities, pericardium, CPR quality
Trans-gastric short axis 0–20°		LV function and size, pericardium
Mid esophageal bicaval 90–110°		Procedure guidance (central venous access), volume assessment
Descending and ascending aorta long and short axis 0–90°		Aortic injuries

# ETE fuera de quirófano

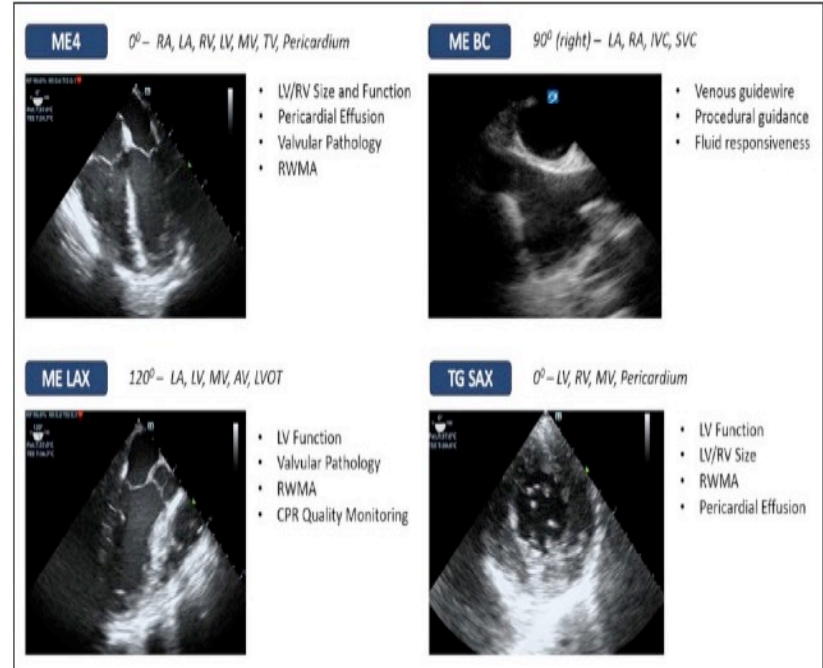
1. Paciente crítico.
2. Endocarditis infecciosa.
3. Disección aórtica.
4. Enfermedad cerebrovascular.
5. Previo a cardioversión eléctrica.
6. Parada cardiorrespiratoria.
7. Valoración de Donantes



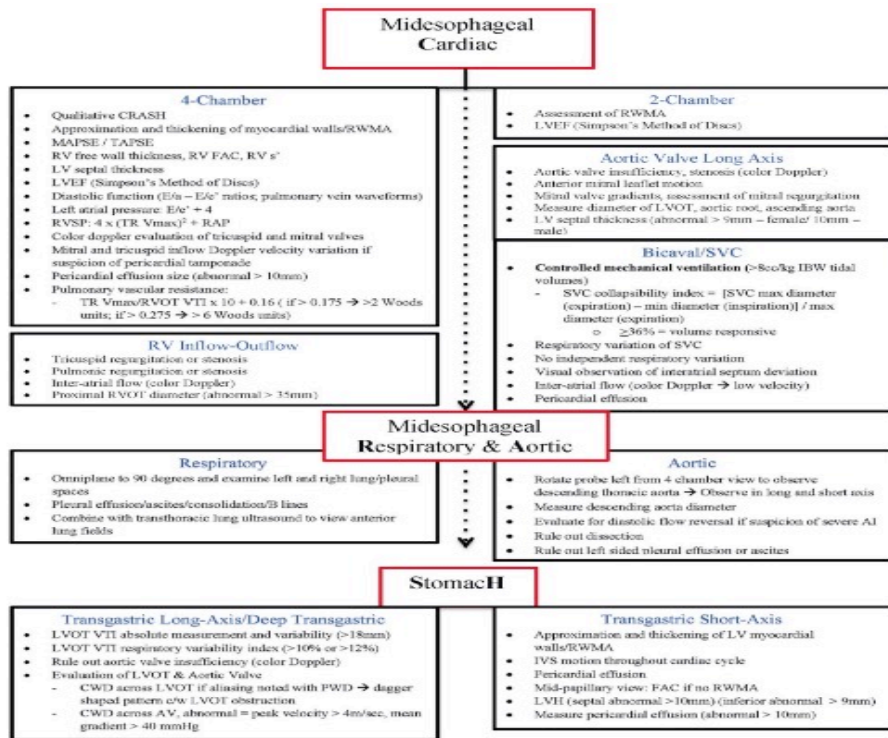
# Paciente crítico



- ✓ 108 estudios con más de 6700 pacientes.
- ✓ ETE logra un cambio en el diagnóstico en el 52%-78% de los casos.
- ✓ ETE logra un cambio en el manejo en el 32%-79% de los casos.



# Paciente crítico



Review > Semin Ultrasound CT MR. 2024 Feb;45(1):74–83. doi: 10.1053/j.sult.2023.12.008. Epub 2023 Dec 6.

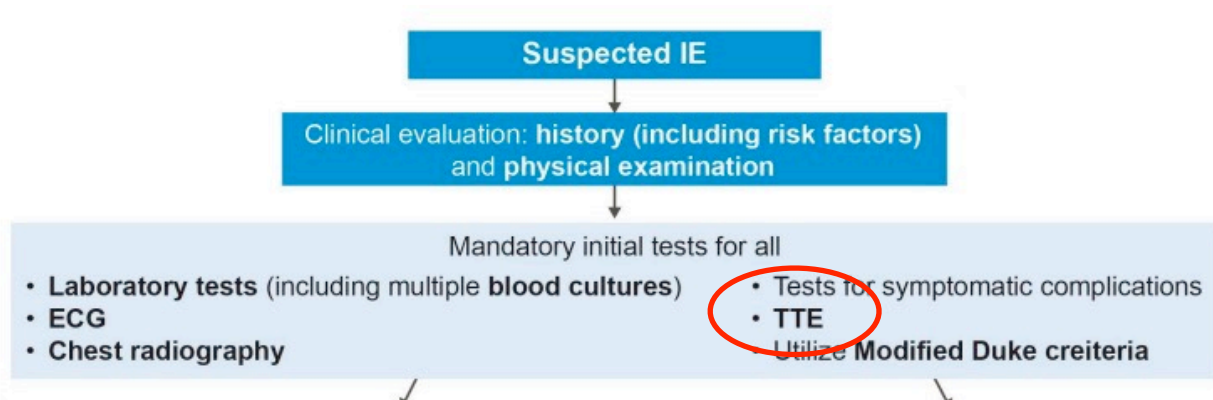
## An Echocardiographic Approach for the Management of Shock: The Subcostal to Apical, Respiratory to Parasternal-Cardiac to Respiratory, Aortic to Stomach Protocol

Sara Nikravan <sup>1</sup>, Nibras Bughrara <sup>2</sup>, John Klick <sup>3</sup>, Michael J Lanspa <sup>4</sup>, Lisa Rapoport <sup>5</sup>, José Díaz-Gómez <sup>6</sup>

## Protocolo CRASH

- ✓ Protocolo para definir fenotipos de shock.
- ✓ Alternativa ETE al Protocolo STARS.
- ✓ Evalúa función cardíaca, respuesta a fluidos y tolerancia a los mismos.
- ✓ Necesita evaluación ecográfica pulmonar complementaria.

# Endocarditis infecciosa



Review > Life (Basel). 2023 Feb 25;13(3):639. doi: 10.3390/life13030639.

### Contemporary Review of Multi-Modality Cardiac Imaging Evaluation of Infective Endocarditis

Aro Daniela Arockiam <sup>1</sup>, Ankit Agrawal <sup>1</sup>, Joseph El Dahdah <sup>1</sup>, Bianca Honnekeri <sup>1</sup>, Tahir S Kafil <sup>1</sup>, Saleem Halablab <sup>1</sup>, Brian P Griffin <sup>1</sup>, Tom Kai Ming Wang <sup>1</sup>

# Endocarditis infecciosa

Review > *Curr Probl Cardiol.* 2024 Jan;49(1 Pt C):102151. doi: 10.1016/j.cpcardiol.2023.102151. Epub 2023 Oct 20.

**Echocardiographic assessment in infective endocarditis: Transthoracic or transesophageal echocardiography, or both?: Echocardiography in endocarditis**

Håvard Dingen <sup>1</sup>, Stig Urheim <sup>2</sup>, Stina Jordal <sup>3</sup>, Sahral Saeed <sup>4</sup>

✓ Aún con ETT positivo se recomienda ETE para descarte de complicaciones locales.

✓ Sensibilidad en diagnóstico de (EI) superior en ETE: válvula nativa 96% contra 70%, válvula protésica 92% contra 50%.

Review > *Pak J Med Sci.* 2022 Mar-Apr;38(3Part-I):736-742. doi: 10.12669/pjms.38.3.5139.

**Comparing the diagnostic accuracy of computed tomography vs transoesophageal echocardiography for infective endocarditis - A meta-analysis**

Liqin Jing <sup>1</sup>, Yanchun Song <sup>2</sup>

Characteristics	CCT	TEE	P value
<b>Vegetation</b>			
Sensitivity	0.80 (0.69 to 0.82) N=12	0.91 (0.84 to 0.97) N=11	0.019
Specificity	0.80 (0.71 to 0.90) N=8	0.80 (0.62 to 0.94) N=7	1
<b>Peri-annular complications (abscesses and pseudoaneurysms)</b>			
Sensitivity	0.88 (0.82 to 0.94) N=11	0.74 (0.65 to 0.84) N=10	0.015
Specificity	0.86 (0.79 to 0.93) N=5	0.89 (0.80 to 0.97) N=5	0.59
<b>Leaflet Perforation</b>			
Sensitivity	0.46 (0.24 to 0.68)	0.76 (0.70 to 0.81)	0.010
Specificity	-	0.88 (0.76 to 1) N=3	-
<b>Fistula</b>			
Sensitivity	0.79 (0.32 to 1) N=2	0.91 (0.73 to 1) N=2	0.52
Specificity	0.98 (0.96 to 1) N=2	0.98 (0.97 to 1) N=2	1

# Endocarditis infecciosa

## 2023 ESC Guidelines for the management of endocarditis

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>A. Diagnosis</b>		
TOE is recommended in all patients with clinical suspicion of IE and a negative or non-diagnostic TTE. <sup>166,178,179</sup>	<b>I</b>	<b>B</b>
TOE is recommended in patients with clinical suspicion of IE, when a prosthetic heart valve or an intracardiac device is present. <sup>166,178,179</sup>	<b>I</b>	<b>B</b>
TOE is recommended in patients with suspected IE, even in cases with positive TTE, except in isolated right-sided native valve IE with good quality TTE examination and unequivocal echocardiographic findings. <sup>165,166,179</sup>	<b>I</b>	<b>C</b>
<b>B. Follow-up under medical therapy</b>		
TOE is recommended when patient is stable before switching from intravenous to oral antibiotic therapy. <sup>43,180</sup>	<b>I</b>	<b>B</b>

# Diseció aórtica

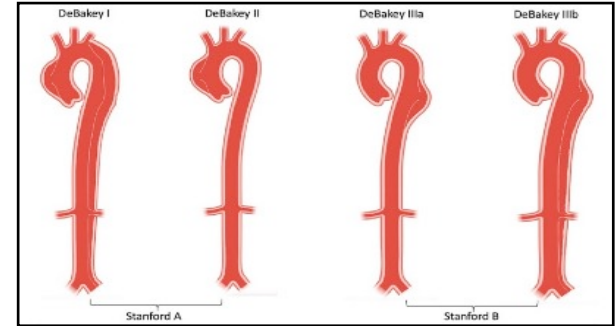
Review > Front Cardiovasc Med. 2024 Jan 10;10:1283703. doi: 10.3389/fcvm.2023.1283703.  
 eCollection 2023.

## Comparison between transthoracic echocardiography and transoesophageal echocardiography in the diagnosis of acute aortic dissection from an emergency perspective. A systematic review and meta-analysis

Hany A Zaki <sup>1</sup>, Bilal Albaroudi <sup>1</sup>, Eman E Shaban <sup>2</sup>, Baha Hamdi Alkahlout <sup>1</sup>, Yavuz Yigit <sup>1,3</sup>,  
 Wael Elnabawy <sup>1</sup>, Kaleem Basharat <sup>1</sup>, Nood Dhafi Almarri <sup>1</sup>, Aftab Mohammad Azad <sup>4</sup>

Affiliations + expand

PMID: 38268852 PMCID: PMC10806094 DOI: 10.3389/fcvm.2023.1283703

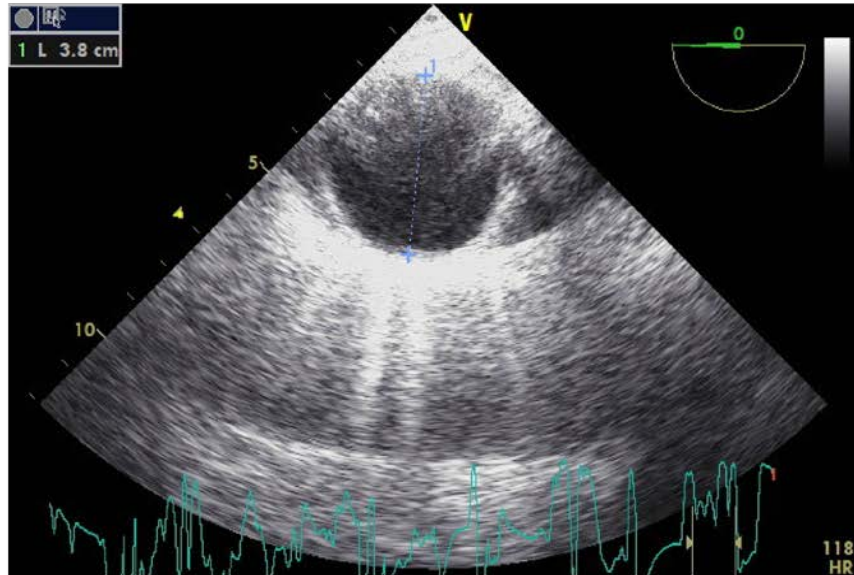


- ✓ 11 estudios con más de 3000 pacientes en total.
- ✓ ETE es mas favorable que ETT para el diagnóstico de AAD.
- ✓ ETT contrastada ofrece similares resultados que ETE.

Index test	Number of studies	Event rate	95% CI
<b>TTE</b>			
False negatives	4	0.286	0.087-0.629
False positives	4	0.186	0.051-0.492
<b>TOE</b>			
False negatives	3	0.024	0.11-0.049
False positives	4	0.043	0.016-0.111

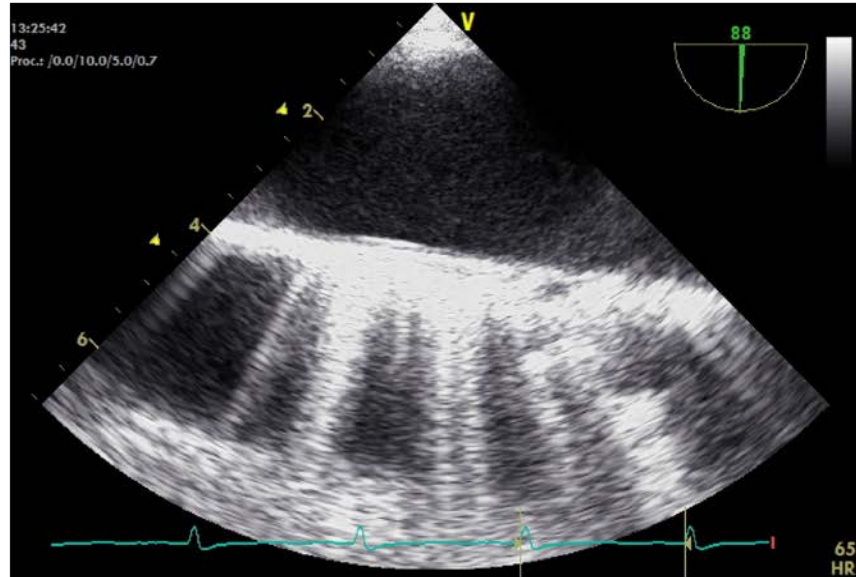
# Dissecció aòrtica

AORTA TORACICA EJE CORTO



# Dissecció aòrtica

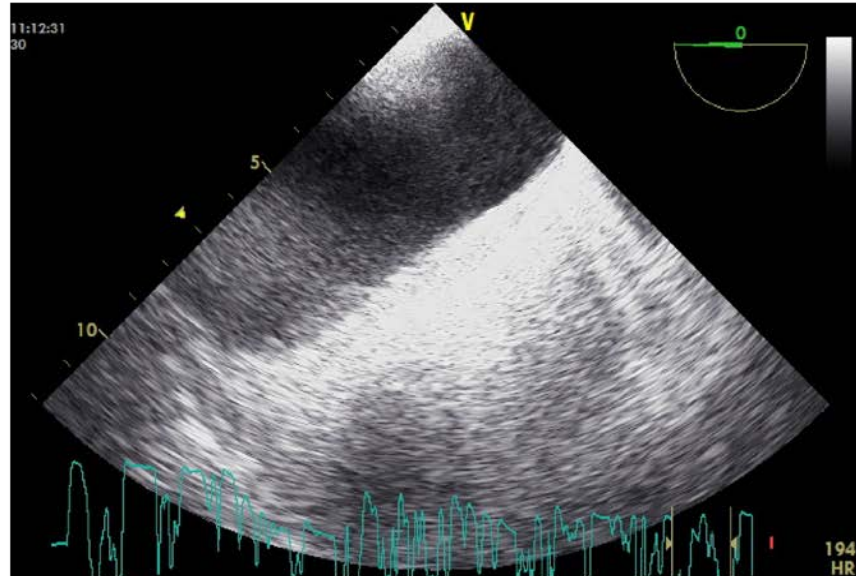
AORTA TORACICA EJE LARGO





# Dissecció aòrtica

## CAYADO AORTICO




# Enfermedad cerebrovascular

Journal of Neurology (2020) 267:1793–1801  
<https://doi.org/10.1007/s00415-020-09766-8>

ORIGINAL COMMUNICATION



**CT angiography vs echocardiography for detection of cardiac thrombi in ischemic stroke: a systematic review and meta-analysis**

Nina-Suzanne Groeneveld<sup>1</sup> · Valeria Guglielmi<sup>1</sup> · Mariska M. G. Leeflang<sup>2</sup> · S. Matthijs Boekholdt<sup>3</sup> · R. Nils Planken<sup>4</sup> · Yvo B. W. E. M. Roos<sup>1</sup> · Charles B. L. M. Majoie<sup>4</sup> · Jonathan M. Coutinho<sup>1</sup> 

- ✓ 14 estudios con más de 1500 pacientes.
- ✓ **CTA fue superior a ETE en la identificación de trombo intracavitario.**
- ✓ Estudio muy heterogéneo.

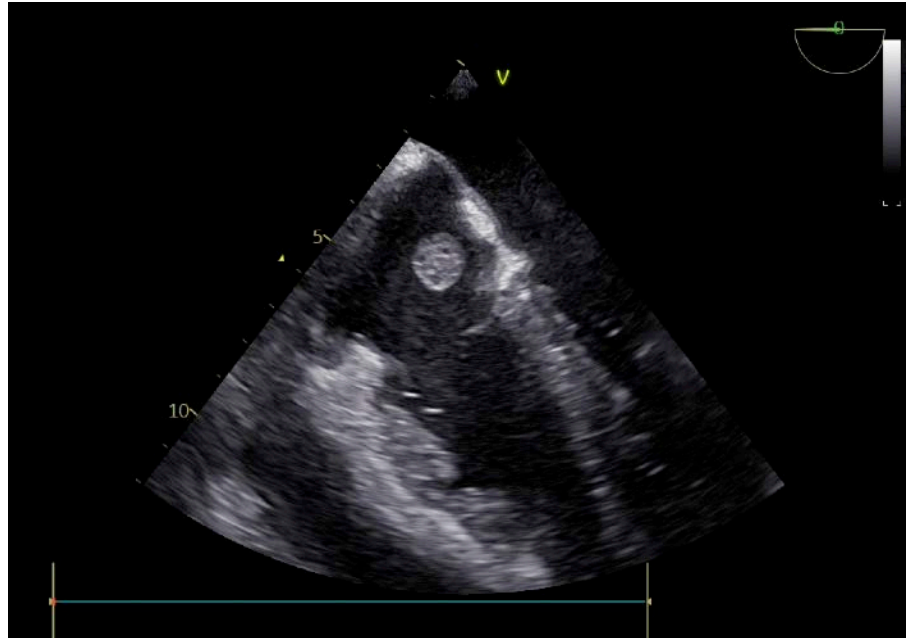
Front Neurol. 2021 Jul 30;12:699838. doi: 10.3389/fneur.2021.699838. eCollection 2021.

**Cardiovascular MRI Compared to Echocardiography to Identify Cardioaortic Sources of Ischemic Stroke: A Systematic Review and Meta-Analysis**

Thomas R Meinel<sup>1</sup>, Angela Eggimann<sup>1</sup>, Kristina Brignoli<sup>1</sup>, Kerstin Wustmann<sup>2</sup>, Eric Buffle<sup>2</sup>, Felix G Meinel<sup>3</sup>, Jan F Scheitz<sup>4</sup> <sup>5</sup> <sup>6</sup>, Christian H Nolte<sup>4</sup> <sup>5</sup> <sup>6</sup>, Christoph Gräni<sup>2</sup>, Urs Fischer<sup>1</sup>, Johannes Kaesmacher<sup>7</sup>, David J Seiffge<sup>1</sup>, Christian Seiler<sup>2</sup>, Simon Jung<sup>1</sup>

- ✓ 27 estudios con más de 2500 pacientes.
- ✓ **CV MRI y ETE tienen similar capacidad diagnóstica.**
- ✓ ETE mejor para de foramen oval persistente.

# Enfermedad cerebrovascular



# Previo a cardioversión eléctrica

Review > Cureus. 2023 May 30;15(5):e39702. doi: 10.7759/cureus.39702.

eCollection 2023 May.

## Transesophageal Echocardiogram Before Cardioversion in Atrial Fibrillation Patients

Victor O Adedara <sup>1</sup>, Vagisha Sharma <sup>2</sup>, Hassan Nawaz <sup>3</sup>, Jonathan Reyes-Rivera <sup>4</sup>, Sumera Afzal-Tohid <sup>5</sup>, Patel T Pareshbhai <sup>6</sup>, Sri P Boyapati <sup>7</sup>, Alireza Sharafshah <sup>8</sup>

- ✓ 20 estudios.
- ✓ ETE con contraste mejora el diagnóstico de trombo auricular izquierda (AI).
- ✓ La CVE guiada por ETE es cada vez más utilizada por sus beneficios.

Review > Cureus. 2023 Nov 2;15(11):e48149. doi: 10.7759/cureus.48149.

eCollection 2023 Nov.

## Effectiveness of Transesophageal Echocardiography in Preventing Thromboembolic Complications Before Cardioversion: A Narrative Review

Prateek Jain <sup>1</sup>, Vishwesh Patel <sup>2</sup>, Yashaswi Patel <sup>3</sup>, Jawairiya Rasool <sup>4</sup>, Siddharth Kamal Gandhi <sup>2</sup>, Priyansh Patel <sup>5</sup>

- ✓ 36 estudios.
- ✓ ETE juega un papel vital en la prevención de tromboembolismo durante la CV de la FA.
- ✓ ETE alta sensibilidad en detección de trombo intracardiaco, en especial en la orejuela de AI.

# Parada cardiorrespiratoria



## HIGHLIGHTS




- Focused TEE overcomes some of the difficulties of performing surface echocardiography during cardiac arrest resuscitation.
- TEE can provide reliable, high-quality cardiac images regardless of any patient-related or external factors.
- Continuous TEE images during cardiac arrest allow feedback on the quality of CPR.
- Like TTE, TEE allows identification of reversible pathologies and can provide prognostic information.

Focused TEE View	Cardiac Structures	Applications
ME4C	All cardiac chambers Pericardium LV/RV walls Mitral and tricuspid valves	Rule out tamponade Assess cardiac activity Identify intracardiac thrombus Assess LV/RV size and function Detect fine VF
MELAX	LV, LA, and RV chambers LV outflow tract Aortic root Mitral and aortic valves	Assess ascending aorta for dissection/injury Determine AMC during CPR
TGSAX	All LV walls and septum	Assess cardiac activity LV/RV size and function, cardiac filling status, presence of tamponade
Bicaval	IVC, RA, and SVC	Procedural guidance (ECMO, CVC) Volume responsiveness in post-arrest, intracardiac thrombus
DTA LAX	Descending aorta	Procedural guidance (ECMO)

# Parada cardiorrespiratoria

Journal of  
*Clinical Medicine* MDPI

Review  
**Physiology-Guided Resuscitation: Monitoring and Augmenting Perfusion during Cardiopulmonary Arrest**

Samuel Bernard , Raymond A. Pashun , Bhavya Varma and Eugene Yuriditsky 

- ✓ ETE menores pausas para control del pulso.
- ✓ ETE identifica mejor causas reversibles de PCR.
- ✓ ETE ideal para determinar el área de máxima compresión.

*diagnostics* MDPI

Review  
**Echocardiography in Cardiac Arrest: Incremental Diagnostic and Prognostic Role during Resuscitation Care**

Alfredo Mauriello <sup>1,2</sup> , Gemma Marrasso <sup>2</sup>, Gerardo Elia Del Vecchio <sup>1,2</sup>, Antonia Ascrizzi <sup>1</sup>, Anna Selvaggia Roma <sup>1</sup>, Adriana Carrera <sup>3</sup>, Francesco Sabatella <sup>2</sup>, Renato Gioia <sup>2</sup>, Alfonso Desiderio <sup>2</sup>, Vincenzo Russo <sup>1</sup>  and Antonello D'Andrea <sup>2,\*</sup> 

- ✓ ETE diagnostica en el 78% de los casos.
- ✓ ETE influye en la decisión terapéutica en el 67% de los casos.
- ✓ ETE útil en los cuidados post-resucitación.

West J Emerg Med. 2024 Mar;25(2):166-174. doi: 10.5811/westjem.18440.


**Performance of Intra-arrest Echocardiography: A Systematic Review**

Yi-Ju Ho <sup>1</sup>, Chih-Wei Sung <sup>1 2</sup>, Yi-Chu Chen <sup>3</sup>, Wan-Ching Lien <sup>1 4</sup>, Wei-Tien Chang <sup>1 4</sup>, Chien-Hua Huang <sup>1 4</sup>

- ✓ 27 estudios, 16 de ETE con 568 pacientes.
- ✓ ETE identifica mejor causas de PCR que ETT.
- ✓ ETT identifica mejor signos de ROSC.

# Complicaciones

PROCD (PBM: UNIV MED CENT)  
 2023;36(6):729–733  
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<https://doi.org/10.1000/108983780.2023.2243381>

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## Transesophageal echocardiography–associated gastrointestinal injuries: systematic review and pooled rates of gastrointestinal injuries

Manesh Kumar Gangwani, MD<sup>a</sup>, Abeer Aziz, MD<sup>b</sup>, Dushyant Singh Dahiya, MD<sup>b</sup>, Rehmat Ullah Awan, MD<sup>d</sup>, Muhammad Aziz, MD<sup>a</sup>, Anooja Rani<sup>f</sup>, Amir Humza Sohail, MD<sup>g</sup>, Hazim Hakmi, MD<sup>g</sup>, Hassam Ali, MD<sup>h</sup>, Umar Hayat, MD<sup>i</sup>, Wade Lee-Smith, MLS<sup>j</sup>, Faisal Kamal, MD<sup>a</sup>, and Sumant Inamdar, MD<sup>i</sup>

**Table 2. Comparing different patient and setting parameters affecting outcomes**

Patient cohort	Total complications
Critically ill patients	9/818 (1.1%)
Patients undergoing cardiac procedures	173/25,687 (0.67%)
Liver transplant patients	16/1177 (1.35%)
In-hospital TEE	9/818 (1.1%)
Intraoperative TEE	189/26,864 (0.7%)

TEE indicates transesophageal echocardiography.

**Table 1. Total complications and their incidence in each study**

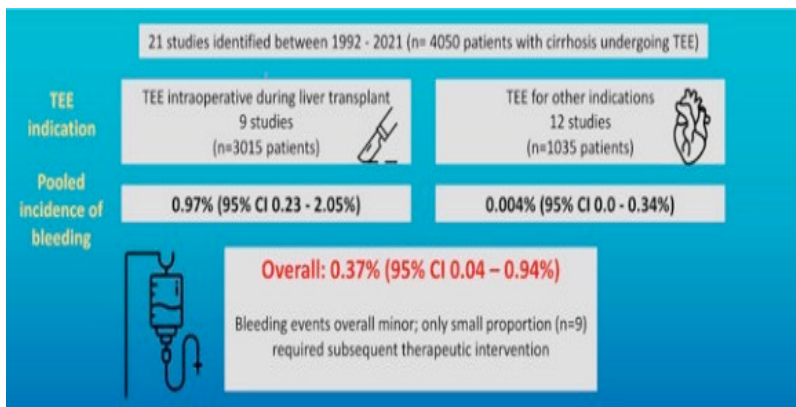
Adverse event	Total adverse events (213)	Individual adverse events
Bleeding	80 (37.6%)	80/46,196 (0.17%) (95% CI 0.1% to 0.3%, $I^2 = 75.7%$ )
Hematoma	17 (7.9%)	17/262 (6.5%) (95% CI -13.7% to 43%, $I^2 = 94.9%$ )
Lacerations	36 (16.9%)	36/30,524 (0.12%) (95% CI -0.1% to 0.5%, $I^2 = 92.3%$ )
Dysphagia/odynophagia	41 (19.2%)	41/15,274 (0.27%) (95% CI -0.1% to 0.5%, $I^2 = 89.3%$ )
Esophageal tear/perforation	20 (9.4%)	20/37,998 (0.05%) (95% CI 0.0% to 0.1%, $I^2 = 46.3%$ )
Vocal cord paralysis	10 (4.7%)	10/8096 (0.12%) (95% CI 0.1% to 0.2%, $I^2 = 0$ )
Dental injury	9 (4.2%)	9/13,225 (0.07%) (95% CI 0.0% to 0.1%, $I^2 = 69.5%$ )

# Complicaciones

Meta-Analysis > Aliment Pharmacol Ther. 2022 May;55(9):1088-1098. doi: 10.1111/apt.16860. Epub 2022 Mar 28.

**Systematic review with meta-analysis: incidence of variceal hemorrhage in patients with cirrhosis undergoing transesophageal echocardiography**

Mobolaji Odewole <sup>1, 2</sup>, Ahana Sen <sup>1, 3</sup>, Ehiamen Okorwu <sup>4</sup>, Sarah R Lieber <sup>1</sup>, Thomas G Cotter <sup>3</sup>, Anh D Nguyen <sup>5</sup>, Arjmand Mufti <sup>1</sup>, Amit G Singal <sup>1, 6</sup>, Nicole F Rich <sup>1, 6</sup>



Riesgo de sangrado post procedimiento bajo en cirróticos, siendo la la ETE segura!!!

Review > Front Cardiovasc Med. 2024 Jun 28;11:1410594. doi: 10.3389/fcvm.2024.1410594. eCollection 2024.

**Transesophageal echocardiography related complications**

Linyue Zhang <sup># 1 2 3</sup>, Yuji Xie <sup># 1 2 3</sup>, Zhaoli Ren <sup>1 2 3</sup>, Mingxing Xie <sup>1 2 3</sup>

	Severity	Prevention	Treatment	Time to resolve
Oropharyngeal				
Lip bruising	+	Use a bite guard and laryngoscope	Apply an ice pack	1-2 days
Lip laceration	++	Lubricate the probe properly	Stitches to close wound	3-5 days
Tooth defect	+	Use a bite block to keep the probe midline	Dental filling or crown	3-5 days
Loose tooth	++	Assess the oral cavity and operate gently	Periodontal therapy/dental replantation	5-7 days
Pharyngeal laceration	++	Place the probe under direct visualization	Restricted oral intake and intravenous antibiotics	3-5 days
Perforation of the hypopharynx	+++	Avoid keeping the probe in a flexed and locked position	Operative suturing or reconstruction surgery	1 month
Accidental tracheal intubation	+++	Place the probe under direct visualization	Refraining from insertion	1-2 days
Esophageal				
Odynophagia	+	Reduce unnecessary operations, freeze image when probe is not being used	Resolve on its own or with medication	3-5 days
Dysphagia	++	Reduce unnecessary operations, freeze image when probe is not being used	Medicine or esophageal dilation	3-5 days
Laceration/perforation	+++	Avoid forceful placement and manipulation of the TEE probe	Operative suturing or reconstruct surgery	3-5 weeks
Mallory-Weiss tear	+++	Refraining from insertion if resistance is met	Endoscopic hemostasis	10 days
Gastric				
Laceration/perforation	+++	Avoid forceful placement and manipulation of the TEE probe	Emergency surgery to prevent acute peritonitis	1-2 months
Hemorrhage	++/+++	Minimize depth manipulation	Observation/stanching medicine with antibiotics/ surgery is considered if bleeding is not self-limiting	1 month



# Desventajas

- ✓ Requiere entrenamiento específico.
- ✓ Observador dependiente.
- ✓ Equipo de elevado coste.
- ✓ En situaciones críticas la introducción y disposición de la sonda no siempre es posible.
- ✓ Invasivo con potencial de iatrogenia.

# Conclusiones

- ✓ La ecocardiografía a probado tener cabida en el manejo hemodinámico de los pacientes sometidos a cirugía no cardiaca. Y el ETE aporta valor adicional.
- ✓ El desarrollo de la ETE ha supuesto un cambio significativo en el adecuado proceso diagnóstico-terapéutico.
- ✓ Es interesante fomentar la formación continuada y certificada en ETE en anesthesiólogos de distintas áreas asistenciales.
- ✓ La aplicación de un protocolo ETE en cirugía NO cardiaca como en pacientes críticos (REA) , constituye una herramienta adicional util en situaciones y pacientes con comorbilidad compleja.

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