Rescue Transesophageal Echocardiography

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Rescue transesophageal echocardiography (rTEE) by definition is a focused echocardiographic examination performed during periods of unexplained hemodynamic instability or other perioperative emergencies. It not only helps identify the pathology but also aids real-time monitoring of the management response.[1]

The major clinical emergencies in which rTEE has shown its immediate benefit are those involving acute unexplained hemodynamic instability [Figure 1], refractory arrhythmias or electrocardiographic changes (ST, T wave changes), hypoxia, and cardiac arrest.[2] As the name suggests, it is not an elective or planned procedure but is initiated in the event of a clinical emergency. Hence, the quick basic views of rTEE focus on identifying life-threatening etiologies such as biventricular dysfunction, hypovolemia, cardiac

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tamponade, acute myocardial ischemia, pulmonary embolism, acute valvular lesions, dynamic left ventricular obstruction, systolic anterior motion of mitral leaflet, stress cardiomyopathy, intracardiac shunts, acute aortic syndromes, pleural effusions, and complications related to vascular access like hemothorax, vascular thrombus, and dissections. Unlike a comprehensive TEE examination, which includes 28 standard views, rTEE has a more focused, limited-view protocol to identify the pathology. The two commonly mentioned protocols are the five-view and the nine-view protocols.[3] However, each protocol modifies the standard views based on the patient's clinical signs and the type of surgery.

The standard five-view protocol includes the mid-esophageal (ME)-4-chamber view, ME Bi-caval view, ME long-axis view, right ventricular inflow-outflow view, and trans-gastric mid-papillary short-axis view.[3] Liver transplant units may add the inferior vena cava and porto-hepatic vein views to the protocol to assess graft perfusion and congestion. The modality used for left ventricular systolic function assessment is fractional area change in the mid-papillary short-axis view. For the rapid systolic function assessment, it is reasonable to use the eyeballing technique. The eyeballing technique has a good correlation with the standard Simpson's method in estimating ejection fraction, even when performed by non-cardiac anesthesiologists in an emergency setting.[4] A hyperdynamic left ventricle (exaggerated LV twist), subnormal ejection fraction, kissing papillary muscles, left ventricular-end diastolic area <10 cm^2 or end diastolic volume index <52 mL/m^2, and an inferior vena cava diameter <2 cm with >50% collapsibility indicates hypovolemia.[5] Systolic anterior motion of the anterior mitral leaflet, dynamic left ventricular outflow tract obstruction, kissing papillary muscles, but adequate left ventricular-end diastolic area point toward a drop in systemic vascular resistance, like septic shock or anaphylaxis. The trans-gastric mid-papillary short-axis view can detect significant regional wall motion abnormalities produced by ischemia of all the three coronary arteries. An enlarged right ventricle (as evidenced by longitudinal dimension >80mm, basal horizontal diameter >40mm in the mid-esophageal RV focussed view and the right ventricle forming the apex). Paradoxical movement of interventricular septum, increased tricuspid regurgitation with or without an isolated right ventricular free wall hypokinesia (Mc Connell's sign) and rarely in-transit thrombus or air in the pulmonary arteries, all point toward acute pulmonary embolism.

The rTEE is increasingly used in high-risk non-cardiac surgeries. In liver transplant surgeries, it helps identify causes of hemodynamic disturbances, ensuring prompt and targeted management strategies by identifying hypovolemia, dynamic outflow tract obstruction or drop in vascular resistance commonly occurring during the anhepatic phase and myocardial ischemia or drop in vascular resistance, reperfusion, acute right ventricular dysfunction, and valvular leaks during the reperfusion phase.[6] In the event of hypoxemia, it helps rule out pulmonary embolism, patent foramen ovale, or other

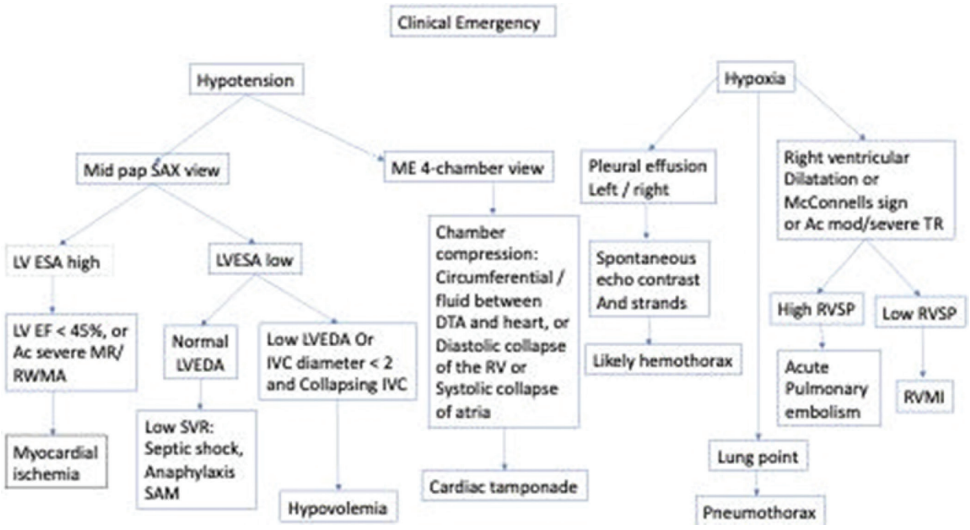

Figure 1: Algorithm - shows quick and simplified protocol for a possible diagnosis during a perioperative emergency. Mid-pap SAX: Trans-gastric mid-papillary short-axis view, LV ESA: left ventricular-end systolic area, LVEDA: left ventricular-end diastolic area, LVEF: left ventricular ejection fraction, Ac MR: acute mitral regurgitation, RWMA: regional wall motion abnormality, IVC: inferior vena cava, ME: mid-esophageal, RV: right ventricle, Ac mod/severe TR: acute moderate to severe tricuspid regurgitation, RVSP: right ventricular systolic pressure, RVMI: right ventricular myocardial ischemia

intracardiac or intrapulmonary shunts. Rescue TEE services have become integral to shock teams, ECMO teams, and emergency cardiac arrest teams.[7] When performed in the pre-cardiac arrest scenario, it aids in diagnosing the possible cause of arrest, helps abort a cardiac arrest, guides resuscitation during the arrest, identifies ROSC, and guides immediate post-ROSC management to prevent a recurrent cardiac arrest. The rTEE can also confirm pulseless electrical activity and fine ventricular fibrillations that may be confused with ROSC or asystole, respectively. It can assess the left and right sides of the heart separately. The advantage of rTEE over transthoracic imaging is that it does not interfere with chest compressions. Once a definitive airway has been established, it provides a better acoustic window, even in the presence of a rib injury-induced limited pneumothorax. Additionally, in the event of failure to achieve ROSC within 10 min, it helps in promptly choosing the type of extracorporeal support to be used. It guides the placement of the cannulas before its initiation.[8] The rTEE is also helpful in identifying lung and pleural abnormalities to some extent and assessing dependent areas of the lungs for effusion and atelectasis, which are often missed on X-ray or lung ultrasound. Additionally, it aids in identifying B-lines, hemothorax, pneumothorax, and consolidation. Transesophageal lung ultrasound (TELUS) can also assist in real-time recruitment maneuvers in the intensive care units. Given the broad range of applications of rTEE, it is time to integrate rTEE into the protocol of the shock team or the emergency response team in all hospitals.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Adelmann D, Kronish K, Ramsay MA. Anesthesia for liver transplantation. Anesthesiol Clini 2017;35:491-508.
2. Devereaux PJ, Goldman L, Cook DJ, Gilbert K, Leslie K, Guyatt GH. Perioperative cardiac events in patients undergoing non-cardiac surgery: A review of the magnitude of the problem, the pathophysiology of the events and methods to estimate and communicate risk. CMAJ 2005;173:627-34.
3. Berrio Valencia MI, Joschko A. Intraoperative transesophageal echocardiogram evaluation for liver transplantation. Korean J Anesthesiol 2019;72:385-6.
4. Raksamani K, Noirit A, Chaikittisilpa N. Comparison of visual estimation and quantitative measurement of left ventricular ejection fraction in untrained perioperative echocardiographers. BMC Anesthesiol 2023;23:106.
5. Hirabuki K, Hata N, Fukuie M, Suzuki R, Suda T, Uechi T, *et al*. Changes in left ventricular function assessed by 3D echocardiography during severe central hypovolemia in healthy humans. Echocardiography 2025;42:e70128.
6. Arcas-Bellas JJ, Siljeström R, Sánchez C, González A, García-Fernández J. Use of transesophageal echocardiography during orthotopic liver transplantation: Simplifying the procedure. Transplant Direct 2024;10:e1564.
7. Rosseel T, Van Puyvelde T, Voigt JU, Dauwe D, Meyns B, Dewolf P, *et al*. How to perform focused transoesophageal echocardiography during extracorporeal cardiopulmonary resuscitation? Eur Heart J Cardiovasc Imaging 2023;24:12-4.
8. Banfi C, Pozzi M, Siegenthaler N, Brunner ME, Tassaux D, Obadia JF, *et al*. Veno-venous extracorporeal membrane oxygenation: Cannulation techniques. J Thorac Dis 2016;8:3762-73.