

## Transesophageal Echocardiography for Cardiac Surgery Patients With Prior Esophagectomies: Insights From a 15-Year Institutional Experience



Transesophageal echocardiography (TEE) has become a routine diagnostic and monitoring technique during cardiac surgery. However, contraindications to TEE may warrant a preoperative multidisciplinary discussion of the relative risks and benefits of the procedure, among which is a history of esophagectomy. Consensus guidelines consider TEE indicated for cardiac surgeries involving heart valves or the thoracic aorta but consider a prior esophagectomy as a *relative* contraindication.<sup>1</sup> The safety, prevalence, and imaging ability of TEE in cardiac surgery patients with a history of bariatric surgery have been described elsewhere, but no data exist for those with esophagectomy.<sup>2</sup> Whereas the benefit of TEE in cardiac surgery is well documented, information regarding the imaging quality and gastric injury rate of TEE in esophagectomy patients is lacking.<sup>3</sup> A qualification of clinical benefit versus risks of TEE during cardiac surgery in patients with prior esophagectomy would aid in clinical decision-making, and as such we sought to qualify (1) the quality of TEE images obtained in these patients; (2) adverse events related to probe placement; and (3) cardiac anesthesiologist opinions and experiences related to such cases.

We performed a retrospective review of the electronic medical records at our academic tertiary-care center among adult patients with a history of esophagectomy who subsequently underwent cardiac surgery from January 2006 to December 2021. We additionally surveyed cardiac anesthesiologists currently performing intraoperative TEE at our institution regarding such cases. Patients were identified based on surgical/anesthesiology procedure codes and diagnosis codes followed by manual review (details available upon request). Complications related to probe placement were characterized by manual review.

Among 20,047 adult cardiac surgery procedures screened, 20 cases meeting the criteria were identified and reviewed (18 unique patients and 2 undergoing reoperation). Esophagectomy type included 12 patients with transhiatal esophagectomies, 2 with transthoracic, and 6 with an unspecified type. Among the 20 cardiac cases evaluated, 8 were valve procedures, 3 thoracic aortic, 4 coronary artery bypass grafting (CABG), and 5 combinations thereof. Among the 20 cases, 2 involved a documented preoperative gastroenterology consult and 3 involved a documented thoracic surgery consult. Two patients underwent esophagogastroduodenoscopy with dilation prior to cardiac surgery. Transesophageal echocardiography placement was attempted in 16 of 20 cases (80%). Successful TEE placement occurred in 14 of 16 attempts (88%). Of 14 successful placements, 12 used an adult probe (Philips X8-2t/X7-2t; 86%) and 2 used a pediatric probe (Philips S7-3t; 14%). Clinical information on the 4 cases without TEE attempts was not available. Summary patient characteristics are described in [Table 1](#).

Among the 14 cardiac surgery procedures with TEE used, all were placed and performed by cardiac anesthesiologists and had images

**Table 1** Characteristics of cardiac surgery procedures among patients with prior esophagectomy

Variable	n (%) or median (interquartile range)
<b>Surgery type:</b>	
CABG	4 (20)
Valve	8 (40)
Aortic	3 (15)
Combination	5 (25)
Age, years	72 (66-76)
<b>Sex:</b>	
Male	16 (80)
Female	4 (20)
Body mass index, kg/m <sup>2</sup>	25.8 (23.6 – 28.5)
<b>Comorbidities:</b>	
Chronic pulmonary disease	12 (60)
Diabetes mellitus	3 (15)
Heart failure (stage C/D)	11 (55)
Hyperlipidemia	10 (50)
Hypertension	15 (75)
Liver disease	2 (10)
History of upper gastrointestinal bleed	0
Peripheral vascular disease	3 (15)
Renal failure requiring dialysis	0
Stroke	2 (10)
Preoperative left ventricular ejection fraction, %	60 (60 – 65)
<b>Esophagectomy type:</b>	
Transhiatal	12 (60)
Transthoracic	2 (10)
Unspecified	6 (30)
Years from esophagectomy on date of cardiac surgery (n = 18)	4.5 (2 – 9)
<b>Preoperative consultations documented:</b>	
Gastroenterology	2 (10)
Thoracic surgery	3 (15)
<b>Intraoperative TEE placement:</b>	
TEE placement, not attempted	4 of 20 (20)
TEE placement, attempted	16 of 20 (80)
Of attempted, successful TEE placement	14 of 16 (88)
Of attempted, unsuccessful TEE Placement	2 of 16 (12)
Of successfully placed TEE, atraumatic	14 of 14 (100)
Of successfully placed TEE, traumatic	0

available for review. Transesophageal echocardiography view distribution is described in [Table 2](#). Most patients undergoing valve surgery (n = 13) underwent intraoperative TEE (n = 10; 77%). Of 4 patients undergoing isolated CABG, 1 (25%) underwent intraoperative TEE. All patients (n = 3) undergoing isolated aortic surgery underwent intraoperative TEE. Two patients (1 valve, 1 CABG; 12.5%) had TEE placement attempted, but it was unsuccessful. Transesophageal

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**Table 2** Summary of intraoperative TEE quality and postoperative outcomes

Parameter	n (%)
<b>TEE characteristics</b>	
Intraoperative TEE performed by:	
Cardiac anesthesiology	14 (100)
Cardiology	0
TEE views/structures, midesophageal:	
Ascending aorta	9 (64)
Left atrial/left ventricle	12 (86)
Aortic valve	14 (100)
Right ventricular inflow-outflow	13 (93)
Bicaval	6 (43)
TEE views/structures, transgastric/deep transgastric:	
Left ventricle	7 (50)
Right ventricular inflow	1 (7)
Deep long axis	4 (29)
Descending aorta	13 (93)
TEE views/structures, upper esophageal:	
Aortic arch	10 (71)
Three-dimensional images	4 (29)
Critical views relevant to procedure able to be obtained?:	
Yes	10 of 14 (71)
Of critical views present, adequate quality	7 of 14 (50)
Of critical views present, inadequate quality	3 of 14/(21)
No	4 of 14 (29)
Postoperative outcomes	
Postoperative consultations:	
Gastroenterology	0
Otolaryngology	1
Thoracic surgery	0
Postoperative events	
Gastrointestinal bleed	0
Pharyngeal trauma	0
Esophageal perforation	0

echocardiography views critical to the procedure, defined as views demonstrating the valvular/aortic disease operated upon, were present in 10 cases (71%), and of these cases there was adequate quality for quantification of valve lesion/wall motion abnormality severity in 7 cases (50%). One patient had an otolaryngology consult for the evaluation of dysphonia after a prolonged intubation and intensive care unit course. Fiberoptic examination revealed no traumatic injury attributable to TEE placement. A summary of intraoperative TEE quality and postoperative outcomes is described in [Table 2](#).

A survey of 19 cardiac anesthesiologists at our institution reveals that 84% used intraoperative TEE for cardiac surgery in patients with a previous esophagectomy. The leading factors influencing

TEE placement were surgery type (84%), consultant recommendations (79%), and preoperative function (44%).

Our study showed that most patients with histories of esophagectomy who presented for cardiac surgery at a tertiary center underwent intraoperative TEE. Cardiac anesthesiologists performing TEE assessments did discriminate in their decisions to perform TEE exams, as demonstrated by a lower incidence of performed exams in the CABG group. The use of pediatric probes suggests a personalized analysis of the risks and benefits of each case. Transesophageal echocardiography placement was atraumatic in each case. Compared to the general population of cardiac surgery patients, TEE placement in our cohort did have a higher unsuccessful placement rate (12.5% vs 0.18%).<sup>4</sup> The small sample size of our cohort reflects the rareness of this condition and precluded comprehensive statistical analysis for safety determination.

Wide variation in image capture and quality existed across our cohort. Critical TEE views were present in only 71% of cases, with adequate quality for interpretation only half of the time. Esophageal views were predominantly present as demonstrated in [Table 2](#); however, there were significantly fewer transgastric views obtained, which may relate to poor image quality or operator choice. Clinical judgment is needed when considering the risks versus benefits of TEE in such patients.

Our study demonstrates that TEE did not result in complications in a cohort of cardiac surgery patients with a history of esophagectomy and furthermore provided critical assessments for 50% of cardiac surgery interventions studied. Our findings inform relative risks versus benefits of TEE in cardiac surgery patients with a history of esophagectomy. Future studies in larger multicenter cohorts are needed to characterize safety and effectiveness endpoints.

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