

Role of perioperative transesophageal echocardiography in decision making in cardiac surgery.

Thesis study

**Submitted for the partial fulfillment of the Master degree in Anesthesia, ICU, Pain
management**

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2015

ACKNOWLEDGMENT

*First and foremost, thanks to **Allah**, the beneficial and the merciful.*

*I would like to express my deepest gratitude and sincere thanks to **Prof. Dr. Maged Salah Abdullah**, Professor of anesthesiology, Faculty of medicine, Cairo University, who kindly helped me a lot in this thesis. It is a great honor for me to work under his supervision with his honesty and modesty.*

*I would like also to thank **Dr. Asser Manaa**, lecturer of Anesthesiology, Faculty of Medicine, Cairo University and **Dr. Yasser Abd Al-Wahab**, lecturer of Anesthesiology, Faculty of medicine, Cairo University, for their sincere guidance and remarkable thoughts throughout the whole work.*

Finally, I would like to dedicate this work to my wife for her great help, love and encouragement that without her I couldn't have finished this study.

Objectives:

This study is based on the hypothesis that the routine use of transesophageal echocardiography in cardiac surgery will influence the surgical decision taken by the surgeon intraoperative in Kasr Al-Ainy.

Study design:

Patients were examined with IOTEE before and after cardiopulmonary bypass. Complete and comprehensive intraoperative TEE examinations will be performed by TEE certified cardiac anesthesiologists. Data that will be collected from the intraoperative examination will be compared with preoperative transthoracic echocardiography and the surgical decision that was taken preoperatively will be revised again with cardiothoracic surgeon before the start of surgery. Also, TEE will be used again after weaning from bypass for revision and assessment of our decision.

Results:

We examined the utility of TEE in 100 selected patients undergoing different types of cardiac procedures in Kasr Al-Ainy hospital. This prospective clinical investigation found that the pre- and post-CPB TEE examinations influenced surgical decision making in 10% of all evaluated patients.

Conclusion:

Intraoperative TEE has the potential to significantly influence clinical decision making for cardiac surgical patients. It is useful in surgical planning, guiding various hemodynamic interventions, and assessing the immediate results of surgery. Thus, IOTEE should be used routinely in all patients undergoing all types of cardiac surgeries.

KEYWORDS:

IOTEE- AHA- MHz- PDA

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List of Abbreviations

TEE	Transesophageal echocardiography
ACC	American College of Cardiology
AHA	American Heart Association
ASE	American Society of Echocardiography
SCA	Society of Cardiovascular Anesthesiologists
GI	Gastrointestinal
MHz	Megahertz
GERD	Gastro-esophageal reflux disease
SVC	Superior Vena Cava
ME	Mid-esophageal
AV	Aortic Valve
LAX	Long Axis
Asc	Ascending
PDA	Posterior Descending Artery
SAX	Short Axis
4CV	Four-chamber View
2CV	Two-chamber View
TG	Transgastric

RCA	Right Coronary Artery
RV	Right Ventricular
SA	Sino-atrial
RA	Right Atrium
IVC	Inferior Vena Cava
PM	Pectinate Muscles
CT	Crista Terminalis
EV	Eustachian Valve
FO	Fossa Ovalis
Ao	Aortic
LV	Left Ventricle
CPB	Cardio-Pulmonary-Bypass
RWMA	Regional Wall Motion Abnormality
CABG	Coronary Artery Bypass Graft
VSD	Ventricular Septal Defect
ASD	Atrial Septal Defect
IOTEE	Intra-operative Transesophageal Echocardiography
MR	Mitral Regurge
MVR	Mitral Valve Replacement
OPCAB	Off-pump Coronary Artery Bypass

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Introduction

Transesophageal echocardiography (TEE) is a relatively recent development in imaging. The major innovations in TEE have all occurred since 1970. Early workers had both Doppler and M-mode technology available for use via the esophageal route, but the most significant development was the rigid, mechanical, two-dimensional, echocardiographic transesophageal endoscope in 1977. ^[1,2]

The establishment of TEE in perioperative cardiac anesthetic care has resulted in a significant change in the role of the anesthetist who, using TEE can provide new information which may change the course and the outcome of surgical procedures. ^[3]

The accuracy of perioperative transesophageal echocardiography in diagnosis of structural abnormalities is quite high, producing results that are reliable and reproducible. The information obtained from TEE influences important therapeutic decisions in valvular surgery, coronary artery surgery, and thoracic aortic surgery. ^[4]

Advances in intraoperative monitoring techniques aid the cardiovascular surgeon in patient management and, possibly, contribute to improved outcomes. Although the usefulness of TEE in influencing clinical decisions during valvular heart surgery is well documented, the clinical utility of routine TEE in patients undergoing all types of cardiac surgery remains unresolved. ^[4]

Aim of our study is to rule out the impact of perioperative transesophageal echocardiography in decision making in different cardiac surgeries.

Applications of TEE

Indications of TEE:

In 1997 the American College of Cardiology (ACC) and the American Heart Association (AHA) published guidelines for the clinical application of echocardiography. These guidelines referred to the overall indications for echocardiography, rather than addressing the relative merits of transthoracic and transesophageal studies. The guidelines were updated in 2003, and that publication included a new and in-depth analysis of the indications for intraoperative echocardiography. Once again the levels of evidence were stratified, although on this occasion the indications were divided into Classes I, IIa, IIb, and III, as follows:

Class I (Class I – conditions for which there is evidence and/or general agreement that a given procedure or treatment is useful and effective).

1. Evaluation of acute, persistent, and life-threatening hemodynamic disturbances in which ventricular function and its determinants are uncertain and have not responded to treatment.
2. Surgical repair of valvular lesions, hypertrophic obstructive cardiomyopathy, and aortic dissection with possible aortic valve involvement.
3. Evaluation of complex valve replacements requiring homografts or coronary reimplantation, such as the Ross procedure.
4. Surgical repair of most congenital heart lesions that require cardiopulmonary bypass.
5. Surgical intervention for endocarditis when preoperative testing was inadequate or extension to perivalvular tissue is suspected.

6. Placement of intracardiac devices and monitoring of their position during port-access and other cardiac surgical interventions.

7. Evaluation of pericardial window procedures in patients with posterior or loculated pericardial effusions.

Class IIa

1. Surgical procedures in patients at increased risk of myocardial ischemia, myocardial infarction, or hemodynamic disturbances.

2. Evaluation of valve replacement, aortic atheromatous disease, the Maze procedure, cardiac aneurysm repair, removal of cardiac tumors, intracardiac thrombectomy, and pulmonary embolectomy.

3. Detection of air emboli during cardiotomy, heart transplant operations, and upright neurosurgical procedures.

Class IIb

1. Evaluation of suspected cardiac trauma, repair of acute thoracic aortic dissection without valvular involvement, and anastomotic sites during heart and/or lung transplantation.

2. Evaluation of regional myocardial function during and after off-pump coronary artery bypass graft procedures.

3. Evaluation of pericardiectomy, pericardial effusions, and pericardial surgery.

4. Evaluation of myocardial perfusion, coronary anatomy, or graft patency.

5. Dobutamine stress testing to detect inducible demand ischemia or to predict functional changes after myocardial revascularization.

6. Assessment of residual duct flow after interruption of patent ductus arteriosus.

Class III

1. Surgical repair of uncomplicated secundum atrial septal defect

- Class II – conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment.

- IIa – weight of evidence/opinion is in favor of usefulness/efficacy.

- IIb – usefulness/efficacy is less well established by evidence/opinion.

- Class III – conditions for which there is evidence and/or general agreement that the procedure/treatment is not useful/effective and in some cases may be harmful. ^[5,6,7]

Guidelines published by American Society of Echocardiography (ASE), American Heart Association (AHA), Society of Cardiovascular Anesthesiologists (SCA) and American College of Cardiology (ACC) have been updated in 2010 to include virtually all cardiac surgeries. The earlier studies published before the 2010 guidelines, were based on the use of intraoperative TEE were according to category I or IIa indications of 1996 guidelines. ^[8]

Contraindications of TEE

Absolute contraindications:

1. Perforated viscus.
2. Esophageal pathology (stricture, trauma, tumor, scleroderma, Mallory-Weiss tear, diverticulum).

3. Active upper GI bleeding.
4. Recent upper GI surgery.
5. Esophagectomy, esophagogastrectomy.

Relative contraindications:

1. Atlantoaxial joint disease causing restricted cervical mobility.
2. Prior radiation to the chest.
3. Symptomatic hiatus hernia.
4. History of GI surgery.
5. Recent upper GI bleeding.
6. Esophagitis, peptic ulcer disease.
7. Thoraco-abdominal aneurysm.
8. Barrett's esophagus.
9. History of dysphagia.
10. Coagulopathy, thrombocytopenia.^[9]

Complications of TEE

- **Gastro-intestinal complications**

1. Injuries of Gastrointestinal Tract:

Dental trauma, submucosal hematoma of pharyngeal area jaw subluxation and tonsillar bleeding are related to probe insertion in upper gastrointestinal (GI) tract. Esophageal perforations mostly occur in the abdominal followed by intra-thoracic and cervical portions of the esophagus. They are caused by anatomic variations like GI abnormalities, extrinsic compression of esophagus from enlarged left atrium, calcified lymph node and cervical spur.^[10]