

# INDICATIONS OF TRANSESOPHAGEAL ECHOCARDIOGRAPHY IN A TEACHING HOSPITAL OF PESHAWAR

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## ABSTRACT

**OBJECTIVE:** To analyze the indications of trans-esophageal echocardiography (TEE) in a teaching hospital of Peshawar.

**METHODOLOGY:** Data collected from April 2003 to September 2009. Consecutive male and female adult patients, who presented to Echo section of Hayatabad Medical Complex for TEE, were included in the study. Information gathered included demographic data, indications, findings, clinical applications and complications of the procedure. Data was expressed as frequencies, percentages, means and standard deviations.

**RESULTS:** A total of 175 cases of TEE were included after excluding 23 repeated procedures, over a period of 6 years. 94 (54%) were female. The patients ranged in age from 13 to 82 years with a mean age of  $31 \pm 18$  years. All the TEE were done in adult echo section. The most frequent indication for TEE was for the evaluations of left atrium (LA) and left atrial appendage (LAA) clot 71 (40.5%), followed by evaluation of infective endocarditis (IE) in 35 (20%) and evaluation of congenital heart disease (CHD) in adults in 35 (20%) cases. No major complication and no mortality recorded related to the procedure.

**CONCLUSION:** TEE has been most commonly performed in Hayatabad Medical Complex to evaluate LA/LAA clot followed by IE and CHD without any major complications.

**KEY WORDS:** Echocardiography, Transesophageal, Imaging.

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intensive care units (ICU) and emergency rooms (ER). Each setting has different indications as per appropriate use criteria (AUC) for TEE.<sup>3</sup> It is a reliable, comprehensive, credible, cost effective and safe technique, if performed by a skilled person in an adequately prepared patient.<sup>7</sup> But there is reluctance on part of cardiac physicians for frequent performance of TEE, partially attributed to; TEE being a semi invasive procedure and some inherent risks has been associated with it.<sup>2</sup> It is time consuming and needs learning curve to be expert in it. It is utilized in echo laboratory and not in OT, cardiac cath. Laboratory, ER and ICU set ups. The indications for TEE are limited in Hayatabad Medical Complex Teaching Hospital. Therefore, this study was conducted to analyze the TEE indications and determine its utility in Hayatabad Medical Complex Peshawar Pakistan.

## METHODOLOGY

This hospital based descriptive study was conducted in the adult echocardiography section of cardiology department, postgraduate medical institute (PGMI), Hayatabad Medical Complex (HMC) Peshawar. The study period extends from April 2003 to September 2009. All successive male and female adult patients, of age 13 years and above, who

## INTRODUCTION

Transesophageal echocardiography (TEE) is a diagnostic and monitoring procedure of immense utility. It provides useful additional information that supplements TTE in a wide ranging spectrum of cardiac conditions. TEE was first used in 1976 when a modified rigid endoscopic probe with capability of M mode cardiac image acquisition was inserted into esophagus.<sup>1</sup> The technology improved rapidly with development of

small, flexible, multi-plane endoscopic probes, phased array ultra sound system, crystal miniaturization and real time three dimensional (rt3D) TEE.<sup>2</sup> The improved technology, absence of intervening air tissue, and close proximity of TEE probe to the posterior cardiac structures, gives clear and vivid images, which helps in accurate diagnosis.<sup>1-6</sup>

TEE utility is increasing in daily practice and it is being used in echo rooms, operation theatres (OT), cardiac catheterization laboratory (cardiac cath),

underwent TEE in adult echo laboratory, were included and repeated TEE for the same patient was excluded from the study.

All the patients were clinically assessed for any bleeding tendency, cervical spine diseases, esophageal and gastric varices, esophageal tumor and strictures. Hepatitis screening, Electrocardiography (ECG) and detailed transthoracic echocardiography (TTE) were mandatory before TEE. Human immune deficiency virus (HIV) screening was done in selected cases. Hepatitis B, Hepatitis C, HIV positive patients, patients with severe bleeding tendency, unstable cervical spine, unstable respiratory status and documented esophageal problems (varices, strictures and tumor) were also excluded from the study. Informed written consent was taken from all patients. All Patients were fasted for at least 4 hours before procedure. PEF-510MA multi plane TEE Transducer (3-7MHz) for Toshiba Nemio was used for all the procedure. The operators were divided into three categories. The Expert operator having done more than 50 TEE, less experienced operator having done 25-50 procedures and learner with less than 25 TEE before start of this study. The expert operators in these cases were senior qualified cardiologists and the learner were senior trainee for fellowship in cardiology. Echo Technician and a nurse assisted all the procedures while anesthetist was called for the patients, who needed conscious sedation. Inj Medazolam 2-3mg was used as an intra venous sedative agent. Awake and comfortable was the criteria

for adequately sedated patient. Oxygen inhalation was essential during sedation. Lidocaine spray and Lidocaine gargle was used as an oro-pharyngeal anesthetic agent for smooth and pain free procedure. The Expert did the procedure in difficult cases, while the learners carried out procedure under supervision of seniors in young and fit patients for simple indications like exclusion of LA/LAA clot. Each TEE was tailored made as per pre test probability of disease. A multi plane long and short axis scan of heart was taken for different cardiac structures by keeping transducer at upper, middle and lower level of esophagus and fundus of stomach.

Descriptive statistics like percentages, means and ranges were obtained for different numerical and categorical variables. All these variables were entered into a database program, SPSS (Statistical Package for Social Sciences) for windows (version 13) and data was expressed in frequencies, percentages, means and standard deviations.

## RESULTS

A total of 198 TEE were done during the period; April 2003 to September 2009. Twenty three procedures were repeated TEE for follow up cases, therefore excluded from the study. The remaining 175 patients were included in this study. Out of 175 cases, 168 (96%) were elective cases, while remaining 7 (4%) needed TEE in emergency. Ninety four (54%) were female. Patients from 13 to 82 years were included with mean age of  $31 \pm 18$  years. Fourteen (8%) patients

came from Afghanistan and 161 (92%) were from different region of Khyber Pakhtunkhwa (KPK). Demographic data has been shown in Table I.

Majority of TEE, 100 (57%) were done by expert operator, while 20 (11%) procedure was carried out by the learner under supervision. Chest X-ray, resting ECG, TTE and Hepatitis B and hepatitis C screening were done in all 175 cases. CT Brain was done in 7 (4%), CT Thorax 11 (6%) and ultra sound abdomen was done in 52 (30%) cases. HIV screening was done in 35 (20%) patients. All screened patients were negative for HIV, hepatitis B and hepatitis C. TTE was inconclusive in 144 (80%) cases. Therefore, these patients underwent TEE to exclude or confirm the diagnosis.

The most common indication for TEE was, to exclude LA and LAA clot; 71 (40.5%). Sixty eight (96%) of these were before percutaneous mitral balloon valvotomy (PMBV) and 3 (4%) were before attempting elective cardioversion for rhythm control in atrial fibrillation (AF). In 35 (20%) cases, TEE was done for infective endocarditis (IE) either to prove the diagnosis by detecting vegetation or to further evaluate for complications of IE. In 35 (20%) patients, TEE was done for congenital heart diseases in adults. Most common congenital anomaly was atrial septal defect (ASD) detected in 21 (60%) cases. In 7 (33%) ASD cases, TEE was done to evaluate suitability for ASD device closure. The frequency of TEE done for suitability of ASD closure device in adults was 7 (4% of total patients). TEE was done to exclude aortic dissection in 14 (8%) cases. Aortic dissection was

**TABLE I: DEMOGRAPHIC DATA OF THE PATIENTS**

Sex distribution	Age range				Total
	13-30 years	31-48 years	49-65 years	>65 years	
Male	41 (23%)	23 (13%)	15 (9%)	2 (1%)	81 (46%)
Female	49 (28%)	27 (16%)	18 (10%)	0	94 (54%)
Total	90 (51%)	50 (29%)	33 (19%)	2 (1%)	175 (100%)

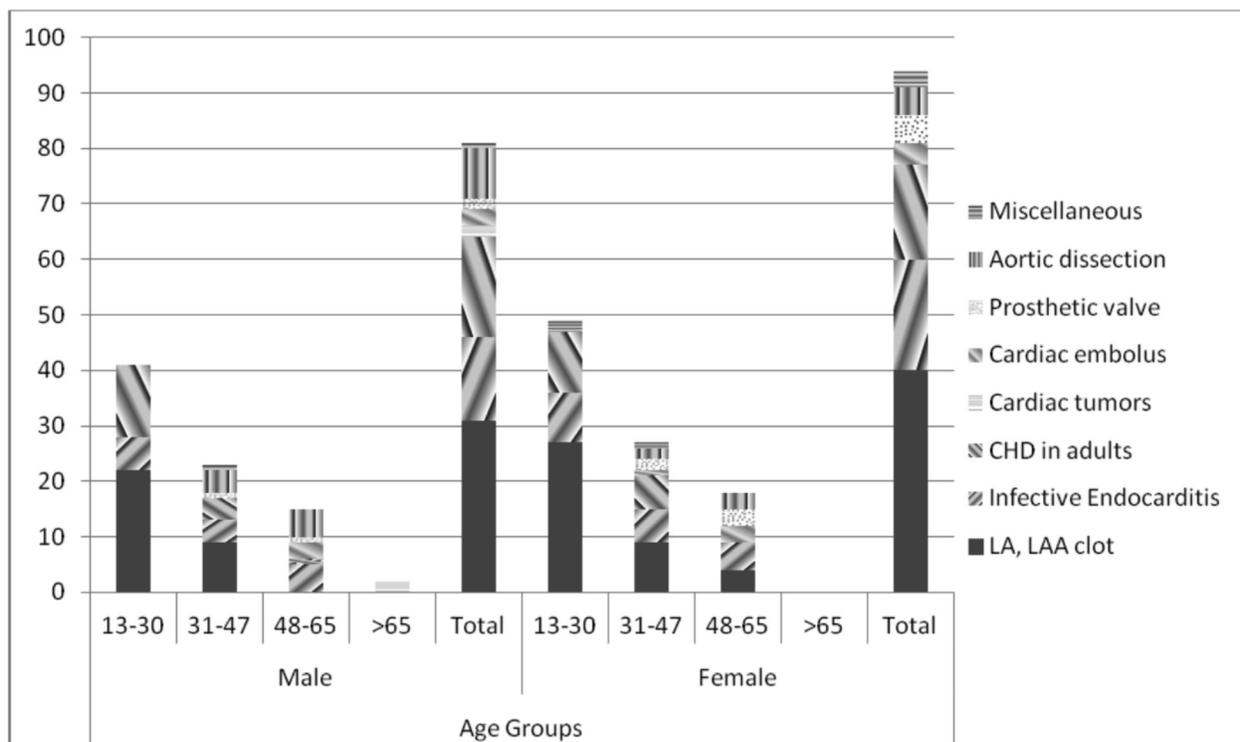


Fig 1: Age group and gender wise distribution of TEE indications

detected in 11 (78%) cases. Dissection flap was identified in all 11 cases, 7 (63%) of them were De-bakey type A dissection. TEE detected 2 (1.8%) patients having right sided echogenic mass attached posteriorly. These masses were missed by TTE.

A total of 25430 TTE were done in the time period from April 2003 to September 2009. TEE was 0.8% of TTE with a ratio of 1:128. On average, 30 TEE per annum were done in our set up. Age group and gender wise distribution of TEE indications shown in figure 1.

## DISCUSSION

TEE is an established cardiac diagnostic and monitoring procedure which is gaining rapid popularity. Its indications are multiplying and equipments are advancing. It has significantly improved our diagnostic decision making. It is semi invasive but safe procedure.<sup>1-3</sup> It is done in different settings like echo room, ER, OR, ICU and cardiac Cath. Laboratory.

Each setting has its own indications.<sup>1-6</sup> In our set up, TEE is limited only to echo room and no procedure was done outside echo room.

Huge number of patients is needed to envisage all the indications for TEE. Our study was limited to 175 patients in six and half years at a rate of 30 TEE per year and ratio of TEE to TTE was 0.8%. In many European echo centers, an average ratio of TEE to TTE was 9.4%.<sup>2</sup> While a study published from Aga Khan University Hospital (AKU) showed 47 TEE per year (236 in 5 years).<sup>5</sup> Similarly, the frequency of TEE in Jamaica was, 38 per year (116 in 3 years).<sup>6</sup> These figures show that TEE was done frequently in European centers but less frequently in our country and other low resource and developing countries like West Indies.<sup>2,5,6</sup>

We did TEE mainly for exclusion of LA/LAA clot (40.5%) followed by evaluation for IE (20%) and detection of congenital intra cardiac shunts in adults

like ASD (20%). The most common indications in Hannover Medical School I data of 5000 patients who underwent TEE, was cardiac source of embolism (35%), Prosthetic heart valve dysfunction (20%) and infective endocarditis (16%). The western centers routinely perform TEE in seriously ill ventilated patients in ICU setting after ischemic stroke. To exclude cardiac source of embolism by TEE is a must for final diagnosis and best management of ischemic stroke.<sup>1</sup> Similarly the yield of TTE is very limited in prosthetic valve dysfunction due to shadow of the prosthetic valve obscuring the image in field of interest. TEE is the only alternative for this limitation of TTE. Number of patients with prosthetic valves is high in western countries therefore, the problems associated with them is also high. Patients having prosthetic valve are very less in our area and therefore, very few patients presents to us with complications of prosthetic valves.

The study in AKU<sup>5</sup> showed a trend

for evaluation of left ventricular function (16%) and peri operative monitoring (6%) and exclusion of cardiac source of embolism (17%), clearly indicates that TEE in AKU done in wide ranging indication and multiple settings. Other local studies<sup>17,18</sup> showed similar trend for LA/LAA clot as major indication for TEE. The high number of TEE to exclude LA/LAA clot (40.5%) is due to prevalence of RHD in our country. Many young patients present to us with symptomatic severe mitral stenosis. Exclusion of LA/LAA clot is must before attempting PMBV.<sup>8,9</sup> This trend was also noticed in Jamaican study,<sup>6</sup> where 42% TEE were done for valvular heart diseases (41%). RHD is probably as common in West Indian islands as it is in our set up. Low resources, poverty, overcrowding and lack of health facilities for early screening and treatment of streptococcal sore throat are contributing factors in our country and the Caribbean city. In our study, in 4% cases, TEE was done to assess suitability for ASD device closure and 20% for IE. Other studies shows similar trend in IE and congenital heart defects in adults.<sup>13,16,19</sup>

The high proportion of cardiac tumor in Hannover school study is due to high proportion of aged population. Cardiac tumor is a disease of advanced age. Muggge et al<sup>10</sup> reported more cases of right sided cardiac masses, when examined by TEE. It is because of the fact that left side of the heart is better visualized by TTE and tumors on left side are seldom missed by it. Right side masses are very difficult to detect by TTE alone.<sup>10,14</sup> Our study showed 1.8% patient with a mass attached to right side cardiac cavities and were totally missed by TTE.

When we compare aortic dissection, in Daniel study<sup>1</sup>, it was 8% of total indications. Our data has the same 8% results. This exact similarity appears to be not a coincident. It may be true because, in

our set up, TEE is considered diagnostic modality of choice for suspected aortic dissection and the cases are referred early. Dissection associated with intimal flap was seen in all the dissection cases (100%) and 63% of them were De-Bakey Type A dissection. This data is comparable with Willen et al,<sup>12</sup> who reported 96% flap and 70% De-Bakey type A dissection. The intra operative monitoring by TEE of high risk cardiac and non cardiac surgeries in OT is also emerging as a reliable and cost effective modality.<sup>5,20,21</sup>

### STUDY LIMITATIONS

The sample size is small due to infrequent performance of TEE in adult patients in our set up and it was not done in ER, OR, ICU and other settings.

### CONCLUSION

Transesophageal echocardiography has been most commonly performed to evaluate LA/LAA clot before PMBV and elective cardioversion in this teaching hospital without any major complication. There were many other indications for TEE as well.

### REFERENCES

- Daniel WG, Muggge A. Transesophageal echocardiography. *N Engl J Med* 1995; 332: 1268-1279.
- Daniel WG, Erbel R, Kasper W, Visser CA, Engberding R, Sutherland GR, et al. Safety of transesophageal echocardiography: A multicenter survey of 10,419 examinations. *Circulation* 1991; 83: 817.
- Flachskampf FA, Badano L, Daniel WG, Feneck RO, Fox KF, Fraser AG, et al. Recommendations for transoesophageal echocardiography: update 2010. *Eur J Echocardiogr* 2010; 11: 557-76.
- Armstrong WF, Feigenbaum H. Echocardiography. In: Braunwald E, Zipes DP, Libby P, Eds. *Heart Disease* 6Th edition. Philadelphia: WB Saunders; 2001: 176-220.
- Hassan K, Orakzai R, Orakzai S, Shaquat A, Dhakam S. Transesophageal echocardiography: Retrospective review and current clinical applications. *Pakistan J Cardiol* 2002; 13: 85-90.

- Madu EC, Tulloch-Reid MK, Baugh DS, Tulloch-Reid E, Potu C. Clinical utility of transoesophageal echocardiography in low resource environments: The Jamaican experience. *West Indian Med J* 2011; 60(6): 653-7.
- Prabhu M, Raju D, Pauli H. Transesophageal echocardiography: instrumentation and system controls. *Ann Card Anaesth* 2012; 15: 144-55.
- Cavalcante JL, Rodriguez LL, Kapadia S, Tuzcu EM, Stewart WJ. Role of echocardiography in percutaneous mitral valve interventions. *JACC Cardiovasc Imaging*. 2012; 5(7): 733-46.
- Ahmad W, Raja MK, Azeem M, Rajput Z, Abbass S, Rafique A, et al. PTMC in children and adolescents: The AFIC/NIHD experience. *J Pakistan Inst Med Sci* 1997; 7(2)8 (1,2): 530-5.
- Muggge A, Daniel WG, Haverich A, Lichtlen PR. Diagnosis of noninfective cardiac mass lesions by two-dimensional echocardiography: comparison of the transthoracic and transesophageal approaches. *Circulation* 1991; 83: 70-8.
- Willen HJ, Kessler Km. Transesophageal echocardiography in the diagnosis of diseases of the thoracic aorta: Part I. Aortic dissection, aortic intramural hematoma, and penetrating atherosclerotic ulcers of the aorta. *Chest* 1999; 116, 1772-9.
- Nienaber CA, Powell JT. Management of acute aortic syndromes. *Eur Heart J* 2012; 33(1): 26-35.
- Baumgartner H, Bonhoeffer P, Natasja M.S, Groot D, Haan F, Deanfield JE. Guidelines: ESC Guidelines for the management of grown-up congenital heart disease: The Task Force on the Management of Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC). *Eur Heart J* 2010; 31(23): 2915-57.
- San Román JA, Vilacosta I, López J, Revilla A, Arnold R, Sevilla T, et al. Role of transthoracic and transesophageal echocardiography in right-sided endocarditis: one echocardiographic modality does not fit all. *J Am Soc Echocardiogr* 2012; 25(8): 807-14.
- Bhatti MA, Karmarkar R, David WK. *Candida albicans* myocardial abscess. *J Coll Physicians Surg Pak* 2003; 13(8): 456-8.
- Sedgwick JF, Burstow DJ. Update on echocardiography in the management of infective endocarditis. *Curr Infect Dis Rep* 2012; 14(4): 373-80.
- Saeed M, Rahman A, Afzal A, Agoston I, Jammula P, Birnbaum Y, et al. Role of transesophageal echocardiography guid-

- ed cardioversion in patients with atrial fibrillation, previous left atrial thrombus and effective anticoagulation. *Int J Cardiol* 2006; 113(3): 401-5.
18. Acsenberg W, Schluter M, Kremer P. Transesophageal two dimensional echo for the detection of LAA thrombus. *J Am Coll Cardiol* 1986; 7: 163-6.
19. Sadiq M, Akram Z, butt M, Giovani JVD, Wilkinson JL, Quraishi S. Transcatheter occlusion of secundum atrial septal defects with the self centering Amplatzer septal occluder initial experience. *Pakistan J Cardiol* 2001; 12: 61-6.
20. Afridi I. Echocardiography in the cardiac operation room: An essential tool for the surgeons. *Pak J Cardiovasc Thoracic Surg* 2000; 11: 74-80.
21. Gouveia V, Marclino P, Reuter DA. The role of transesophageal echocardiography in the intraoperative period. *Curr Cardiol Rev* 2011; 7(3): 184-96.

### AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under

- RG:** Conception and design, acquisition of data, drafting the manuscript, final approval of the version to be published
- SSS:** Analysis and interpretation of data, final approval of the version to be published
- MR & BAK:** Acquisition of data, final approval of the version to be published
- ZAA:** Critical revision, final approval of the version to be published

### CONFLICT OF INTEREST

Author declares no conflict of interest

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