Transesophageal Echocardiography: Experience, Indications and Complications as an Outpatient Department Procedure at Queen Alia Heart Institute

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ABSTRACT

Objective: To assess the safety and complications of outpatient transesophageal echocardiography procedures.

Methods: Between June 2010 and 2011, 308 patients underwent outpatient transesophageal echocardiography. All the examinations were performed under local anaesthesia in the outpatient echocardiography laboratory. The demographic data, indications and complications were recorded.

Results: Patient population consisted of 158 (51.3%) females and 150 (48.7%) males. The mean age was 42 years (range 11 to 81 years). Procedure failure was recorded in two patients due to inability to introduce the ultrasound probe. The most common indication was native valve pathology (37.3%) followed by atrial septal abnormalities (34%), prosthetic valve pathology (6.4%), infective endocarditis (6.1%), congenital heart diseases (5.8%), cardiac source of embolism (4.2%), aortic dissection (3.6%) and intracardiac masses (2.3%). Minor complications were recorded in two patients (1.3%) but no major complications. Most (92%) of the procedures were considered useful and gave additional information that confirmed or excluded the prior study diagnosis.

Conclusion: Transesophageal echocardiography can be performed comprehensively and safely as an outpatient procedure and adds valuable clinical information.

Key words: Complications, Indications, OPD, Transesophageal echocardiography,

Introduction

Although Transthoracic Echocardiography (TTE) remains the cornerstone of diagnostic cardiac testing in daily practice, transesophageal echocardiography (TEE) has become widely recognized as a valuable complementary tool.1-3 As compared with transthoracic echocardiography (TTE), TEE offers superior visualization of posterior cardiac structures because of the close proximity of the esophagus to the posterior heart structures, the lack of intervening lung and bone, and the ability to use high-frequency imaging transducers which afford superior spatial resolution.1-4

Methods

A retrospective review of patients who underwent TEE examination in our...
Table I. Indications for the TEE examination

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>%</th>
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<tbody>
<tr>
<td>Native valve pathology</td>
<td>115</td>
</tr>
<tr>
<td>Atrial septal abnormalities</td>
<td>105</td>
</tr>
<tr>
<td>Prosthetic valve pathology</td>
<td>20</td>
</tr>
<tr>
<td>Infective endocarditis</td>
<td>19</td>
</tr>
<tr>
<td>Congenital heart diseases</td>
<td>18</td>
</tr>
<tr>
<td>Cardiac source of embolism</td>
<td>13</td>
</tr>
<tr>
<td>Aortic dissection</td>
<td>11</td>
</tr>
<tr>
<td>Intracardiac masses</td>
<td>7</td>
</tr>
</tbody>
</table>

Table II. Contraindications for TEE

1. Esophageal stricture or malignancy
2. Recent esophageal ulcer or hemorrhage
3. Zenker's diverticulum
4. Altered mental status or an uncooperative patient
5. History of odynophagia or dysphagia (need screening endoscopy and/or barium swallow prior to TEE)
6. Suspected neck injury

Echocardiographic laboratory between June 2010 and 2011, was done. All patients had a prior full TTE study and the TEE was done for specific indications (See Table I). All patients had no contraindications to TEE examinations (see Table II). The TEE was performed by two cardiologists trained to perform TEE procedures.

The examination protocol

The arrival time of the patient was documented on the patient’s sheet. A written consent is signed by the patient or the care giver after explaining the procedure including the potential complications.

All patients were fasting for at least four to six hours prior to the examination and forearm intravenous access was established prior to the procedure. A resuscitation trolley was in near access.

The patients were placed in the left lateral position to permit easier drainage of oral secretions. Oxygen supply via nasal cannula was used and all moving dentures were removed prior to the procedure.

All patients were attached to ECG monitor, blood pressure cuff in the right arm and pulse oximeter. Topical anesthesia to the posterior pharyngeal wall was applied using 10% Lignocaine followed by intravenous sedation using midazolam (0.1 mg/kg up to 3mg) and pethidine (1mg/kg up to 12.5 mg).

The American Heart Association guidelines for antibiotic prophylaxis for the prevention of infective endocarditis were followed. Anticoagulation therapy was not discontinued prior to the study.

The TEE probe was inserted after lubrication with a sterile jelly through a bite-guard and we generally initiated tape recording on probe insertion which was turned off after removal of the probe. Throughout the study there was an assistant to help secure the patient’s position, monitor the vital signs and if required to give more sedation. The discharge time was documented on the patient’s record.

Results

A total of 308 patients underwent TEE examination between June 2010 and 2011. The patients were 158 (51.3%) females and 150 (48.7%) males. The mean was 42 years (range 11 to 81 years). The main indications for TEE are summarized in Table I.

The TEE probe was successfully placed into the esophagus easily in all but two of our patients within one minute and the study was completed within 20 minutes time.

Ninety eight (31.8%) patients needed additional dose of midazolam due to persistent anxiety or severe gag reflex, and 25 patients (8.1%) needed infective endocarditis antibiotic prophylaxis.

No major complications occurred (see Table III). Minor complication, such as failure to insert the probe in two patients due to severe gag reflex and resistance by the patients, and minor bleeding in two others who were on anticoagulation therapy occurred (1.3% complication rate). There was no mortality directly related to the procedure.

All our patients were sent home after four hours of fully awaking, with no immediate complaints; no one needed admission to conditions related to the procedure.

Out of the 20 patients that were evaluated with prosthetic valve heart disease, only for three patients the exam did not add any further information while in six patients it helped in planning some sort of urgent intervention, and the rest of them it gave the necessary information in order to set the follow up plan.
Table III. Complications of TEE

**Major or Serious complications**
1. Death
2. Sustained ventricular tachycardia
3. Severe angina
4. Buckling of the transducer probe
5. Gastrointestinal mucosal trauma and bleeding
6. Cerebrovascular accidents
7. Jaw dislocation

**Minor complications**
1. Failure to insert the probe
2. Transient bronchospasm
3. Transient hypoxia
4. Nonsustained ventricular tachycardia
5. Transient atrial fibrillation
6. Minimal bleeding
7. Vomiting

Out of the 11 patients that were sent as dissection by 2d-echo, only three patients were confirmed to have a flap, although in one patient another modality was requested due to poor TEE pictures.

Out of the 19 patients that were sent to rule out vegetations, five were found to have vegetations that could not be confirmed by the TTE. Out of the 105 patients that were sent to confirm the presence of Atrial Septal Defect (ASD) or Patent Foramen Ovale (PFO), 39 were found to have intact inter-atrial septum with negative bubble test.

Ninety two percent of the studies were considered useful and gave additional information that confirmed or excluded the prior study diagnosis.

**Discussion**

Transesophageal echocardiography (TEE) is a semi-invasive tool broadly used and it has earned an important role in diagnosing and influencing the course of management in cardiovascular diseases.\(^2,4-10\)

Since its introduction in the late 1970s, it has been improved during the years and the ensuing technological developments facilitated the transition of TEE to its present clinical status.\(^1,2,7\) TEE is currently used in approximately 5–10% of patients being evaluated in the cardiovascular ultrasound imaging and hemodynamic laboratory.\(^4\)

TEE has proved its superiority to TTE in evaluating patients with prosthetic valves.\(^11\) In our study 20 patients with prosthetic valves were evaluated for the function and the presence of vegetations or pannus formation which were difficult to visualize by the TTE, in three patients it confirmed the presence of thrombus at the valve causing one leaflet to be obstructed which led to immediate initiation of streptokinase therapy, while in two patients it confirmed the presence of significant paraavalvular leak for which the patients were booked for redo open heart surgery, while in 11 patients it ruled out a malfunction in the valves, alleviating any further intervention, and out of the five patients that were sent to rule out vegetations on the prosthetic valve only one was having a vegetation like structure for which he was started on antibiotics and his follow up in two weeks time revealed no improvement, so he was booked for redo replacement.

Most studies showed an 85% specificity and 98% sensitivity in diagnosing aortic dissection.\(^4\) Among our 11 patients that were sent for dilated aortic root and query presence of flap by TTE, only three were found to have a flap that was confirmed by CT-scan and operative results, and one patient needed CT-scan later due to poor TEE pictures due to excessive salivation.

Most of the studies in infective endocarditis had shown its superiority in detecting small vegetations that were missed by TTE.\(^9,12\) In our study, five out of the 19 patients were found to have vegetations that could not be confirmed by the TTE.

Atrial septal abnormalities are better evaluated by TEE, since in most of the patients the septal echo drop will be mistaken for an atrial septal defect (ASD) or patent foramen ovale.\(^13\) In our 105 patients that were sent to confirm the presence of ASD or PFO, 39 were found to have intact inter-atrial septum with negative bubble test.

Intracardiac masses or presence of cardiac cause for systemic thrombus were better evaluated by TEE, due to the proximity of the heart to the esophagus especially the left atrial appendage were most of the thromboses are missed by TTE.

In our study 92% of our procedures were considered valuable and helped in planning the treatment protocol.

We had two cases of failure in probe insertion
because the patients were anxious despite the sedation and surprisingly none of which were in the pediatric age group. Failure of probe insertion is a well-documented complication or failure (as shown in Table III) and it was reported in 1.2% in the European multicenter survey that involved around 10,000.(4)

Our complication rate (1.3%) was consisted with the rate reported by most centres, although the bleeding was not significant and it was in two patients whom were on warfarin and it stopped even before the patients were fully awake.

We did not have any deaths related to the procedure although it was reported in the European survey as one death and another death was reported by Mayo clinic.(4)

We did not encounter any infective endocarditis that was related to our procedure. The American Heart Association guidelines on endocarditis prophylaxis included only patients undergoing upper gastrointestinal endoscopy with biopsy, but all the same 8.1% of our patients received antibiotics because they were considered high risk patients in terms of prosthetic valve patients, a previous history of infective endocarditis and immune suppressed patients.(8)

Our experience is evolving, especially in the pediatric age group, since the TEE was not done before in children at our centre, and since the TEE experience is also recent in the pediatric age group worldwide and still evolving in terms of indications and safety (14,15) we hope to have increasing experience there, and in the near future to report our experience in larger study group number. Till now and from our study we did not encounter any major complications in this age group.

Conclusion

TEE is a semi-invasive procedure, but with increasing experience it can be performed safely and effectively as an outpatient procedure in all age groups, providing useful and additional information that confirm or even alter the medical outcome to our patients.

References


