

# Segurança da Ecocardiografia Transesofágica em Doentes com Acidente Vasculares Cerebral Agudo

## *Safety of Transesophageal Echocardiography in Acute Stroke Patients*

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### Resumo

**Introdução:** A ecocardiografia transesofágica (ETE) é um método de utilização crescente, considerado semi-invasivo e seguro. Recomendações para a abordagem de doentes com acidente vascular cerebral (AVC) agudo consideram o ETE como um exame essencial em alguns doentes. O objectivo deste estudo foi avaliar a segurança do ETE em doentes com AVC agudo, de acordo com a casuística de um único centro.

**Material e Métodos:** Incluímos 171 adultos (idade média 62,8 anos) submetidos a ETE em contexto de AVC agudo. Avaliámos as complicações do ETE: impossibilidade de realização do exame, complicações pulmonares, cardíacas ou hemorrágicas, trauma/perfuração e outras (odinofagia, lesão dentária e morte).

**Resultados:** Dos 171 doentes, 2,9% tiveram complicações *minor*: 2 casos de recusa do doente, 2 casos de impossibilidade de introdução da sonda e 1 caso de odinofagia. Ocorreu uma complicação *major* (0,6%): uma perfuração esofágica.

**Discussão e Conclusão:** Neste estudo, o ETE teve uma complicação *major* (0,6%), uma perfuração esofágica, sem ocorrência de óbitos. O ETE é um procedimento seguro, mesmo em doentes com AVC agudo.

**Palavras-chave:** Acidente Vasculares Cerebral; Avaliação de Risco; Ecocardiografia Transesofágica; Gestão de Segurança

### Introduction

Transesophageal echocardiography (TEE) offers unique advantages in certain clinical scenarios and is superior to conventional transthoracic echocardiography<sup>1</sup> in patients with stroke of undetermined etiology.

The role of TEE in the evaluation of acute stroke patients is still ill-defined, and recommendations of TEE in stroke patients are controversial.<sup>2,3</sup> Besides therapy implications<sup>2,3</sup> and cost-effectiveness,<sup>4</sup> the fact that TEE is semi-invasive, time consuming and not readily available everywhere<sup>2</sup> fuel the controversy. Nevertheless, although TEE has a low complication rate,<sup>5</sup> this rate has not been studied specifically in patients with acute ischemic stroke.

The aim of our study was to study the complication rate of transesophageal echocardiography in acute stroke patients.

### Methods

This was a retrospective, observational, longitudinal, cohort study.

### Abstract

**Introduction:** Transesophageal echocardiography (TEE) is a method increasingly used in cardiology and it is considered semi-invasive and very safe. Recommendations on the management of acute stroke consider TEE as an essential exam in some patients, emphasizing the increasing use of TEE in a wider spectrum of patients. The purpose of this study was to evaluate a single-center experience of the safety of TEE in a special population of patients with acute ischemic stroke.

**Methods:** We included 171 adult patients (mean age 62.8 years) who underwent TEE because of the management of acute ischemic stroke. We determined complications of TEE: examination impossible to perform, pulmonary, cardiac and bleeding complications, trauma/perforation and others (odynophagia, dental injury and death).

**Results:** Of the 171 patients, 2.9% had minor complications: 2 cases of patient refusal, 2 cases of failure to successfully insert the TEE probe and 1 case of odynophagia. Major procedural complications were noted in one case (0.6%): an esophageal perforation.

**Discussion and Conclusion:** In our study, TEE had one major complication, an esophageal perforation, but no deaths occurred. TEE is a safe procedure, even in acute stroke patients.

**Keywords:** Echocardiography, Transesophageal; Risk Assessment; Safety Management; Stroke

The study was approved by our hospital ethics committee. Informed consent was considered unnecessary.

### STUDY POPULATION

We used our hospital's procedure data-base to select all adult patients ( $\geq 18$  yr old) who had at least one transesophageal echocardiogram (TEE) performed between 1/January/2007 and 31/December/2008. We reviewed the clinical registries of these patients and excluded those without a diagnosis of stroke or transient ischemic attack as the admitting diagnosis. The remaining patients were our study population.

In patients with repeated TEE, only the first TEE was considered.

### TRANSESOPHAGEAL ECHOCARDIOGRAM

All TEE were performed on a Vivid 3 System, General Electric, using a multiplane 3.5 to 6.5 MHz probe, according to standard protocols<sup>1</sup> (all

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**Tabela 1:** Demographic characteristics and cardiovascular risk factors of the study patients (n=171)

Characteristic	n (%)
Age (mean, standard deviation, minimum-maximum)	62.8 ± 11,2 years (35-83)
Male sex	105 (61.4)
Hypertension	140 (81.9)
Diabetes mellitus	66 (38.6)
Smoking	49 (28.6)
Dyslipidaemia	100 (58.5)
History of coronary heart disease	36 (21.1)
Percutaneous coronary intervention	19 (11.1)
Coronary artery bypass surgery	9 (5.3)

exams were performed and interpreted by recommendations of the European Society of Echocardiography).

The average time of the TEE examination was less than 30 minutes. The patients with INR > 2.0, esophageal or pharyngeal carcinoma and esophageal or gastric varices were excluded.

#### DATA

Using the clinical registries, we collected data on patients' age, gender, cardiovascular risk factors (hypertension, diabetes mellitus, smoking, dyslipidaemia, history of acute myocardial infarction/coronary heart disease, percutaneous coronary intervention, coronary artery bypass surgery), the time between stroke symptoms onset and TEE, hemispheric or vertebrobasilar stroke and Rankin score by Modified Rankin Scale (at admission, day of TEE and discharge).

Medical and nurse registries were reviewed, from TEE performance to patient discharge, and data was also collected on possible complications of TEE: examination impossible to perform (because of patient refusal or inability for probe progression), pulmonary complications (bronchospasm, respiratory failure), cardiac complications (arrhythmias, atrioventricular block and severe angina pectoris), bleeding complications (pharyngeal bleeding, upper gastrointestinal bleeding, hemorrhagic shock), trauma/perforation (pharyngeal, esophageal, gastric) and others (odynophagia, dental injury and death).

**Tabela 2:** Other characteristic of the study patients (n= 171)

Characteristic	n (%)
Time between stroke symptoms onset and TEE (mean, standard deviation)	11.8 ± 5,1 days
Hemispheric stroke	144 (84.3)
Vertebrobasilar stroke	27 (15.7)
Rankin score (mean, standard deviation)	
- at admission	2.8 ± 0.6
- day of TEE	2.6 ± 0.7
- discharge	2.2 ± 1.0

#### STATISTICAL ANALYSIS

The program Statistical Package for the Social Sciences version 12.0 for Windows was used as a database.

Continuous variables are expressed as means ± standard deviation. Categorical variables are expressed as frequencies and percentages.

#### Results

The study population comprised 171 adult patients with stroke or transient ischemic attack who underwent TEE to our unit.

The demographic characteristics, cardiovascular risk factors and other characteristic of the study patients are shown in Table 1 and 2.

Most complications (Table 3) were caused by impossible to perform the TEE: 2 cases (1.2%) of patient refusal and 2 cases (1.2%) of inability for probe progression.

Acute upper gastrointestinal hemorrhage with hemorrhagic shock caused by esophageal perforation after TEE examination occurred in one patient (0.6%), a 70-years-old woman with a right hemispheric stroke undergoing TEE two days after the beginning of stroke symptoms. TEE probe insertion was not difficult and the acquired images were reasonable in quality. Three hours after TEE she had a large hematemesis and became hemodynamically unstable. Diagnostic esophagogastroduodenoscopy revealed fresh blood in the stomach, but a lesion could not be localized; she underwent urgent laparotomy which showed a large bleeding cervical esophageal perforation, which was oversewn.

One patient (0.6%) experienced mild postoperative odynophagia. No fatalities occurred.

#### Discussion

In our study population of 171 consecutive TEE examinations of adult patients with stroke or transient ischemic attack, the majority of TEE-associated complications were caused by patient refusal (1.2%) and inability for probe progression (1.2%). There was one case (0.6%) of mild postoperative odynophagia; and one case (0.6%) of esophageal perforation with hemodynamic instability and surgical correction. In our series no fatalities occurred (0%).

We are not aware of any previous study of transesophageal echocardiography safety specifically in acute stroke patients. Overall, the incidence of TEE complications is in the range of 0-0.5%.<sup>7,8</sup> The morbidity and mortality of TEE is comparable to esophagogastroduodenoscopy. In a European multicenter study, Daniel et al,<sup>5</sup> published an overall complication rate of 0.2% and a mortality rate of 0.0098% of attempted TEE in 10,419 patients.

**Tabela 3:** TEE associated complications

Complications	n	% (n=171)
Patient refusal	2	1.2
Inability for probe progression	2	1.2
Pulmonary complications		
Bronchospasm	0	0
Respiratory failure	0	0
Cardiac complications		
Arrhythmias	0	0
Atrioventricular block	0	0
Severe angina pectoris	0	0
Bleeding complications		
Pharyngeal bleeding	0	0
Upper gastrointestinal bleeding	1	0.6*
Hemorrhagic shock	1	0.6*
Trauma/perforation		
Pharyngeal	0	0
Esophageal	1	0.6*
Gastric	0	0
Others		
Odinophagia	1	0.6
Dental injury	0	0
Death	0	0

\*Complications on the same patient

Failure to insert or advance the TEE probe occurs in 0.7-1.9% of sedated adult patients and in 0.8% of anesthetized pediatric patients.<sup>5</sup> Insertion and manipulation of the TEE probe may cause oropharyngeal, esophageal or gastric trauma. The odynophagia or dysphagia after TEE is associated with failed insertion or malposition of the probe. Injury to the esophagus after TEE is rare, but, the potential for esophageal rupture does exist. The factors in iatrogenic lesion associated to TEE examinations are pressure generated by the probe and the integrity of the esophageal wall.<sup>10</sup> Perforation incidence after TEE is extremely low.<sup>8,9</sup> Once a perforation occurred, the time from injury to diagnosis is a critical factor and should lead to improvement in morbidity and mortality.<sup>10,11</sup>

### Conclusion

There are limitations to the current study: the small number of patients studied and the experience of a single center. However, despite the number of patients is small, it is enhanced by all being in TEE patients with specific pathology – acute ischemic stroke.

This was a retrospective observational study, in which the decision to perform a TEE in acute stroke patients was left to the attending physician. As we have stated before, in our hospital, only about 20% of acute stroke patients are referred for a TEE.<sup>3</sup> We cannot compensate for any bias in the selection of those patients.

These data suggest that TEE is a safe diagnostic test for the management of acute stroke patients. Retrospective case series studies, including our single-study, may underestimate the true incidence of TEE complications, because of limitations in standardizing the evaluation of patients and poor definitions of clinically significant adverse events.<sup>7</sup> ■

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