

Comparative Study of Transesophageal to Transthoracic in Detecting Thrombus and Spontaneous Echo Contrast in Mitral Stenosis

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ABSTRACT

Background. Spontaneous Echo Contrast (SEC) appears as a curling motion of echo in real time and this indicates blood stasis. It is therefore predictive for thrombus formation and higher risk for thromboembolic phenomenon. Accumulating evidence showed higher incidence of thrombus formation in mitral stenosis (MS) patients if they presented with positive SEC. Detection of left atrial thrombus is even more important before mitral valvuloplasty procedure to prevent systemic and especially cerebral embolism. The aim of this study was to compare the utility of transthoracic echocardiography (TTE) to transesophageal echocardiography (TEE) in detecting SEC and thrombus in patients with MS.

Method. Forty-eight patients with MS were studied with TEE and TTE. The diagnosis of MS was established by TTE.

Result. With TTE, 15 patients (31,3%) had positive SEC, 33 patients (68, 7%) had negative SEC and 6 patients (12,5%) of the SEC positive patients had thrombus in LA. On the other hand with TEE, SEC were positive in 36 (75%) patients, negative in 12 (25%) patients and 17 (35,4%) of the SEC positive patients showed LA thrombus. This study confirmed the strong association between SEC and thrombus formation, as thrombus was only observed in SEC positive patients.

Conclusion. TEE is superior to TTE in detecting SEC and LA thrombus in patients with MS, because of the better acoustic window of TEE. TEE should be considered in every patients with MS where thrombus formation has to be ruled out, particularly before balloon mitral valvuloplasty procedure.

INTRODUCTION

Transesophageal echocardiography (TEE) has emerged as an integral part of a comprehensive echocardiographic examination since the transducer of TEE is facing the heart directly and more closely without any interference of the chest wall as in transthoracic echocardiography (TTE). Certain structures such as aorta, mitral valve, left atrium (LA), left atrial appendage (LM) and prosthetic valves are much more clearly seen by the TEE.¹

The excellent resolution of TEE even enables it to detect prethrombotic sluggish blood flow, mainly in the LA and the LAA such as in patients with mitral stenosis (MS), which has been described as a spontaneous echo contrast (SEC).³⁻⁶ Although TTE is occasionally able to detect SEC in LA, this is not always the case if it is located in the LM.⁷ Detection of LA thrombus is important in situation where a cardiac source of peripheral or cerebral embolism is suspected and prior to balloon mitral valvuloplasty procedure to prevent systemic embolism. In this study we would like to compare the utility of TEE as compared to TTE in detecting SEC and thrombus in LA and LM in patient with MS.

METHOD

This study has a cross sectional design and was conducted between January until July 1998 in Mohammad Hoesin Hospital Palembang. The study population were patients with mitral stenosis as demonstrated by TTE.

Echocardiography

We used A TL Cx 200 echo machine, with multi frequency transducer for TTE and multiplane 5 mHz transducer for TEE. Echocardiographic parameters were measured following recommendation of the American Society of Echocardiography and Herzog modification.⁸

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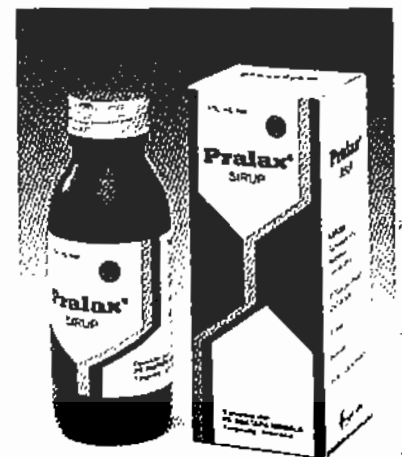
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TEE examination was performed in the same week after TTE examination. We applied standard measurement to assess LA size, and color guided pressure half time to measure mitral valve area both for TEE and TTE. Gain setting was adjusted at the level of intracavitary noise to optimal detect SEC. Echocardiography was done by one operator blinded to the patients.

DEFINITION

Spontaneous echo contrast appears as a dynamic smoke like appearance with curling motion, while noise resulting from excessive gain setting appears as static dot like echoes.(Figure 1)

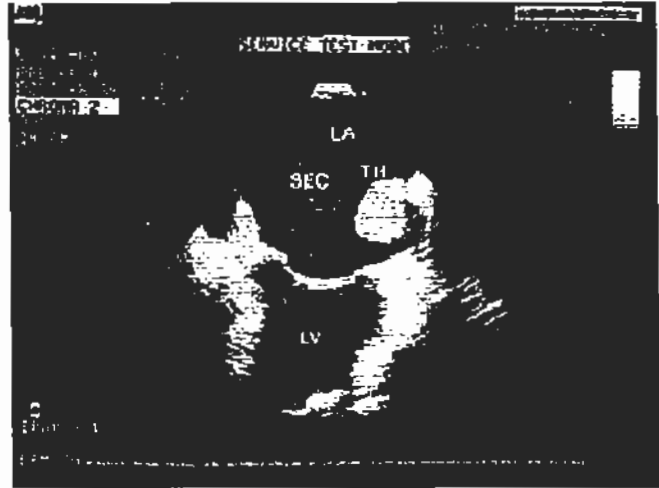


Figure 2. The Same Patient as Figure 1 with More Clear Thrombus in The Left Atrial Appendage

(p=0.007) (table 1) With TTE, LA thrombus was detected in 6 patients (12.5%), all had SEC, while with TEE thrombus was found in 17 patients (35.4%); being in the LA in 6 patients and in the LAA in 11 patients. (p=0.003) (table.2)

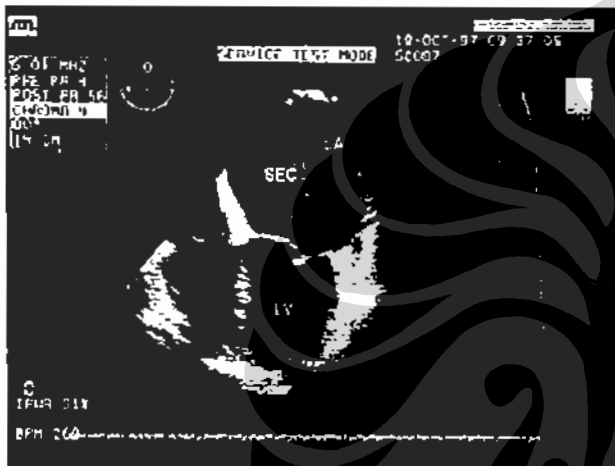


Figure 1. Severe Mitral Stenosis detected by TEE (Trans Esophageal Echocardiography) LA = Left Atrium, LAA = Left Atrial Appendage, LV = Left Ventricular SEC = Spontaneous Echo Contrast

Clot is defined as a dense echo pattern separated from the cardiac wall, while thrombus is a dense echo attached to the cardiac wall.(Figure 2)

Data analysis

Echocardiographer was blinded to the patients, and analysis echo was done at the end of study by reviewing echo-recording from the video tapes. Statistical analysis was done using chi-square test.

Exclusion Criteria

Patient who had any experience of pain during swallowing was excluded.

Results

Forty eight MS patients were recruited, of whom by TTE, SEC was positive in 15 patients (31.3%), and negative in 33 patients (68.7%). By TEE, SEC was positive in 36 patients (75%) and negative in 11 patients (25%).

Table 1. Spontaneous Echo Contrast by TTE and TEE

Echo Procedure (n = 48)	SEC		P*
	+ (%)	- (%)	
TTE	15 (31,3)	33 (68,7)	0,007
TEE	36 (75)	12 (25)	

* Chi Square Test

Table 2. Thrombus by TTE and TEE

Echo Procedure (n = 48)	THROMBUS		P*
	+ (%)	- (%)	
TTE	6 (12,5)	42 (87,5)	0,003
TEE	17 (35,4)	31 (64,6)	

* Chi Square Test

Table 3. Thrombus Location by TTE and TEE

Echo Procedure (n = 48)	Thrombus Location	
	AK (%)	AAK (%)
TTE	6 (12,5)	-
TEE	6 (12,5)	11 (22,9)

DISCUSSION

The present study significantly proved that TEE is superior to TTE in detecting SEC and thrombus in the LA, especially in the LAA. Some authors reported very similar results to our study, that the yield of TTE to detect SEC ranged from 1% -10% compared to a yield

of 43%-58% if the study was done with TEE^{2,7,9,14}. (table. 4)

Table 4. Comparative Data of The Utility of TEE versus TTE to Diagnose SEC

No.	Author	Total	TTE	TEE
1.	Daniel WG ²	122	1 (0,8 %)	61 (50 %)
2.	Ilicetto ⁷	281	10 (3,5 %)	140 (49 %)
3.	Vigna C ⁹	68	2 (2,9 %)	40 (58 %)
4.	Ye Heng Lie ¹⁰	39	0 (0 %)	17 (43 %)
5.	Ghanle	48	6 (12,5 %)	36 (75 %)

This could be explained by the fact that TEE has a wider acoustic window and a more closer distance to the heart. All of the thrombus occurred in a positive SEC patients, confirming the close relationship between SEC and thrombus formation. In a study by Black^{6,17} (81 %) of 21 LA thrombi were associated by SEC, and SEC was found to be the only independent predictor of LA thrombus in mitral valvular disease and non valvular atrial fibrillation. There was controversy regarding the timing of when to use TEE in patients with MS, because TEE is an rather invasive procedure. Vigna was the one who stated that TEE is not necessary in MS patient which has a big LA and atrial fibrillation, because SEC almost certain in this situation.⁹ However this is not necessarily the case, if there was an accompanying mitral regurgitation. As also reported by other authors the most common location for thrombus was LAA, probably because LAA is the area with most sluggish flow. Therefore for thrombus detection TEE is mandatory because the LAA could not be well visualized by TTE.

Even though there was no comparative study of TTE versus TEE prior to balloon valvuloplasty procedure, TEE seems to be indispensable prior to embarking to this procedure as there is always a higher risk to detach thrombus in LA with the resulting serious complication of systemic thromboembolism. This study further showed that the procedure of TEE was quite simple and well tolerated by all patients. With the multiplane transducer, excessive manipulation is not necessary and it takes 10 to 15 minutes to complete the procedure without any significant complication.

CONCLUSION

TEE was superior to TTE in detecting SEC in patient with MS, probably because of closer distance of the transducer to the LA and LM. Thrombus formation always occurred in SEC positive patients. TEE also de-

tected thrombus more often in mitral stenosis patients, because most thrombus was located in the LM, which was more readily visible with TEE because of its better acoustic window.

SUGGESTION

TEE should be performed prior to balloon mitral valvuloplasty procedure. Where there is a suspicion of cardiac source of systemic embolism, SEC should be sought carefully using TEE. It also important to rule out SEC or thrombus in patients where anticoagulant is contraindicated, to make sure that those patients are in a group of low risk to develop thromboembolic complications.

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