

ORIGINAL ARTICLE

Mural vegetation in infective endocarditis – Is it a predictor for embolism?

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Abstract

Background: Infective endocarditis is a microbial infection of endocardial surface of the heart and vegetation is the characteristic lesion of the disease. Mural endocarditis is a condition of rare diagnosis and may be difficult to find vegetation by standard views in transthoracic echocardiography (TTE). Identifying the mural vegetation not only helps to diagnose Infective endocarditis, but also predicts the risk for developing embolism. Aim of this study is to find the occurrence of embolism in patients with mural endocarditis.

Method: A Retrospective, observational study was done for IE patients admitted from the year 2012 to 2018, in which total of 58 patients with definite diagnosis of infective endocarditis were identified. Among which 8 patients were excluded based on the exclusion criteria.

Results: Total 50 patients were identified with IE, which includes 7 with mural vegetation and 43 without mural vegetation. Cultures were positive in 71.4% and 88.3% IE patients with and without mural vegetation respectively. One patient was found to have *corynebacterium* species with mural vegetation and embolic stroke, which is a rare occurrence. Among 43 IE patients without mural vegetation, 88.3% patients showed presence of vegetation in echocardiogram. Size of vegetation were 13 ± 6 and 14.6 ± 2.9 mm, respectively ($p > 0.005$). All the patients with mural vegetation and 9.3% from without mural vegetation had cerebral embolic events ($p < 0.005$).

Conclusion: Though mural vegetation is not common, but if present, it helps in diagnosis and also it may predict a propensity for embolism. Our results indicate that in patients with mural endocarditis, the propensity of embolism is more.

Keywords: Infective endocarditis, mural endocarditis, embolism

Introduction

Infective Endocarditis (IE) is a microbial infection of endocardial surface of the heart. An early diagnosis will reduce complication and death. Presence of vegetation is one of the criteria to diagnose IE.

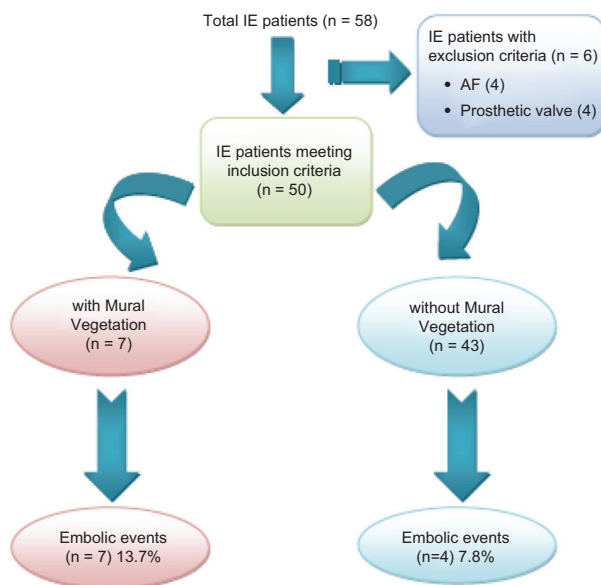
Heart valves are the most common site for vegetation, but at times vegetation may occur or extend to the mural endothelium (mural vegetation). Mural vegetation is rare but not uncommon. The present study is to evaluate occurrence of mural vegetation in patients with IE and to assess its

clinical significance in reference to embolic complications. Currently in the literature only few case reports on mural endocarditis with cerebral infarct were available. There is no study to compare clinical outcome, with respect to embolism in Infective endocarditis with and without mural vegetation. Thus we conducted retrospective study to compare clinical features and outcome with respect to embolic events in IE patients with and without mural vegetation.

Methods

Study Group

We performed a retrospective chart review of all patients' admitted with the diagnosis of IE, in PSG Hospitals, department of cardiology from March 2012 to May 2019, after Institutional Human Ethics committee approval. The diagnosis of IE was made based on documented clinical evidence, blood culture reports and presence of vegetation in echocardiogram as per modified Duke's criteria. A total of 58 IE patients' data were collected, among that eight patients were excluded from study as per exclusion criteria as follows;



1. Patients with atrial fibrillation⁴
2. Patients with prosthetic valves⁴

The remaining 50 patients were diagnosed to have IE, based on modified duke's criteria and were included in the study.

Echocardiography

ECHO of the 50 patients was reviewed by two independent observers, who were unaware about the clinical data. The diagnosis of vegetation was made if an abnormal Echocardiographic findings met all of the following conditions. The patient was said to have vegetation if the independent observer had concurrent observations.

1. Structure attached to an endocardial surface (valves/mural endocardium)
2. Present throughout the cardiac cycle consistently.
3. Visible in multiple views.
4. Independent mobility or with distinct echogenicity from the valve or endocardial surface.

Size of the vegetation is observed from measuring maximum dimension of the vegetation in any view. Site of the vegetation is classified as valvular, if involvement was in aortic valve, mitral valve, pulmonary valve or in combination, and mural vegetation if vegetation was attached/extended to endocardium other than valvular structure. Patients with mural vegetation and without mural vegetation were categorized as IE with mural and without mural vegetation, respectively.

Cerebral embolism

Cerebral embolism was defined as sudden transient or permanent focal neurological deficit and is supported by brain imaging (CT/MRI)

Statistical analysis

Fishers's exact test was used to find the significance of cerebral infarct between IE patients, with and without mural vegetation. Chi-square test (univariate analysis) was used to determine the size factor for embolization. It was statistically significant if $p < 0.005$.

Results

Clinical characteristics

The mean age of IE patients with and without mural vegetation was 34 ± 12 and 55 ± 14 years, respectively. Male patients were predominant in

both groups with 71.4% in IE with mural vegetation and 69.7% in IE patients without mural vegetation. Fever was the common clinical presentation in both groups. One patient (14.2%) in mural vegetation group and 4 patients (9.3%) without mural vegetation had stroke as an initial presentation. Rheumatic heart disease was the common etiology for patients without mural vegetation 19 (44.1%), and mitral valve Prolapse 6 (85.7%) was the common etiology in IE with mural vegetation. Mitral valve disease was predominant in both groups in IE with mural vegetation 6 (85.7%) and without mural vegetation 27 (62.7) (Table 1).

Bacteriological data

Blood cultures were positive in 43 patients (86%). *Streptococcus* species accounted for majority of cases. *Corynebacterium mycetoides* was present in one patient with mural vegetation. Culture negative IE were 2 (28.5%) and 5 (11.6%) in IE groups with & without mural vegetation respectively (Table 2).

Echocardiography

Echocardiograms of 50 patients were reviewed in which 7 patients were found to have IE with mural vegetation and 43 patients without mural vegetation. Among 43 patients without mural vegetation, 38 patients (88.3%) had vegetation in echocardiogram. The mean size of vegetation was 13 ± 6 mm and 14.6 ± 2.9 mm in IE patients with and without mural vegetation respectively (>0.005). Clear evidence of embolism was present in 11 out of 50 patients. Embolic events occurred in all 7 patients in IE with mural vegetation and 4 (9.3%) in the IE without mural vegetation (<0.005). All the embolic events were into the cerebral circulation in both groups (Table 1).

Discussion

IE is an infection of the endocardium or valves, which is caused by various bacteria or fungi. A pre-existing valvular disease, mainly

Table 1 Clinical characteristics of IE patients

Characteristics	IE With Mural Vegetation (n = 7)	IE Without mural vegetation (n = 43)	Total
Total IE patients	7	43	50
Mean age (years)	34 ± 12	55 ± 14	
Gender			
• Male	5 (71.4%)	30 (69.7%)	35 (70%)
• Female	2 (28.5%)	13 (30.2%)	15 (30%)
Clinical presentation			
• Fever	5 (71.4%)	31 (72.09%)	36 (72%)
• Dyspnoea	3 (42.8%)	24 (55.8%)	27 (54%)
• Stroke events	1 (14.2%)	4 (9.3%)	5 (10%)
Etiology			
• RHD	1 (14.2%)	19 (44.1%)	20 (40%)
• MVP	6 (85.7%)	18 (41.8)	24 (48%)
• CHD	0 (0%)	1 (2.3)	1 (2%)
• Others	0 (0%)	5 (11.6)	5 (10%)
Vegetation site			
• Mitral valve	6 (85.7%)	27 (62.7%)	33 (66%)
• Aortic valve	1 (14.2%)	9 (20.9%)	10 (20%)
• Mitral + Aortic valve	1 (14.2%)	5 (11.60%)	6 (12%)
• Others	0 (0%)	1 (2.3%)	1 (2%)
Presence of Vegetation in ECHO	7 (100%)	38 (88.3%)	45 (90%)
Vegetation size ** (mm)	13 ± 6	14.6 ± 2.9	
Blood culture**			
• <i>Streptococcus</i> species	3 (42.8%)	23 (53.4%)	26 (52%)
• <i>Staphylococcus</i> species	1 (14.2%)	2 (4.6%)	3 (6%)
• Others	1 (14.20%)	13 (30.2%)	14 (28%)
• Sterile	2 (28.5%)	5 (11.6%)	7 (14%)
Infarct *	7 (100%)*	4 (9.3%)*	12 (24%)*

* $p < 0.05$; ** $p > 0.05$; IE, Infective Endocarditis; RHD, Rheumatic Heart Disease; CHD, Congenital Heart Disease; MVP, Mitral valve Prolapse.

Table 2 Patients with Mural Vegetation

Patient no.	Age	Gender	Valve	Organism	Vegetation size (mm)
1	28	F	MV	<i>Streptococcus sp.</i>	14.5 x 10.3
2	32	M	MV	<i>Staphylococcus sp.</i>	6.1 x 6.9
3	25	M	MV	<i>Corynebacterium mycetoides</i>	6.8 x 4.3
4	28	M	MV	<i>Streptococcus sp.</i>	7.8 x 19.2
5	27	M	MV	<i>Streptococcus sp.</i>	8.7 x 8.89
6	29	M	MV	<i>Streptococcus sp.</i>	13.4 x 12
7	43	F	MV & AV	<i>Streptococcus sp.</i>	25.2 x 22.7

mm, millimeter; F, Female; M, male; MV, Mitral Valve; AV, Aortic valve; MCA, Middle cerebral Artery; AML, Anterior Mitral leaflet; PML, posterior Mitral leaflet; LVOT, Left Ventricular Outflow Tract.

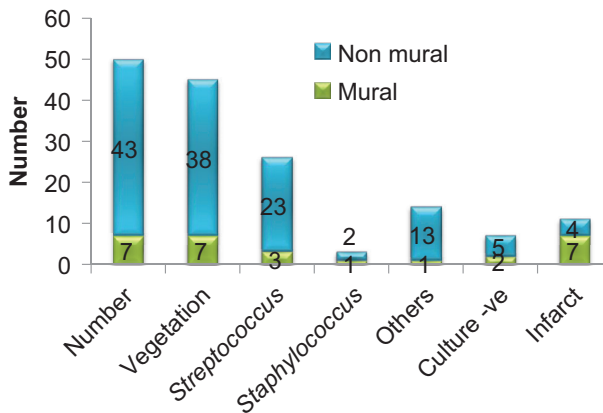


Figure 1 IE Patients with mural and non-mural vegetation.

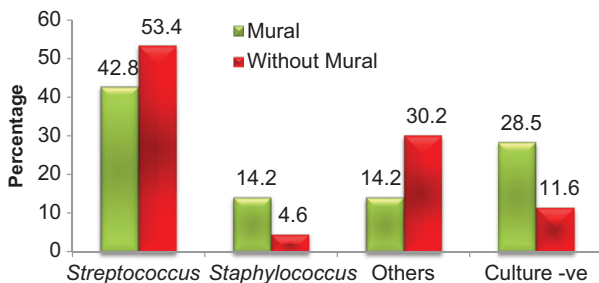


Figure 2 Blood culture.

regurgitation lesion is a predisposing factor for developing IE (Figures 1 and 2).

We collected the IE patients (with and without mural vegetation) demographic profile, clinical presentation, etiology, echocardiographic findings, and outcomes, which was compared with pre-existing Indian and western data. Our study showed male predominance; where male to female ratio was 2.3:1. This was similar in other Indian studies, which showed 2.5:1¹³, 2.7:1¹⁴, 1.8:1¹⁵ and 2.7:1.¹⁶ Higher male to female ratio in India may be because of decrease in incidence of rheumatic heart disease.

We analyzed the predisposing conditions, where 85.7% of the IE patients with mural vegetation had mitral valve prolapse, which was higher than the other Indian studies, which showed only 3.3% and 6.7%. But it was similar to western data, where MVP was most common.¹⁹ Fever was the main presenting symptoms seen common in both IE patients with mural (71.4%) and without mural vegetation (72.09%). This was similar in both Indian and western studies.^{2,12} Any prolonged fever in RHD patients should evoke suspicion of IE. 14.2% of IE patients with mural vegetation presented with neurological focal deficit, which is less compared to Jain et al.,² where they compared with whole IE subset.

Blood cultures were done in all the patients, which was positive in 71.4% and 88.3% IE patients with and without mural vegetation respectively. In our study Streptococcus was found most common in both IE patients with and without mural vegetation 42.8% and 53.4%, respectively, which is similar to other Indian studies.⁹ Streptococci are the most common bacteria in Native valve endocarditis (NVE). But this was in contrast with Western

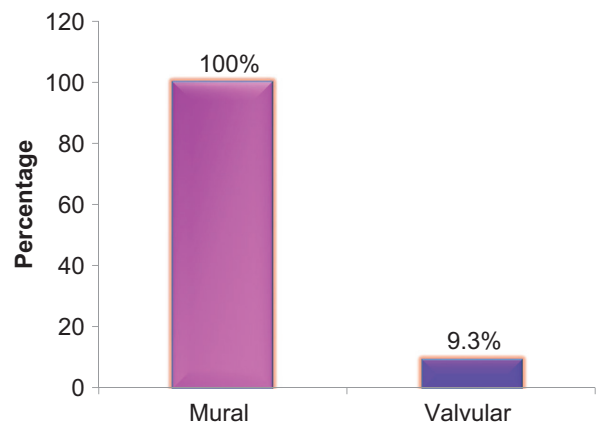
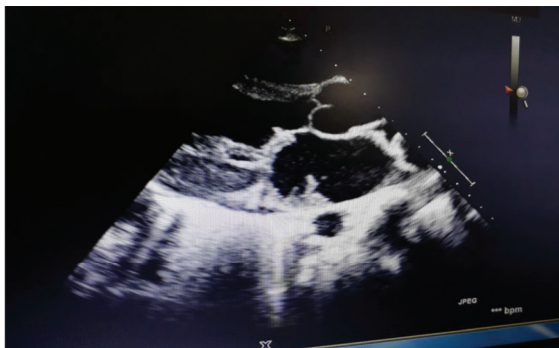
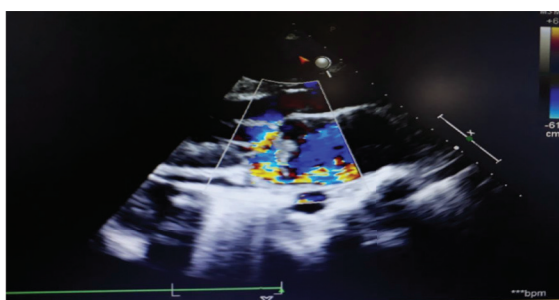


Figure 3 Stroke events.



PLAX view where vegetation is seen in the posterior wall of left atrium.



PLAX view showing MR jet hitting the posterior wall of LA, where mural vegetation was attached.

studies, which showed higher incidence of staphylococcal species, may be due to higher incidence of healthcare associated infections.^{14,16} One patient in IE with mural vegetation group had corynebacterium species, which is a rare organism for IE, had developed embolic stroke.

In our study 50 patients with IE, all the patients with mural vegetation and 88.8% without mural vegetation had echocardiographic vegetation. Comparing the site of vegetation, mitral valve was more common in both with mural and without mural vegetation patients (85.7% and 62.7%) compared to aortic valve. Other studies also revealed that the involvement of mitral valve was more than aortic valve.^{8,10,14} In previous studies patients were divided into those who had small (≤ 10 mm) or absent vegetation and those with large (>10 mm) vegetation. In majority of studies the risk of embolism doubles in the group with size of vegetation >10 mm, but because of small number it was not statistically significant. However when the data were pooled the difference were significant.

In our study large vegetation was documented in 57.1% of patient with mural vegetation (>10 mm), which was similar as compared to Indian

study, 43%.¹⁴ IE patients with mural vegetation had mean vegetation size of 13 ± 6 mm with that of 14.6 ± 2.6 mm in the IE patients without mural vegetation and the difference in size was not statistically significant. In mural vegetation group 100% patients had embolism and 9.3% in IE patients without mural vegetation had embolism ($p < 0.005$). We have excluded the patients with prosthetic valve IE, as the presence of prosthetic valve may confound the risk of embolism. Hence we conclude that the presence of mural vegetation is a predictor for embolism in patients with IE.

Study limitation

- It is not a prospective study.
- We did not include the patients with prosthetic valve and patients who had previous embolism, hence that results cannot be extrapolated to these groups.
- We did not analyze the echocardiogram of all patients who had been admitted with suspicion of IE and not met Duke's criteria.

Conclusion

Mural vegetation in infective endocarditis is rare but not uncommon. Comprehensive echocardiographic evaluation should be considered among all IE patients, particularly those with high velocity eccentric regurgitant jets. Careful search for mural vegetation in patients with valvular lesion presented with clinical suspicion of IE, not only helps in diagnosis but also in risk stratifying the embolic event and helps the surgeon in full clearance of the vegetation during surgery.

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