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Evaluation of Echogenic Material on Transvenous Leads by Transesophageal Echocardiography in Patients with and without Lead-associated Endocarditis

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Evaluation of Echogenic Material on Transvenous Leads by TEE In Patients with and without Lead-associated Endocarditis

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Disclosures: None

Introduction

- Transesophageal echocardiography (TEE) is often required to diagnose lead-associated endocarditis (LAE) in patients with cardiovascular implantable electronic device (CIED) and persistent bacteremia.
- TEE may detect echogenic material (EM) on CIED leads in up to 10% of patients without infection.
- The objectives of the study were:
  1) To determine the incidence of EM in patients with and without LAE.
  2) To define the specific morphologic features of infected vs. non-infected EM detected by TEE.
  3) To characterize the echocardiographic parameters associated with EM in non-infected patients.

Methods

- Consecutive TEE studies performed in patients with CIED between 1/1/2009 and 3/31/2014 were retrospectively analyzed by an echocardiographer (PM) blinded to clinical information.
- Lead-associated EMs were classified as mass-like or linear densities and then evaluated for morphologic characteristics (multi-lobulation, calcification, and mobility), size, the total number of EMs.
- A clinical diagnosis of LAE was adjudicated using the modified Duke criteria.
- Continuous variables were summarized using medians and interquartile ranges ([IQR] = 25th percentile value - 75th percentile value). Clinical and echocardiographic variables were compared between patients with and without definite LAE using chi-square tests for categorical variables and Mann-WhitneyU for continuous variables. All $p < 0.05$ were considered statistically significant.

Results

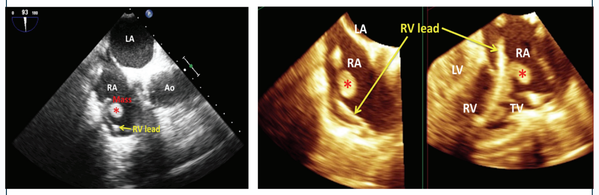
- A total of 289 TEE studies were performed in 255 patients.
  - Group I (n=35): Definite LAE
  - Group II (n=254): Without definite LAE
- EM of any type was present in
  - 31/35 (89%) in Group I
  - 71/254 (28%) in Group II ($p < 0.001$)

Results

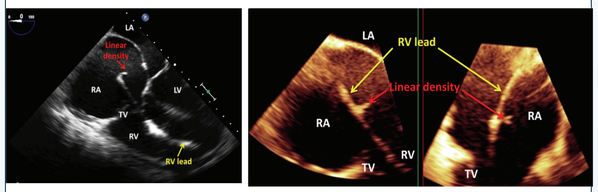
Table	Group I: LAE (n=35)	Group II: No LAE (n=254)	p-value
Age (yr)	68 [55-78]	70 [61-77]	NS
Male	27 (77.1)	164 (64.6)	NS
Echogenic material			
None	4 (11.4)	183 (72)	<0.001
Linear	8 (22.9)	45 (17.7)	
Mass	23 (65.7)	26 (10.2)	
Long axis (mm)	12 [8-18]	9 [7-12]	0.024
Short axis* (mm)	8 [6-12]	5 [4-7.25]	0.006
Long axis > 10 mm	18 (58.1)	21 (29.6)	0.006
Multiple (>2)	15 (48.4)	10 (14.3)	0.001
Multi-lobulated	17 (54.8)	15 (21.1)	0.001
Calcified	1 (3.2)	4 (5.6)	NS
Mobile	29 (93.5)	67 (94.4)	NS
Multiple (>2), large, and multi-lobulated mass	14 (40)	3 (1.2)	0.001

Values depicted as median [IQR] or n (%). *mass-like EMs only. P<0.05 is significant. NS=non-significant, LAE=lead-associated endocarditis

Representative Cases



Representative Case 1 (Group I). A 57-year-old man with a dual-chamber pacemaker and lead-associated endocarditis. Several multi-lobulated mass-like echodensities were seen attached to the RV lead on TEE. Red asterisk(*) denotes the same mass seen on the 2D and 3D images (two orthogonal planes by multi-planar reconstruction). He successfully underwent complete device and lead removal. RA=right atrium, LA=left atrium, Ao=ascending aorta, RV=right ventricle, LV=left ventricle, TV=tricuspid valve.



Representative Case 2 (Group II). A 62-year-old women with severe cardiomyopathy and a single-chamber ICD underwent TEE for the assessment of ventricular function. A small mobile linear echodensity was present on the atrial portion of the RV lead. RA=right atrium, LA=left atrium, RV=right ventricle, LV=left ventricle, TV=tricuspid valve.

Results

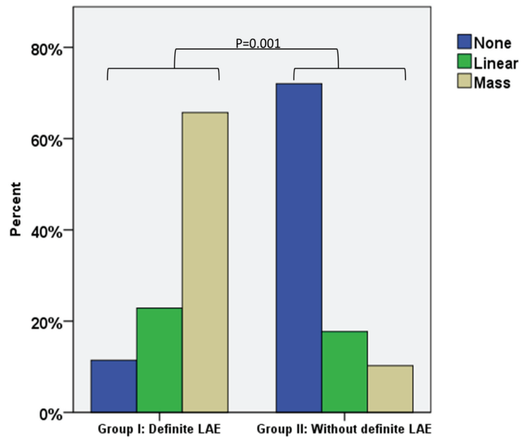


Figure 1. Morphology: Group I vs. II

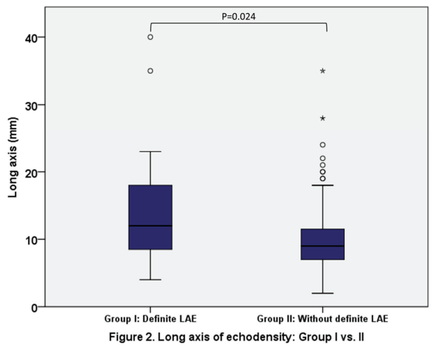


Figure 2. Long axis of echodensity: Group I vs. II

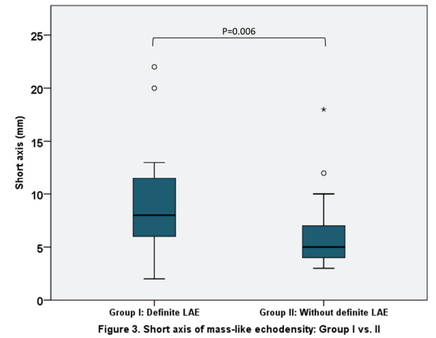


Figure 3. Short axis of mass-like echodensity: Group I vs. II

Results

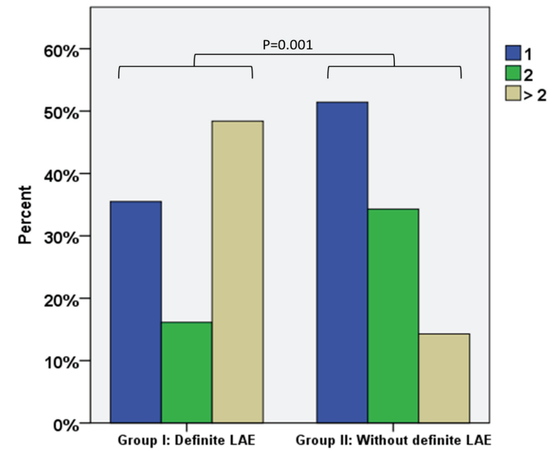


Figure 4. Number of EM: Group I vs. II

- Compared to Group II, echogenic materials (EM) in group I were more likely mass-like, larger, multiple and multi-lobulated. (**Figure 1 - 4**)
- Sensitivity and specificity of a mass-like EM for diagnosing LAE irrespective of clinical context were 66% and 90%, respectively.
- Sensitivity and specificity of multiple, large (>10 mm), and multi-lobulated mass-like EMs for diagnosing LAE were 40% and 99%, respectively.
- In patients in Group II, the presence of EM (fibrous strands and thrombi) was not associated with RA size, RV size, RV function, LV function or estimated pulmonary artery pressure.

Conclusion

1. **Echogenic material on non-infected CIED leads is a common finding (28%).**
2. **Several morphologic characteristics of EM (mass-like rather than linear, large [>10 mm], multiple and multi-lobulated) are more commonly seen in LAE. However, these characteristics alone are NOT diagnostic for LAE.**
3. **Lead-associated EM on TEE should be interpreted within the overall clinical context.**