Clinical, Radiographic, and Microbiologic Features of Infective Endocarditis in Patients With Hypertrophic Cardiomyopathy

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Infective endocarditis (IE) is an infection of the inner lining of the heart with high morbidity and mortality despite medical and surgical advancements in recent decades. Hypertrophic cardiomyopathy (HC) is one of several medical conditions that have been linked to an increased risk of IE, but there is a paucity of data on this association. We therefore sought to define the clinical phenotype of IE in patients with HC at a single tertiary care center. A retrospective cohort of 30 adult patients with HC diagnosed with IE between January 1, 2006 and December 31, 2016 at Mayo Clinic Rochester were identified. Similar rates of aortic (n = 14) and mitral (n = 16) valve involvement by IE were noted (47% vs 53%). This finding persisted even in patients with left-ventricular outflow tract obstruction and systolic anterior motion of the mitral valve. Symptomatic embolic complications occurred in 10 cases (33%). Surgical intervention was performed in 11 cases (37%). One-year mortality was remarkably low at 7%. In conclusion, in the largest single-center cohort of IE complicating HC, there were similar rates of both mitral and aortic valve involvement regardless of the presence of left ventricular outflow tract obstruction, which is contrary to a long-standing tenet regarding the association of HC and IE. Moreover, no "high risk" IE subset was identified based on HC-related parameters. **(Am J Cardiol 2017;■■:■■–■■)**

Infective endocarditis (IE) is an infection of the inner lining of the heart with high morbidity and mortality despite medical and surgical advancements in recent decades.[1,2] Hypertrophic cardiomyopathy (HC), a thickening of the heart muscle in the absence of an alternative systemic condition, has been linked to an increased risk of IE.[3–6] Since this association was first described in 1966, there has been very limited systematic evaluation on the subject.[7] In 1999, a retrospective study identified 10 HC patients with IE, all of whom had a similar clinical phenotype with mitral valve involvement and outflow tract obstruction.[8] This was consistent with several case reports in the English literature over the preceding 2 decades.[9–20] More recently, a multicenter report of 34 HC patients with IE has called this classic presentation into question, demonstrating both aortic and mitral IE occurring with and without left ventricular outflow tract (LVOT) obstruction.[21] The objective of the current investigation is to define the clinical phenotype of IE in consecutive patients with HC at a single US tertiary care center.

Methods

A retrospective cohort of 30 adult (18 and older) patients with HC who were diagnosed with IE between January 1, 2006 and December 31, 2016 at Mayo Clinic Rochester were analyzed. Patients were identified by screening the medical record for HC diagnosis codes. This list was then filtered for IE diagnosis codes. At our institution, all patients with definite or possible IE receive infectious disease (ID) consultation. Therefore, patients without ID consultations were excluded. The resulting 72 charts were reviewed manually to verify the diagnoses of HC and IE. Equivocal cases of HC were adjudicated by a cardiologist with training in advanced imaging. Equivocal cases of IE were adjudicated by an ID specialist.

HC was defined in accordance with published national and international guidelines as a segment of left ventricular wall thickness ≥15 mm that is not explained by hypertensive heart disease, valvular heart disease, or physiologic remodeling due to intense athletic training.[3,4] Baseline cardiac magnetic resonance imaging data were used if available. Transthoracic echocardiography was also assessed in all patients. LVOT obstruction was defined as a gradient ≥30 mm Hg either at rest or with provocation.

All definite and possible IE cases were included according to the modified Duke criteria.[22] Imaging reports were reviewed for evidence of vegetation, abscess or pseudoaneurysm, leaflet perforation, dehiscence, or fistula.

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See page 4 for disclosure information.

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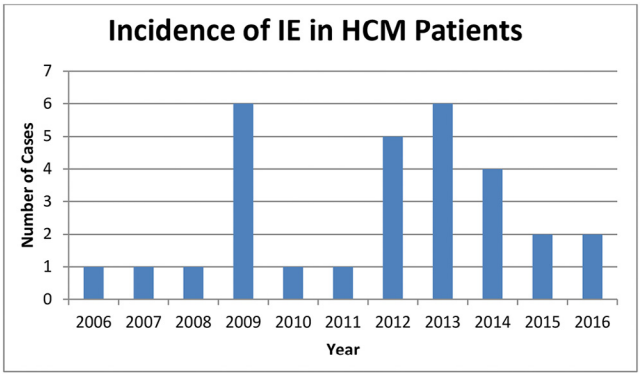

Figure 1. Incidence of IE complicating HC during the study period. Note: The number of patients treated for IE in the setting of HC each year during the study period is displayed. IE = infective endocarditis; HC = hypertrophic cardiomyopathy.

Clinical records were evaluated for embolic complications of IE including septic pulmonary emboli, ischemic stroke, and other systemic emboli (splenic, renal, mesenteric or peripheral). Mortality was assessed formally by the Mayo Clinic Health Sciences Research Department through the LexisNexis Accurint tool (New York City, New York).

Chi-square Fisher's exact test was used to compare all values provided except survival. Survival was calculated by Wilcoxon test for survivorship. A value of $p < 0.05$ was considered significant for all tests. All analyses were performed using JMP (SAS Institute, Cary, North Carolina).

Results

Nearly 2/3 of cases occurred in the final 5 years of the study period (Figure 1). Thirty cases were identified with baseline characteristics outlined in Table 1. The most common predisposing factor for IE among the cohort was presence of a nonvalvular intracardiac device (37%) or a prosthetic valve (30%). Of the patients with intracardiac devices, 8 had automatic implantable cardioverter-defibrillators (AICDs), 3 had permanent pacemakers, and 1 had a left-ventricular assist device as a bridge to transplantation. HC imaging features are outlined in Table 2, with 63% having sigmoid morphology. Fifty percent demonstrated LVOT obstruction, and 47% had previous septal reduction.

Microbiological findings were similar to IE in the general population, with staphylococcal and streptococcal species accounting for 80% of cases, followed by enterococci (10%) (Table 3). The aortic and mitral valves were similarly involved at 47% and 53%, respectively. Of the patients with viridans group streptococcal (VGS) IE, only 1 was noted to have had a preceding dental procedure (root canal 2 months prior). This patient also had a mechanical mitral prosthesis and did not take antibiotic prophylaxis before the procedure. Symptomatic embolic complications were noted in 1/3 of the cohort, and surgical intervention was required in 37%. Indications for surgery were acute heart failure (n = 7), recurrent emboli (n = 2), severe valvular incompetence (n = 1), and perivalvular abscess (n = 1). Among patients who did not undergo surgery, there were no surgical indications identified retrospectively. Of note, clinical outcomes were favorable with 1-year mortality of 7% (n = 2) and no IE relapses or recurrences over 29 months of median follow-up. Both deaths occurred after dismissal from the index hospitalization. The first was approximately 45 days after diagnosis of IE related to multiorgan failure and family decision to pursue palliative care measures. The second was approximately 9 months after diagnosis of IE and resulted from biventricular heart failure. Neither patient underwent surgery as it was felt to be prohibitively high risk because of severe co-morbidity in both cases.

When patients without any cardiac prosthetic devices were compared with those with prosthetic valves or intracardiac devices, a significantly higher rate of aortic valve involvement was seen (75% vs 28%, p = 0.02, Table 4). All 3 cases of tricuspid valve involvement occurred in the setting of either a tricuspid valve prosthesis or a nonvalvular intracardiac device.

Table 1
Population characteristics (n = 30)

Mean age at diagnosis of endocarditis (years)	57.7
Range (years)	19–81
Male	26 (87%)
Diabetes mellitus type 2	8 (27%)
End-stage renal disease	5 (17%)
Congestive heart failure	11 (37%)
Ejection fraction <50%	1 (3%)
Chronic obstructive pulmonary disease	2 (7%)
Intravenous drug use	1 (3%)
Rheumatic heart disease	1 (3%)
History of prior endocarditis	2 (7%)
Prosthetic valve	9 (30%)
Aortic	4 (13%)
Mitral	6 (20%)
Tricuspid	2 (7%)
Intra-cardiac device	11 (37%)
Automatic implantable cardioverter-defibrillator	8 (27%)
Pacemaker	3 (10%)
Left-ventricular assist device	1 (3%)
Endovascular graft	2 (7%)
Prosthetic joint	4 (13%)
Prior hypertrophic cardiomyopathy intervention	14 (47%)
Alcohol septal ablation	2 (7%)
Septal myectomy	12 (40%)
Median follow up (months)	29

Table 2
Hypertrophic cardiomyopathy imaging features

Hypertrophic cardiomyopathy morphology	
Sigmoid	19 (63%)
Apical	1 (3%)
Reverse curve	5 (17%)
Neutral	4 (13%)
Other	1 (3%)
Left-ventricular outflow tract obstruction	15 (50%)
Systolic anterior motion of the mitral valve	20 (63%)
Mean maximal wall thickness (mm)	20.6
Had baseline MRI	14 (47%)
Delayed enhancement on MRI	10 (71%)
Greater than moderate aortic stenosis	1 (3%)
Greater than moderate mitral regurgitation	7 (23%)