Cardiac Imaging

Intracardiac Echocardiography Begs to Differ

Spyridon Deftereos[1,2], Charalampos Kossyvakis[1,2], Georgios Giannopoulos[1,2], Konstantinos Raisakis[1], Vasiliki Panagopoulou[1], Konstantinos Doudoumis[1], Vlasios Pyrgakis[1]

[1]Cardiac Catheterization and Cardiac Electrophysiology Department, "G. Gennimatas" General Hospital, Athens, Greece; [2]Section of Cardiovascular Medicine, Yale University School of Medicine, New Haven, CT, USA

Key words:
Intracardiac echocardiography, left ventricular noncompaction, structural heart disease, cardiomyopathy.

Manuscript received:
November 21, 2012;
Accepted:
November 26, 2013.

Address:
Spyridon Deftereos

Section of Cardiovascular Medicine
Yale University School of Medicine
New Haven, CT, USA
spdeftereos@gmail.com;
spiridon.defteros@yale.edu

This 55-year-old man was referred to our cardiac electrophysiology department for evaluation of frequent episodes of non-sustained ventricular tachycardia. The referral diagnosis was apical hypertrophic cardiomyopathy, based on the images obtained on the transthoracic echocardiogram (TTE) (Figure 1), showing hypertrophy of the apical segments of the left ventricle and obliteration of the apical cavity at systole, although his rest electrocardiogram did not show the characteristic alterations of this disorder (deep inverted T-waves). His past history was notable for chronic obstructive pulmonary disease (hence the rather poor quality of his transthoracic acoustic windows). His presenting symptom for his current evaluation was presyncope. The referring physicians found repeated episodes of non-sustained ventricular tachycardia on his 24-hour ambulatory recording and recommended an invasive electrophysiological study for further risk stratification and consideration for an implantable cardioverter defibrillator.

Intracardiac echocardiography (ICE) is extensively used in our laboratory, especially for atrial fibrillation ablation procedures. In order to obtain better views of the left ventricular cavity, we inserted an ICE catheter (AcuNav™, Biosense Webster, Waterloo, Belgium) through the right femoral vein. ICE revealed marked trabeculations of the myocardium of the seemingly hypertrophic regions of the left ventricle, with deep intertrabecular recesses (Figure 2A), a finding compatible with the diagnosis of left ventricular non-compaction cardiomyopathy (LVNC). This was confirmed by contrast echocardiography (Figure 2B). Subsequent magnetic resonance imaging showed a maximal non-compacted-to-compacted myocardium ratio of 3.1 (consistent with the diagnosis of isolated left ventricular non-compaction) (Figure 2C).

ICE is increasingly being used to guide percutaneous interventions and electrophysiological procedures. Its role in structural heart disease is limited, but it can be used in various contexts, including transcatheter interventions for valvular heart disease.[1,2] Left ventricular non-compaction is usually diagnosed with TTE and contrast echocardiography, often with confirmation by magnetic resonance imaging; however, the diagnosis is not always unambiguous and there are several caveats in the echocardiographic evaluation of potential cases.[3] Our case is largely similar to another reported in the literature, where LVNC was diagnosed by ICE during an electrophysiology study—although the authors did not provide confirmation of the diagnosis with magnetic resonance

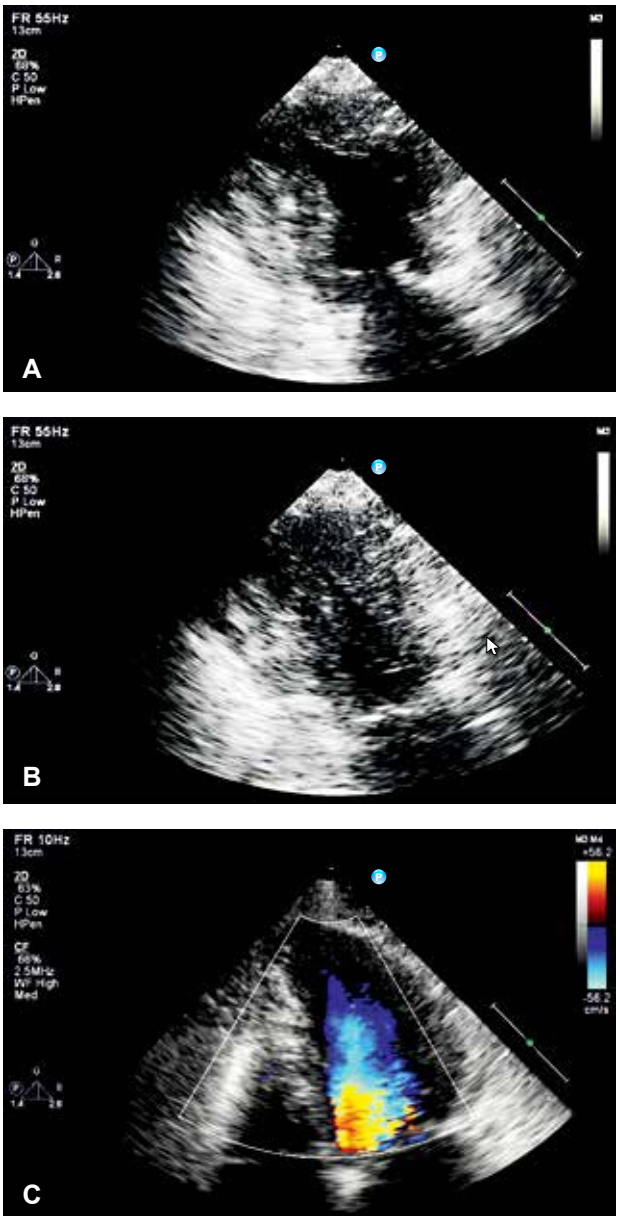

Figure 1. A: Diastolic frame from the transthoracic echocardiography study, presumably showing substantial hypertrophy in the apical segments of the left ventricle. B: Systolic frame showing obliteration of the apex at systole, with "mouse-tail" appearance of the left ventricular cavity, also suggestive of apical hypertrophy. C: Apical four-chamber view with color-flow mapping, showing systolic obliteration of the apex.

imaging[4] – indicating that ICE can offer high-quality imaging of the left ventricle and allow reliable diagnostic assessment of patients with suspected left ventricular non-compaction and an inadequate TTE study.

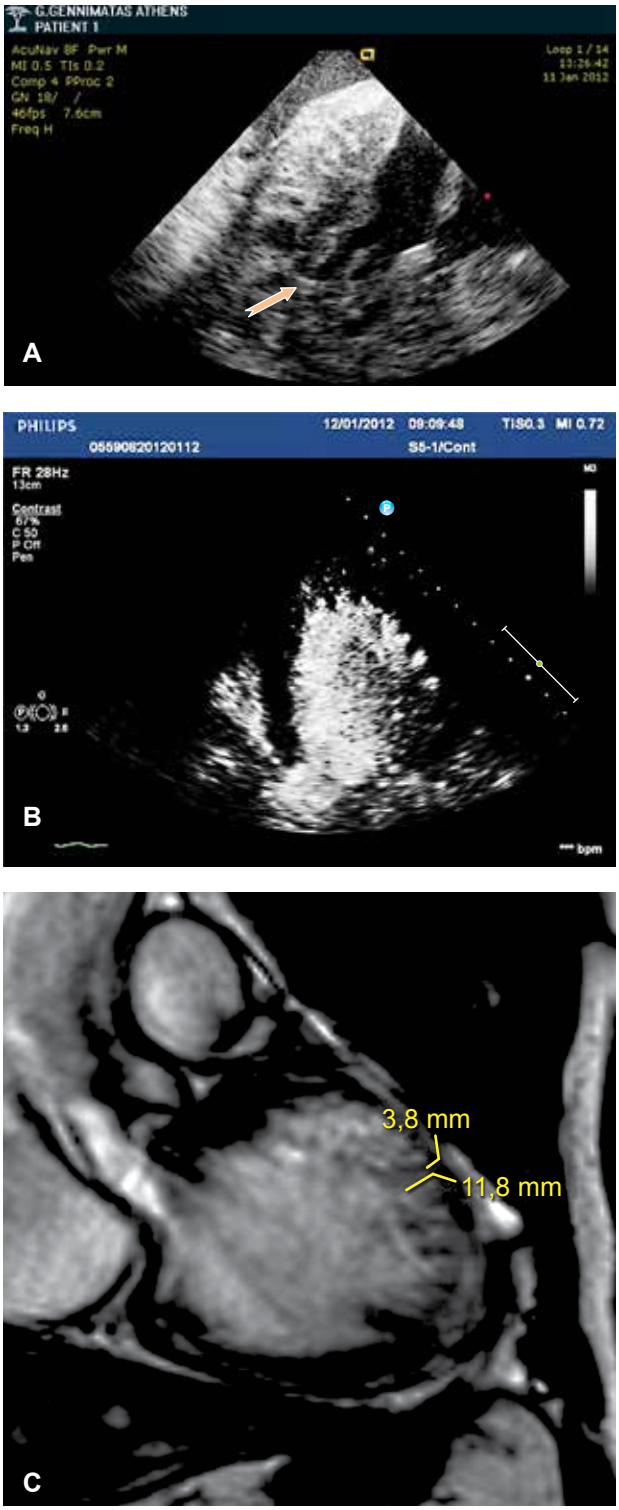

Figure 2. A: Imaging of the left ventricular apex from the right ventricle with intracardiac echo. Deep recesses are evident in the myocardium (arrow), which is markedly trabeculated (non-compacted myocardium). B: Contrast echocardiography (left ventricular opacification) in the same patient, showing penetration of the contrast microbubbles between the trabeculae of the left ventricular myocardium. C: Magnetic resonance image revealing a non-compacted to compacted myocardium ratio of 3.1 (right).

References

1. Zamorano JL, Badano LP, Bruce C, et al. EAE/ASE recommendations for the use of echocardiography in new transcatheter interventions for valvular heart disease. Eur Heart J. 2011; 32: 2189-2214.
2. Deftereos S, Giannopoulos G, Raisakis K, Kaoukis K, Kossyvakis C. Intracardiac echocardiography imaging of periprosthetic valvular regurgitation. Eur J Echocardiogr. 2010; 11: E20.
3. Attenhofer Jost CH, Connolly HM. Left ventricular noncompaction: dreaming of the perfect diagnostic tool. Eur J Heart Fail. 2012; 14: 113-114.
4. Ficili S, Pandozi C, Galeazzi M, et al. Noncompacted ventricular myocardium: characterization by intracardiac echo. J Cardiovasc Med (Hagerstown). 2011; 12: 294-296.