

Left Ventricular Non-Compaction: A Case Report

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ABSTRACT

We present a comprehensive case of left ventricular non-compaction (LVNC) in a 45-year-old woman, focusing on diagnostic approaches and management strategies. LVNC is a rare congenital cardiomyopathy characterized by excessive trabeculations and a spongy myocardial appearance, predisposing patients to heart failure, arrhythmias, and thromboembolism. The case outlines the diagnostic process, including echocardiography and cardiac MRI, highlighting findings such as reduced ejection fraction, fibrosis, and left ventricular trabeculations. Management included heart failure therapy, anticoagulation, and potential device implantation. The case emphasizes the significance of early recognition, multidisciplinary management, and ongoing research into the genetics and treatment of LVNC.

Keywords: *Left Ventricular Non-Compaction, Cardiomyopathy, Heart Failure, Echocardiography*

Introduction

Left ventricular non-compaction (LVNC) is a rare congenital cardiomyopathy resulting from arrested myocardial development during embryogenesis (Couissi *et al.*, 2023). The non-compacted myocardium fails to undergo the normal process of compaction, leading to a thickened, trabeculated myocardium, particularly in the left ventricle (Álvarez Pérez *et al.*, 2020). First recognized in the late 20th century, LVNC has become more identifiable with advancements in cardiac imaging (Petersen *et al.*, 2005). The condition is frequently associated with heart failure, arrhythmias, and increased risk of thromboembolic events (Singh *et al.*, 2024).

The etiology of LVNC is complex, with potential genetic factors playing a key role in its development. Studies have suggested a familial component, where mutations in genes encoding sarcomeric proteins contribute to LVNC in a subset of patients (Filho *et al.*, 2021). Early diagnosis of LVNC can significantly alter

the clinical course, as early treatment of heart failure symptoms, arrhythmias, and prevention of embolic events is crucial to improving long-term outcomes.

The intent of this report is to highlight a typical presentation of LVNC and review the current diagnostic modalities, including echocardiography and cardiac MRI. We will also discuss management strategies, including pharmacological therapy, anticoagulation, and device implantation for advanced cases. This case aims to contribute to the growing knowledge base of LVNC and underscore the need for ongoing research into its pathophysiology and treatment.

Case Presentation

A 45-year-old female, previously healthy, presented with worsening dyspnea, fatigue, and intermittent palpitations over six months. She denied any history of cardiomyopathy in her family. Upon examination, her heart rate was irregularly irregular, and her vital signs indicated mild tachycardia with a blood pressure of 130/85 mmHg. A third heart sound (S3) was noted, and bilateral lung crackles were present, indicative of early heart failure.

Diagnostic evaluation began with an ECG, revealing atrial fibrillation. Echocardiography demonstrated prominent trabeculations in the left ventricle, with a non-compacted to compacted myocardium ratio of 2.5:1, consistent with LVNC (Fig. 1-2). The ejection fraction was markedly reduced at 35%. Cardiac MRI provided further confirmation, showing subendocardial fibrosis and the characteristic spongy appearance of the myocardium. BNP levels were significantly elevated at 800 pg/mL, supporting the diagnosis of heart failure.



Figure 1: Echocardiography: Short-axis view showing trabeculations.

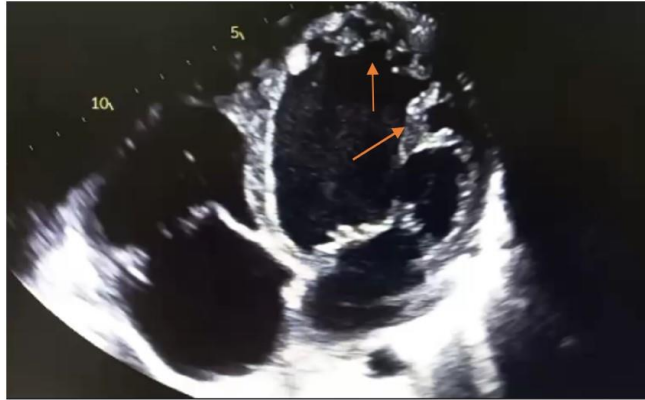


Figure 2: Echocardiography: Apical 4-chamber view showing LV trabeculations.

Discussion

LVNC, though rare, is an increasingly recognized cause of heart failure and arrhythmias, particularly as imaging techniques improve (Gallucci *et al.*, 2023). The pathophysiology of LVNC involves the failure of normal myocardial compaction during fetal development, leading to excessive trabeculations and deep intertrabecular recesses (Paluszkiewicz *et al.* 2022). The clinical presentation is highly variable, ranging from asymptomatic individuals to those with severe heart failure, arrhythmias, or thromboembolic events (Filho *et al.*, 2021).

In this case, the patient's presentation with heart failure symptoms and atrial fibrillation was typical of LVNC, underscoring the need for heightened clinical suspicion in patients with heart failure of unknown etiology. Imaging modalities play a critical role in diagnosing LVNC, with echocardiography providing initial identification of the characteristic myocardial trabeculations (Hirono *et al.*, 2022). Cardiac MRI offers more detailed visualization of the myocardium, as well as the ability to detect fibrosis and assess the risk of arrhythmias and sudden cardiac death (Mewton *et al.*, 2011).

The management of LVNC focuses on treating heart failure and preventing complications. Our patient was treated with ACE inhibitors and beta-blockers to improve cardiac function, as well as anticoagulation therapy due to the presence of atrial fibrillation and risk of thromboembolic events. CRT was considered due to her persistent symptoms and reduced ejection fraction. The role of CRT in LVNC remains an area of ongoing research, with some studies suggesting benefit in select patients (Oginosawa *et al.*, 2008). The genetic underpinnings of LVNC may guide future therapies, as research into sarcomeric protein mutations continues to evolve.

This case contributes to the existing knowledge by emphasizing the need for early recognition and treatment of LVNC to prevent adverse outcomes. Ongoing follow-up and a multidisciplinary approach are essential for managing LVNC, particularly in patients with heart failure and arrhythmias.

Conclusion

This case underscores the importance of recognizing LVNC as a cause of heart failure and highlights the role of advanced imaging in its diagnosis. Effective management includes pharmacological therapy for heart failure, anticoagulation to prevent embolic events, and consideration of device therapy in advanced cases. Early diagnosis and multidisciplinary care are critical for optimizing outcomes in patients with LVNC.

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Conflicts of Interest: The author declares no conflicts of interest.

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