American Journal of Case Reports

e-ISSN 1941-5923
© Am J Case Rep, 2026; 27: e953259
DOI: 10.12659/AJCR.953259

Received: 2025.02.28
Accepted: 2026.05.22
Available online: 2026.05.28
Published: 2026.XX.XX

A 46-Year-Old Man Presenting With Chest Pain Due to Apical Hypertrophic Cardiomyopathy (Yamaguchi Syndrome) Diagnosed by Multimodal Cardiac Imaging

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABDEF 1,2 Mauro de Deus Passos
ABDEF 3 Daniel Lopes Marques de Araújo
ABDEF 3 Lucas de Ávila Mariano
ABDEF 1,2 Dilson Palhares Ferreira
ABDEF 4,5 Luciano Moreira Alves
ABDEF 6 Simone Nascimento dos Santos

1 Internal Medicine Unit, Sobradinho Regional Hospital, State Department of Health, Brasília, DF, Brazil
2 Higher School of Health Sciences/Foundation for Teaching and Research in Health Sciences, State Department of Health, Brasília, DF, Brazil
3 Medical Residency Program in Internal Medicine, Sobradinho Regional Hospital, State Health Secretariat, Brasília, DF, Brazil
4 São Francisco de Assis Hospital, Goiânia, GO, Brazil
5 Goiânia Emergency Hospital, State Department of Health, Goiânia, GO, Brazil
6 Eccos Advanced Cardiovascular Diagnostics, Brasília, DF, Brazil

Corresponding Author: Mauro de Deus Passos, Sobradinho Regional Hospital (Internal Medicine Unit), Q 12 CJ B LT 38 Sobradinho, 73010-120, Brasília, DF, Brazil, Phone: +55(61)999312699, e-mail: mauropassos@cardiol.br

Financial support: None declared
Conflict of interest: None declared

Patient: Male, 46-year-old
Final Diagnosis: Apical hypertrophic cardiomyopathy • Yamaguchi syndrome
Symptoms: Chest pain
Clinical Procedure: Cardiac magnetic resonance imaging • CT angiography • ECG • invasive coronary angiography
Specialty: Cardiology
Objective: Rare disease

Background: Apical hypertrophic cardiomyopathy (ApHCM), also known as Yamaguchi syndrome, is a rare variant of hypertrophic cardiomyopathy characterized by the thickening of the left ventricle apex (>15 mm) and giant negative T-waves on the precordial leads of the electrocardiogram (ECG), which can present symptoms and electrocardiographic changes that mimic acute coronary syndrome (ACS). This report describes the case of a 46-year-old man with chest pain and giant T-wave inversion on ECG, requiring multimodal cardiac imaging to diagnose ApHCM (Yamaguchi syndrome) and exclude the diagnosis of coronary artery occlusion and myocardial infarction.

Case Report: We report the case of a 46-year-old man who presented to the Emergency Department with typical chest pain. His ECG revealed significant alterations highly suggestive of ACS, including ST-segment depression and giant negative T-waves (>10 mm) in leads V4-V6. Despite this presentation, serial high-sensitivity troponin levels remained consistently within the normal range. Coronary computed tomography angiography (CCTA) revealed non-obstructive coronary arteries but indicated increased apical left ventricular (LV) wall thickness with characteristic trabeculation, raising suspicion for ApHCM. Transthoracic echocardiography (TTE) confirmed pronounced apical LV thickening (20 mm) and a reduced Global Longitudinal Strain (GLS) of -14.3%. Cardiac magnetic resonance (CMR) imaging provided a definitive diagnosis, identifying significant apical hypertrophy with systolic obliteration of the LV cavity and quantifying multifocal myocardial fibrosis at 6% of the LV mass. The patient's symptoms improved significantly with medical therapy, including losartan, metoprolol, and trimetazidine.

Conclusions: This case highlights the critical diagnostic challenge of ApHCM masquerading as ACS. It underscores the indispensable role of a multimodal imaging approach—integrating ECG, TTE, CCTA, and CMR—for an accurate diagnosis, particularly for identifying underlying myocardial fibrosis and guiding appropriate patient management.

Keywords: Apical Hypertrophic Cardiomyopathy • Chest Pain • Diagnosis, Differential • Electrocardiography • Magnetic Resonance Imaging

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/953259

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

Introduction

Hypertrophic cardiomyopathy (HCM) is the most common monogenic cardiac disease, with an estimated prevalence of 1 in 500 individuals [1]. It is a leading cause of sudden cardiac death in young people and athletes [1,2]. Apical hypertrophic cardiomyopathy (ApHCM), also known as Yamaguchi syndrome, is an uncommon morphological variant of HCM characterized by myocardial hypertrophy localized predominantly at the left ventricular (LV) apex [3,4].

Epidemiologically, ApHCM shows a higher incidence in Asian populations, accounting for approximately 25% of HCM cases in Japan, whereas in Western populations the prevalence is significantly lower, ranging between 1% and 10% [4,5]. The clinical presentation of Yamaguchi syndrome is broad and can include atypical chest pain, palpitations, dyspnea, or syncope [4,6]. Frequently, the combination of precordial pain and dramatic electrocardiographic changes—such as giant negative T-waves (>10 mm) and high QRS voltage—mimics acute coronary syndrome (ACS) [3,4].

The diagnosis is based on demonstration of apical hypertrophy and the "ace-of-spades" configuration of the LV cavity at the end of diastole [3,4]. Although transthoracic echocardiography is the initial modality, its accuracy can be limited by poor visualization of the apex, making cardiac magnetic resonance (CMR) imaging essential to confirm the diagnosis, evaluate complications such as apical aneurysms, and quantify myocardial fibrosis via late gadolinium enhancement [4,7]. The management of ApHCM focuses on symptomatic control with beta-blockers or calcium channel blockers to improve diastolic filling and reduce ischemia, alongside risk stratification for the prevention of sudden death [4,6].

Previously published case reports highlight the diagnostic challenge of ApHCM across different populations. Almehrij et al (2024) described a 65-year-old Saudi man whose presentation mimicked ACS [5]. Giri et al (2022) reported an incidental diagnosis in a 52-year-old patient with sudden chest pain and normal coronary angiography [8]. Additionally, Doctorian et al (2017) detailed the case of a 53-year-old woman where the initial diagnosis was masked by technical difficulties during echocardiography, later confirmed by catheterization and CMR [7].

This report describes the case of a 46-year-old man presenting with chest pain and giant T-wave inversion on ECG, requiring

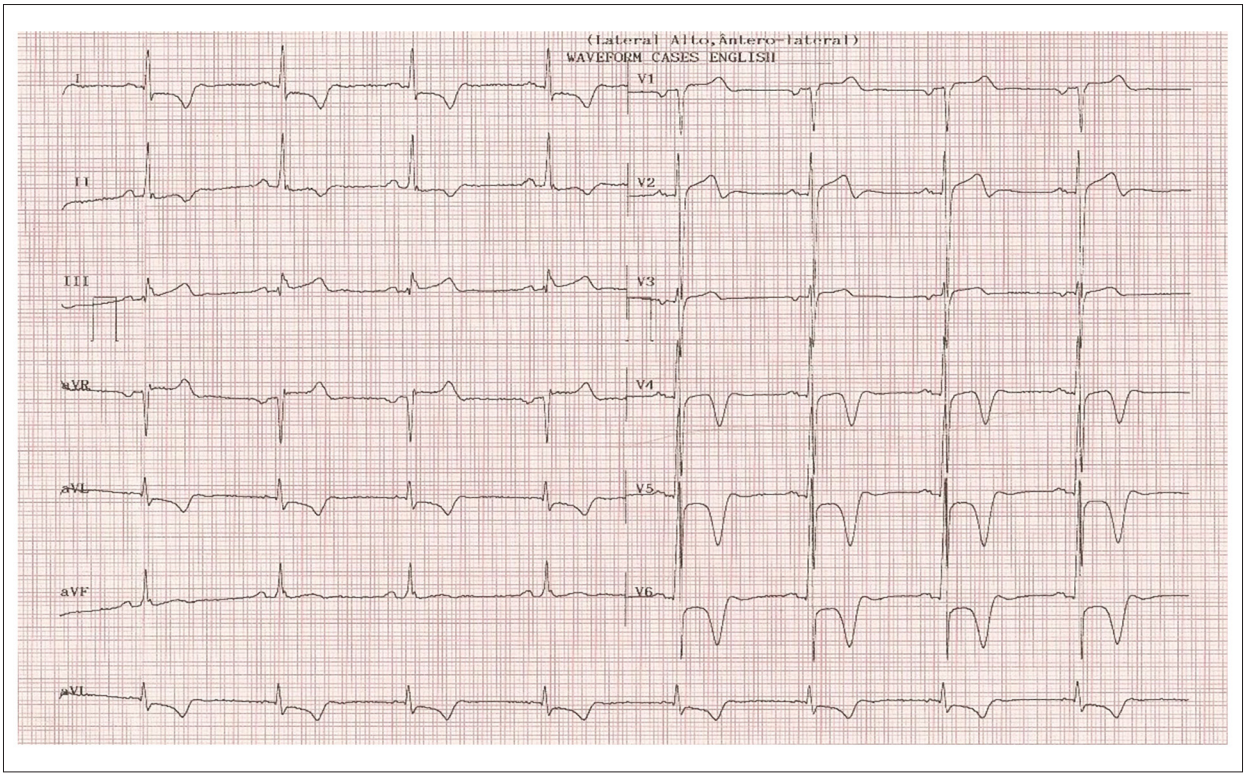

Figure 1. Standard 12-lead electrocardiogram (ECG) on admission demonstrating signs of left ventricular hypertrophy and apical ischemia. The 12-lead ECG shows significant ST-segment depression in leads I, aVL, and V5-V6, associated with tall R-waves from V2 to V6, and characteristic giant negative (inverted) T-waves with an amplitude exceeding 10 mm in the precordial leads V4 to V6. These findings are highly suggestive of apical hypertrophic cardiomyopathy (Yamaguchi syndrome). ECG, electrocardiogram.

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

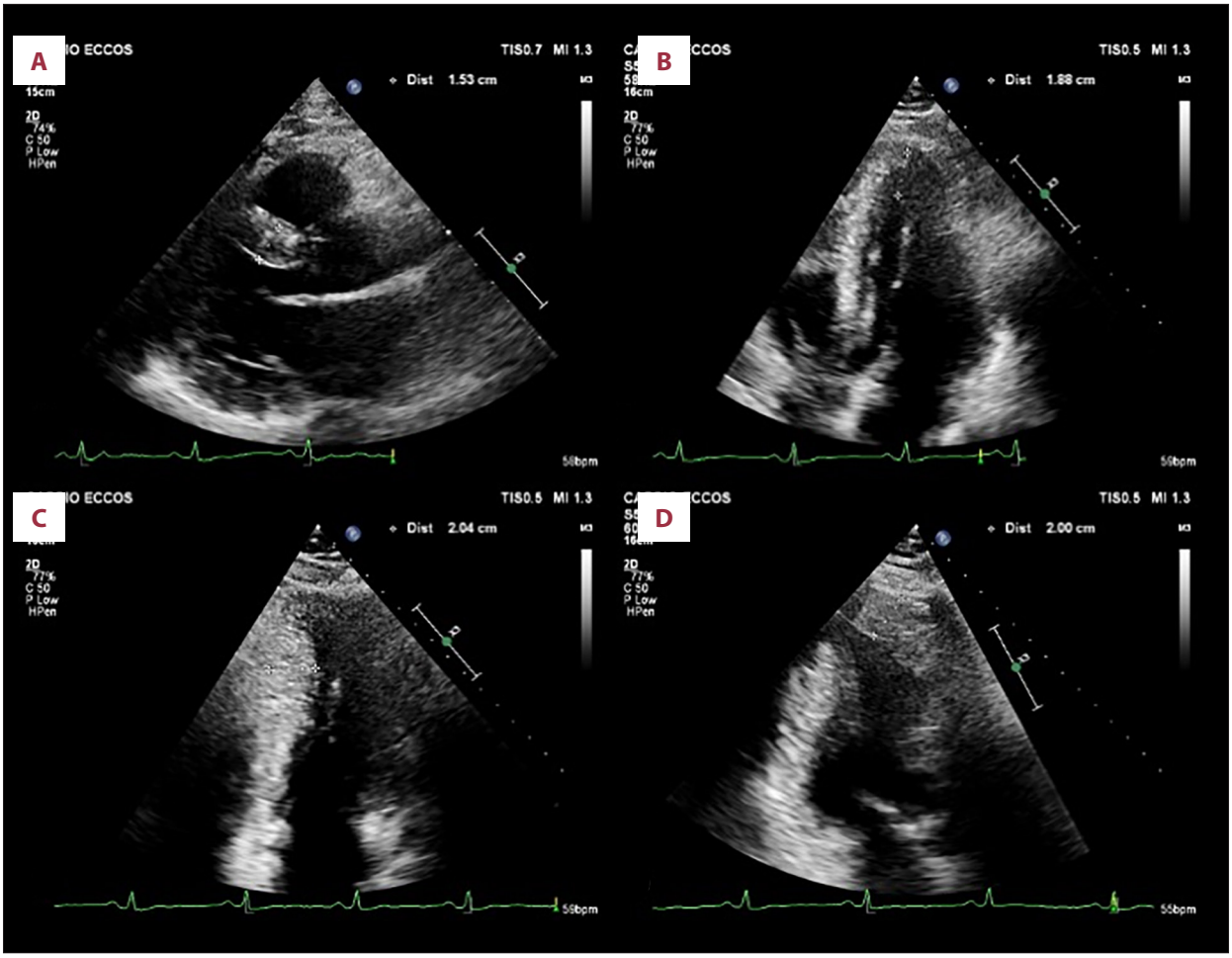

Figure 2. Two-dimensional transthoracic echocardiogram (TTE) assessing myocardial wall thickness. Transthoracic echocardiographic images in the parasternal long-axis and apical views showing increased diastolic wall thickness in the (**A**) left ventricular (LV) anteroseptal basal segment (15.3 mm), (**B**) LV apex segment (18.8 mm), (**C**) LV septal apical segment (20.4 mm), and (**D**) LV anterior apical segment (20.0 mm). The images demonstrate the characteristic "spade-like" configuration of the LV cavity during diastole. LV, left ventricular; TTE, transthoracic echocardiogram.

multimodal cardiac imaging to diagnose ApHCM and exclude the diagnosis of coronary artery occlusion and myocardial infarction.

Case Report

A 46-year-old male patient with no significant prior medical history, including an absence of hypertension, diabetes mellitus, or known family history of premature coronary artery disease (CAD), presented to the Emergency Department with a 6-hour history of typical, exertional chest pain that resolved with rest. He reported experiencing several similar episodes of stable angina over the preceding months.

Upon admission, a diagnostic 12-lead electrocardiogram (ECG) was performed (**Figure 1**), revealing a sinus rhythm with pronounced ST-segment depression in leads I, aVL, and V5-V6; tall R-waves in leads V2-V6; and the characteristic deep, inverted T-waves (>10 mm) in the precordial leads V4-V6. This electrocardiographic pattern, highly suspicious for an acute coronary syndrome (ACS) such as Wellens' syndrome or a non-ST-elevation myocardial infarction (NSTEMI), remained stable on serial ECG recordings. However, serial high-sensitivity cardiac troponin (hs-cTn) assays remained consistently within the reference range, effectively ruling out acute myocardial necrosis.

Given the discordance between the ischemic ECG findings and the negative cardiac biomarkers, a non-invasive investigation with coronary computed tomography angiography (CCTA) was performed to evaluate the coronary anatomy. The CCTA revealed a coronary artery calcium (CAC) score of 29 (Agatston method), placing the patient above the 86th percentile for his age and sex. While the CCTA demonstrated non-obstructive coronary arteries, it provided the initial morphological evidence of

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

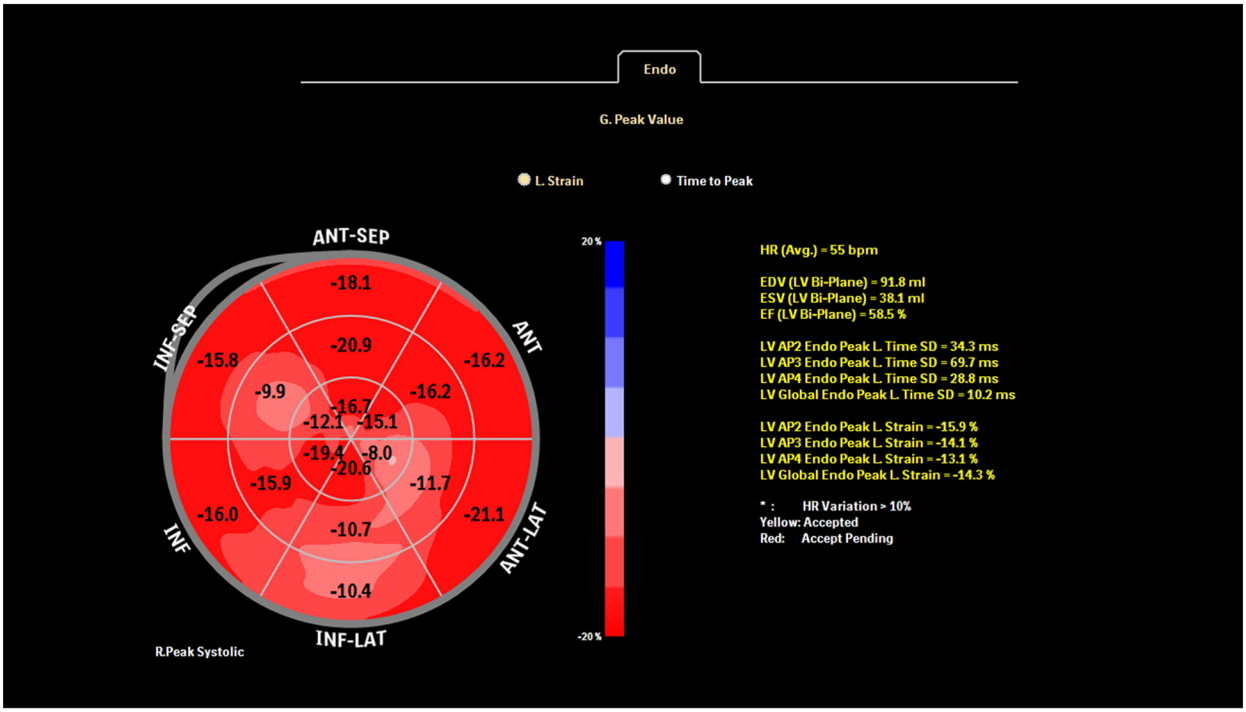

Figure 3. Two-dimensional speckle-tracking echocardiography showing global longitudinal strain (GLS) analysis. The bull's-eye plot represents a diffusely reduced longitudinal strain, most pronounced in the apical segments (represented by the lighter colors in the center of the plot), with an average GLS value of -14.3%. This pattern indicates regional myocardial dysfunction despite a preserved ejection fraction. GLS, global longitudinal strain.

disease by identifying increased wall thickness and prominent trabeculation in the left ventricular (LV) apical region, highly suggestive of apical hypertrophic cardiomyopathy (ApHCM).

Despite the CCTA findings, the patient's persistent anginal symptoms and high-risk ECG prompted an invasive coronary angiography (ICA) to definitively rule out obstructive CAD or eccentric lesions. The ICA confirmed that the epicardial coronary arteries were free of hemodynamically significant stenosis, shifting the diagnostic focus toward a primary cardiomyopathy.

To further characterize the myocardial structure and function, a transthoracic echocardiogram (TTE) was performed on an outpatient basis. The TTE demonstrated a significant and asymmetric increase in myocardial thickness localized to the apical segments of the LV, with a maximum wall thickness of 20 mm in the apical anteroseptal and inferolateral walls (**Figure 2**). Although the LV ejection fraction (LVEF) was preserved at 58%, two-dimensional (2D) speckle-tracking echocardiography revealed a diffusely reduced global longitudinal strain (GLS) of -14.3%, with the most pronounced impairment in the hypertrophied apical segments (**Figure 3**).

For definitive tissue characterization and to assess for myocardial scarring, a cardiac magnetic resonance (CMR) study was performed (**Figure 4**). The CMR confirmed significant LV hypertrophy confined to the apex, resulting in near-complete systolic obliteration of the LV cavity. Importantly, late gadolinium enhancement (LGE) imaging identified areas of multifocal, intramyocardial fibrosis within the hypertrophied segments, quantified at 6% of the total LV mass.

Based on the multimodal imaging findings, the patient was diagnosed with ApHCM (Yamaguchi syndrome). Medical therapy was initiated with losartan 50 mg/day, metoprolol succinate 50 mg/day, and trimetazidine 70 mg/day. Trimetazidine was specifically included as an adjunctive metabolic modulator to address microvascular ischemia and the oxygen supply-demand mismatch inherent in the hypertrophied myocardium. At the 3-month follow-up, the patient reported a significant improvement in symptoms and a marked reduction in the frequency of anginal episodes.

Discussion

This case report demonstrates that apical hypertrophic cardiomyopathy (ApHCM) should be considered a crucial differential diagnosis in patients presenting with chest pain and giant T-wave inversions, even when the clinical picture strongly mimics acute coronary syndrome (ACS) [9,10]. The primary learning point is the necessity of a multimodal imaging approach to

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

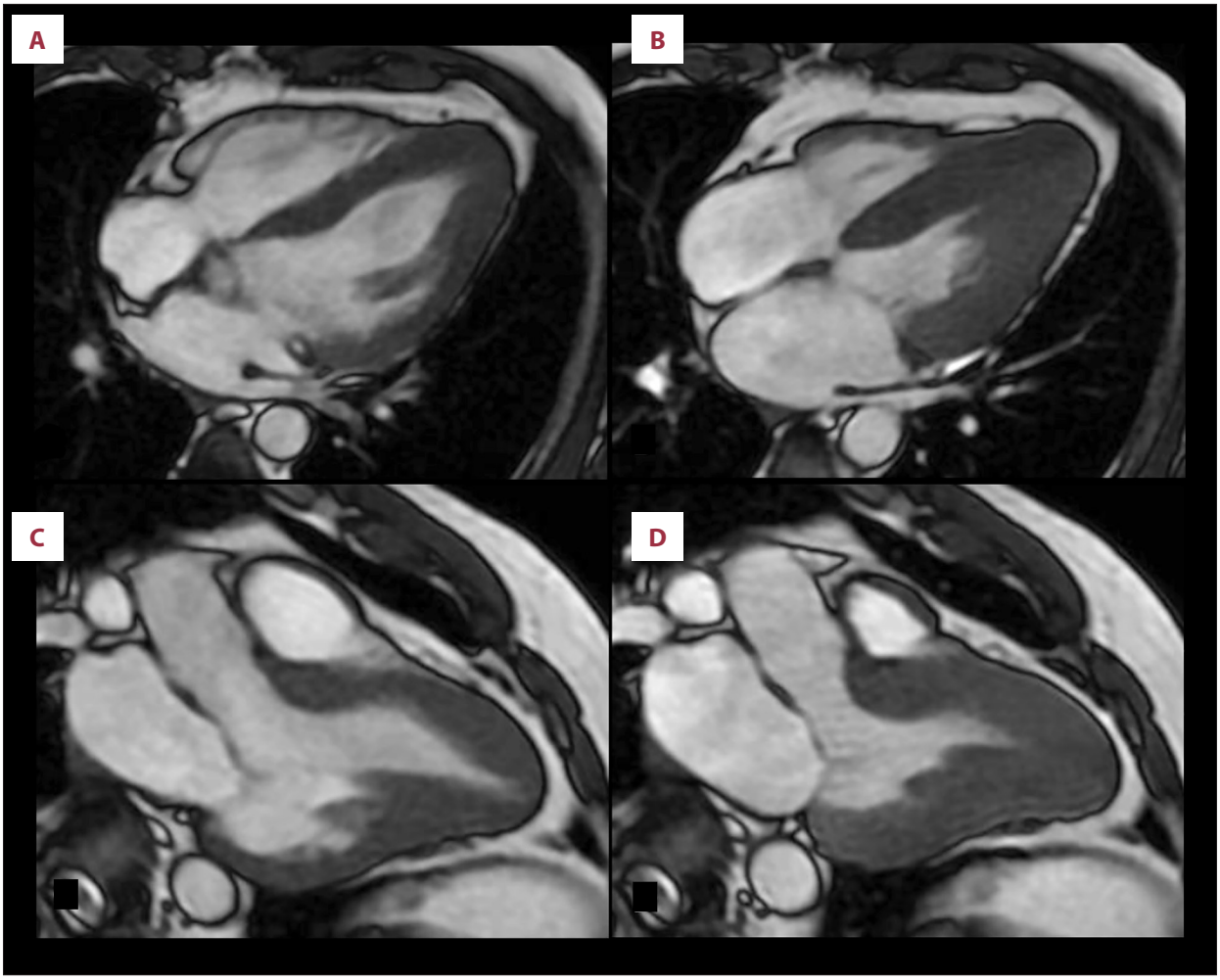

Figure 4. Multiplanar cardiac magnetic resonance (CMR) imaging confirming apical hypertrophy. The CMR images include 4-chamber long-axis views in diastole (**A**) and systole (**B**), and coronal views in diastole (**C**) and systole (**D**). The arrows highlight the increased left ventricular (LV) wall thickness with marked apical predominance and complete systolic obliteration of the LV apex (**B, D**), confirming the diagnosis of Yamaguchi syndrome. LV, left ventricular; CMR, cardiac magnetic resonance.

differentiate structural myocardial changes from obstructive coronary ischemia, enabling the identification of myocardial fibrosis and appropriate risk stratification [10,11].

The patient's initial clinical presentation—typical exertional angina combined with dramatic ECG changes—created a strong and appropriate initial suspicion of myocardial ischemia, prompting an evaluation consistent with standard ACS protocols [11,12]. The presence of deep, symmetric T-wave inversions, often termed "giant negative T-waves," is a classic feature of ApHCM, found in up to 93% of patients [3,12]. These changes result from delayed repolarization in the hypertrophied apical myocardium, creating an abnormal electrical gradient [13]. However, in the acute setting, these findings are difficult to distinguish from the T-wave inversions of Wellens' syndrome or non-ST-elevation myocardial infarction [3,11].

The diagnostic pivot in this case occurred with the finding of persistently normal high-sensitivity troponin levels [10]. This crucial negative finding contradicted the initial hypothesis of acute myocardial necrosis and mandated a broader differential diagnosis, highlighting that when clinical and ECG data suggest ischemia but biomarker evidence is absent, clinicians must actively consider non-ischemic etiologies [13,14].

The presentation, diagnosis, and clinical course of this patient are similar to cases reported by Almehrij et al (2024) and Giri et al (2022), where ApHCM perfectly mimicked ACS in middle-aged and elderly men [5,8]. Like the case by Almehrij et al, our patient had anginal symptoms and a high-risk ECG but non-obstructive coronary arteries [5]. Unlike the case reported by Doctorian et al (2017), where technical difficulties in echocardiography masked the initial diagnosis, the early use of coronary computed tomography angiography (CCTA) in our

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

protocol allowed for the immediate identification of apical hypertrophy and prominent trabeculation before confirmation by echocardiography [7,10].

The subsequent diagnostic investigation underscores the incremental value of a multimodal imaging strategy. CCTA served a vital dual purpose: it showed a low probability of obstructive epicardial coronary disease and provided the first morphological evidence of ApHCM [4,14]. TTE further solidified the diagnosis by quantifying the apical hypertrophy (20 mm) and revealing a reduced GLS of -14.3%, a sensitive marker of subclinical myocardial dysfunction [15,16]. CMR was the ultimate arbiter, providing unparalleled tissue characterization and identifying multifocal myocardial fibrosis (6% of LV mass) via LGE [17,18]. The detection of fibrosis is of paramount prognostic importance, as it is a known substrate for ventricular arrhythmias and sudden cardiac death (SCD) [18,19].

Regarding therapy, the patient's symptomatic improvement with a combination of a beta-blocker (metoprolol), an angiotensin receptor blocker (losartan), and an anti-anginal agent (trimetazidine) is consistent with current management strategies for non-obstructive HCM [20,21]. The inclusion of trimetazidine as a metabolic modulator was a strategic choice to address the microvascular ischemia inherent in the hypertrophied myocardium, a personalized approach that resulted in a marked reduction of anginal episodes at the 3-month follow-up [22]. While Mavacamten has emerged as a targeted therapy for the obstructive form, the management of ApHCM remains focused on symptom control and arrhythmia prevention [23,24].

Conclusions

This case illustrates the significant diagnostic challenge of apical hypertrophic cardiomyopathy (ApHCM) masquerading as acute coronary syndrome (ACS). The integration of a multimodal imaging approach—comprising electrocardiography (ECG), coronary computed tomography angiography (CCTA), transthoracic echocardiography (TTE), and cardiac magnetic resonance (CMR)—was indispensable for achieving an accurate diagnosis and excluding obstructive coronary artery disease. Specifically, CMR provided definitive tissue characterization and identified myocardial fibrosis, which is critical for risk stratification. Furthermore, the clinical improvement observed with a personalized medical regimen, including the metabolic modulator trimetazidine, highlights an effective strategy for managing microvascular ischemia in non-obstructive apical phenotypes.

Institution Where Work Was Done

Sobradinho Regional Hospital, State Department of Health, Brasília, DF, Brazil.

Patient Permission/Consent Declarations

The patient authorized publication of this case report by signing an informed consent form.

Acknowledgements

The authors acknowledge the use of Gemini AI (Google) and ChatGPT (OpenAI, GPT-5) for linguistic refinement and technical translation assistance to meet academic English standards. The authors emphasize that the final content and clinical conclusions are their sole responsibility.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Semsarian C, Ingles J, Maron MS, Maron BJ. New perspectives on the prevalence of hypertrophic cardiomyopathy. J Am Coll Cardiol. 2015;65(12):1249-54
2. Maron BJ, McKenna WJ, Danielson GK, et al. American College of Cardiology/European Society of Cardiology Clinical Expert Consensus Document on Hypertrophic Cardiomyopathy. J Am Coll Cardiol. 2003;42(9):1687-713
3. Yamaguchi H, Ishimura T, Nishiyama S, et al. Hypertrophic nonobstructive cardiomyopathy with giant negative T waves (apical hypertrophy): Ventriculographic and echocardiographic features in 30 patients. Am J Cardiol. 1979;44(3):401-12
4. Parisi R, Mirabella F, Secco GG, Fattori R. Multimodality imaging in apical hypertrophic cardiomyopathy. World J Cardiol. 2014;6(9):916-23
5. Almehrij A, AlSaleem AZ, Suliman I. A case report of Yamaguchi syndrome in a Saudi male. Cureus. 2024;16(1):e52241
6. Hughes RK, Knott KD, Malcolmson J, et al. Apical hypertrophic cardiomyopathy: The variant less known. J Am Heart Assoc. 2020;9(5):e015294
7. Doctorian T, Mosley WJ, Do B. Apical hypertrophic cardiomyopathy: Case report and literature review. Am J Case Rep. 2017;18:525-28
8. Giri A, Acharya S, Kamat S, et al. Yamaguchi syndrome: A hidden masquerader of ischemic heart disease. Cureus. 2022;14(6):e26439
9. Gupta S, Bhatia S, Singh A, et al. Apical hypertrophic cardiomyopathy: A review. Curr Probl Cardiol. 2024;49(12):102856
10. Mihos CG, Pineda AM, Santana O, et al. A review of the diagnosis and management of apical hypertrophic cardiomyopathy. J Thorac Dis. 2013;5(3):360-66
11. Gulati M, Levy PD, Mukherjee D, et al. 2021 AHA/ACC Guideline for the evaluation and diagnosis of chest pain. Circulation. 2021;144(22):e368-454
12. Yan L, Wang Z, Yiu KH, et al. Comparison of apical hypertrophic cardiomyopathy with and without giant negative T waves. Europace. 2013;15(11):1663-70
13. Januzzi JL, Morss A, Chae C, et al. Troponin T levels in patients with hypertrophic cardiomyopathy. Am J Cardiol. 2003;92(7):818-21
14. Knuuti J, Wijns W, Saraste A, et al. 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. Eur Heart J. 2020;41(3):407-77
15. Tower-Rader A, Mohananey D, To A, et al. Prognostic value of global longitudinal strain in hypertrophic cardiomyopathy. JACC Cardiovasc Imaging. 2019;12(10):1930-39

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

16. Afonso LC, Bernal J, Bax JJ, et al. Speckle-tracking echocardiography in hypertrophic cardiomyopathy. J Am Soc Echocardiogr. 2008;21(7):784-91
17. Moon JC, Fisher NG, McKenna WJ, et al. The role of cardiovascular magnetic resonance in patients with hypertrophic cardiomyopathy. Eur Heart J. 2004;25(15):1281-89
18. Chan RH, Maron BJ, Olivotto I, et al. Prognostic value of quantitative contrast-enhanced cardiovascular magnetic resonance in hypertrophic cardiomyopathy. Circulation. 2014;130(6):484-95
19. Aquaro GD, Masci P, Formisano F, et al. Prognostic value of late gadolinium enhancement in hypertrophic cardiomyopathy. J Am Coll Cardiol. 2012;60(17):1722-29
20. Elliott PM, Anastasakis A, Borger MA, et al. 2014 ESC Guidelines on diagnosis and management of hypertrophic cardiomyopathy. Eur Heart J. 2014;35(39):2733-79
21. Maron BJ, Desai MY, Nishimura RA, et al. 2020 AHA/ACC Guideline for the diagnosis and treatment of patients with hypertrophic cardiomyopathy. Circulation. 2020;142(25):e558-631
22. Fragasso G, Piatti MdPM, Monti L, et al. Trimetazidine in hypertrophic cardiomyopathy: a new therapeutic option? J Cardiovasc Pharmacol. 1999;33(3):500-6
23. Olivotto I, Oreziak A, Barriales-Villa R, et al. Mavacamten for treatment of symptomatic obstructive hypertrophic cardiomyopathy (EXPLORER-HCM). Lancet. 2020;396(10253):759-69
24. Braunwald E, Saberi S, Abraham TP, et al. Mavacamten: A first-in-class myosin inhibitor for obstructive hypertrophic cardiomyopathy. Eur Heart J. 2023;44(44):4622-33

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]