CLINICAL ARRHYTHMIA
Case Report
https://doi.org/10.24207/jca.v39.3572

Sudden Death and ICD Implantation in Special Situations: Prinzmetal's Angina

Gabrielle Lahoud Chati[1*], Fernando Mello Porto[2], Daniel Fioravanti Gimenez[2], Guilherme Viana Barbosa[2], Adão Bento de Lucena Neto[2], Halim Cury Filho[2], José Marco de Nogueira Lima[2]

ABSTRACT

The objective of this study was to report the case of a patient with Prinzmetal's angina who experienced cardiac arrest due to ventricular fibrillation. The patient was successfully resuscitated, and underwent implantation of an implantable cardioverter-defibrillator (ICD) for secondary prevention. Data were collected through a review of medical records, analysis of diagnostic tests, and a literature review. This case highlights the importance of risk stratification and ICD implantation in patients with Prinzmetal's angina and life-threatening arrhythmic events, ensuring appropriate management and reducing the risk of recurrence.

KEYWORDS: Angina Pectoris, Variable; Heart Arrest; Arrhythmias, Cardiac; Defibrillators, Implantable.

INTRODUCTION

Prinzmetal's angina is a rare clinical condition characterized by coronary artery spasms, often affecting the epicardial vessels, which can lead to myocardial ischemia. Although its exact pathophysiology remains incompletely understood, factors such as smoking, psychological stress, and the use of substances like cocaine are known triggers of intense chest pain episodes at rest, typically associated with transient ST-segment elevation[1]. This condition is classified within the spectrum of myocardial infarction with non-obstructive coronary arteries (MINOCA)[2].

Although Prinzmetal's angina is infrequently linked to severe arrhythmogenic events such as ventricular arrhythmias, it may lead to fatal complications, including sudden cardiac death, especially in individuals with elevated cardiovascular risk profiles[3]. Early detection and appropriate treatment, including the use of devices such as the implantable cardioverter defibrillator (ICD), have proven to be effective strategies for the prevention of complex ventricular tachyarrhythmias.

Therapeutic management of Prinzmetal's angina typically involves the administration of calcium channel blockers and nitrates to control anginal episodes[1–4]. The use of ICDs in selected cases, particularly in patients with a history of arrhythmias or high-risk features, may play a critical role in reducing mortality associated with these complications[3,4].

The literature on sudden cardiac death related to Prinzmetal's angina remains limited, with few detailed case reports available. In this case report, we present the diagnostic process, management, and outcomes of a patient with Prinzmetal's angina who progressed to sudden cardiac death, emphasizing the importance of an effective therapeutic approach and appropriate risk stratification.

1. Faculdade São Leopoldo Mandic – Campinas (SP), Brazil.
2. Pontifícia Universidade Católica – Faculdade de Medicina – Campinas (SP), Brazil.
***Correspondence author:** gabi.lahoo@gmail.com
Received: Nov 7, 2024 | **Accepted:** Dec 27, 2025

CASE REPORT

A 40-year-old Japanese-descendant male patient, sedentary and without any personal or familial cardiovascular risk factors, presented with a two-month history of chest pain episodes. Initially, these episodes occurred during stressful work-related situations, with spontaneous relief within a few minutes and a maximum duration of 10 to 15 minutes.

During one particularly stressful episode, the patient experienced a recurrence of chest pain, this time of greater intensity and associated with diaphoresis, followed by loss of consciousness. Bystanders noted cyanosis and initiated chest compressions. Approximately 4 minutes later, emergency medical services confirmed cardiac arrest with ventricular fibrillation. Defibrillation and cardiopulmonary resuscitation were performed, resulting in return of spontaneous circulation.

The patient was transferred to a hospital and initially admitted to the Coronary Care Unit, where he was stabilized. The initial electrocardiogram showed sinus rhythm, no chamber overload, but T wave inversion in leads V1 and V2. Cardiac necrosis markers were elevated. Transthoracic echocardiography revealed normal cardiac chamber dimensions, but with apical anteroseptal hypokinesia.

Coronary angiography demonstrated non-significant atherosclerotic coronary artery disease, with a 30% lesion in the right coronary artery and a 40% lesion in the left anterior descending artery, without any evidence of acute plaque-related events.

During hospitalization, the patient had another episode of intense oppressive chest pain, similar to the previous one. ST-segment elevation suggestive of myocardial ischemia was noted, which normalized following intravenous nitroglycerin administration (Fig. 1).

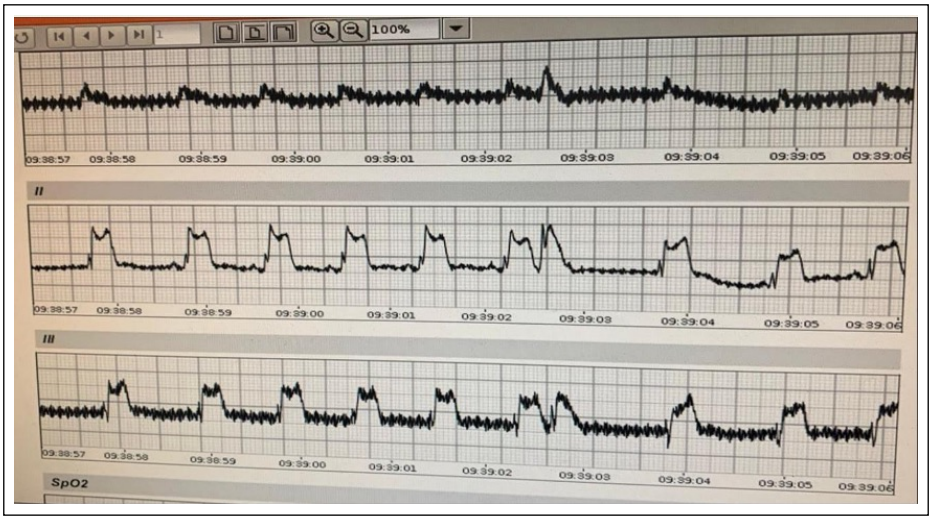

Figure 1. Telemetry monitoring during hospitalization showing a QRS complex with marked ST-segment elevation during an episode of anginal pain.

After discussion with the Heart Team, the patient was diagnosed with Prinzmetal's angina associated with a severe ventricular arrhythmic event and aborted sudden cardiac death. It was decided to initiate pharmacological therapy for symptom control and proceed with subcutaneous ICD implantation. The patient was discharged on medical therapy with a calcium channel blocker, nitrate, and statin (Fig. 2).

Currently, he has remained asymptomatic, with no episodes of chest pain or arrhythmias for two years, and has been counseled on lifestyle modifications. A follow-up echocardiogram performed two months after the event showed no abnormalities.

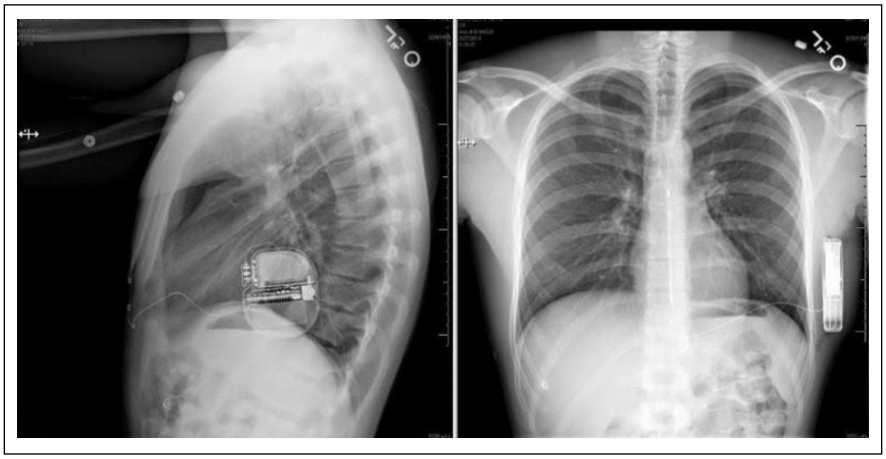

Figure 2. Chest radiographs showing the implantable cardioverter-defibrillator in left lateral and right anteroposterior projections.

DISCUSSION

This case highlights the complexity of managing patients with Prinzmetal's angina and the risk of this condition progressing to life-threatening ventricular arrhythmias. Although the literature supports pharmacological treatment with sublingual nitrates for acute episodes and calcium channel blockers, possibly combined with long-acting nitrates, for prevention as an effective strategy[5,6], the current case presents an atypical scenario. The patient, who had not been on any prior pharmacological therapy, developed sustained ventricular tachyarrhythmia and aborted sudden cardiac death (ASCD), justifying the decision to implant an ICD.

According to the 2023 Brazilian Guidelines on Implantable Cardiac Electronic Devices, ICD implantation is recommended as a secondary prevention in patients with a history of life-threatening arrhythmic events[7,8]. The decision for implantation in this case was based on the high risk of recurrent ventricular arrhythmias, despite Prinzmetal's angina is not a common risk factor for such complications. Recent literature reinforces that this condition can be a cause of sudden cardiac death, especially when there is progression to ventricular fibrillation or sustained ventricular tachycardia[9–12].

Several risk factors have been associated with Prinzmetal's angina, including ethnic and behavioral characteristics. Studies have shown that Japanese individuals are at a higher risk of developing vasospastic angina compared to Caucasians. This disparity is significant regarding outcomes: Japanese patients have an approximately threefold increased risk of sudden cardiac death. Moreover, Japanese women are more likely to present with this type of angina. Other risk factors described in the literature include smoking, alcohol abuse, hyperventilation, and the use of drugs such as cocaine, a known trigger for coronary vasospasm. It is noteworthy that the patient in this report descends of Japanese, which represents an additional risk factor in his clinical progression[1,13,14].

The arrhythmic risk associated with Prinzmetal's angina is underscored by the study of Roberts et al.[15], which described three patients with angiographically confirmed angina, all of whom progressed to sudden death. Autopsy findings revealed fixed coronary artery narrowing and persistent coronary spasms, indicating that severe vasospasm can lead to complete coronary occlusion, ultimately triggering fatal ventricular arrhythmias and sudden cardiac death.

Studies have demonstrated that patients with variant angina and ASCD have significantly worse prognoses, with higher risk of recurrence of lethal arrhythmic events and adverse clinical outcomes[3,16]. Although the risk factors remain incompletely defined, some predictors have been associated with increased likelihood of ASCD, including advanced age, hypertension, hyperlipidemia, family history of sudden cardiac death, multivessel spasm, and spasm involving the left anterior descending artery[16].

Analysis of similar cases reveals high rates of cardiac death, even after successful resuscitation and treatment with multiple vasodilator therapies. Moreover, the incidence of ventricular tachyarrhythmias in these individuals has been substantial, reaching 32.4 per 1,000 patient-years, reinforcing the necessity of ICD therapy as an essential measure to prevent recurrent cardiac events[3].

These findings emphasize that, although Prinzmetal's angina is generally considered a benign condition manageable with calcium channel blockers and nitrates, there is a subgroup of patients at increased risk of fatal events[3,11]. According to the study by Indik[17], the observation that statins have a protective effect against mortality and fatal cardiac events is a relevant finding that may, in the future, clarify whether this therapeutic intervention effectively contributes to improved survival.

This context is exemplified by the present case, which underscores the importance of individualized risk stratification and the implementation of more intensive therapeutic strategies, such as ICD implantation, used in this case to prevent the recurrence of malignant ventricular arrhythmias and provide greater safety to the patient.

CONCLUSION

Although rare, Prinzmetal's angina can lead to sudden cardiac death due to complex ventricular tachyarrhythmias, posing significant challenges to clinical management. Early diagnosis and appropriate treatment are essential to prevent such complications. This case report reinforces the importance of clinical follow-up in these patients and highlights the need to consider ICD implantation in those presenting with ventricular arrhythmic events.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR CONTRIBUTIONS

Conceptualization: Chati GL, Gimenez DF and Porto FM. **Investigation:** Barbosa GV, Lucena Neto AB and Cury Filho H. **Data curation:** Chati GL and Barbosa GV. **Methodology:** Gimenez DF and Porto FM. **Writing – Original Draft:** Chati GL. **Writing – Review & Editing:** Gimenez DF, Porto FM and Lima JMN. **Supervision:** Lima JMN; **Final approval:** Chati GL.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

FUNDING

Not applicable.

DECLARATION OF USE OF ARTIFICIAL INTELLIGENCE TOOLS

Artificial intelligence tools were used exclusively for language translation, grammatical revision, and formatting according to journal standards. No artificial intelligence tools were used for data analysis, interpretation of results, or formulation of the conclusions. The authors take full responsibility for the content of the manuscript.

ACKNOWLEDGMENTS

The authors would like to thank the clinical staff involved in the patient's care.

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