Cardiac perforation and post-cardiac injury syndrome: a rare complication of temporary pacing mimicking acute coronary syndrome

Perforación cardíaca y síndrome poslesión cardíaca: una complicación poco frecuente de la estimulación temporal que simula un síndrome coronario agudo

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Received: 05/20/2025 Accepted: 08/19/2025 Published: 09/12/2025 DOI: http://doi.org/10.5281/zenodo.17113432

Abstract

Temporary transvenous pacemaker implantation serves as a critical intervention for severe bradyarrhythmias in emergency settings. While life-saving, this procedure carries a risk of rare but serious complications. We present the case of a 48-year-old male who developed chest discomfort five days after temporary pacemaker insertion for complete heart block. Initial evaluation revealed ST-segment elevation on electrocardiogram, suggestive of acute coronary syndrome, along with cardiomegaly and pericardial effusion on imaging. Emergent coronary angiography demonstrated normal coronary anatomy; however, right ventricular ventriculography revealed pacemaker lead perforation through the myocardial wall. The lead was surgically explanted and the myocardial defect repaired. The patient subsequently met diagnostic criteria for post-cardiac injury syndrome, confirmed by pericardial thickening on computed tomography, and was managed successfully with anti-inflammatory therapy. This case highlights that cardiac perforation, though uncommon, should be considered in patients with persistent symptoms following cardiac device implantation. Comprehensive imaging plays a crucial role in diagnosis, and concomitant inflammatory complications require appropriate recognition and management to ensure optimal outcomes.

Keywords: Transvenous Pacemaker, Temporary transvenous pacemaker, Myocardial perforation, Post Cardiac Injury Syndrome

Resumen

El implante de un marcapasos transvenoso temporal es una intervención crucial para las bradiarritmias graves en situaciones de emergencia. Si bien salva vidas, este procedimiento conlleva el riesgo de complicaciones poco frecuentes pero graves. Presentamos el caso de un hombre de 48 años que presentó molestias torácicas cinco días después de la inserción de un marcapasos temporal por un bloqueo cardíaco completo. La evaluación inicial reveló una elevación del segmento ST en el electrocardiograma, sugestiva de síndrome coronario agudo, junto con cardiomegalia y derrame pericárdico en las imágenes. La angiografía coronaria de emergencia mostró una anatomía coronaria normal; sin embargo, la ventriculografía del ventrículo derecho reveló una perforación del electrodo del marcapasos a través de la pared miocárdica. El electrodo se explantó quirúrgicamente y se reparó el defecto miocárdico. Posteriormente, el paciente cumplió los criterios diagnósticos del síndrome poslesión cardíaca, confirmado por engrosamiento pericárdico en la tomografía computarizada, y fue tratado con éxito con terapia antiinflamatoria. Este caso destaca que la perforación cardíaca, aunque poco frecuente, debe considerarse en pacientes con síntomas persistentes tras la implantación de un dispositivo cardíaco. Las imágenes integrales juegan un papel crucial en el diagnóstico, y las complicaciones inflamatorias concomitantes requieren un reconocimiento y manejo adecuados para garantizar resultados óptimos.

Palabras clave: Marcapasos transvenoso, Marcapasos transvenoso temporal, Perforación miocárdica, Síndrome poslesión cardíaca

Introduction

Cardiac arrhythmias are significantly related to increased risk in cardiovascular death, particularly in emergency conditions[1]. Temporary Transvenous Pacemakers are indicated in certain emergencies as life-saving treatment associated with symptomatic bradycardia and severe bradyarrhythmias. A transvenous pacemaker may generate electrical impulses, which is essential in preserving cardiac output while reversible causes are resolved or shifted to permanent pacemakers[2]. High-risk and potentially fatal complications related to pacemaker implantation are bleeding, electrode displacement, and myocardial perforation. Myocardial perforation remains an important and life-threatening complication that may clinically present as chest discomfort, dyspnea, pneumothorax, and cardiogenic shock from cardiac tamponade[3]. Those circumstances may impact extended hospital stays, the need for multiple drugs, and re-intervention procedures. Furthermore, the risk of mortality was increased[4]. Temporary cardiac pacemakers are used as a life-saving device in emergency situations such as severe bradycardia or complete atrioventricular blocks and play a vital role in stabilizing the hemodynamic status of patients. However, as with any intervention, the use of this device is not without complications and in rare cases may be associated with life-threatening consequences. These complications include lead displacement, myocardial perforation, and post-cardiac injury syndrome, which can not only lead to prolonged hospitalization and increased medical costs, but also lead to death if not diagnosed promptly[5].

An important and challenging point in this context is the similarity of the clinical manifestations of these complications to other cardiac emergencies, including acute coronary syndrome. This similarity can lead to errors in initial diagnosis and, as a result, delays in providing appropriate treatment. Therefore, it is of great clinical importance to be aware of these rare complications and to consider them in the differential diagnosis of patients with a history of cardiac interventions who present with chest pain. Reporting such cases will not only help increase knowledge about the clinical manifestations and management of these complications, but will also increase the vigilance of the medical community in the face of similar cases in the future[6].

In this case, we report diagnostic challenges, utility of several modalities, complications and treatments in a patient with an iatrogenic temporary transvenous cardiac pacemaker after PCIS and myocardial perforation underwent successful surgical repair. Temporary transvenous pacemaker insertion remains a critical intervention in managing life-threatening bradyarrhythmias, serving as a bridge to recovery or permanent device implanta-

tion. While generally safe, the procedure carries a well-documented, albeit rare, risk of serious complications. Among these, myocardial perforation represents one of the most feared technical complications. The reported incidence varies widely across studies, influenced by factors such as operator experience, patient population, and anatomical considerations[7]. Certain patient demographics, including advanced age, female sex, low body mass index, and the use of corticosteroid therapy, have been associated with a heightened risk of perforation. The clinical presentation can be insidious or dramatic, ranging from asymptomatic lead malposition to cardiac tamponade and cardiogenic shock, making a high index of suspicion paramount for timely diagnosis[8, 9].

A significant diagnostic challenge arises from the ability of these complications to mimic other acute cardiac syndromes. The occurrence of post-procedural chest pain, electrocardiographic changes such as ST-segment elevations, and elevated cardiac biomarkers can create a clinical picture virtually indistinguishable from acute coronary syndrome. This masquerade often leads to initial misdiagnosis and delays in appropriate management[10, 11, 12]. Furthermore, a perforation can trigger an inflammatory response known as post-cardiac injury syndrome, which adds another layer of diagnostic complexity[13]. This syndrome is characterized by pericardial and often pleural inflammation, presenting with effusions, pain, and fever, further confounding the clinical picture.

The diagnostic pathway relies heavily on imaging modalities. While chest X-ray may raise suspicion by showing an abnormal lead position beyond the cardiac silhouette or revealing new effusions, its findings are often subtle and can be missed. Transthoracic echocardiography plays a crucial role in identifying pericardial effusion and may sometimes directly visualize the perforating lead. However, computed tomography (CT) scanning has emerged as the definitive non-invasive tool for confirming lead extravasation, offering superior spatial resolution to precisely define the relationship between the lead tip and the cardiac structures. The management of such cases is inherently multidisciplinary, often requiring urgent collaboration between cardiology and cardiothoracic surgery teams for lead extraction and repair of the cardiac injury, followed by medical therapy to address the ensuing inflammatory response[14].

Materials and methods

Study Design and Ethical Considerations

This study is a single-case report detailing a rare and serious complication following a temporary transvenous pacemaker (TVPM) insertion. The report was drafted in accordance with the CARE (CAse REport) guidelines to ensure comprehensive and transparent reporting. The study was conducted after obtaining explicit written informed consent from the patient for the publication of his clinical details and accompanying images. All patient data were anonymized to protect privacy and confidentiality. The ethical standards of the institutional review board were adhered to throughout the process of compiling this report.

Data Collection

The clinical data for this case was gathered through a meticulous review of the patient's electronic medical records, including physician and nursing notes, laboratory results, and diagnostic imaging reports. All diagnostic images (electrocardiograms, chest X-rays, echocardiograms, angiograms, and computed tomography scans) were retrieved from the hospital's picture archiving and communication system (PACS) for analysis and presentation.

Case Presentation

A 48-year-old male with no significant prior medical history was referred to our tertiary care institution for persistent substernal chest pain of five days' duration. The pain was described as throbbing and non-radiating. His initial presentation at a peripheral hospital was for a total atrioventricular block, which was suspected to be secondary to an acute coronary syndrome. A temporary transvenous pacemaker was implanted at the referring facility, and he was subsequently transferred for potential percutaneous coronary intervention.

Upon admission, an electrocardiogram revealed a junctional escape rhythm with episodes of atrial flutter and ST-segment elevations in leads I, aVL, and V3-V6. Initial chest radiography demonstrated cardiomegaly and a right-sided pleural effusion. Transthoracic echocardiography showed preserved left ventricular systolic function but identified a moderate pericardial effusion, predominantly in the basal and inferior segments. Laboratory investigations were significant for elevated cardiac troponin levels. A diagnostic coronary angiography was performed, which revealed normal coronary anatomy without any evidence of occlusion or significant stenosis. However, during a subsequent right ventricular (RV) ventriculogram, the tip of the temporary pacemaker lead was clearly visualized outside the RV cardiac silhouette, confirming a myocardial perforation. The cardiothoracic surgery team was immediately consulted. The patient underwent surgical extraction of the misplaced pacemaker lead and successful repair of the RV perforation.

In the postoperative period, the patient's course was complicated by the development of post-cardiac injury syndrome (PCIS), diagnosed based on the presence of persistent pleuritic chest pain, elevated inflammatory

markers (C-reactive protein), and persistent pleural and pericardial effusions. A cardiac computed tomography (CT) scan was performed for further assessment, which revealed pericardial thickening highly suggestive of active inflammation or pericarditis. Management included anti-inflammatory therapy initiated with ibuprofen and colchicine. Due to a temporary shortage, ibuprofen was substituted with aspirin after 48 hours. The patient's condition gradually improved with medical management. He was monitored in the intensive care unit post-operatively and was subsequently discharged home in a stable condition.

Results

The diagnostic and clinical progression of this case revealed a complex interplay of iatrogenic complication and subsequent inflammatory response. The initial presentation was marked by symptoms and signs highly suggestive of acute coronary syndrome, which guided the early diagnostic approach. However, advanced imaging techniques ultimately identified the true underlying pathology.

Table 1: Timeline of clinical events and interventions

Time Point	Clinical Event	Intervention
Day 0	Presentation to rural hospital with total AV block	Temporary pacemaker implantation
Day 1-4	Persistent chest discomfort	Monitoring at referring hospital
Day 5	Transfer to tertiary center	Comprehensive diagnostic workup
Day 5	Coronary angiography and RV ventriculography	Diagnosis of myocardial perforation
Day 5	Surgical consultation	Pacemaker lead extraction and RV repair
Day 6-8	Development of PCIS	Initiation of anti-inflammatory therapy
Day 10	Clinical improvement	Discharge planning

The clinical course spanned ten days from initial presentation to discharge, highlighting the rapid sequence of events from complication recognition to definitive management. The timeline demonstrates the typical progression from initial intervention to complication development and subsequent management.

Table 2: Laboratory parameters during hospitalization

Parameter	Admission	Post-Operation	Discharge	Normal Range
Troponin I (ng/mL)	15.2	8.7	1.2	<0.04
CRP (mg/L)	45	128	32	<5
White Blood Cells ($\times 10^3/\mu L$)	11.5	14.2	8.1	4.5-11.0
ESR (mm/hr)	28	56	22	0-20

Laboratory findings demonstrated significant myocardial injury at presentation with markedly elevated troponin levels. The postoperative period showed escalating inflammatory markers, consistent with the development of post-cardiac injury syndrome. By discharge, all parameters showed substantial improvement toward normal ranges.

Table 3: Imaging findings and diagnostic yield

Modality	Key Findings	Diagnostic Contribution
ECG	ST-elevation in I, aVL, V3-V6; atrial flutter	Suggested ACS, prompted urgent angiography
Chest X-ray	Cardiomegaly, right pleural effusion	Raised suspicion of complication
Echocardiography	Moderate pericardial effusion, normal LV function	Detected pericardial involvement
Coronary Angiography	Normal coronary anatomy	Excluded coronary etiology
RV Ventriculography	Lead tip outside RV contour	Confirmed myocardial perforation
Cardiac CT	Pericardial thickening, inflammation	Confirmed PCIS diagnosis

Multimodal imaging was essential for accurate diagnosis. While initial studies suggested ischemic pathology, advanced imaging conclusively identified mechanical complication and subsequent inflammatory response, demonstrating the sequential utility of different modalities in complex cases.

Table 4: Hemodynamic and vital parameters

Parameter	Pre-Operative	Post-Operative	Discharge
Heart Rate (bpm)	85	92	76
Blood Pressure (mmHg)	135/85	125/80	130/80
Oxygen Saturation (%)	96	98	99
Respiratory Rate	18	16	16

Hemodynamic parameters remained stable throughout the clinical course, indicating compensated cardiac function despite the significant structural complication. The stability of vital signs likely contributed to the delayed recognition of the severity of the condition.

Table 5: Medical therapy and response

Medication	Dose	Duration	Clinical Response
Ibuprofen	400 mg TID	2 days	Partial symptom improvement
Colchicine	0.5 mg BID	10 days	Significant inflammatory reduction
Aspirin	100 mg daily	8 days	Adequate anti-inflammatory control
Procedural antibiotics	Standard protocol	3 days	No infection documented

Anti-inflammatory management evolved based on medication availability while maintaining therapeutic efficacy. The substitution of ibuprofen with aspirin demonstrated comparable effectiveness in controlling inflammatory symptoms, providing insight into alternative treatment regimens for PCIS.

Table 6: Complications and management outcomes

Complication	Time of Onset	Management	Outcome
Myocardial perforation	Day 0 (procedure time)	Surgical repair	Resolved
Pericardial effusion	Day 3-4	Monitoring, medical management	Improved
Pleural effusion	Day 3-4	Monitoring, medical management	Improved
Post-cardiac injury syndrome	Day 6-8	Anti-inflammatory therapy	Resolved

The case involved multiple sequential complications beginning with the initial perforation and culminating in systemic inflammatory response. Each complication was successfully addressed through appropriate intervention, demonstrating the importance of comprehensive management strategies in complex iatrogenic complications.

The comprehensive assessment of this case through multiple diagnostic parameters illustrates the multifaceted nature of pacemaker-related complications. The integration of laboratory findings, imaging results, and clinical monitoring allowed for successful navigation of this complex clinical scenario despite the diagnostic challenges presented by the mimicking nature of the complications.

Discussion

This case illustrates a serious and diagnostically challenging complication of temporary transvenous pacemaker implantation. The development of both myocardial perforation and subsequent post-cardardic injury syndrome in our patient created a clinical presentation that closely mimicked acute coronary syndrome, highlighting the critical importance of maintaining a broad differential diagnosis in patients with recent cardiac interventions. The ST-segment elevations on ECG and elevated cardiac biomarkers initially directed our evaluation toward ischemic heart disease, yet the normal coronary anatomy on angiography prompted consideration of alternative etiologies. The diagnostic journey underscores the essential role of multimodal imaging in identifying iatrogenic complications. While chest X-ray and echocardiography raised initial suspicion through demonstration of effusions, the definitive diagnosis of lead perforation was established through RV ventriculography. This case reinforces that cardiac perforation, though rare, must remain a consideration in any patient with persistent symptoms following pacemaker implantation, particularly when clinical findings seem discordant with initial expectations.

The development of post-cardiac injury syndrome in our patient added another layer of complexity to the clinical course. This inflammatory response likely contributed to the persistent symptoms and laboratory abnormalities observed in the postoperative period. The temporal relationship between the initial injury and the subsequent inflammatory response aligns with established criteria for PCIS, further supported by the characteristic pericardial thickening noted on CT imaging. Management of this case required a multidisciplinary approach involving cardiology, cardiac surgery, and critical care teams. The successful outcome demonstrates the importance of timely intervention for lead extraction and repair of cardiac injury, followed by appropriate anti-inflammatory therapy for the ensuing inflammatory syndrome. The comparable effectiveness observed between ibuprofen and aspirin in controlling inflammatory symptoms provides practical insight for clinicians working in settings with limited medication availability.

This case also highlights particular challenges in resource-limited settings where access to advanced imaging and specialized cardiac care may be constrained. The delayed recognition of the complication in our patient emphasizes the need for increased awareness and vigilance among practitioners working in such environments. Enhanced training in pacemaker implantation techniques and complication recognition could potentially reduce the incidence and improve early detection of such events.

Cardiac perforation represents a rare but potentially life-threatening complication of temporary pacemaker implantation that requires a high index of suspicion for timely diagnosis. This case demonstrates that clinical and electrocardiographic features may closely mimic acute coronary syndrome, potentially leading to diagnostic delay without appropriate imaging assessment. The combination of RV ventriculography and cardiac CT proved essential in establishing the correct diagnosis and guiding appropriate management in our patient. The subsequent development of post-cardiac injury syndrome further complicated the clinical course, emphasizing that inflammatory complications may follow mechanical injury in a temporal sequence. Successful management requires a multidisciplinary approach including surgical correction of structural complications and medical management of inflammatory sequelae.

This case underscores the importance of considering iatrogenic complications in patients with recent cardiac interventions who present with persistent symptoms. Increased awareness of these potential complications, particularly in resource-limited settings, may lead to earlier recognition and intervention. Furthermore, the comparable effectiveness of different anti-inflammatory regimens observed in this case provides practical guidance for clinicians facing medication availability challenges. Ultimately, vigilance, appropriate imaging, and timely intervention are crucial for achieving favorable outcomes in these complex cases.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form

The authors have no conflicts of interest to declare.

Ethical Statement:

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance by the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent for publication of this case report and accompanying images was obtained from the patient.

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