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CASE REPORT

Acute myocardial infarction in a previously healthy child: case report

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Abstract

Introduction: Acute myocardial infarction is a rare life-threatening event in children. Although more frequent in those with congenital heart disease and/or abnormal coronary anatomy, it can occur in otherwise healthy children. **Case report:** We present the case of a previously healthy seven-year-old boy evaluated because of chest pain. An ECG revealed major repolarization abnormalities in the inferior and left precordial leads and an echocardiogram showed mild global left ventriclar dysfunction and a dyskinetic apical interventricular septum. Laboratory testing showed an isolated, but significant, elevation of cardiac markers. He underwent cardiac catheterization that confirmed an occlusion of the distal segment of the left descending artery. Cardiovascular magnetic resonance findings indicated a recent transmural infarction of the apical septal segment. **Discussion:** Despite being an uncommon entity in the pediatric population, myocardial ischemia and infarction can be the reason behind plain chest pain. The diagnosis warrants a high index of suspicion and should prompt meticulous cardiac testing.

Keywords: Chest pain. Myocardial infarction. Pediatrics. Cardiology. Case report

Enfarte agudo do miocárdio em criança previamente saudável: caso clínico

Resumo

Introdução: O enfarte agudo do miocárdico é um evento ameaçador da vida raro em crianças. Apesar de ser mais frequente em doentes com cardiopatia congénita e/ou alterações da anatomia coronária, pode ocorrer em crianças previamente saudáveis. **Relato de caso:** Os autores descrevem o caso de um menino de 7 anos, previamente saudável, avaliado por dor torácica. O ECG revelou alterações da repolarização nas derivações pré-cordiais inferiores e esquerdas e o ecocardiograma mostrou disfunção ligeira do ventrículo esquerdo e discinésia da porção apical do septo interventricular. O estudo analítico demonstrou uma elevação isolada e significativa dos marcadores de necrose miocárdica. O paciente foi submetido a cateterismo cardíaco que confirmou a oclusão do segmento distal da artéria descendente anterior esquerda. Os achados da ressonância magnética cardíaca indicaram enfarte transmural recente do segmento apical. **Discussão:** Ainda que seja uma entidade incomum na população pediátrica, a isquemia do miocárdio pode ser a razão por detrás de uma simples dor torácica. Por este motivo, o diagnóstico de um enfarte agudo do miocárdio pediátrico requer um alto índice de suspeição e deve ser acompanhado de uma investigação cardíaca meticulosa.

Palavras-chave: Dor torácica. Enfarte do miocárdio. pediatria. Cardiologia. Caso clínico.

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Keypoints

What is known
- Myocardial infarction is a rare, life-threatening condition in healthy children.
- Chest pain is a frequent cause of emergency department visits in the pediatric population.
- Chest pain associated with cardiac causes is rare.

What is added
- Description of a rare case of myocardial infarction in a child.
- Importance of prompt and meticulous cardiac testing and invasive coronary angiography to establish diagnosis if there is a high index of suspicion.

Introduction

Acute myocardial infarction (AMI) is a life-threatening condition resulting from a sudden reduction or interruption in the blood flow of the vessels supplying the heart[1]. This clinical entity is well known in adult patients, though very rare in children. Chest pain, however, is a frequent cause of emergency department visits in the pediatric population, although for the large majority, it is not associated with cardiac causes[2]. Myocardial ischemia leading to AMI in childhood is more common in those with congenital heart disease (CHD) and abnormal coronary anatomy. Nevertheless, it can have different etiologies requiring different management approaches. AMI etiologies in children include Kawasaki disease, myocarditis, cardiomyopathy, substance abuse, trauma, complications from CHD surgery, and other rare conditions[3]. In this report we present an AMI case of a previously healthy child that presented with chest pain after minor chest trauma.

Case report

A seven-year-old boy was transferred from a private hospital to the emergency department of a tertiary hospital due to abnormal findings in a chest radiography and echocardiogram. On the day before admission, he suffered a minor chest compression while playing and subsequently presented retrosternal chest pain and discomfort with low tolerance in supine position and trouble sleeping. He had no palpitations, syncope, gastric or respiratory symptoms. He was previously healthy and had no family history of cardiovascular disease. He had a COVID-19 infection six weeks before.

On examination, the patient looked unwell and pale, denying any chest pain at the time. He was afebrile, with a normal respiratory rate and oxygen saturation, a heart rate of 116 beats per minute and blood pressure of 108/75 mmHg (50th percentile) in the upper right arm. There were no visible chest abnormalities or contusion marks. Cardiac auscultation revealed tachycardia, normal heart sounds and no murmurs, rubs or gallop. No peripheral edemas were observed and no other clinical alterations were found upon physical examination.

The 12-lead electrocardiography (ECG) showed sinus tachycardia with ST segment elevation in leads DI, aVL and V2 to V6 and ST segment depression in leads DIII, aVR and V1 (Fig. 1). A 2D echocardiogram revealed a segmental dysfunction of the left ventricle with a dyskinetic/akinetic interventricular septum and apex, a foramen ovale with left-to-right shunt, a small posterior pericardial effusion next to the right ventricle apex, with hyper-refringence of the pericardium and minor left pleural effusion. Cardiac morphology and the origin and initial course of the coronary arteries were normal. Laboratory tests revealed elevated levels of troponin-I (6908.4 ng/L, reference range: < 34.0 ng/L), CK-MB (59.7 ng/mL, reference range: 0.00-6.40 ng/mL) and BNP (746.8 pg/mL, reference range: < 100.0 pg/mL). A computed tomography (CT) angiography scan confirmed the pericardial and left pleural effusion and raised suspicions about a small segment of myocardial bridging in the mid/distal left anterior descending artery. No other coronary abnormalities were found. In view of the patient's clinical presentation, laboratory test results and imaging findings, cardiac catheterization was performed promptly. The examination showed an occlusion of the distal segment of the left descending artery and no significant lesions in the remaining coronary arteries (Fig. 2). After the procedure, the patient was transferred to the pediatric intermediate care unit for clinical surveillance, under anti-aggregation with acetylsalicylic acid (150 mg/day).

On the first day of hospitalization, due to clinical deterioration, he was transferred to the pediatric intensive care unit (PICU) and started high-flow oxygen therapy and furosemide perfusion for two days. He presented a favorable clinical evolution and was discharged from the PICU after six days. At the pediatric cardiology ward, he remained hemodynamically stable. A cardiovascular magnetic resonance (CMR) was performed on the seventh day of hospitalization and revealed an akinetic apical segment of the cardiac septum with relative

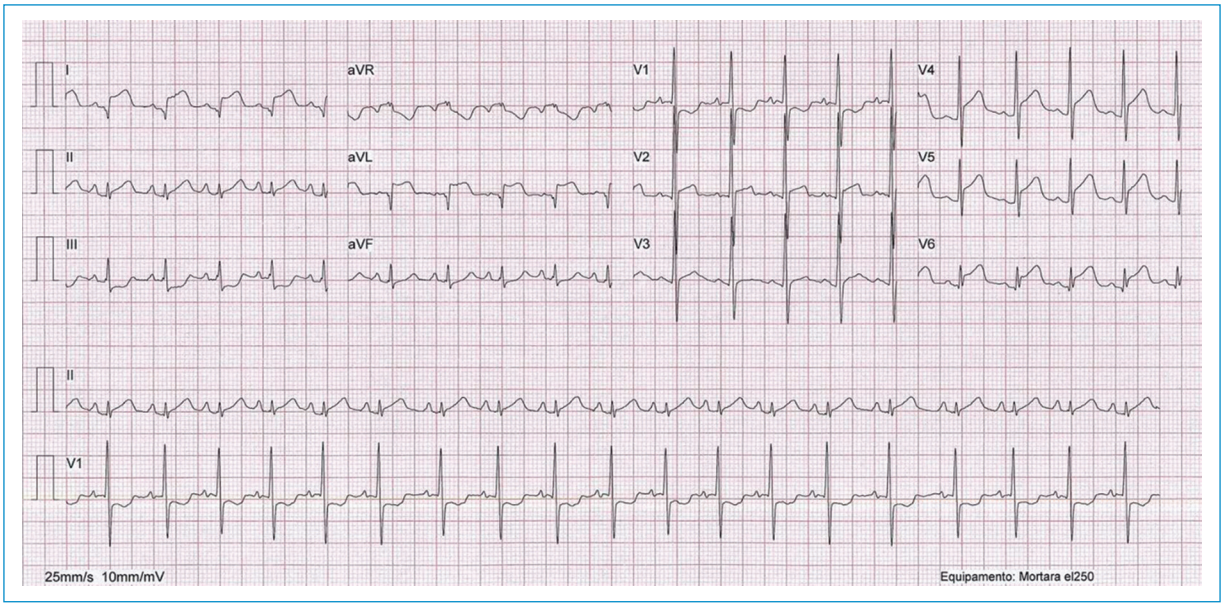

Figure 1. ECG showing sinus tachycardia with ST segment elevation in leads DI, aVL and V2 to V6 and ST segment depression in leads DIII, aVR and V1.

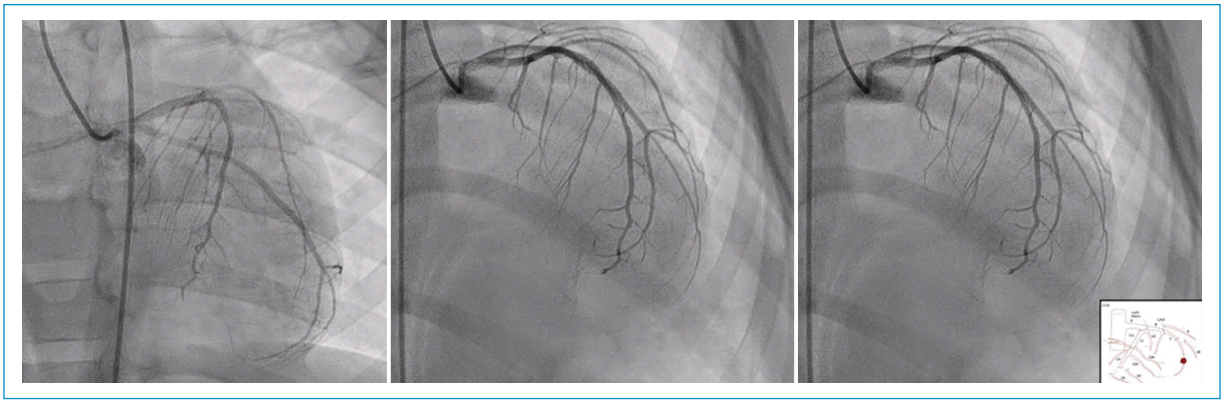

Figure 2. Cardiac catheterization examination showed an occlusion of the distal segment of the left descending artery.

parietal thickening. No alterations to the other segments were found. T2-weighted imaging showed transmural myocardial edema in the apical segment with a hypointense core, suggestive of intramyocardial hemorrhage. Post-contrast enhancement of the apical septal segment evincing microvascular obstruction was identified. He presented normal biventricular volumes and good global systolic function. There was no evidence of intracardiac thrombi or masses, or pericardial or pleural effusions. Findings were indicative of a recent transmural infarction of the apical septal segment (Fig. 3), compatible with an AMI. Serial laboratory measurements of cardiac biomarkers showed progressive normalization: troponin-I 302.6 ng/L (reference range: < 34.0 ng/L), CK-MB 0.9 ng/mL (reference range: 0.00-6.40 ng/mL), myoglobin 36.3 ng/mL (reference range: < 146.9 ng/mL) and BNP 219.7 pg/mL (reference range: < 100.0 pg/mL) at the last evaluation. Further investigations were negative, namely coagulation, prothrombotic, and infection screening. An echocardiography prior to discharge evinced a discrete dilatation of the ventricle apex and normal ventricular function with no pericardial or pleural effusion. An ECG showed a sinus rhythm, poor R-wave progression and

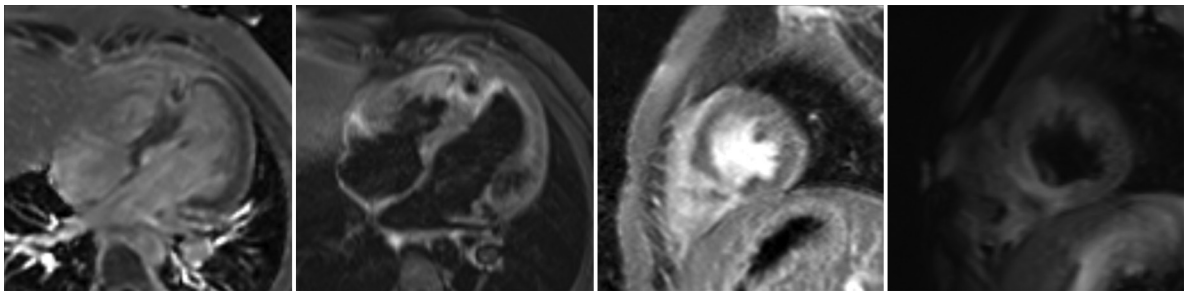

Figure 3. CMR revealing transmural myocardial edema in the apical segment with a hypointense core suggestive of intramyocardial hemorrhage. Post-contrast enhancement of the apical septal segment evincing microvascular obstruction was identified.

normal repolarization in the precordial leads. He was discharged on furosemide and bisoprolol. He remained asymptomatic one month later and, on his last visit, the ECG showed changes in repolarization that were compatible with a subacute myocardial infarction. The echocardiogram showed hyper-refringence of the distal part of the septum and right ventricle apex, as well as a slight dilatation of the left ventricle apex.

Discussion

Myocardial ischemia and infarction are uncommon in children with normal coronary anatomy. Nevertheless, when dealing with acute typical chest pain in a child, this etiology must not be forgotten. A clear protocol workup is needed, and these children may require hospital admission for further investigation, monitoring and treatment, whenever clinical and laboratory findings are indicative. Here we report the occurrence of an AMI caused by an occlusion of the left anterior descending artery in a patient presenting primarily with chest pain after a minor chest injury. Although an AMI in the context of chest trauma is extremely rare, particularly in this age group, no other causative factor was found, despite exhaustive investigation. The mechanisms of coronary occlusion following chest trauma could be the result of intraluminal thrombosis caused by a tear in the intimal layer due to the shear force impacting the coronary artery, embolism to the coronary arteries, vascular rupture, or a vascular spasm at the site of the injury. The left anterior descending artery is the most frequently injured vessel[4]. This patient had no prior artery disease, yet the ECG and echocardiogram were consistent with myocardial infarction confirmed by cardiac catheterization. Catheter-directed thrombolysis was not a management option for this child and conservative treatment with long-term anti-aggregation was the main treatment option. There are no controlled trials to guide early treatment of AMI in the pediatric population and long-term follow-up is necessary[5]. To conclude, AMI in not a common entity in children and its diagnosis requires a high index of suspicion. It may occur as a result of different causes that require different management approaches. However, once the hypothesis is raised, there needs to be prompt and meticulous cardiac testing (including an ECG, echocardiography, and cardiac enzyme levels). Invasive coronary angiography will establish the diagnosis.

Authors' contribution

Catarina Maria Almeida, Sofia Granja and Jorge Moreira: Conception and design of the study, report, review or other type of work or paper. Acquisition of data either from patients, re-search studies, or literature. Analysis or interpretation of data either from patients, research studies, or literature. Drafting the article. Critical review of the article for important intellectual content. Final approval of the version to be published. Agreement to be accountable for the accuracy or integrity of the work. Marisa Pereira: Final approval of the version to be published. Agreement to be accountable for the accuracy or integrity of the work. João Carlos Silva: Analysis or interpretation of data either from patients, research studies, or literature. Final approval of the version to be published. Agreement to be accountable for the accuracy or integrity of the work.

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Conflicts of interest

None.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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