

Rapid-onset myocardial calcifications, a rare complication of septic shock in a young patient. A case report

Calcificaciones miocárdicas de rápida aparición, una complicación rara de choque séptico en paciente joven. Presentación de caso

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Summary

Myocardial calcifications in the setting of septic shock are a rarely described imaging finding. Most cases reported in the literature have been in patients with chronic disturbances in the homeostasis of intracellular calcium and phosphorus of any etiology. The case presented is that of a young patient with no history of cardiac, renal or metabolic disorders who developed myocardial calcifications acutely and was found incidentally through an in-hospital tomographic study, which was performed after a state of septic shock and multi-organ failure secondary to a pneumonic process.

Resumen

Las calcificaciones miocárdicas en el contexto del choque séptico son un hallazgo de imagen raramente descrito. La mayoría de los casos informados en la literatura han sido de pacientes con trastornos crónicos en la homeostasis del calcio y fósforo intracelular de cualquier etiología. El caso presentado es de una paciente joven sin antecedentes cardiacos, renales o problemas metabólicos, quien desarrolló calcificaciones miocárdicas agudas, halladas de forma incidental en un estudio tomográfico intrahospitalario realizado después de un estado de choque séptico y falla multiorgánica secundarios a un proceso neumónico.

Introduction

Myocardial calcifications refer to the deposition of calcium salts in cardiac muscle tissue, a rare phenomenon that can occur in various pathologies and has significant implications for cardiac function. The current absolute rates of morbidity and mortality are unknown. The main pathophysiological mechanisms of classically described myocardial calcifications are metastatic and dystrophic (1). The first mechanism involves calcium deposition in previously healthy or injured tissues, in the context of disturbances in intracellular calcium and phosphorus homeostasis, most frequently seen in patients with chronic kidney disease or hyperparathyroidism. On the other hand, dystrophic calcifications result from the accumulation of intracellular calcium in areas of injured myocardial tissue, as a consequence of local cellular damage and metabolic stress triggered by ischemia and cellular necrosis; their primary etiology is myocardial infarction, although cases related to inflammatory, infectious, and neoplastic processes have also been reported. In the context of septic shock, the mechanism has been considered a consequence of myocardial infarction, a rare but significant sequela (2, 3).

Case report

A 21-year-old female patient with a history of periosteal osteosarcoma of the right tibia, diagnosed eight months prior and currently undergoing chemotherapy. She presented to the emergency department with symptoms of acute respiratory infection, was admitted, and on the third day of her hospitalization rapidly progressed to septic shock and multiple organ failure, including acute respiratory, cardiac, and renal failure. A chest CT scan had been performed ten weeks earlier to assess the stage of her underlying cancer, with no significant cardiac or pulmonary findings (Figure 1). During her current hospitalization, a chest CT scan was performed, revealing extensive myocardial calcifications primarily involving the interventricular septum and the left ventricle (Figure 2a–c), which were new findings compared to the previous examination; it also showed multiple pulmonary consolidation lesions and widespread pulmonary cavitations (Figure 2d, e).

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The patient's serum calcium, phosphorus, and creatinine levels remained stable during her hospital stay (between 8.4 and 9.2 mg/dL, between 3.5 and 4.4 mg/dL, and between 0.9 and 1.4 mg/dL, respectively). A bacteriological examination of tracheal aspirate was performed, which isolated *Acinetobacter baumannii*.

Additional imaging studies were ordered, including a CT scan of the head and abdomen with intravenous contrast, as well as an echocardiogram; however, these could not be performed due to the patient's deteriorating clinical condition. She received hemodynamic and ventilatory support, as well as broad-spectrum antibiotic therapy; nevertheless, she died shortly after one month of hospitalization.

Discussion

Myocardial calcifications in the context of septic shock are an imaging finding rarely described in the literature, but they have gained importance due to their association with impaired cardiac function and complications such as cardiac arrhythmias, ventricular dysfunction, and death (4, 5).

The case presented involves a young female patient with no history of cardiac, renal, or metabolic disorders who developed acute myocardial calcifications, incidentally detected on a CT scan, following septic shock and multiple organ failure secondary to a pulmonary process.

In the context of septic shock, the acute systemic inflammatory process leads to cellular damage, ischemia, and myocardial infarction, and the formation of dystrophic calcifications is the primary related pathophysiological mechanism. However, in sepsis, multiple other events occur that could contribute to this phenomenon, such as altered calcium metabolism, chronic inflammation, and fibrosis. On the other hand, in most cases described in the literature, as in the case presented in this article, there was no evidence of altered calcium homeostasis (3).

In some cases, myocardial calcifications may be asymptomatic and detected incidentally on imaging studies. CT is the most commonly used imaging technique for confirming this finding, due to its high contrast and spatial resolution when other methods, such as X-rays, echocardiography, and magnetic resonance imaging (MRI), are inconclusive. However, there are currently no exact data on the sensitivity and specificity of each diagnostic imaging method for detecting these findings in such cases (2).

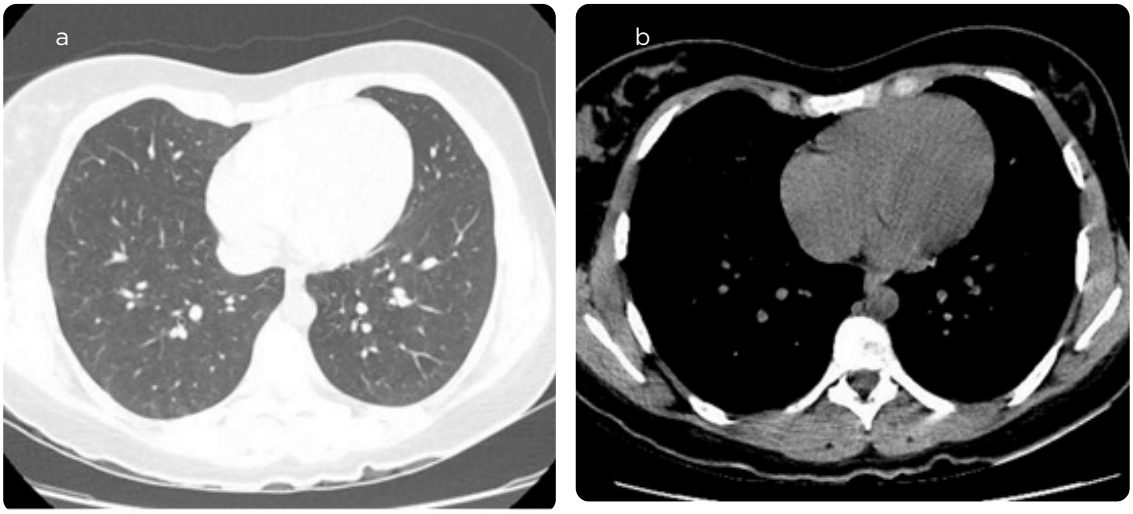


Figure 1. Chest CT scan. a) Axial section in lung window. b) Axial section in mediastinal window. Ten weeks prior to hospitalization: no radiographic findings involving the heart or lungs.

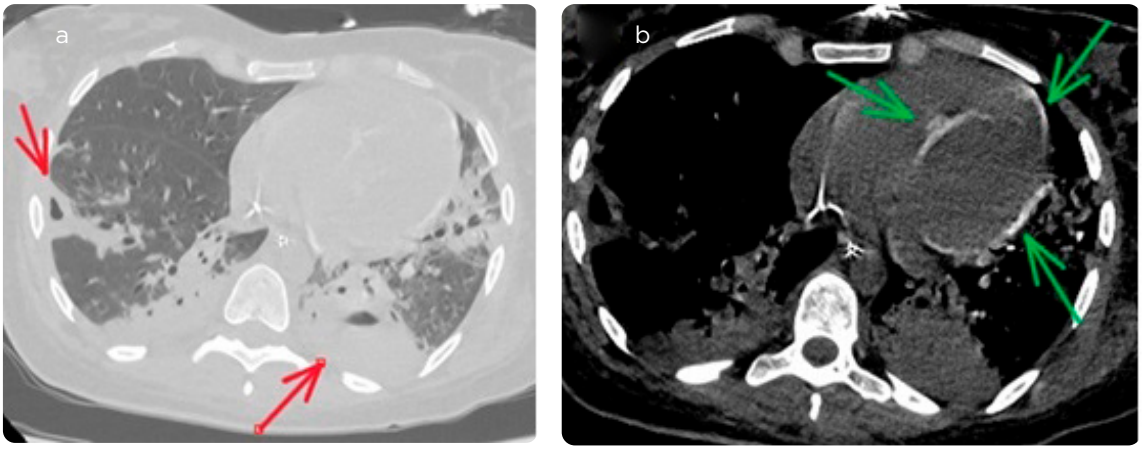


Figure 2. Chest CT scan during the current hospitalization. a) Axial section in lung window, multiple lesions of pulmonary consolidation and cavitations distributed bilaterally (red arrows), related to an infectious process with pulmonary septic emboli. b) Axial section in mediastinal window: extensive myocardial calcifications (green arrows).

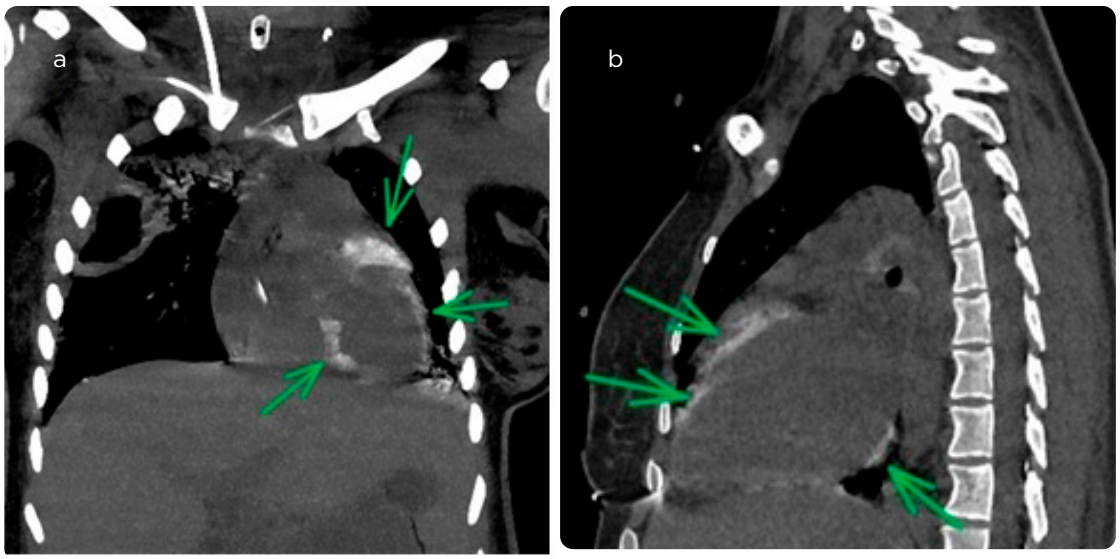


Figure 3. Chest CT. a) Coronal and b) sagittal views, taken during hospitalization, both in the mediastinal window, showing the extent of myocardial calcifications (green arrows).

Because the patient in the present case died prematurely, it was not possible to perform adequate clinical, laboratory, or imaging follow-up. No methods for assessing cardiac function were performed to analyze the impact of myocardial calcifications on prognosis, morbidity and mortality, and treatment.

Conclusion

Rapidly developing myocardial calcifications following septic shock are a topic of growing interest because they represent a rare complication, especially in young individuals, whose incidental and early detection on imaging studies could have a significant impact on the prognosis and mortality of these patients. However, no diagnostic imaging method has yet been established as the gold standard; therefore, scientific evidence is needed to allow for a comparative analysis of the sensitivity and specificity among the different methods.

Finally, further research is needed to improve our understanding of the various molecular mechanisms leading to post-sepsis calcification, its clinical impact, and prognosis, in order to optimize diagnostic tools for early detection, implement a multidisciplinary approach, and provide follow-up with appropriate preventive and therapeutic strategies.

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