

Hematogenous dissemination mediastinitis: case report

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Abstract

Background: Acute mediastinitis is the inflammation of the connective tissue and fat surrounding the mediastinal structures. It is a high-mortality entity and its most frequent causes include sternotomy infections from cardiovascular surgery, esophageal perforation and extension of head and neck infections. Isolated cases of acute mediastinitis from hematogenous spread are described in the literature.

Case presentation: 58 year-old man, with history of gouty arthritis managed with steroids, diagnosed with acute mediastinitis by *S. aureus*, secondary to septic arthritis of the ankle, managed with drainage of mediastinal collections by thoracoscopy and antibiotic therapy, with satisfactory evolution.

Conclusions: In patients with acute mediastinitis, hematogenous dissemination should be considered when the etiologies most frequently associated with the entity are ruled out. Early surgical treatment derived from a multidisciplinary diagnostic approach improves the prognosis of these patients.

Keywords: Mediastinitis, Hematogenous dissemination, *Staphylococcus aureus*.

Mediastinitis de diseminación hematogena: Reporte de un caso

Resumen

Antecedentes: la mediastinitis aguda es la inflamación del tejido conectivo y la grasa que rodea las estructuras mediastínicas. Es una entidad de alta mortalidad y sus causas más frecuentes incluyen infecciones de la esternotomía de la cirugía cardiovascular, perforación esofágica y extensión de infecciones de cabeza y cuello. Casos aislados de mediastinitis aguda por diseminación hematogena se describen en la literatura.

Caso: Hombre de 58 años, con antecedente de artritis gotosa manejado con esteroides, diagnosticado de mediastinitis aguda por *S. aureus*, secundaria a artritis séptica de tobillo, manejada con drenaje de colecciones mediastínicas por toracoscopia y antibioterapia, con evolución satisfactoria.

Conclusiones: En pacientes con mediastinitis aguda, se puede considerar la diseminación hematogena cuando las etiologías más frecuentemente asociadas a la entidad están descartados. El tratamiento quirúrgico precoz derivado de un abordaje diagnóstico multidisciplinar mejora el pronóstico de estos pacientes.

Palabras clave: Mediastinitis, Diseminación hematogena, *Staphylococcus aureus*.

Background

Acute mediastinitis (AM) is the inflammation of the connective tissue and fat surrounding the mediastinal structures. It is a high-mortality entity, more frequent in young people and predominantly in males¹⁻⁴. Conditions associated with AM are variable and include: postoperative complications from sternotomy, head and neck infections, esophageal perforation and extension of osteomyelitis of underlying structures^{1,5,6}. Isolated cases of AM by hematogenous dissemination have been described^{5,7}. The identification of suggestive findings in the images in a context of compatible clinical manifestations and associated predisposing factors, result in an AM diagnosis. The early surgical approach is the cornerstone in the management of the entity^{6,8}.

Case presentation

58-year-old man with history of gouty arthritis self-medicated with steroids and NSAIDs (Dexamethasone 8 mg and diclofenac 75 mg intramuscularly every 3-4 days) for approximately 10 years. He consulted the emergency department due to polyarticular pain, fever, asthenia, adinamia and inflammatory changes in the medial region of the leg and left internal malleolus with a 15-day evolution. Upon admission, fever and soft tissue swelling in the ankle were evidenced, associated with leukocytosis with neutrophilia and an increase in the amount of inflammatory phase reactants. Due to the suspicion of septic arthritis, antibiotic treatment with Piperacilin Tazobactam and Vancomycin was initiated (after the collection of blood cultures) (Table 1 and 2). X-rays of the

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left knee and ankle did not show any alteration in the bone structures. Magnetic resonance imaging (MRI) of the left leg showed collection in the anteromedial region of the left thigh, between the planes of the adductor muscles and the vastus intermedius. In blood cultures, methicillin-sensitive *Staphylococcus Aureus* was isolated after 24 hours. Transesophageal echocardiogram ruled out vegetations or thrombi, valvular alterations and showed preserved systolic and diastolic functions. Two days after admission, left ankle arthrotomy and abscess drainage were performed in the dorsum of the foot and anteromedial region of the left thigh.

Table 1. Results of blood tests carried out during the course of the illness. 1: admission paraclinical evaluations, 2: 48 hours later and 3: 72 hours after admission.

Test	1	2	3
Leukocytes (/uL)	12223	22980	28900
Neutrophils (%)	83.3	89.10	88.7
Lymphocytes (%)	4.4	7	4.5
Hemoglobin (g/dL)	15.9	15	14.5
Platelets (/uL)	162000	153000	180000

Table 2. Results of paraclinical evaluations performed during hospitalization.

Paraclinics	Reference	Paraclinics	Reference
CRP	385.3		
Bilirubin (mg/dL)	1.78	Potassium (Meq/L)	3.32
Direct Bilirubin	1.52	Ionic Calcium	1.13
ASAT (IU/L)	43	Sodium (Meq/L)	138
ALAT (IU/L)	52	HIV	Negative.
TP (sec)/INR	13.1/1.2	BUN (mg/dL)	15.2
Creatinine	0.75	HBA1c	6.4

ALAT: alanine aminotransaminase, ASAT: aspartate aminotransferase, TP: prothrombin time, BUN: blood urea nitrogen, CRP: C-reactive protein, HBA1c: glycosylated hemoglobin, HIV: human immunodeficiency virus.

Due to clinical deterioration, complementary studies were carried out, including: thorax radiography in which mediastinal widening was evidenced (Fig 1) and computerized tomography (CT) of the chest that defined mediastinal collections with air bubbles inside, alteration in mediastinal fat density and pleural effusion (Fig 2). With tomographic image suggestive of mediastinitis and signs of clinical deterioration, mediastinal collection drainage was performed with right thoracoscopic approach (two ports, in supine position), with initial finding of serohematic pleural effusion (500 cc). Initial opening of anterior mediastinal pleura, with drainage of purulent collection of 100 cc and mediastinal fat necrosis. In the debridement the superior vena cava was injured and repaired. Subsequently, the posterior mediastinal pleura was opened, with drainage of 300 cc of purulent material, followed by washing and drainage of mediastinal spaces with thoracostomy tubes.

Extension studies showed no infection in face, or neck compartments. Methicillin-sensitive *Staphylococcus aureus* was isolated in all cultures.

The clinical evolution after drainage of infectious foci and antibiotic therapy was satisfactory with oxacillin at a dose of 2 grams every 4 hours intravenously for 3 weeks.

Discussion and conclusions

Mediastinitis is the inflammation of the connective tissue and fat surrounding the mediastinal structures. The entity is associated with high mortality (12 to 47%)^{1-3,9} and mainly affects young people, with higher prevalence in men (4:1 ratio)⁴. Mediastinitis is classified into acute and chronic. In general, acute mediastinitis (AM) is related to bacterial infections and chronic mediastinitis (CM) is associated with granulomatous infections such as histoplasmosis and tuberculosis. The conditions most frequently associated with acute mediastinitis include: postoperative complications of sternotomy (mainly cardiovascular surgery), head and neck infections (descending necrotizing mediastinitis), esophageal perforation (spontaneous, foreign-body, or iatrogenic), and extension of osteomyelitis from adjacent bone structures (sternum and sternoclavicular joint)¹. Isolated cases of mediastinitis due to hematogenous dissemination have been described⁷.

The diagnosis of AM associated with deep sternal wound infection is considered in patients with fever, chest pain or sternal instability and purulent discharge from surgical wound, mediastinal widening in imaging studies, microbiological isolation in mediastinal cultures, or histological findings of mediastinitis³. The incidence of AM associated with sternotomy is reported to be between 0.5% and 2.2% of cardiac surgeries, with mortality up to 14%¹⁰. Risk factors for sternal infection following cardiac surgery have been identified, such as advanced age, obesity, renal impairment, diabetes, hyperglycemia in non-diabetics³, heart failure, chronic obstructive pulmonary disease, smoking, ventricular assist devices, female gender¹¹, nasal colonization by *S. aureus*⁵, and early percutaneous tracheostomy¹².

AM associated with esophageal perforation presents a clinical triad of retrosternal pain, vomiting and subcutaneous emphysema and is associated with close to 20% mortality. In relation to esophageal perforation, it can be related to foreign bodies (fishbone or chicken bone) or iatrogeny (endoscopic or transesophageal procedures); it is characteristically located in the Killian triangle, the cricopharyngeal region and the esophagogastric junction. Other causes of AM associated with esophageal perforation include spontaneous perforation or Boerhaave's syndrome (8-33%), neoplasms (20%)^{13,14}, penetrating trauma, and the dehiscence of esophageal anastomosis sutures (30%)⁵.

Necrotizing descending mediastinitis (NDM) is defined as the extension to the mediastinum of head and neck infections. The initial clinical manifestation corresponds to the base entity and later on it is treated with systemic manifestations.



Figure 1. Portable Chest X-ray. Mediastinum widening. Opacity of the right hemithorax related to pleural fluid.

Neck collections can condition airway obstruction by extrinsic compression. The extension to the mediastinum of cervical infections can be anterior, lateral or posterior (through the retropharyngeal space). The most frequent causes of NDM include odontogenic focus infection (36%-47%), pharyngeal infection (33%-45%) and cervical infection (15%). The mortality associated with NDM varies between 15% and 30%^{4,15}. The risk factors associated with the entity are considered diabetes mellitus, oral glucocorticoid consumption and heart failure. In 13% of patients no comorbidity or associated factors are identified and the microbiological isolation is usually polymicrobial, with a predominance of gram-positive bacteria, followed by anaerobic bacteria¹⁵.

Among the causes of acute mediastinitis, hematogenous dissemination is the one listed most often. There are not available data related to incidence or prevalence of AM of this nature. Isolated reports of AM related to extrathoracic septic arthritis, in intravenous drug users or immunocompromised to a certain degree, are described in the literature. The confirmation of the entity is supported by the concomitant microbiological isolation of the peripheral and mediastinal focus^{6,16}.

In relation to the clinical manifestations of AM, these are variables and are initially related to the entity or base condition; as the disease progresses, hypotension, shock, sepsis and requirement of vasopressors are manifested, identifying the comorbidities (diabetes, obesity, COPD, cardiac surgery, osteoporosis and smoking) as factors that can condition variations of the clinical condition³.

Radiological alterations are related to the presence of AM and the underlying entity or condition. The imaging manifestations common to the different etiologies of AM include increased attenuation of mediastinal fat, mediastinal collection(s), extraluminal air, mediastinal lymph nodes, pericardial and pleural effusion. Postoperative AM includes widening of the mediastinal radiolucent band (related to sternotomy diastasis), rupture or displacement of the sternal fixation wires and sclerosis and/or fragmentation of the sternum. The presence of collections or extraluminal air beyond the 14th postoperative day of sternotomy suggests AM^{6,17,18}. In patients with AM secondary to esophageal perforation the main findings are thickening of the esophageal wall, periesophageal collections, pneumomediastinum and extravasation of the contrast medium into the mediastinum^(19,20). In patients with NDM, alterations in imaging studies correspond to basal infection (collections in the neck compartments), with caudal extension to the mediastinum, subcutaneous emphysema, subcutaneous cellular tissue edema, and manifestations related to mediastinitis^{6,21,22}.

In the management of AM the fundamental pillar is early surgical drainage, with approaches that vary according to the etiology of the entity. Measures of general support are also considered, as well as resuscitation by goals in patients with septic shock, early advanced airway management (in necrotizing descending mediastinitis) and broad-spectrum antibiotic therapy with coverage for *Staphylococcus aureus*, Gram (-) bacteria, gastrointestinal and anaerobic. There is no consensus regarding the duration of antibiotic therapy. The empirical antifungal coverage decision is recommended if 3 of the following conditions are met: Septic shock, female sex, previous upper gastrointestinal surgery and broad-spectrum antibiotic in the last 48 hours⁸.

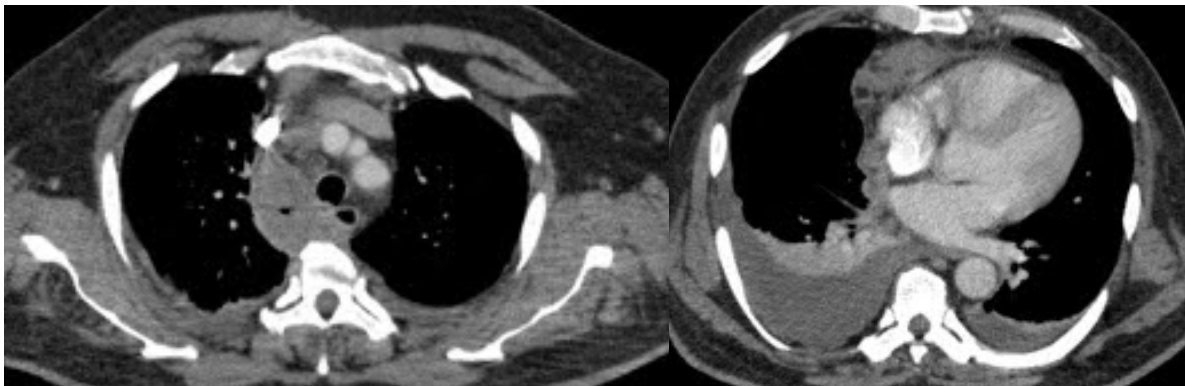


Figure 2. Chest CT scan. A and B. Axial cuts. Transcompartmental mediastinal collections, with air bubbles and increased mediastinal fat density. Free bilateral pleural fluid, of greater right volume. C. Coronal reconstruction. Anterior mediastinal collection (retrosternal).

In conclusion, the case presented is relevant because of the low frequency of reports available in the literature of acute mediastinitis due to hematogenous dissemination. In this patient, the rigorous search for an explanation for the clinical deterioration in spite of the orthopedic management, a correct interpretation of the images and an appropriate surgical management yielded an excellent outcome in spite of the patient's comorbidities. Considering the high mortality of the entity related in most cases to a late diagnosis, a fast and efficient multidisciplinary exercise that allows opportune management is indispensable.

Abbreviations

ALAT:	alanine aminotransaminase
AM:	Acute mediastinitis
ASAT:	aspartate aminotransferase
BUN:	blood urea nitrogen
CM:	chronic mediastinitis
COPD:	Chronic Obstructive Pulmonary Disease
CRP:	C-reactive protein
CT:	computerized tomography
HBA1c:	glycosylated hemoglobin
HIV:	human immunodeficiency virus.
MRI:	Magnetic resonance imaging
NDM:	Necrotizing descending mediastinitis
NSAIDs:	nonsteroidal anti-inflammatory drugs
TP:	prothrombin time

Ethical disclosures

Protection of human and animal subjects. This report was approved by Medical Ethic Committee of Rosario University (DVO005 1201-CV1258). Consent Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Confidentiality of data. No data that identifies patient are revealed

Conflict of interest. Authors declared no competing interests

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Authors' contributions. CMM analyzed and interpreted the patient data regarding and was a major contributor in writing the manuscript. LR and LCR performed the writing manuscript, JAC analyzed and interpreted image and contributed to manuscript preparation.

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