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Klebsiella Aerogenes Endocarditis Associated with Port Catheter, Case Report

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Abstract **Case Report**

Endocarditis affects one or more cardiac valves and is a potentially fatal, multisystem disease of bacterial origin. It has an incidence of 3 to 7 cases per 100,000 people per year. Fever and sepsis are the most common clinical presentations, followed by embolic events, paravalvular abscess, and heart failure. Diagnosis is based on the modified Duke criteria, which include two major and five minor criteria. The most common infectious agents are Streptococcus viridians, Streptococcus bovis (HACEK group), and Staphylococcus aureus. Klebsiella species are very rare. Medical treatment is based on antibiotics, which have provided a good response to cephalosporins, aminoglycosides, and carbapenems. Surgical treatment is reserved for vegetation larger than 10 mm or dysfunction in a heart valve, with an estimated cure rate of 80.3% and an overall mortality rate of 19.4%.

Keywords: Endocarditis, Klebsiella, blood culture, echocardiogram, criteria, fever.

INTRODUCTION

Endocarditis is defined as an infection of the endocardium that typically affects one or more cardiac valves. It is a multisystem disease that results in infection, usually of bacterial origin, of the heart surface. It affects both native and prosthetic valves, any intracardiac device, and, less commonly, nonfunctional embryonic remnants present in the right atrium [1]. Its annual incidence ranges from 3 to 7 cases per 100,000 people per year, according to surveys by the American Heart Association, and is currently the fourth most common life-threatening infectious syndrome, after sepsis, pneumonia, and intra-abdominal abscess [2].

Diagnosis is based on the modified Duke criteria, which include two major and five minor criteria. Major criteria include, first, typical microorganisms compatible with two separate blood cultures for Streptococcus viridians, Streptococcus bovis, HACEK group, Staphylococcus aureus, community-acquired enterococci, or a positive blood culture for Coxiella burnetii or anti-phase 1 IgG antibodies >1:800; second, echocardiographic evidence of endocardial involvement with vegetation, abscess, partial dehiscence of the prosthetic valve, or regurgitation. Minor criteria include, first, a history of a predisposing cardiac condition or intravenous drug use; second, evidence of fever, temperature >38°C; Third, vascular phenomena, major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, and Janeway lesions; fourth, immunologic phenomena such as glomerulonephritis, Osler's nodes, Roth spots, and the presence of rheumatoid factor; fifth, microbiologic evidence: positive blood culture but not meeting a major criterion as above (excluding single positive cultures for coagulase-negative staphylococci and organisms not causing endocarditis), or serologic evidence of active infection with an organism consistent with infective endocarditis [3].

Confirmatory diagnosis is established by two major criteria, one major criterion plus three minor criteria, or five minor criteria; the probable case is established by one major criterion plus one minor criterion, or three minor criteria. The term HACEK indicates Haemophilus spp., Aggregatibacter actinomycetemcomitans, Cardiobacterium hominis, Eikenella corrodens, and Kingella kingae, which are gram-negative bacteria that are part of the normal flora of the mouth and upper respiratory tract in humans.

These organisms cause a wide range of infections, of which infective endocarditis is one of the most notable [4].

Historically, the main patient risk factors for infective endocarditis included rheumatic and congenital valvular heart disease. However, today, risk factors have evolved and are increasingly associated with aging, age-related morbidities, invasive procedures, implanted cardiac devices, intravenous drug use, and immunosuppression, leading to an increasing incidence of bacterial etiologies, including prosthetic valve and device-related endocarditis [5].

According to the research of Borelli *et al.,* transthoracic echocardiography (TTE) is the first-line imaging method for identifying rheumatic endocarditis associated with diabetic retinopathy in congenital heart disease. The right cardiac structures are located anteriorly in the thorax and are closer to the TTE transducer; therefore, the acoustic window should be adequate for anatomical study, especially in young patients. However, multiple surgeries, scarring, placement of conduits in extraanatomical positions, metallic stents or devices, and high thoracic impedance make multiple off-axis projections necessary to investigate right structures when rheumatic endocarditis is suspected [6].

The risk increases with age and is more prevalent in women. The most frequently isolated etiological agent was Streptococcus pyogenes (57%) in patients with a history of diabetes (63%) and hypertension (60%); the most prevalent symptoms were fever (80%) and dyspnea (56%), the aortic valve was the most affected (36.6%) and the most frequent complications were acute renal failure (39%), sepsis (21.9%) and heart failure (19.5%) [7].

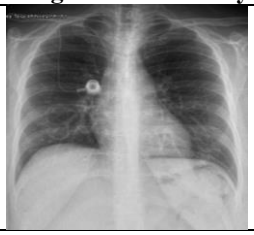
Clinical Case

In the following case, we address a 36-year-old female with a family history of maternal genetic load of systemic arterial hypertension, no relevant pathological history, a pathological history of acute systemic bone marrow mastocytosis diagnosed in November 2019 under treatment with Imatinib and Omalizumab, refractory to treatment, under surveillance by the Hematology Service. Surgical history of right central reservoir port catheter placement in February 2024, history of allergy to NSAIDs (naproxen, diclofenac, ketorolac) characterized by skin rash, laryngeal itching and dyspnea; she denies drug addiction, with a previous hospitalization in May 2024 for anaphylaxis after taking NSAIDs.

It begins in October 2024 with general malaise, unquantified hyperthermia in evening prevalence peaks, and dyspnea on moderate exertion after self-manipulation of a port catheter for administration of unspecified analgesics without medical indication. At the beginning of September 2024, he presented with a 3-day history of febrile syndrome, occurring in peaks, with evening and nocturnal prevalence, quantified up to 38.5 degrees C, dyspnea on moderate exertion, and entered the emergency area with the following vital signs: BP 90/60 mmHg, HR 85 bpm, RR 19 rpm, SpO2 96%, Temp 39.2 C; On physical examination, she was found to be oriented in place, disoriented in time and space, in poor general condition, four score of 14 points (E: 3, M: 3, B: 4, R: 4), normolian chest with port catheter in the right infraclavicular region with purulent exudate at the insertion site, with adequate amplexion and amplexation movements, lung fields with respiratory sounds with inspiratory crackles at the bases, without integrating pleuropulmonary syndrome, rhythmic precordium, of adequate frequency, low intensity with the presence of a grade III systolic murmur in the aortic focus, asignological abdomen, intact extremities.

Upon admission, a chest x-ray was taken (Image 1) which was found to be normal with the presence of a right port catheter. Laboratory studies were requested on 13.09.24 with Hb 12.9 g/dl, Hct 39.8%, platelets 272 thousand per mm3, leukocytes 16,300 /mm3, lymphocytes 1.99 /mm3, neutrophils 14,200 /mm3, monocytes 100 /mm3, eosinophils 10 /mm3, urea 8 mg/dl, creatinine 0.6 mg/dl, GGT 88 U/l, BT 0.25 mg/dl, BI 0.10 mg/dl, BD 0.15 mg/dl, alanine aminotransferase 7 U/l, alkaline phosphatase 138 U/l, alanine aminotransferase 16 u/l, BNP 35, C-reactive protein 9.20 mg/dl, ESR 40 mm/Hr, procalcitonin negative, Antibodies against HIV, Hepatitis B, Hepatitis C: non-reactive.

Image 1: Chest X-ray



Chest X-ray in anteroposterior projection, intact soft tissues, costal arches and clavicles without signs of fracture, central trachea visible up to the bifurcation, intact lung parenchyma, preserved bronchovascular network, normal cardiac silhouette, visible cardio and costophrenic angles, with the presence of a right port catheter with the distal end at the cava-atrial junction.

Upon presenting clinical and biochemical data of infection, empirical treatment with third-generation cephalosporin was started without improvement, so on 15.09.24 sputum and urine cultures were taken with negative results, as well as blood cultures 12 hours apart (Table 1).

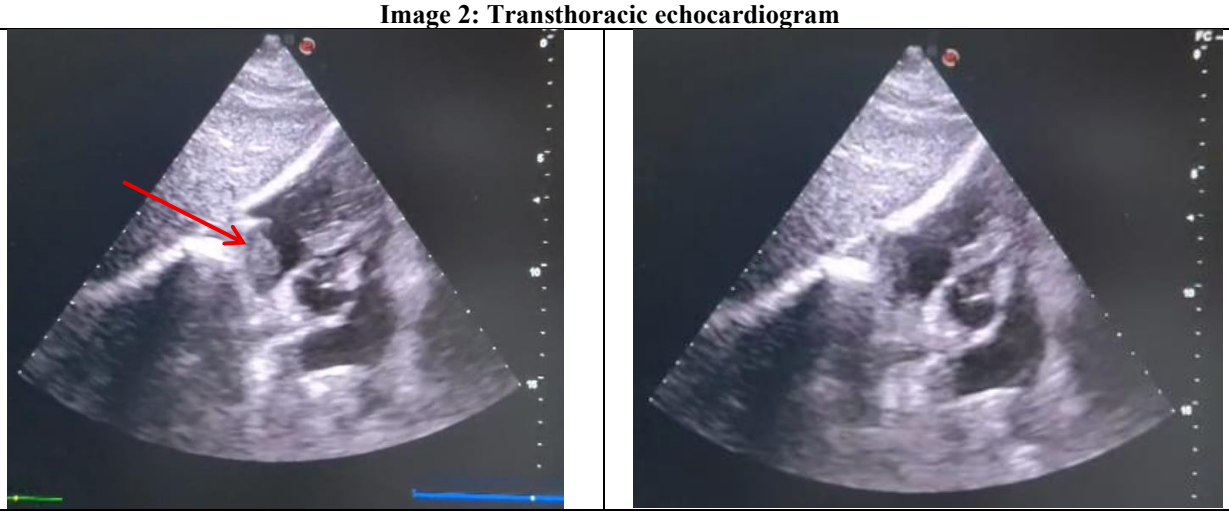
Table 1: Blood cultures

Date	**15.09.24**	**15.09.24**	**04.12.24**
Location	Blood culture from catheter insertion exit site	Central and peripheral blood culture	Peripheral blood culture
Agent isolation:	Klebsiella aerogenes	Klebsiella aerogenes	No development at 168 hours
Antibiogram:	Cefepime MIC <0.12 (sensitive) Ertapenem MIC <0.12 (sensitive) Meropenem MIC <0.25 (susceptible)	Cefepime MIC <0.12 (sensitive) Ertapenem MIC <0.12 (sensitive) Meropenem MIC <0.25 (susceptible)	

The patient continued to have persistent fever, leukocytosis, presence of purulent secretion at the catheter port exit site and due to the heart murmur evidenced in the physical examination, endocarditis was suspected, so a transthoracic echocardiogram was requested (image 2) with the following report:

1. Normal-sized left ventricle, normal systolic function. Left ventricular ejection fraction: 70%. Normal systolic mobility and thickening of all walls.
2. Normal-sized right ventricle. Normal systolic function, tapse: 17 mm.
3. Both atria were normal in size, with no thrombi inside. The subcostal view showed an irregular image with heterogeneous echogenicity along the vena cava axis, measuring 23 x 13 mm and an area of 2.3 cm2, suggesting vegetation.
4. Structurally normal mitral valve, without insufficiency or stenosis.
5. Trileaflet aortic valve, structurally normal, without insufficiency or stenosis.
6. Structurally normal tricuspid valve, a mild central regurgitation jet is observed, with a transtricuspid gradient of 20 mm Hg, so psap is estimated at: 25 mm Hg
7. Structurally normal pulmonary valve without insufficiency or stenosis.
8. No intracardiac shunt, no pericardial effusion. Non-dilated inferior vena cava with inspiratory collapse greater than 50%.

Image 2: Transthoracic echocardiogram



Right atrium with irregular image (red arrow) with heterogeneous echogenicity, mobile, dimensions of 23 by 13 mm and area of 2.3 cm2, suspicious for vegetation.

The evolution was stationary, 3 days after taking blood cultures the report of the catheter insertion exit site was obtained, as well as the central and peripheral with a positive report for Klebsiella aerogenes, so antibiotic therapy was escalated to carbapenem with Meropenem in doses of 1 gram intravenously every 8 hours for 2 weeks, subsequently the reservoir catheter was removed when having a vegetation greater than 10 mm, without eventualities.

Results and Discussion

The patient presented with an infectious presentation with the presence of inflammatory markers, leukocytosis at the expense of neutrophils and a transthoracic echocardiogram imaging study in which a vegetation of 23 by 13 mm was observed in the right atrium on the axis of the cavae. With the data previously described, she met 1 major criterion (positive echocardiogram with vegetation) and 3 minor criteria [2] positive blood cultures for Klebsiella aerogenes with 12

hours difference, fever of 38 degrees, history of IV medication administration) of modified Duke [3], being sufficient for the diagnosis of infectious endocarditis.

According to the systematic review by Petros in 2021 [8], within the Klebsiella species associated with endocarditis, the diagnosis is based on transthoracic echocardiography in 46.2%, while the diagnosis is established at autopsy in 9.2% of the included patients. Blood cultures were positive in 93.8%.

The most common sites of Klebsiella sp. were the aortic valve (44.4%), the mitral valve (33.3%), the tricuspid valve (14.3%), the right atrium (6.3%), the ventricular wall (6.3%), the Eustachian valve (3.2%), and the pulmonary valve (1.6%). Multiple valves were present in 7.9%.

Fever and sepsis were the most frequent clinical presentations, followed by embolic phenomena, paravalvular abscess, and heart failure. Cephalosporins, aminoglycosides, and carbapenems were the most commonly used antimicrobials. Treatment consisted of carbapenems such as meropenem, ertapenem, and imipenem, which act by inhibiting bacterial cell wall synthesis and binding to penicillin-binding proteins in bacteria, interfering with cell wall formation and leading to bacterial death. Treatment duration ranged from 10 days to more than 60 months, with a median duration of 6 weeks [9]. Surgical treatment with antimicrobials was administered in 37.3% of patients; clinical cure was observed in 80.3%, while overall mortality was 19.4%.

For this reason, specific antibiotic treatment with a carbapenem was completed for 14 days in an institutional setting according to the antibiogram obtained in the cultures and removal of the port catheter, presenting remission of fever peaks, decrease in leukocytosis, and clinical improvement. Follow-up was performed 3 months later; the patient presented with clinical improvement, without the presence of fever or dyspnea, with recovery of functional status. A urine culture was requested, as well as a culture of sputum with negative results and a peripheral blood culture (Table 1) which was reported without development.

Conclusions

Endocarditis is a serious and potentially fatal disease. It was suspected due to the history of port catheter and fever, and confirmed by cultures and a transthoracic echocardiogram within the first five days of hospital stay, since a transesophageal echocardiogram was not available. The Klebsiella aerogenes agent is atypical in this type of pathologies since it is resistant to several antibiotics, including ceftazidime, ceftriaxone and ciprofloxacin, but sensitive to imipenem, meropenem, tigecycline and amikacin [10]. The infection in this patient was associated with self-manipulation of the catheter for administration of analgesics without medical indication, without adequate hygiene measures, or having sterile means, causing catheter infection and subsequently the cardiac condition. With blood cultures and an antibiogram available, antibiotic therapy with a carbapenem was escalated, subsequently with catheter removal, resulting in a successful cure, with recovery of the patient's functional status in accordance with what was established in the systematic review by Petros in 2021 [8].

Conflicts of Interest: The authors declare no conflicts of interest.

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