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An unusual case of multivalvular infective endocarditis complicated by staphylococcal pneumonia in an intravenous drug user: a case report

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Abstract

Infective Endocarditis (IE) is a rare but potentially lethal infection of the endocardium and heart valves, native or prosthetic. Staphylococcus aureus-associated IE was identified as the most common cause of IE and is an independent predictor of mortality. Most cases of IE are left-sided and involve a single valve. Here we report a case of Staphylococcus aureus bivalvular endocarditis (MVE) in a patient with a history of intravenous drug use and provide a literature review of MVE identification, treatment, and prognosis. Our patient underwent a 4-week course of intravenous antibiotic therapy for infective endocarditis. Serial Transthoracic Echocardiography (TTE) during hospitalization demonstrated a reduction in the size of the vegetations on both the mitral and tricuspid valves. Upon clinical stabilization, the patient was transitioned to oral antibiotic therapy for an additional two weeks. At discharge, the patient was in stable condition and was advised to continue outpatient follow-up. Routine surveillance with TTE every three months was recommended to monitor for recurrence or progression.

Key words: Albania, case report, infective endocarditis, intravenous drug user, *Staphylococcus aureus.*

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Introduction

Infective Endocarditis (IE) is a rare but potentially lethal infection of the endocardium and heart valves, native or prosthetic. Staphylococcus aureus - associated IE was identified as the most common cause of IE and is an independent predictor of mortality.[1,2]

Infective endocarditis has an estimated mortality of 14%–37%.[3] In 2019, the estimated incidence of IE was 13.8 cases per 100 000 subjects per year.[4] The epidemiological profile of the disease has shifted significantly due to changes in predisposing factors, notably the increasing prevalence of Intravenous (IV) drug use and the increasing number of patients with prosthetic heart valves.[5,6] Bivalvular involvement has not been extensively studied, but available data suggest an incidence ranging from 12% to 30%, with a higher likelihood of requiring surgical intervention.[7] However, since its clinical presentation is highly variable, timely diagnosis of IE is critical to prevent surgical intervention, complications and reduce mortality.

Case Report

A 37-year-old male was admitted to the Emergency Care Unit with a three-day history of confusional state and psychomotor agitation. The patient had a history of intravenous heroin use for approximately six years. During the initial assessment in the ER, his vital signs were stable. His initial blood pressure was 117/60 mmHg, heart rate was 102/min, respiratory rate was 37/min, oxygen saturation was 95 % on room air, and temperature was 94.8 F.

Cardiovascular examination revealed a regular heart rhythm with no murmurs or jugular venous distension. Electrocardiogram (EKG) revealed sinus tachycardia without significant conduction abnormalities. Blood exams (Table 1) revealed marked leucocytosis with a White Blood Cell (WBC) count of 21,000/mm^3, and a significantly elevated C-reactive protein marker (C-reactive protein, CRP, 44 times the upper limit of normal). Severe thrombocytopenia was noted, with a platelet count of 19,000/µL, alongside with an increased creatinine level of 1.75 mg/dL, elevated high sensitivity troponin I with a laboratory value of 1.134 ng/L (RR < 0.013 ng/L), and D-dimer > 20 µg/mg. These findings are summarized in Table 1. The patient was subsequently transferred to the toxicology unit for further evaluation and was empirically started on IV vancomycin and ceftriaxone. Evaluation by an infectious disease specialist recommended continuation of broad-spectrum antibiotics pending the result of blood cultures, a CT scan of the thorax and abdomen and an echocardiogram to rule out endocarditis. The CT scan revealed symmetrical consolidations in both lungs, appearance in the form of multifocal staphylococcal pneumonia (Figure 1). Contrast-enhanced chest CT (Figure 2) shows a corresponding focus of ill-defined parenchymal consolidation with surrounding ground glass and adjacent pleural thickening. The low-attenuation areas (right), reflecting regions of necrosis and the cavitation. Paraseptal emphysema parallels the costo-vertebral pleura (left). Transthoracic echocardiography revealed endocarditis of the mitral and tricuspidal valve, with moderate MR, confirm-

ing the diagnosis of bivalvular endocarditis.

The images below show apical four-chamber views from a Transthoracic Echocardiogram (TTE), focusing on the tricuspidal (left) and mitral (right) valve area. There are mobile vegetations attached to the mitral valve leaflets**,** more prominently the anterior leaflet**.** These vegetations are irregular in shape and mobile. The left atrium is moderately dilated, while the left ventricle has a normal size and systolic function. There is also a mobile vegetation on the atrial side of the tricuspid valve leaflet. Following the confirmation of infective endocarditis, the patient was transferred to the

Table 1. Blood exam parameters.

Test	Patient value	Reference Range (RR)	Interpretation / Remarks
White Blood Cells (WBC)	21,000 /mm³	4,000-11,000 /mm³	Markedly elevated; suggests inflammation or infection
C-Reactive Protein (CRP)	44× ULN	< 5 mg/L (ULN varies by lab)	Significantly elevated; indicates severe inflammation
Platelet Count	19,000 /µL	150,000-400,000 /µL	Severe thrombocytopenia
Creatinine	1.75 mg/dL	0.6-1.3 mg/dL	Elevated; may indicate impaired kidney function
High Sensitivity Troponin I	1.134 ng/L	< 0.013 ng/L	Highly elevated; suggests myocardial injury
D-dimer	> 20 µg/mL	< 0.5 µg/mL	Markedly elevated; suggests thrombotic activity

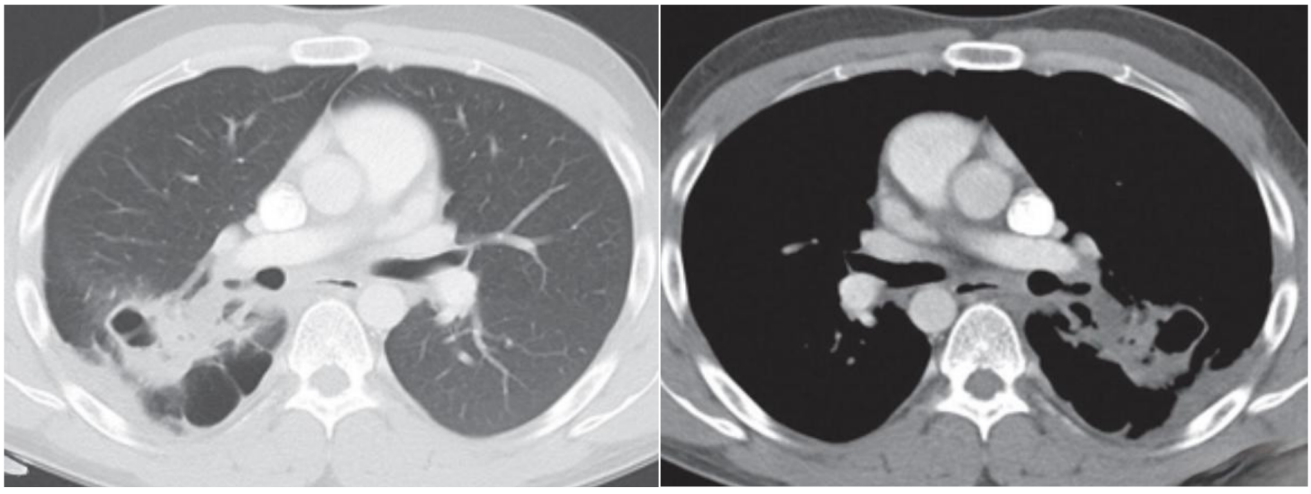

Figure 1. CT scan results.

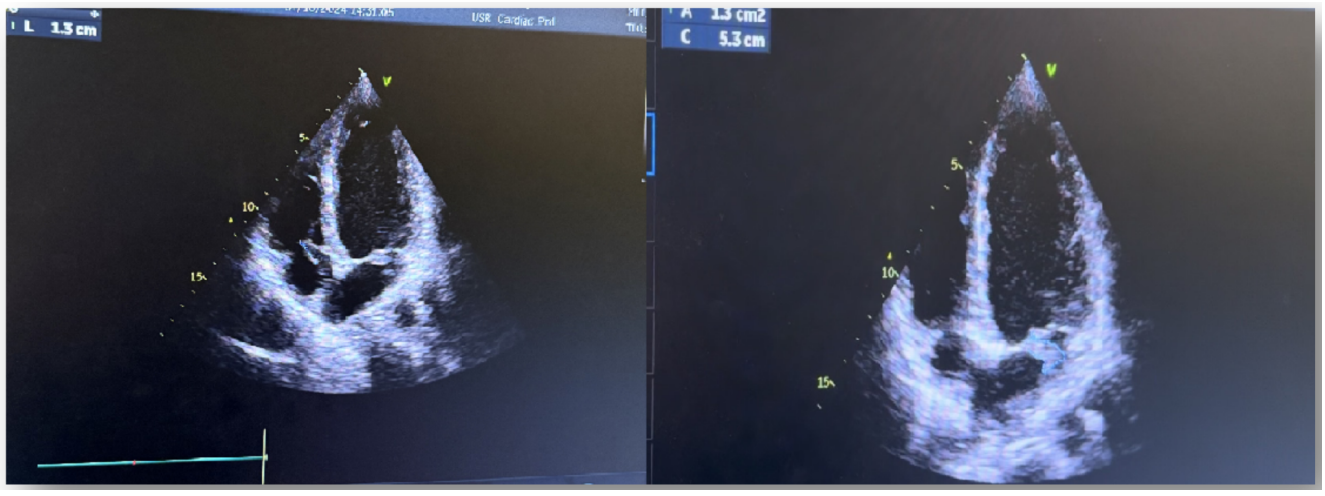

Figure 2. Contrast-enhanced chest CT (left: lung window; right: mediastinal window).

infectious disease center for further management. The blood cultures returned positive for Staphylococcus aureus, and the patient's antibiotic regimen was transitioned to IV Vancomycin and Piperacillin-Tazobactam.

During hospitalization, the patient developed respiratory failure and was placed on CPAP support. CPAP was started at 8 cm H_2O with an FiO_2 of 60%, delivered via full-face mask. Oxygenation and respiratory effort were closely monitored, and settings were titrated to maintain $SpO_2 \geq 92\%$.

After three days, the patient's oxygenation improved ($SpO_2 \geq 92\%$ on $FiO_2 < 50\%$, RR ↓), and gradual reduction of CPAP pressure was initiated. On the fourth day, step-down of CPAP pressure continued to 5–6 cm H_2O and $FiO_2 < 40\%$, and on the following day, the patient was transitioned to nasal cannula.

Blood cultures were repeated after 72 hours and returned negative, indicating that the patient was responding to intravenous antibiotic therapy. The patients clinical situation improved remarkably within the days and TTE showed significant reduction in the size of the vegetations. The patient was discharged from the hospital on day 32 on oral antibiotics therapy following this regimen: Ciprofloxacin 750 mg every 12 hours plus Rifampin 300 mg every 8 hours for two weeks**.**

Discussion

Infective Endocarditis (IE) remains one of the most severe complications associated with Intravenous Drug Use (IDU), primarily involving substances like heroin and cocaine. In developed countries, IDU is one of the leading causes of IE, along with degenerative valve disease of the elderly and mitral valve prolapse.[8,9]

In urban areas and in patients of young age, IDU is the predominant cause of IE. The incidence of IE among IDU in the United States ranges between 1–5% every year. In IDU patients, IE accounts for 5–20% of hospitalizations and 5–10% of total deaths.[10,11]The tricuspid valve is the most commonly affected site (70%), with methicillin-sensitive Staphylococcus aureus (MSSA) accounting for 60–70% of cases.[11]

Prognosis in IDU-associated IE depends on the side of cardiac involvement and the responsible pathogen. Right-sided staphylococcal IE generally has a favourable prognosis (mortality <5%, surgical intervention <2%).[12] However, left-sided involvement, is associated with significantly higher mortality rates (20–30%, with surgery 15-25%).

Bivalvular involvement in IE has not been extensively studied, however available data suggests an incidence ranging from 12% to 30% and require more frequently surgical intervention.[7]

Surgical management is indicated in the presence of life-threatening complications, including heart block, aortic abscesses, or extensive valvular destruction causing heart failure. Additionally, surgery is recommended when medical therapy fails to control infection or when the causative organism is fungal or demonstrates significant antimicrobial resistance.[3]

Surgical treatment of IDU-associated IE poses particular challenges. Relapse rates are high, which raises concerns regarding the long-term success of valve surgery. While expedited surgery may offer rapid symptom resolution, faster bacteraemia clearance, and lower rates of long-term valve regurgitation, the long-term mortality and complication rates remain concerning.[13]

IDUs with infective endocarditis typically experience a more severe clinical progression. They have a higher rate of systemic embolization and heart failure, which are usually the causes of death. Higher rate of recurrence is expected in this patient population. Thus, aggressive medical treatment is required.[14]

Revilla *et al.*[14] reported surgery for IE and congestive cardiac failure to be performed in 72% of patients, currently representing the most prevalent indication for surgery in IE patients.

Conclusions

This case highlights the complex challenges in diagnosing and managing multivalvular infective endocarditis in intravenous drug users.

Despite the severity of the disease, a conservative medical approach can lead to significant clinical improvement, but long-term outcomes remain uncertain. Multidisciplinary management and greater research into targeted therapies for this unique patient population are critically needed.

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