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A Rare Case of E. coli Prosthetic Valve Endocarditis

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Abstract

PVE (Prosthetic valve endocarditis) is a rare but potentially fatal side effect of valve surgery. Escherichia coli (E. coli) is a very uncommon cause of endocarditis; thus far, only 11 cases have been reported. In this case report, we present an interesting case of a rare E. coli prosthetic valve infective endocarditis (IE) in a 73-year-old man, which was successfully treated with Ceftriaxone without cardiac surgery. We summarize the previous cases alongside highlighting the difficulty in diagnosing PVE with transesophageal echocardiography.

Keywords: Prosthetic valve endocarditis; Escherichia coli; Infective endocarditis

Background

PVE, or prosthetic valve endocarditis, is a rare alongside potentially fatal outcome of valve replacement surgery, which has a high mortality as well as morbidity rate. It accounts for 10-30% of all IE cases and occurs in 0.3-1.2% of patients annually [1]. Staphylococci, streptococci, enterococci, and the HACEK-organisms are the most prevalent pathogens associated with IE [2]. E. coli endocarditis presents a very uncommon cause of IE, accounting for only 0.51percent of cases [3]. Thus far, only 35 E. coli IE cases have been documented, of which 11 are associated with prosthetic valves.

Case Presentation

A 73-year-old man arrived at emergency department in April 2024 due to complaints of malaise and a 3-day fever, not responding to analgesia. Upon clinical investigation, the patient was hemodynamically unstable with tachypnea, tachycardia, hypoxemia and hypotension. Abdomen was soft but tender, lung auscultation revealed ronchi bilaterally. He did not have any abdominal complaints. There were no dermatological abnormalities. Neurologic examination was considered within normal limits. Heart auscultation revealed no murmurs.

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Patient had undergone coronary artery bypass graft in 2021, with an AVR (aortic valve replacement) along with MVR (mitral valve repair) due to significant aortic and mitral regurgitation. Earlier in 2024, patient was found to have an ischemic colitis for which he was hospitalized in the gastro-enterology department, which resolved with conservative management (a course of Ciprofloxacin and Metronidazole for 10 days).

Biochemical analysis showed an inflammatory blood count with neutrophilia and a CRP of 66mg/L and troponin T hs 57ng/L. Lactate was 6.7 mg/dL. Electrocardiograph is shown in figure 1, which reveals a known right bundle branch block. Initial imaging by CT abdomen revealed edematous stenotic wall thickening of the distal 1/3rd of the colon sigmoid; image suggestive of diverticulitis. CT thorax could not demonstrate any pulmonary infiltrates. Given signs of septic shock with oxygen and vasopressor need, the patient was admitted to intensive care unit for monitoring. Blood cultures were taken. Based on the suspicion of gastrointestinal origin of the septic shock, Ciprofloxaxin-Metronidazole was started as the patient mentioned a penicillin allergy (could however not specify the reaction nor the antibiotic agent).

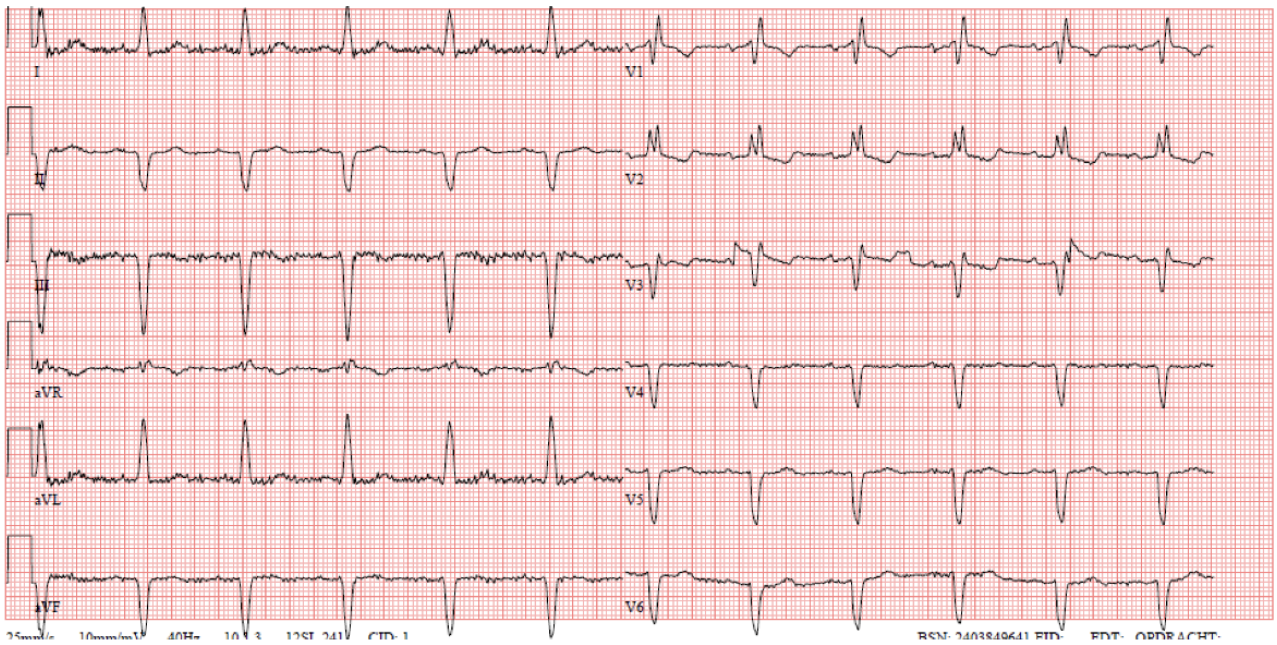

Figure 1: ECG at admission.

On day two of the hospitalization, blood cultures eventually grew GNR (gram-negative rods) in 4/4 collection tubes, which later speciated as E. coli. Ciproxin was continued. During the next two days, vasopressors could be discontinued, and clinical status of patient ameliorated; patient was transferred to the ward. Since the hypothesis of the gastro-intestinal origin of the septic shock remained unclear as this was a recurring phenomenon and the patient did not have any abdominal complaints, decision was made to perform an FDG-PET CT after a rigorous cardio diet. This revealed a zone of strong metabolic activity at the prosthetic aortic valve outline, which may be consistent with a focal infectious zone. This brought us to the diagnosis of infective endocarditis. Urgent Transesophageal Echocardiography (TOE) was planned, which revealed no vegetation on the aorta-bio prosthesis. Based on Duke criteria [4], a diagnosis of definite infective endocarditis was made, defined by one major criterium (positive imaging by FDG/PET-CT) and 3 minor criteria (predisposing heart condition (prosthetic aortic valve), fever, as well as microbiological evidence).

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After extensive deliberation with the hospital's microbiologists and a search in the literature, ceftriaxone high dose was initiated after 5 days of Ciproxin-Metronidazole. Deliberation with the hospital's cardio-thoracic surgeons, who preferred conservative management. With this antibiotic regimen, the patient recovered well. Blood cultures were negative on day three of antibiotic regimen. Ceftriaxone could be continued in an outpatient setting with OPAT (Outpatient Antibiotic Therapy). Patient completed a 6-week course of IV antibiotics without any adverse events.

Several weeks later, at the end of the antibiotic regimen. The patient's clinical status deteriorated with an elevated inflammatory panel. A CT scan of abdomen revealed an inflammatory thickening of colon. At this moment, the decision was made to perform a hemicolectomy. After another shorter course of antibiotics, the patient recovered well.

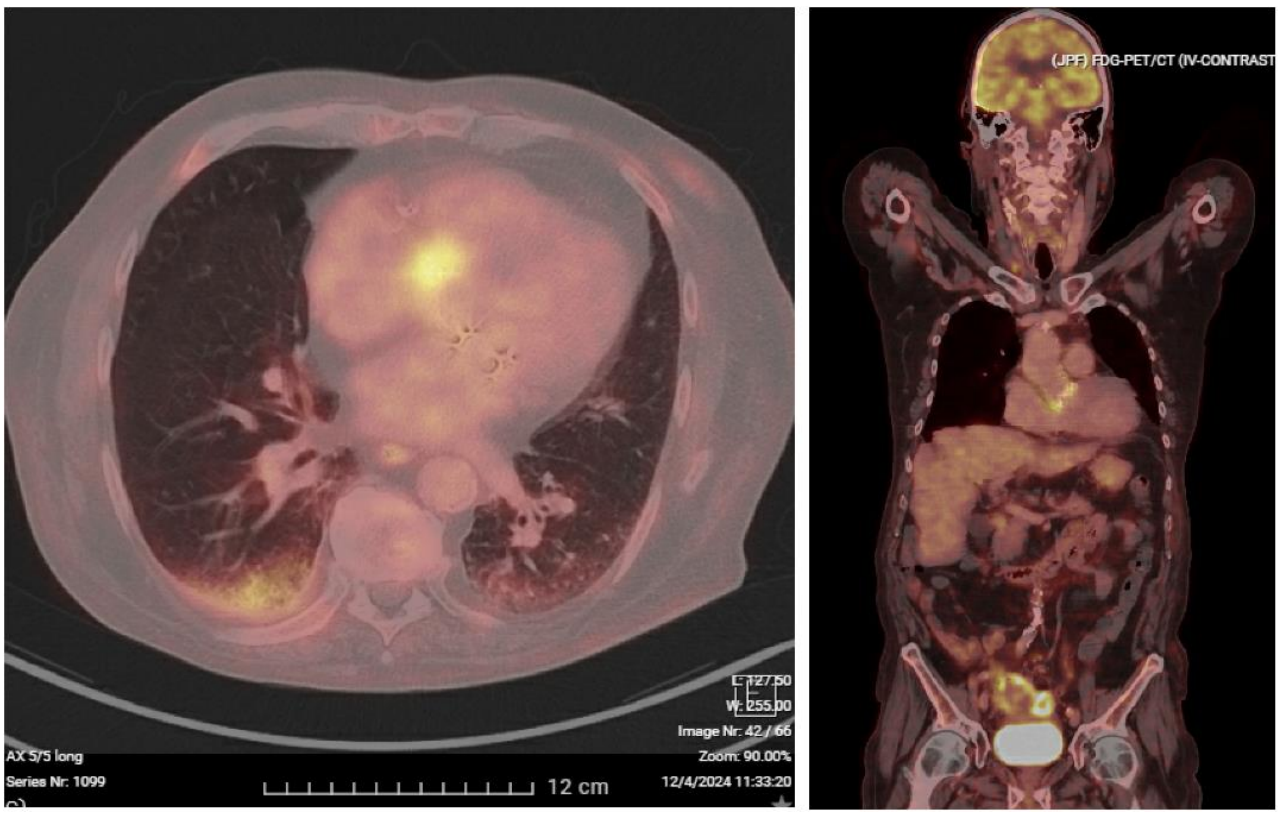

Figure 2: FDG-PET/CT during admission.

Discussion

This is very uncommon case of an E. coli prosthetic valve endocarditis. Currently, this is only the 12th reported case. Risk factors linked to E. Coli IE involve age above seventy, diabetes, female sex, previous healthcare exposure, endovascular device implantation, genitourinary infection, and immunosuppressive medication III. Of the 11 cases, mitral valve was most affected (63%) [5-10], Genito-urinary infection was as likely as gastrointestinal source (50-50%) (table 1).

In all these cases, vegetations were seen on transoesophageal echocardiography (TOE). However, there are some significant restrictions of modified Duke criteria, especially when prosthetic material (PVE, cardiac devices, aortic grafts, and congenital heart disease) is present. Additionally, the clinical presentation of IE can vary greatly. Even when IE is present in these circumstances, up to 30% of echocardiograms can be normal or inconclusive. Despite being required in cases of suspected PVE, TOE has a lower diagnostic value than NVE (native valve endocarditis).

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It has recently been demonstrated that nuclear methods, in particular [18F] FDG-PET/CT, enhance sensitivity along with the diagnostic accuracy of Duke criteria. According to latest meta-analysis, [18F] FDG-PET/CT in PVE had an 84% specificity and an 86% sensitivity. [18F] FDG-PET/CT is advised in cases of inconclusive echocardiogram when PVE is suspected. This is first case of E. coli PVE in the literature detected with a [18F] FDGPET/CT.

There is also heterogeneity in antimicrobial regimens (cfr table 1). Furthermore, E. Coli IE has a greater mortality rate (21%) than IE because microorganisms of the HACEK group III. The AHA recommends using Beta-lactam in combination with either Gentamycin or a Fluoroquinolone for six weeks in non-HACEK NVE. However, for PVE, there is no consensus [11].

In this case, according to the latest ESC guidelines on endocarditis [4], there was no indication for surgical treatment of the vegetation (e.a no heart failure, no deteriorating infectious state, no signs of systemic embolisms and no vegetation > 10 mm). In the Heart team meeting, the decision was made for conservative treatment.

Table 1: Summary of current reported cases of E. coli PVE.

Author	Valve	Source	Antibiotics	Surgery
Branger 2005 **(V)**	Aortic	Gastro-intestinal	Ciprofloxacin-Cefepim	Yes
Branger 2005	Mitral	Genito-urinary	Imipenem + Gentamycine two weeks, followed by 4 weeks Ceftriaxone	Yes
Branger 2005	Mitral	Gastro-intestinal	Ciprofloxacin	No
Branger 2005	Mitral	Genito-urinary	Not specified	Unknown
Modi 2011 **(VIII)**	Mitral	Unknown	Imipenem	No
Senel 2012 **(VII)**	Aortic	Gastro-intestinal	Ampicillin/Sulbactam and Gentamycine	Yes
Loublet 2015 **(VI)**	Aortic	Genito-urinary	Unknown	Yes
Loublet 2015	Aortic	Genito-urinary	Ceftriaxone +Ofloxacin	No
Loublet 2015	Mitral	Gastro-intestinal	Ceftriaxone + Amikacin	No
Quirring 2021 **(IX)**	Mitral	Gastro-intestinal	Ceftriaxone + Gentamycin	No
Peralta 2023 **(X)**	Mitral	Genito-urinary	Ceftriaxone	No

Conclusions

This leads us to conclude that E. coli is a very rare, although ominous, condition with high mortality. Diagnostic accuracy for TOE is high, yet nuclear imaging may increase sensitivity in diagnosing this rare condition.

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The authors report there are no competing interests to declare.

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