

Infective Endocarditis with *Escherichia coli* Secondary to Urosepsis

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Case Report

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Abstract

Infective endocarditis (IE) is a multisystem disease that results from infection, usually bacterial, of the endocardial surface of the heart. The main causative organisms of IE are gram-positive streptococci, staphylococci, and enterococci infection. Although *Escherichia coli* is among the most common causes of gram-negative bacteremia, IE due to this pathogen is rare. Here we report a case a 68-year-old female was presented with 10 days history of fever diagnosed with infective endocarditis according to Modified Duke Criteria where her blood culture isolated *Escherichia coli* organisms. On day two of admission, the patient developed an episode of atrial fibrillation, which was resolved with two stat doses of verapamil 2.5 mg. The patient was treated with intravenous cefotaxime 2 g 8 hourly. Intravenous antibiotics were continued for six weeks, and the patient had complete recovery without any complications.

Introduction

Infective endocarditis (IE) is a multisystem disease that results from infection, usually bacterial, of the endocardial surface of the heart (1). IE is a relatively rare but life-threatening disease. The crude incidence of IE ranges from 1.5 to 11.6 cases per 100,000 person-years. Untreated, mortality from IE is uniform. Even with the best available therapy, mortality rates from IE are approximately 25% (1). The main causative organisms of IE are gram-positive streptococci, staphylococci, and enterococci infection. Together, these three groups account for 80–90% of all cases. Apart from that, other common colonizers of the oropharynx, such as the HACEK organisms (*Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella*, and *Kingella*) can less frequently be the culprit bacteria, and fungal endocarditis represents only about 1% of cases. However, it can be a typically fatal complication of systemic *Candida* and *Aspergillus* infection in the immunocompromised population (2). Although *Escherichia coli* is among the most common causes of gram-negative bacteremia, IE due to this pathogen is rare (3). Here we report a case of IE caused by *Escherichia coli* following a urinary tract infection.

Case Presentation

A 68-year-old female was presented with 10 days history of fever. The fever was mild to moderate in severity and associated with chills but no rigors. She also had exertional dyspnoea (NYHA class III), orthopnoea, and paroxysmal nocturnal dyspnoea. Simultaneously, she complained of dysuria, haematuria, frequency, and urgency at the onset of fever which was persistent throughout the illness, and intermittent episodes of constipation, passing stool once in four days for the preceding few weeks. She also had bilateral lower limb swelling up to mid-calf level, and the onset of the heart failure symptoms was about 4 days after the onset of fever. She did not have any history of chest pain, cough, pleurisy, headache, abdominal pain, diarrhea, or vomiting. She did not have any history of per rectal bleeding or alteration of bowel habits. Her daily water intake was low mainly due to poor personal care, which may have been the main cause of constipation. She was not allergic to any drugs, foods, or plasters, and her family history did not reveal any heart diseases or malignancies.

She was a known patient with bilateral knee joint osteoarthritis where she was on long-term non-steroidal anti-inflammatory drugs and proton pump inhibitors, and she did not complain of any knee joint pain in the current admission. She had undergone a total abdominal hysterectomy with bilateral salpingo-oophorectomy at 51 years.

On examination, she was obese (body mass index of 31.2 kg/m²), febrile 100 °F, the vital parameters recorded, blood pressure of 150/90 mmHg, pulse rate of 96 beats per minute. She did not have any peripheral stigmata of infective endocarditis. However, she had tender hepatomegaly on abdominal examination with liver palpable 3 cm below the right subcostal margin. The remaining cardiovascular, respiratory and neurological system examination was unremarkable.

The initial investigations on admission revealed a white cell count of $24.99 \times 10^3 /\mu\text{L}$ (neutrophils 86.9%), a hemoglobin level of 12.1 g/dL, platelet count of $154 \times 10^3 /\mu\text{L}$. The inflammatory markers were elevated, c-reactive protein of 148.4 mg/L, and erythrocyte sedimentation rate of 100 mm/1st hour. The blood picture was suggestive of the evidence of severe sepsis, and the urinalysis revealed a moderate field full of pus cells per high power field and 12–15 red cells per high power field, with dysmorphic red cells being visible. Her urine culture became positive for *Escherichia coli* ($> 10^5$ CFU), and her blood culture also isolated *Escherichia coli* organisms in two out of three separate cultures, the first and last one taken more than one hour apart.

Since the patient had clinical features of heart failure, a 2D echocardiogram was performed, which revealed an oscillating mass attached to the posterior valve leaflet of the mitral valve, vegetation concluding the diagnosis of infective endocarditis secondary to bacteremia following a urinary tract infection by *Escherichia coli*. However, the cardiac biomarkers were within the normal range; the high sensitive troponin I level was 82.6 ng/L (< 100 ng/L).

On day two of admission, the patient developed an episode of atrial fibrillation, which was resolved with two stat doses of verapamil 2.5 mg. The patient was treated with intravenous cefotaxime 2 g 8 hourly, where the blood culture was sensitive. Intravenous antibiotics were continued for six weeks, and the patient had a complete recovery. The follow-up blood cultures were negative and the 2D echocardiogram in six weeks did not show any vegetations or valvular defects, and the ejection fraction was more than 55%.

Discussion

IE is a noncontagious infection of the endocardium and heart valves. The epidemiology of IE has shifted recently with an increase in healthcare-associated IE. Infective endocarditis requiring intensive care unit stay increases, and nosocomial IE is frequently responsible (4). The diagnosis of IE anchors on both microbiologic and echocardiograph evidence of infection. Diagnosis has long been predicated on the Modified Duke Criteria, divided into major and minor criteria; diagnosis requires satisfaction of either two major criteria, one major and three minor criteria, or five minor criteria (5).

The first major criterion involves confirmation of bacteremia. The Modified Duke Criteria requires two separate blood cultures positive for typical pathogens such as viridans group strep, *S. gallolyticus*, HACEK organisms, *S. aureus*, or community-acquired enterococci absence a primary focus. If other culprit pathogens are suspected, blood cultures must remain persistently positive as defined by either two positive cultures drawn more than 12 hours apart or positive results of all three or the majority of 4 or more separate cultures (with first and last samples drawn one hour apart) (6). Although our patient had positive blood cultures, they did not fulfill this major criterion where only two out of three blood cultures were positive for *Escherichia coli* organisms. The second major criterion involves sonographic evidence of endocardial involvement. An echocardiogram must demonstrate a vacillating intra-cardiac mass fixed to a valve, supporting structure, or implanted material. Initial evaluation with a transthoracic echocardiogram (TTE) is common; however, the American Heart Association (AHA) recommends obtaining a more sensitive and specific transesophageal echocardiogram (TEE) if suspicion of infectious endocarditis remains high despite a negative TTE (7). Our patient fulfilled the second major criterion without any necessity of a TEE. Circumstances such as comorbid chronic obstructive pulmonary disease, previous thoracic surgery, obesity, and prosthetic valve involvement may hamper visualization via the transthoracic approach and should prompt more expeditious attainment of a TEE (5).

The five minor criteria include; first predisposing conditions such as underlying valvular abnormalities, structural heart disease or intravenous drug use, second fever defined by a temperature greater than 38 degrees of Celsius, third evidence of vascular phenomena such as mycotic aneurysms, intracranial hemorrhage, Janeway lesions, major arterial emboli, or septic pulmonary infarcts, fourth evidence of immunologic phenomena such as Osler's nodes, Roth spots, glomerulonephritis, or positive rheumatoid factor, fifth positive blood cultures that do not satisfy the aforementioned major criterion or serologic evidence of infection consistent with infectious endocarditis (7). Of these five minor criteria, our patient fulfilled three where she had a fever of more than 38 degrees of Celsius, evidence of glomerulonephritis, and a positive blood culture not fulfilling the major criterion. Therefore, this patient's diagnosis of infective endocarditis was made, fulfilling one major and three minor of the Modified Duke Criteria.

Escherichia coli is a rare cause of infectious endocarditis with few reported cases in the literature (3, 8–10). Among the reported cases, most of the patients had concurrent urinary tract infections suggesting that the urinary tract is the most common portal of entry of the organism and mostly in elderly females (8, 9, 11). Most cases showed a favorable outcome with conventional antibiotics and did not require surgery (8). However, some patients required prosthetic tissue valve replacement and ended up with congestive cardiac failure (9) or valvular defects (12). At the same time, some cases have been reported with concurrent spondylodiscitis and bilateral endophthalmitis (3), purulent spondylitis (10) and septic abortion (13). Villamil-Cajoto et al. has reported a case of infective endocarditis with vegetations attached to the pacemaker lead, where the pacemaker was, therefore, exchanged surgically (14).

Conclusion

Escherichia coli can rarely cause infective endocarditis, commonly following a urinary tract infection. However, the outcome is favorable with adequate antibiotic therapy.

Declarations

Acknowledgment

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Conflict of Interest Statement

No conflict of interest

Funding Statement

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Ethical Approval

Not applicable

Consent

Written informed consent was obtained from the patient for publishing this case report.

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