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Christine Hein

christine.hein@otterbein.edu

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Infective Endocarditis

Christine Hein, BSN, RN

Otterbein University, Westerville, Ohio



Introduction

- Infective endocarditis (IE) is a severe inflammatory disease of the endocardium, affecting valve structure and function.
- IE develops when bacteria or fungi in the blood attaches to the surface of the heart (Pierce, Calkins, & Thornton, 2012).
- If left untreated, IE will likely cause congestive heart failure, leading to death.
- It is important for health care professionals to understand the causes, clinical presentation, diagnosis, and treatment of IE in order to adequately intervene and care for their patients.

This topic was chosen as a result of experience caring for patients affected by the illness in a pediatric cardiothoracic intensive care unit. Six months ago, a teenager without any prior health history was diagnosed with IE. Literature states that more than one-half of IE cases now occur in patients without any prior heart disease (Cahill et al., 2017). The patient was placed on a left ventricular assistive device (LVAD) and then received a heart transplant. With multiple complications post-operatively, including an aggressive fungal infection that led to multisystem organ failure, the patient did not live. This patient, along with many others affected by the illness, led to a more in-depth research of IE.

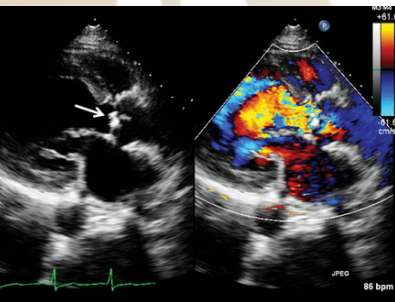


Figure 1. This is a parasternal long axis view showing vegetation on the aortic valve (arrow) and severe aortic regurgitation on an echocardiogram. (American Heart Association, 2013)

Underlying Pathophysiology

- IE occurs when endothelial lining of the heart is damaged by direct trauma or scarring. Platelets and fibrin develop on the damaged endothelium, forming a thrombus. Thrombus formation makes it susceptible for circulating microorganisms, such as *Staphylococcus aureus* and *Streptococcus pneumoniae* to colonize (Thornton, 2000).
- The vegetation enlarges due to recurrent fibrin deposition and microbial multiplication (Sandoe, Watkin, & Elliott, 2013).
- Vegetation on heart valves can cause them to work improperly, leading to heart failure.
- Organisms enter the bloodstream from surgical wounds, dirty intravenous needles, and invasive lines.
- Bacteremia can also enter the blood as a result of dental, upper respiratory, urologic, and lower gastrointestinal procedures (Thornton, 2000).
- Bacterial vegetation can break off and travel to the brain, lungs, abdominal organs, or limbs and cause a stroke, emboli, kidney failure, and abscesses.

Significance of Pathophysiology

- Those at an increased risk for developing IE include those with a prosthetic heart valve, structural or congenital heart disease such as mitral valve prolapse or aortic valve disease, intravenous drug use, and a history of a recent invasive procedure, such as renal dialysis (Bor, Woolhandler, Nardin, Brusch, & Himmelstein, 2012).
- Identifying the microorganism responsible for causing IE is crucial for patient survival, lowering the risk of recurrent infection, and prescribing the correct type and duration of treatment (Oberbach et al., 2017).
- Diagnosis of IE is made using Duke criteria, which includes clinical, laboratory, and echocardiographic findings (Pierce et al., 2012).
- Multiple positive blood cultures are the most important diagnostic indicator when making an IE diagnosis.
- Three sets of blood cultures should be taken at different times over a 24-hour period prior to starting treatment. If the patient is unstable, the cultures can be obtained over a shorter period (Sandoe et al., 2013).
- Ideally, antibiotic therapy should be avoided until a microorganism is identified.

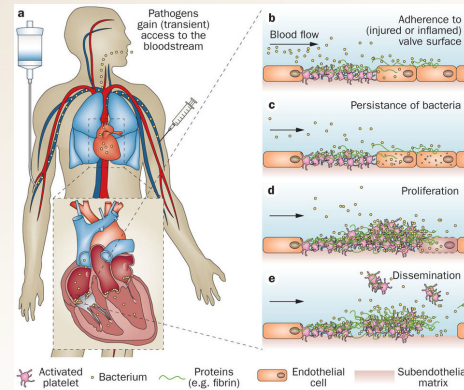


Figure 2. This picture illustrates the pathophysiological process of infective endocarditis. (Werden, et al., 2014)

Signs & Symptoms

- Patients with IE often present with a high fever, new-onset cardiac murmur, and peripheral emboli causing a rash to the extremities.
- Peripheral lesions including petechiae of the palate, conjunctiva, or beneath the fingernails as well as Osler nodes (raised lesions of the fingers, toes, or feet), Janeway lesions (painless sores of the palms or soles), and Roth spots (exudative lesions in the retina) may be noted (Thornton, 2000).
- Complaints may also be vague, consisting of fever lasting several days to a two weeks accompanied by cough, dyspnea, arthralgia, arthritis, and abdominal complaints. (Thornton, 2000).



Figure 3. Vascular skin lesions associated with IE. (Cleveland Clinic, 2010)

Treatment

- Treatment requires appropriate antibiotic therapy based on the microorganism detected.
- The antibiotic must have the ability to penetrate the valve surface, disseminate into the tissue, and enter both the membranes of host cells and bacterial cell walls in order to work effectively (Oberbach et al., 2017).
- Surgery may be required depending on the depth of injury to the valves in the heart. Surgical treatment in mitral valve IE is considered when patients have a mitral abscess, vegetation larger than ten millimeters, uncontrolled sepsis, and multiple emboli (Rostagno, Carone, & Stefano, 2017).
- Surgical intervention is also considered in patients with fungal infections, infection with aggressive antibiotic-resistant bacteria, or bacteria that respond poorly to antibiotics (Pierce et al., 2012).
- In one study completed over a sixty-year period, blood culture results were positive in 47 of 53 IE cases, with the most common organisms being streptococci and staphylococcus aureus (Johnson, Boyce, Cetta, Steckelberg, & Johnson, 2012).

Prevention

- From 1955 to 2007, The American Heart Association (AHA) recommended antibiotic prophylaxis for patients with congenital heart disease and rheumatic heart disease prior to dental procedures (Pant et al., 2015).
- The efficacy of this practice was questioned after studies deemed a failure rate of up to fifty percent in patients treated with prophylactic antibiotics (Cahill et al., 2017).
- The AHA revised prophylaxis guidelines in 2007 for patients with congenital heart diseases due to the lack of evidence that prophylactic antibiotic administration prevented IE from invasive procedures (Johnson et al, 2012).
- Antibiotic prophylaxis is now only recommended for patients at extremely high risk for obtaining IE.

Nursing Implications

- It is important to know risk factors that predispose patients to IE, such as a heart defect or previous diagnosis of IE.
- The nurse should understand the importance of correct blood culture collection to prevent contamination of outside bacteria.
- Caregivers should be aware that the risk for emboli to migrate causing CNS embolic events is highest during the first week after initiation of antibiotic therapy (Hodges, Hussain, Stewart, & Pettersson, 2016). Therefore, frequent neurological examinations will be important.
- After the patient completes antibiotic therapy, education should be provided about the importance of daily dental hygiene, regular visits to the dentist, and possibly the need of antibiotic prophylaxis before certain procedures (Pierce et al., 2012).

Conclusion

IE is a serious health concern that is on the rise. Those most at risk include individuals with preexisting cardiac conditions and implanted cardiac devices. Correctly obtained blood cultures are the most important diagnostic test confirming IE. Antibiotics are the main course of treatment, however surgical debridement and valvular surgery are often required. It is imperative that healthcare workers be aware of the signs and symptoms of this illness in order to adequately screen and treat it in hopes to prevent mortality.

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