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Infected Endocarditis

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Infective Endocarditis

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Introduction

- Infective endocarditis is a bacterial infection that adheres to the endothelium of the heart causing vegetations that can lead to systemic consequences.
- Infective Endocarditis (IE) is a disease that while not widely prevalent, it does have a mortality rate as high as 30% at 30 days after diagnosis.
- Risk factors of infective endocarditis include:
 - Ventricular septal defect
 - Long term venous access
 - Illicit intravenous drug use
 - Exposure to extracardiac devices
 - Naturally acquired blood stream infections

• IE has consequences in the cardiac system as well as multisystem organ dysfunction through embolism of the vegetation.

• Treatment of IE is primary focused on a dual approach of long-term antibiotic management and surgical removal of vegetation or replacement of affected valve.

• Patients with IE undergoing surgical procedures for vegetation removal or valve replacement have altered cardiac blood flow as well as specific anesthetic requirements that provide best outcomes for them. Understanding the pathophysiology behind these unique requirements would be beneficial as a future nurse anesthetist.

Signs and Symptoms

Systemic

- Fever and chills
- Leukocytosis
- Septic Shock

Cardiac

- Chest pain
- Heart failure
- Valvular regurgitation

Respiratory

- Shortness of breath
- Cough

Embolic Phenomena

- Stroke
- Myocardial infarction
- Distal tissue infarction
- Abscess

Underlying Pathophysiology

Systemic

- The vegetation that adheres to the endothelium of the heart is bacterial in nature. This stimulates a systemic immune response that can escalate to multiorgan system failure related to septic shock.

Cardiac and Respiratory

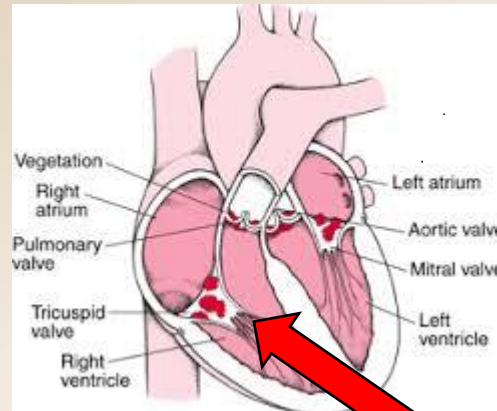
- Vegetations often present on the atrioventricular or semilunar valves of the heart and cause insufficiency of the valve. This insufficiency results in diminished cardiac output, leading to chest pain, heart failure, and respiratory symptoms such as shortness of breath.

Embolic phenomena

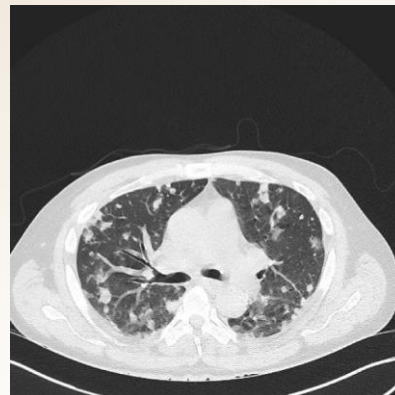
- Similarly to blood clot emboli, septic emboli separated from the vegetation in the heart can travel throughout the body and create infarction.
- In addition to infarction, the embolized bacteria can infect distal tissues leading to abscess.

Blood Flow

Vegetations on the valves cause structural integrity changes. Valvular regurgitation has a high incidence rate in IE, cause decreased cardiac output and following complications such as pulmonary congestion, hypotension, and heart failure.



"An inside view of infective endocarditis" by MSD Manuals



"Embolic septic emboli with mrsa: a different source" by Journal of Intensive Care and Medicine

Septic Emboli

Viewed through magnetic resonance imaging, vegetations have embolized from the right side of the heart cause infarctions in the pulmonary vascular bed. This increased physiologic dead space often requires increased respiratory support escalating up to mechanical ventilation.

Significance of Pathophysiology

- IE is a condition that affects the entire body.
- Not only are individual organ system functions compromised, cardiac output and oxygen delivery is significantly reduced in the setting of valve regurgitation related to valvular vegetation.

Implications for Nursing Care

- Many studies have been conducted to find patterns in the clinical course of IE along with interventions that can decrease the mortality suggesting the following:
 - Early surgical intervention was found to be related to a lower rate of mortality.
 - Risk for hospital mortality can be predicted by presence of septic shock, need for dialysis, and stroke.
 - In the surgical population, 30-day mortality risk is increased with age, body mass index, ischemic heart disease, prolonged aortic cross clamp time, increased cardio-pulmonary bypass time, presence of paravalvular abscess, IE caused by *S. aureus* infection.
 - Patient outcomes are most positive when anesthesia technique focuses on keeping heart rate elevated to prevent regurgitation time during diastole, systemic vascular resistance (SVR) should be reduced, and positive inotropes should be considered to improve cardiac output during surgery.

Conclusions

- Infective Endocarditis, while not the highest occurring infection in today's medical world, the mortality rate of those affected is exceedingly high
- As healthcare providers we should be doing everything possible to lower the mortality rate associated with IE. To do this, interventions should be selected in reference to science-based evidence.
- Being knowledgeable about risk factors related to increased mortality will allow providers to be proactive in preventing them if possible.
- If the patient is a candidate, surgical intervention at earliest possible time is advisable.
- During surgery, the nurse anesthetist should use techniques to maintain best cardiac output possible. This can be achieved through:
 - Maintaining adequate heart rate with medications such as Isuprel
 - Decreasing systemic vascular resistance with vasodilators.
 - Increasing contractility of the heart through positive inotropes.

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