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Aortic Stenosis Poster

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Aortic Stenosis

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Introduction

What is Aortic Stenosis?

- Defined as "fixed aortic valve narrowing" (Tanaka et al. 2018)
- Normal aortic valve area is 2.5–3.5 cm² (Hines & Marshall, 2018)
- Aortic stenosis= valve area < 2.5 cm²

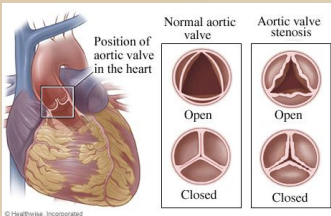


Figure 1. Comparison of normal aortic valve to aortic valve stenosis (University of Michigan Frankel Cardiovascular Center, 2018).

Why is it Important?

- Aortic stenosis is the most common valvular heart disease in the elderly population (Hines & Marshall, 2018)
- It is estimated that 25% of people over the age of 65 develop calcific aortic stenosis from aging and inflammatory processes in the body (Hines & Marshall, 2018)
- As the elderly population continues to grow, so will the patient population with aortic stenosis.
- Over the next 20 year, the population with aortic stenosis is expected to double. (Hines & Marshall, 2018)
- As a CRNA it is important to understand the pathophysiology and management of aortic stenosis when administering anesthesia to patients in noncardiac related surgery.
- Morbidity and mortality increase two to three times during the perioperative period with patients that have aortic stenosis (Hines & Marshall, 2018)

Presentation of Process

Risk Factors

- Age: 25% of adults older than 65 have aortic stenosis to varying degrees
- Systemic Hypertension
- Hypercholesterolemia
- Diabetes Mellitus
- Smoking
- Male Gender

(Hines & Marshall, 2018)

Clinical Manifestations

- 50% of patients with severe aortic stenosis are asymptomatic (Ledwoch & Thiele, 2017)
- Onset of symptoms changes life expectancy from normal to a 50% mortality rate within 2 years (Yurek, Jakub & Menacho, 2015)
- Symptoms start presenting as progressive activity intolerance, dyspnea on exertion, and orthopnea (Yurek et al., 2015)
- Systolic ejection murmur secondary to blood forcefully being pumped through narrow valve (Yurek et al., 2015)
- Murmur softens with severe aortic stenosis due to decreased cardiac output (Yurek et al., 2015)
- Aortic stenosis is classified as mild, moderate and severe based on valve area, jet velocity, and mean gradient pressure (Yurek et al., 2015).

**TABLE
CLASSIFICATION OF PROGRESSIVE AORTIC STENOSIS AND
FREQUENCY OF ECHOCARDIOGRAM MONITORING**

Indicator	Mild	Moderate	Severe
Jet velocity (m/s) ^a	<3	3 to 4	>4
Mean gradient (mmHg) ^b	<25	25 to 40	>40
Valve area (cm ²) ^c	>1.5	1 to 1.5	<1
Valve area index (cm ² /m ²)	—	—	<0.06
Two-dimensional doppler interval (years)	5	2	1

^a The speed blood flows across the aortic valve.

^b The difference in pressure between the inferior (i.e., ventricular) and superior (i.e., aortic) surfaces of the aortic valve.

^c A measure of the aortic valve opening.

Table 1. Classification and Progression of Aortic Stenosis (Yurek et al., 2015)

Underlying Pathophysiology

- Accumulation of lipoproteins and chronic inflammation followed by calcification and fibrosis of aortic valve (Yurek et al., 2015).
- Degenerative process with endothelial dysfunction, lipid deposition, and oxidative changes (Hines & Marshall et al., 2017).
- Matrix metalloproteinases (MMPs) play a major role in the inflammatory process (Lurins et al., 2017).
- MMPs were found to be the highest during moderate stage of aortic stenosis and lowest in severe aortic stenosis (Lurins et al., 2017).
- This suggests that most remodeling occurs during moderate stage of the disease and calcification in later stages (Lurins et al., 2017).
- Aortic valve leaflets thicken and have decreased flexibility (Yurek et al., 2015).
- The aortic opening narrows secondary to build up of calcium, obstructing outflow of blood from left ventricle into the aorta (Yurek et al., 2015).
- Left ventricle has to generate more pressure to create flow across narrowed valve → increased aortic jet velocity (Yurek et al., 2015).
- Congenital bicuspid aortic valve (two leaflets instead of three) → abnormal valve and abnormal mechanical stress leads to inflammation and calcification → aortic stenosis (Hines & Marshall, 2018).
- The narrowing of the aortic valve leads to left ventricular hypertrophy and diastolic dysfunction (Tankura et al., 2018).
- Patients can exhibit angina despite not having coronary artery disease because of increased oxygen demand from increased workload on the heart to push through narrow valve (Hines & Marshall, 2018)
- Increase pressures in left ventricle affect left atrium size → causing dilation → marker for severity of disease progression (Tanaka et al., 2018).
- Bicuspid aortic stenosis occurs earlier in life (age 30-50) compared to tricuspid aortic stenosis (age 60-80) (Hines & Marshall, 2018).
- Bicuspid aortic valve is also associated with aortic dilation → aortic aneurysms grow faster in this patient population → increased risk for aortic dissections (Hines & Marshall, 2018).

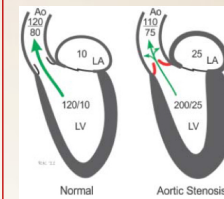
Implications for Nursing Care

- Aortic stenosis is most common valvular disease in the USA and second most frequent reason for cardiac surgery (Lurins et al., 2017)
- Thorough assessment and H&P are imperative to recognizing aortic stenosis → Patients often unconsciously decrease level of activity and are not aware they have become symptomatic
- RNs and APRNs should have clear understanding of classifications of aortic stenosis and when surgical referral is appropriate (Yurek, Jakub & Menacho, 2015)
- Disease management education by nurses improves patient and family understanding as well as compliance to care plan (dietary restrictions, medications, follow up appointments) (Yurek et al., 2015)
- Periodic echocardiograms monitoring is recommended to effectively monitor patients. (Yurek et al., 2015)
- Computed topography (CT) is another alternative to assess valve area and calcification (Hines & Marshall, 2018)
- Aortic valve area, aortic jet velocity, and mean pressure gradient across the valve are important criteria to use to monitor disease progression (Yurek et al., 2015)

Treatment

- Current guidelines suggest medical management until patient becomes symptomatic (Ledwoch & Theil, 2017)
- Treatment with statins helps delay progression of the disease (Ledwoch & Thiele, 2017)
- SAVR**
(Surgical Aortic Valve Replacement)
- Open Heart surgery with median sternotomy and cardiopulmonary bypass (Yurek et al., 2015)
- 30% of patients with severe aortic stenosis do not qualify or refuses surgery (Yurek et al., 2015)
- Higher rates of bleeding and onset of atrial fibrillation
- TAVR**
Transcatheter Aortic Valve Replacement
- Alternative option for patients denied as surgical candidate due to advanced age and comorbidities (Hines & Marshall, 2018).
- TAVR outcomes were neither inferior or superior to SAVR (Yurek et al., 2015)
- Increase risk for TIA/CVA (Yurek et al., 2015)
- Anticoagulation necessary for 3-6 months after procedure (Yurek et al., 2015)

Conclusions



Normal left ventricular pressures vs. pressures with AS (Yurek et al., 2015)

- Aortic stenosis is a very common disease and is going to become more prevalent as the elderly population increases
- Disease progression can happen very quickly, therefore proper monitoring and patient education is necessary to increase survival
- APRNs and RNs should be aware of current treatments when they see patients in primary care preoperatively and postoperatively
- The pathophysiology of aortic stenosis leads to left ventricular hypertrophy and left atrial dilation due to increased pressure to create flow across the narrow valve.
- Patients with aortic stenosis are at increases risk during noncardiac surgery
- Anesthesia providers should maintain patient's normal sinus rhythm, prevent hypotension, and avoid anything that will decrease cardiac output during surgery (Hines & Marshall, 2018).
- During CPR, it is impossible to create enough pressure to produce flow through stenotic aortic valve with internal or external compressions (Hines & Marshall, 2018)

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