Aortic/Thoracic Aneurysm; Nursing Considerations

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Objectives

• By the end of this session the participant will be able to:
  1. Discuss the definition and causes of an aortic/thoracic aneurysm
  2. Describe the medical treatment of a patient with an aortic/thoracic aneurysm, and describe the nursing care of that patient
  3. Explain surgical treatment of aortic/thoracic aneurysm, including open repair and endovascular repair, and describe nursing management

Cleveland Clinic Heart and Vascular Institute

• Hospital Tower:
  – 288 Hospital Beds
  – 110 Critical care Beds
  – Our Heart Center has ranked No. 1 for 21 years in a row

Thoracic Aortic Aneurysm

• Definition:
  Permanent localized dilation of the thoracic aorta that is at least 50% larger in diameter than a normal aorta

Thoracic Aortic Aneurysms

• Definition:
  – A thoracic aortic aneurysm occurs in the chest
  – Affects men and women equally
  – Becomes more common with increasing age

• Inherited connective tissue disorders
  – Marfan syndrome
  – Ehlers-Danlos syndrome

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Aortic Aneurysm/Silent Killer

- Many thoracic aortic aneurysms are detected incidentally during imaging scans for other reasons

Risk Factors for Aortic Aneurysm

- Hypertension
- High cholesterol
- Atherosclerosis
- Smoking

Common Sites

- Thoracic Aortic aneurysm ~ 19%
- Thoracic Abdominal Aorta ~ 2%

Common Sites

- Abdominal Aortic aneurysm ~ 65%
- Abdominal Aortic aneurysm associated with iliac ~ 13%

Thoracic Aortic Aneurysms

- 75% of aneurysms develop in the abdominal aorta
- The rest develop in the thoracic aorta
  - 25% Ascending aorta
  - 25% Aortic arch
  - 50% Descending thoracic aorta

Thoracic Aortic Aneurysm

- Signs and symptoms:
  - Sharp, sudden pain in the chest or upper back
  - Shortness of breath
  - Difficulty breathing or swallowing
Pathophysiology of Aortic Aneurysm

- The underlying cause is unknown in many individuals
- Atherosclerosis may cause aneurysms

Pathophysiology of Aortic Aneurysm

- Degeneration of the arterial media

Pathophysiology of Aortic Aneurysm

- Arterial media is made up of collagen and elastin
- Collagen and elastin are fibrous protein

Pathophysiology of Aortic Aneurysm

- Collagen:
  Responsible for the mechanical strength of vessel

Pathophysiology of Aortic Aneurysm

- Elastin:
  Provides elasticity to the vessel and allows it to double in diameter
- There is no evidence that elastin is synthesized in adult life
Pathophysiology of Aortic Aneurysm

- Elastin has half life of 40-70 yrs
- Elastin in normal vessel ~ 36%
- Elastin in aneurysmal vessel ~ 8%

Marfan Syndrome

- A disorder discovered in 1896 by a French doctor named Antoine Marfan
- Main traits:
  - Tall
  - Long narrow face
  - Long arms and legs
  - Aortic root dilatation

Ehlers-Danlos Syndrome

- A group of inherited disorders that affect connective tissues
  - Primarily skin, joints and blood vessel walls
  - Due to defects in type III collagen which cause hyperelasticity
  - Vascular Ehlers-Danlos syndrome, can cause the walls of the blood vessels to rupture

"When you hear the sound of hooves, think horses, not zebras"

Rates of Rupture

- < 4.0 cm = low
- 4.0 - 4.9 cm = 5%
- 5.0 - 5.9 cm = 25%
- 6.0 - 6.9 cm = 35%
- ≥ 7.0 cm = 75%

Thoracic Aortic Aneurysm

- For the thoracic aorta:
  - 3.5 cm is generally considered dilated
  - Greater than 4.5 cm would be considered aneurysmal
Diagnostic Tests

- Aortogram
  - Locates site and extent of dissection
- CT, MRI
- TEE (ascending and descending aorta)

Medical Treatment

- Blood pressure control
- Oral beta-blockers reduce HR, BP, and myocardial contractility
- Antihypertensives to control blood pressure

Medical Treatment

- Smoking cessation immediately
- Diameter of aneurysm monitored every 6 months
- Elective repair: surgical or endovascular

Indication for Repair

- When risk of rupture is greater than risk of surgery

Indication for Repair

- When patient is symptomatic
- Lives could be saved if the aorta is repaired before rupture

Open Repair or Endovascular Aneurysm Repair (EVAR)

- Institution and physician dependant
- Open repair is more invasive
- EVAR is less invasive

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Open Repair or Endovascular Aneurysm Repair (EVAR)

- Open repair for younger and healthier patients
- EVAR for older and more debilitated patients
- Anatomic considerations
- Patient preference

Open Surgical Technique

- Median sternotomy for ascending aorta and arch
- Left thoracotomy for descending aorta

Surgical Techniques

- Partial upper sternotomy
- Mini-thoracotomy
- Robotic totally endoscopic
- Transapical / Transfemoral

Open Surgical Technique

- Aorta is cross clamped
- Patient is put on cardiopulmonary bypass
- Diseased portion of aorta is replaced with a Dacron or Teflon graft
- Graft is sewn into place
Open Repair

- Recovery is similar to cardiac surgical procedure
- Admitted to ICU for 1-3 days
- Rapid assessment in the ICU is performed by the nurse

Open Repair

- Routine care includes continuous ECG monitoring
- Measurement of BP by arterial line
- Pulse Ox
- Pulmonary artery pressures

Open Repair

- If aortic valve is involved bradycardia or heart block may occur
  - Inflammation
  - Trauma
  - Sutures close to the conduction system

Open Repair

- Hypotension occurs often during the first 12 hours after surgery
  - As the patient warms
  - As systemic vascular resistance decreases to normal levels

Open Surgical Repair

Poor Prognostic Factors

- Abnormal EKG
- Prior myocardial infarction
- Underlying pulmonary disease
Open Surgical Repair
Poor Prognostic Factors

- Age > 70
- Pre-existing renal failure

Surgical Complications

- Myocardial infarction
- Perioperative bleeding
- Graft infection

Elephant Trunk Procedure

- Used for extensive aortic aneurysms
- Graft replacement of the ascending aorta, arch and descending aorta
Elephant Trunk Procedure

• During the first surgery the ascending aorta and arch are repaired
• Also prepare for the replacement of the descending aorta
• Second surgery the descending aorta is replaced

Hybrid Approach

• Hybrid approach involving open repair of the arch with elephant trunk graft placement
• With an endovascular completion procedure

Hybrid Repair of the Aorta

• Using a carotid subclavian bypass
• Thoracic endovascular stent graft for an arch and descending thoracic aortic aneurysm

Hybrid Repair of the Aorta

• Hemodynamic monitoring
• PA catheter, CO CI, arterial line
• Keep MAP > 65 mmHg
### Elephant Trunk Procedure
#### Nursing Management
- SA drain
- IVF’s maintenance
- Strict I&O

### Elephant Trunk Procedure
#### Nursing Management
- HCT, K+, ABG’s
- Blood products as needed
- Sedation
- Patient Controlled Analgesia

### Elephant Trunk Procedure
#### Nursing Management
- Ventilator management
- Wound care
- Neurovascular management

### Endovascular Aneurysm Repair (EVAR)
- Endo – within + Vascular – vessel
- Minimally invasive technique
- EVAR grafts have been used to repair thoracic and abdominal aneurysms

### Endovascular Aneurysm Repair (EVAR)
- Use a metal stent covered with graft material
- The stent is deployed inside the aorta and held in place with metal hooks or barbs

### Endovascular Aneurysm Repair (EVAR)
- Transvascular approach
- Femoral incision
- Insertion of a bypass conduit or endograft
Endovascular repair

- Endovascular repair of a descending aortic aneurysm

Advantages of an Endovascular Repair

- Good short term morbidity and mortality rates
- Patients who are too ill for conventional surgery can be considered for EVAR
- Benefit is greatest for high risk patients

Endovascular Aneurysm Repair

EVAR

- The stent graft create a new lining within the aneurysm sac
- Reduce pressure in the sac and protect from rupture

Advantages of an Endovascular Repair

- Decrease amount of total blood loss
- Decrease in incidence of cardiac and respiratory events

Complications of Endovascular Repair

- Damage to blood vessels or organs
- Durability of endograft uncertain
- Potential for graft migration

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Complications of Endovascular Repair

**Endoleak:**
Endoleak is defined as a persistent blood flow outside the lumen of the graft and into the aneurysm

**Endoleak**
- Most common types of endoleaks:
  - Type I (A) from proximal or distal neck
  - Type II (B) from a tributary artery
  - Type III (C) due to stent rupture or malposition
  - Type IV (D) by graft permeability

Complications of Endovascular Repair

- Renal complications
- Limb ischemia
- Groin hematoma or infection

Spinal Complications

- May cause paralysis
- Due to hypotension
- Due to inflammation
- Hemorrhage

Spinal Complications

- May cause paralysis
- Fluctuations in BP
- Decreased spinal perfusion
Nursing Considerations
Management of Complications
• Evaluate:
  – Circulation
  – Edema
  – Limb occlusion due to blockage of a blood vessel

Aortic Interventions and Nursing Considerations
• Document and report:
  • Cardiac dysrhythmias
  • Vital signs
  • Respiratory status

Summary
• Causes of an aortic/thoracic aneurysm and natural history of a thoracic aneurysm
• Pathophysiology of aortic aneurysm
• Medical treatment of a patient with a thoracic aneurysm
• Difference between an open aneurysm repair and endovascular repair
• Nursing considerations

Nursing Considerations
• Listen to patient and family fears
  • Hear what is unsaid

Aortic Interventions and Nursing Considerations
• Document and report:
  • Abrupt onset of acute pain
  • Fluid balance
  • Level of fatigue

Nursing Considerations
• Temperature of extremities
  • Pulses
  • Color of extremities
  • Capillary refill
Conclusion

• Take your knowledge and skill combine it with your compassion and give all to your patient