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Abdominal Aortic Aneurysm

An aortic aneurysm is a localized weak, bulging area within the aortic wall (Wedro, 2017). The earliest historical evidence of aneurysms appeared in the Ebers Papyrus, a collection of ancient Egyptian hieroglyphics dating to 1500 BC. Ancient Egyptians recognized interrupting blood flow to a bulging vessel stops the pulsation, with cauterization of the vessel as the attempted treatment. The papyri describe numerous aspects of anatomy and physiology, and document a detailed understanding of cardiovascular function (Barr, 2014).

Aneurysms can affect any part of the aorta but most develop in the abdominal aorta, which runs from the diaphragm to the bifurcation of the iliac arteries (Cantwell-Gab, 2018; Wedro, 2017). Atherosclerosis is the typical cause of aortic aneurysms. However, infections, inflammatory conditions, trauma, and some genetic disorders also can cause this condition (Association of periOperative Registered Nurses [AORN], 2017; Centers for Disease Control and Prevention [CDC], 2016; Gordon & Toursarkissian, 2014). The formation of an abdominal aortic aneurysm (AAA), associated risk factors, and clinical manifestations are described in this article. Treatment options and postoperative nursing implications also are discussed.

Anatomy of an Aneurysm

Three layers compose the aortic vessel wall: the *tunica intima* (inner layer), *tunica media* (middle layer), and *tunica adventitia* (outer layer) (Wedro, 2017). An aneurysm develops because the tunica media is injured, and the pressure within the vessel allows widening at the localized area of weakness (Cantwell-Gab, 2018). The renal arteries provide a landmark for the location of an AAA: *suprarenal* is above, *pararenal* is level with, and *infrarenal* is below the renal arteries. The shape of the vessel injury can be *saccular* (ballooning or out pocketing) or *fusiform* (circumferential) (Gordon & Toursarkissian, 2014). The majority of AAAs are infrarenal and fusiform (see Figure 1) (Chaikof et al., 2017; Wedro, 2017).

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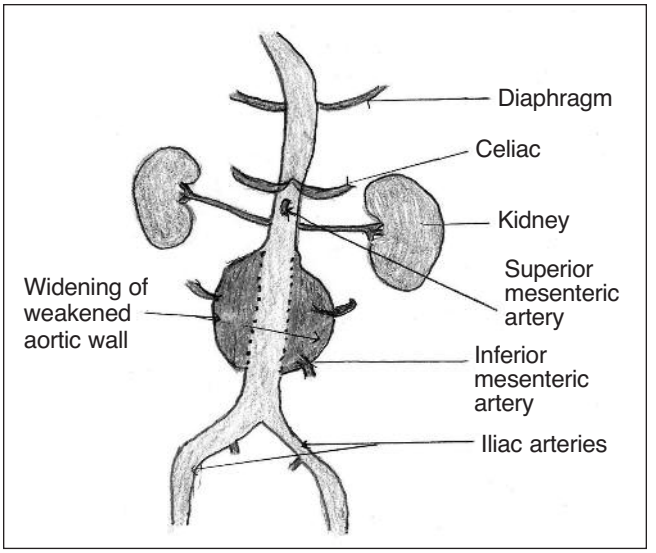
FIGURE 1.
Fusiform Infrarenal Abdominal Aortic Aneurysm



Source: Welch, 2018. Reprinted with permission.

Risk Factors

Aneurysmal risk factors parallel those of atherosclerosis, stroke, and peripheral artery disease (Wedro, 2017). Smoking is the most significant risk factor (Gordon & Toursarkissian, 2014). Smoking causes injury to the vessel wall, and the potential for aneurysm growth *and* rupture is related directly to the length of time spent smoking or chewing tobacco products (Mayo Clinic, 2017; Wedro, 2017). See Table 1 for non-modifiable and modifiable risk factors for AAA.

Clinical Manifestations and Diagnostics

An AAA usually grows slowly and silently, producing no symptoms and easily evading detection (Gordon & Toursarkissian, 2014; Mayo Clinic, 2017). Its identification can be missed in the patient who is obese or has a large, protruding abdomen; it also can be diagnosed incorrectly as a kidney stone (Gordon & Toursarkissian, 2014; Smith-Burgess, 2017; Wedro, 2017). Common manifestations include pain in the abdomen, flank areas, back, groin, buttocks, or legs (CDC, 2016; Wedro, 2017). Assessment of a pulsatile mass in the mid-to-

TABLE 1.
Risk Factors for Abdominal Aortic Aneurysm

Non-Modifiable	Modifiable
• Females > age 55 • Males ≥ age 65 • Males affected more than females • Immediate family member with aneurysm history • Caucasian (especially Northern European descent)	• Smoking • Atherosclerosis • Hypertension • Hyperlipidemia • Diabetes

Sources: Mayo Clinic, 2017; Smith-Burgess, 2017; Wedro, 2017

TABLE 2.
Signs and Symptoms of Abdominal Aortic Aneurysm Rupture

- Pain
  - – Abdominal and low back
  - – Radiating to legs
- Hypotension
- Dizziness
- Tachycardia
- Nausea and vomiting
- Clammy skin

Sources: Cantwell-Gab, 2018; Mayo Clinic, 2017

upper abdomen is a significant clinical finding. In some patients, a bruit also can be auscultated at the aneurysm site (Cantwell-Gab, 2018).

Sudden, severe abdominal pain and low back pain can indicate an imminent rupture. Immediate assessment is critical, especially for the patient who is at high risk for or is known to have an aneurysm (Cantwell-Gab, 2018). Rupture requires rapid repair. See Table 2 for signs and symptoms suggesting AAA rupture.

Diagnostic tests commonly used to determine aneurysm site and size include duplex ultrasonography and computed tomography (CT) scanning with contrast. Magnetic resonance imaging/arteriography may be ordered when the patient has renal impairment or an allergy to contrast dye (Wedro, 2017).

Treatment

All aneurysms require close monitoring, but all are not surgically significant (Smith-Burgess, 2017). An aneurysm less than 4.0 cm in diameter is deemed a low rupture risk, and observation of growth is recommended. Some aneurysms can be monitored for many years without need for surgical intervention (Cantwell-Gab, 2018; Wedro, 2017). Medications can be effective for blood pressure management and reduction of stress on the vessel walls within the aneurysm (Wedro, 2017), but should not be ordered only for this purpose (Chaikof et al., 2017). Nurses can provide valuable health education to address modifiable risk factors, such as smoking cessation, a healthy diet, and management of other health conditions (e.g., diabetes, hypercholesterolemia) (Wedro, 2017).

TABLE 3.
Nursing Interventions after Abdominal Aortic Aneurysm Repair

- Vital signs monitoring
- Cardiac assessment
- Lower-extremity neurovascular assessment
  - ◦ Peripheral pulses with Doppler
- Operative site assessment
  - ◦ Endovascular access site (typically the femoral artery) or open surgical site (abdomen)
    - ▪ Pain
    - ▪ Edema
    - ▪ Hematoma
    - ▪ Bleeding
      - – Hemoglobin and hematocrit
      - – Endoleak (vessel leak at repair site)
    - ▪ Infection
    - ▪ Wound care
- Positioning
  - ◦ Supine x 6 hours
  - ◦ After 2 hours, HOB allowed up ≤ 45°
- Multimodal pain management
  - ◦ Central regional blockage
  - ◦ Patient-controlled analgesia
- Intake and output measures
  - ◦ Urinal or bedpan until ambulation
- Lower-extremity assessment for DVT
  - ◦ DVT prophylaxis
    - ▪ Intermittent compression devices
    - ▪ Ambulation as early as possible
- Blood transfusion
  - ◦ For hemoglobin ≤ 7 g/dL
- Nasogastric decompression
  - ◦ *Only* when nausea or abdominal distention present
- Nutrition
  - ◦ Parenteral nutrition when unable to tolerate meals within 1 week after repair
- Patient education after repair
  - ◦ Lifelong antibiotic prophylaxis before *any* procedure with risk for infection (e.g., dental, gastrointestinal, genitourinary, integumentary, respiratory)
  - ◦ Lifelong annual monitoring of repair site
  - ◦ CT scan (no contrast) every 5 years of *complete* aorta

Sources: Cantwell-Gab, 2018; Chaikof et al., 2017; Gordon & Toursarkissian, 2014

CT = computed tomography, DVT = deep vein thrombosis, HOB = head of bed.

AAA can be repaired via open surgery, or endovascular aortic repair (EVAR) can be performed with stent placement; the latter is less invasive and preferred (Gordon & Toursarkissian, 2014; Wedro, 2017). AAA with rapid and large expansion has increased risk for rupture and is often fatal (Gordon & Toursarkissian, 2014; Mayo Clinic, 2017). When rupture occurs, chance for survival is approximately 50% (Wedro, 2017). Because time management is critical, required interventions and repair should occur within 90 minutes of the patient's emergency room arrival (door to repair) (Chaikof et al., 2017).

Nursing Implications/Complications after Repair

After AAA repair by either method, the patient must be monitored closely. Vital signs, cardiac and respiratory condition, pain management, and condition of the surgical site are critical post-procedure nursing assessments. After an aneurysm repair, myocardial infarction becomes the leading cause of death (AORN, 2017). Stent placement can result in bowel ischemia, spinal cord ischemia, or renal failure if the stent occludes an abdominal, spinal, or renal artery, respectively. Without complications, EVAR promotes earlier ambulation and discharge than an open procedure (Gordon & Toursarkissian, 2014). See Table 3 for postoperative nursing interventions.

Emotional support should be provided to the patient and family members. AAA can contribute to notable stress and anxiety. Education must be provided regarding the serious nature of AAA, need for screening for early detection and treatment, and importance of close evaluation after repair (Smith-Burgess, 2017). Postoperative follow up includes a CT scan and duplex ultrasonography within 30 days of aneurysm repair. If the CT scan is normal, ultrasound surveillance is performed after 12 months and continued annually unless assessment findings warrant greater exploration and detail (Chaikof et al., 2017).

Conclusion

Aneurysms can develop slowly and silently or can grow rapidly with symptoms. An anuerysm rupture is a medical emergency. Men and women who are ages 65-75 and have a history of smoking should be screened at least once for AAA (Chaikof et al., 2017). Treatments can include medications and lifestyle modifications, and surgery may be necessary (CDC, 2016; Smith-Burgess, 2017). After identification and repair, monitoring should be lifelong (Gordon & Toursarkissian, 2014). MSN

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