ABDOMINAL AORTIC ANEURYSM

BASIC INFORMATION

WHAT IS ABDOMINAL AORTIC ANEURYSM?

• A potentially life-threatening condition, abdominal aortic aneurysm is characterized by a ballooning of a section of the wall of the aorta
  • The aorta is the largest artery in the body, and it has the thickness of a common garden hose
  • The aorta is the main blood vessel that supplies the body's circulation system with oxygenated blood
  • The aorta originates from the top-most portion of the heart, and ends at about the level of the umbilicus (belly button)
    • An aneurysm can develop anywhere along the course of the aorta
    • This topic however focuses on the clinical manifestations related to the portion of the aorta that is located within the abdominal cavity
  • Abdominal aortic aneurysm is a relatively common disease affecting roughly 15,000 persons per year in the United States alone

WHAT ARE COMMON SIGNS AND SYMPTOMS?

• Most cases are asymptomatic (absence of signs and symptoms) and thus are discovered incidentally when seeking medical attention for other reasons such as a routine physical examination
• When signs or symptoms are present (but in the absence of a rupture), any of the following may be noted
  • Abdominal pain
  • Middle back pain
  • Flank pain
    • Characterized by pain beginning along the back below the ribs or sides of the body, and radiates down towards the front near the groin area
  • A pulsating abdominal mass may or may not be present
• In the presence of a rupture, any of the following may be noted
  • Severe abdominal pain
  • Severe middle back pain
  • Severe flank pain
  • Grey Turner sign (bruising along the flanks; retroperitoneal hemorrhage) a sign of bleeding behind the peritoneal membrane
    • The peritoneal membrane forms the lining of the abdominal cavity and covers abdominal organs
    • The function of the peritoneal membrane is to provide a mechanism for peritoneal fluid transport, to provide a pressure gradient within the abdominal cavity, and it may also serve as a natural prevention against visceral (internal organ) adhesion formation following surgery
  • A pulsating abdominal mass is more commonly seen with a ruptured abdominal aorta
  • Syncope (partial or complete loss of consciousness due to very low blood pressures) and collapse
  • Signs and symptoms consistent with hypovolemic shock may also be seen, including
    • General weakness
    • Lightheadedness, confusion
    • Pallor, clammy skin
    • Low blood pressure
    • Decreased or no urine output
    • Rapid breathing
  • Sudden death
• Other non-specific signs and symptoms may be seen, including
  • Fever
  • Fatigue
  • Early satiety
  • Nausea, vomiting
  • Groin pain
  • Leg pain or weakness with walking (claudication)
WHAT CAUSES ABDOMINAL AORTIC ANEURYSM?

- Structural protein failure of the vessel wall has been attributed to many factors, including:
  - Genetic predisposition
  - Vessel wall inflammatory processes
  - Biomechanical forces as would occur in a motor vehicle accident

WHAT INCREASES MY RISK?

- Risk factors for this condition have been well established, and include:
  - Family history (genetic predisposition)
  - Caucasian race followed by African Americans
    - This condition is not as common in other racial groups (Hispanics, Asians, Native Americans)
  - Current or past smoking
  - Advanced age
  - Hypertension (abnormally high blood pressure)
  - Hyperlipidemia (abnormally high levels of fats or lipids in the blood)
  - Obesity
  - There tends to be a male predilection up to 70 years of age (2:1 vs female)
    - Gender predilection disappears after 70 years of age
  - Other vascular disorders can also increase risk
  - Risk for rupture increases when the following are present:
    - Aneurysm diameter exceeds 5 cm
    - Fast rate of expansion (more than 0.5 cm in six months)
    - Female gender

WHAT ARE POSSIBLE COMPLICATIONS?

- Complications depend on the location and size of the aneurysm; also listed are some complications that may stem from surgical intervention:
  - Heart attack
  - Infection
  - Pulmonary embolism (blood clot in the lungs)
  - Aortoenteric fistula
    - An uncommon and catastrophic complication
    - Due to pressure, the aneurysm of the aorta erodes the bowel wall of the abutting intestine
      - Patients may present with minor traces of blood in the stool, and recurrent septicemia (bacterial infection in the blood)
      - The aortoenteric fistula may also cause massive, life-threatening bleeding
    - This complication may present as a primary manifestation from a growing aneurysm, or it may occur as a secondary process following aneurysmal repair
  - Graft or stent (surgical treatment) failure
  - Treatment-induced vasculopathy (injury to the aorta and/or iliac/femoral arteries due to treatment; iatrogenic)
  - Spinal cord ischemia
    - This is due to decreased distal aortic perfusion pressure or surgical intervention
    - Blood flow interruption of segmental spinal arteries causes tissue death of the affected spinal cord section
    - May lead to:
      - Lower extremity paralysis (loss of ability to move)
      - Lower extremity motor and sensory deficits (partial loss of motor and/or sensory nerve function)
      - Loss of bladder and bowel control
      - Erectile dysfunction
  - Mesenteric ischemia
    - Embolus, or clot, to the mesenteric arteries impeding blood supply to the affected region of the intestines
    - May cause tissue death of the affected region of the intestine
  - Kidney damage
    - Contrast-induced nephropathy (kidney exposure to contrast media can lead to kidney damage)
    - Stent-induced inflammatory changes
    - Perianeurysmal fibrosis of ureteric vessels
      - Scaring around the aneurysm affecting ureteric vessels can reduce blood supply to the kidney
• Lower extremities
  • Distal embolization (clot) of atherosclerotic (fatty) debris
    • May lead to livedo reticularis of the feet (mottled discoloration of the skin of the feet)
    • Livedo reticularis also known as "blue toe syndrome"
  • There is a high mortality rate with rupture of an abdominal aortic aneurysm

**WHAT CAN I EXPECT?**

- In non-ruptured cases, surgical repair may be required if signs and symptoms are present, and if optimization of medical therapy has failed
- More than 80% of patients who experience a rupture outside of the hospital do not survive

**HOW DO I REDUCE MY RISK?**

- Reduce risk by focusing on modifiable risk factors
  - Quit smoking
  - Consume a healthy diet
  - Exercise regularly
WHAT GENERAL MEASURES SHOULD I TAKE?

• A detailed medical history will be obtained, and a thorough physical examination will be performed
• Additional tests may be needed to confirm the diagnosis and to rule out other conditions that may present similarly
• Self-care
  • Follow recommendations on reducing risk
  • Keep all follow-up appointments
• Activity
  • Individualized physical activity recommendations will be provided
  • Patients with abdominal aortic aneurysm are encouraged to participate in an exercise program for the prevention of further cardiovascular disease
  • Activities such as the following do not precipitate rupture of the aneurysm
    • Running
    • Biking
    • Swimming
    • Hiking
    • Sexual activity
    • Or other activities such as golfing, horseback riding or gardening
• Diet
  • Consume a healthy diet
• Helpful link
  • To learn more: Centers for Disease Control and Prevention
    • Website: http://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_aortic_aneurysm.htm
    • Phone: (800) 232-4636

WHAT ARE COMMON LABS AND TESTS?

• Laboratory tests
  • Pre-operative lab tests that may be required include
    • Complete blood count (CBC)
    • Urinalysis, including urea and urine electrolyte measurements
      • Provides an overview of kidney function
    • Erythrocyte sedimentation rate
      • A nonspecific test that tends to be elevated during inflammatory and infectious disease
    • Cardiac enzymes
      • Measures protein blood levels that are linked to heart injury
    • Complete metabolic panel
      • This is a broad screening tool to evaluate a wide-range of body functions by measuring the following parameters
        • Glucose level
        • Electrolyte and fluid status
        • Kidney function
        • Liver enzyme levels
    • Coagulation profile
      • Screens for abnormal bleeding/clotting patterns
    • Fecal occult blood test
      • Checks for blood in the stool which may be a sign for gastrointestinal bleeding (aortoenteric fistula)
    • Women of child-bearing age will likely need a pregnancy test
• Imaging studies
  • Electrocardiography (ECG or EKG)
    • Detects abnormal electrical activity of the heart
    • Identifies patients who may be at risk of developing heart problems during or after surgery
  • Chest x-ray
    • Recommended as part of risk assessment for perioperative and post-operative morbidity and mortality
  • Ultrasound
    • Provides the quickest imaging test in the urgent care setting
    • Ultrasound is also the best imaging test for screening purposes
CT scan and MRI
- Provides detailed images of the aorta and the surrounding tissues and organs
- Considered a necessity, especially for surgical planning
- CT with 3D reconstruction provides even greater detail

Angiogram
- Contrast-enhanced x-ray used to assess various anatomic characteristics of an aneurysm
- Less often used nowadays as a way to diagnose aortic aneurysms due to advances in CT technology with 3D reconstruction
- Angiograms are however frequently used intra-operatively to facilitate aneurysm repair

WHAT ARE MY TREATMENT OPTIONS?

- Initial management depends on hemodynamic stability of the patient
  - Hemodynamic stability is defined as having normal blood pressure and adequate perfusion to vital organs
- Patients who are hemodynamically unstable and who are candidates for surgery are taken to the surgical room as soon as possible
  - Open surgical repair
  - Endovascular surgical repair (placement of graft material through a remote location such as the blood vessels located near the groin)

Goal of surgery
- Prevent aneurysmal rupture
- Relieve signs and symptoms
- Restore adequate blood flow to other organs of the body
- Patients who are stable but without risk of rupture are treated with an unspecified period of observation which includes
  - Medial therapy optimization
    - Blood pressure control
    - Lipid/cholesterol management
    - Glucose (diabetes) management if indicated
  - Risk assessment at specified intervals with a cardiovascular specialist
    - Aneurysmal expansion is assessed with imaging studies, typically with an ultrasound
    - Modifiable risk factors are targeted
      - Smoking cessation
      - Weight loss program if indicated
      - Avoidance of a sedentary lifestyle

WHAT MEDICATIONS MAY BE PRESCRIBED?

- Antihypertensive medications are typically prescribed
  - Goal is to reduce hemodynamic tension on the weakened wall of the aorta
  - The selection of antihypertensive medications must be individualized given a person's medical history

WHAT CAUTIONS SHOULD I TAKE?

- Follow all recommendations that relate to the modifiable risk factors (e.g., smoking, obesity, physical activity)
- Follow recommended screening intervals if indicated
- Take all prescription medications as prescribed; report any intolerable effects
- Keep all follow-up appointments

WHEN SHOULD I SEEK MEDICAL HELP?

- Seek medical attention if signs and symptoms of abdominal aortic aneurysm develop
REFERENCES

- Image of Abdominal Aortic Aneurysm courtesy of National Institutes of Health. [Public Domain]. Available at: https://www.nhlbi.nih.gov/health/health-topics/topics/arm/types
- Image of Endovascular Treatment courtesy of National Institutes of Health. [Public Domain]. Available at: https://www.nhlbi.nih.gov/health/health-topics/topics/arm/types

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