Vascular Anatomy and Pathology

ALISHA HAWRYLACK RT(R)(VI)

UNIVERSITY OF VIRGINIA
Structure and Function

• Arteries
• Arterioles
• Capillaries
• Venules
• Veins
Structure and Function of Vascular Anatomy

- TUNICA INTERNA:
  - Endothelium
  - Basement membrane
  - Internal elastic lamina

- TUNICA MEDIA:
  - Smooth muscle
  - External elastic lamina

- TUNICA EXTERNA

Lumen
(a) Artery

Lumen
(b) Vein
Thoracic Anatomy and Pathology
Thoracic Anatomy

**Ascending Aorta**
- Rises from the left ventricle
- Includes aortic valve
- Gives rise to the coronary arteries

**Views**
- Visualized on 30 degree LAO

**Injection**
- 25cc for 50cc

**Frame rate**
- 4-6 frames a second
## Thoracic Anatomy

### Aortic Arch
- Arches over the heart and begins descending posteriorly
- Extends from the arch of the aorta to the intervertebral space between C4 and C5
- Gives rise to the **three great vessels**

### Views
- 30 degree LAO profiles the arch
- 45 degree LAO profiles the great vessels

### Injection
- 25cc for 50cc
- 20cc for 20cc

### Frame rate
- 4-6 frames per second
Brachiocephalic (Inominate)
Circle of Willis

• “Circulatory anastomosis”

• Anatomy
  • Anterior cerebral
  • Anterior communicating
  • Internal carotid
  • Posterior cerebral
  • Posterior Communicating
Thoracic Anatomy

Variants

• Left carotid and Innominate have common origin

• Variant Seen in 1% - 22% of Population
Thoracic Anatomy

Variants

• The left common carotid artery originates separately from the innominate artery.
• This anatomy occurs in 9% of the population.
Atherosclerosis

**Innominate Artery Disease**

- Occurs when the innominate, brachiocephalic, becomes blocked.
Atherosclerosis

Subclavian Steal Syndrome

• Involves structural problems or blockages in the arteries that branch off from the aortic arch.
## Atherosclerosis

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>• PAD</td>
<td>• Dizziness</td>
</tr>
<tr>
<td>• PVD</td>
<td>• Blurred vision</td>
</tr>
<tr>
<td>• Smoking</td>
<td>• Weakness</td>
</tr>
<tr>
<td>• Diabetes</td>
<td>• Transient ischemic attacks, or &quot;mini-strokes&quot;</td>
</tr>
<tr>
<td></td>
<td>• Sudden changes in blood pressure</td>
</tr>
<tr>
<td></td>
<td>• Reduced pulse</td>
</tr>
<tr>
<td></td>
<td>• Arm numbness</td>
</tr>
</tbody>
</table>
Atherosclerosis

Treatment

• Surgery
• PTA
• Stenting
Marfans Syndrome

- Disorder of the connective tissue that supports all of the body’s structures
Aneurysms

TAA of the Ascending Aorta

Risk Factors

• Atherosclerosis
• Family history
• Cystic medial degeneration
• Genetic disorders
  • Marfans
Thoracic Anatomy

TAA of the Aortic Arch

Risk Factors

- Atherosclerosis
- Takayasu's arteritis
- Continuation of ascending aneurysm
# Thoracic Anatomy

### Symptoms
- Severe or dull pain in the abdomen, chest, lower back or groin
- Sharp, sudden pain in the back or abdomen (may signal a rupturing aneurysm)

### Treatment
- Surgery
Upper Extremity Anatomy (Arterial)

• Subclavian
  • Internal mammary
  • Head and neck

• Axillary
  • Lateral thoracic
  • Humeral Circumflex

• Brachial
• Radial
• Ulnar Arteries
• Interosseous
• Digital arteries

View
• Varies depending on indication
• Usually AP

Injections
• Flush aortagram
• Selective runs

Frame rate
• 2-4 frames per second
Upper Extremity Anatomy (Arterial)

Buergers Disease

• Inflammation of the blood vessels resulting in swelling and thrombus.
## Upper Extremity Anatomy (Arterial)

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Claudication</td>
</tr>
<tr>
<td>Men under 40</td>
<td>Raynaud's Phenomenon</td>
</tr>
<tr>
<td></td>
<td>Loss of sensation</td>
</tr>
<tr>
<td></td>
<td>Absent or weak pulses</td>
</tr>
<tr>
<td></td>
<td>Ulcers</td>
</tr>
<tr>
<td></td>
<td>Gangrene</td>
</tr>
</tbody>
</table>
Upper Extremity Anatomy (Arterial)

**Treatment**

- Surgery
- Medication
Upper Extremity Anatomy (Arterial)

**Hypothenar Hammer Syndrome**

- Occurs from trauma to the distal ulnar artery or proximal portion of superficial palmar arch as a result of repetitive trauma to the hypothenar eminence
Upper Extremity Anatomy (Arterial)

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupations that require repetitive compression or blunt trauma to the palm of the hand</td>
<td>Cold sensation and pain in the palm</td>
</tr>
<tr>
<td></td>
<td>Absent or weak pulses</td>
</tr>
<tr>
<td></td>
<td>Raynaud syndrome</td>
</tr>
<tr>
<td></td>
<td>Tender hypothenar eminence</td>
</tr>
<tr>
<td></td>
<td>Ischemia of (usually) fourth and fifth fingers</td>
</tr>
</tbody>
</table>
Upper Extremity Anatomy (Arterial)

**Treatment**

• Surgery
Upper Extremity Anatomy (Arterial)

**Raynaulds Syndrome**

• Excessively reduced blood flow in response to cold or stress

• Occurs as a result of vasospasm
Upper Extremity Anatomy (Arterial)

**Risk Factors**
- Vascular pathologies
- Eating disorders
- Connective tissue disorders
- Trauma
- Tobacco use
- Occupation
- Female gender

**Symptoms**
- Symptoms induced by cold
- Typically have predictable asymmetric digital pallor or cyanosis
Upper Extremity Anatomy (Arterial)

**Treatment**

- Treat the underlying cause
- Vasodilators
- Avoid triggers
# Thoracic Anatomy

<table>
<thead>
<tr>
<th>Descending thoracic aorta</th>
<th>Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lies between aortic arch and diaphragm</td>
<td>• Varies</td>
</tr>
</tbody>
</table>

**Injection**

• 25cc for 50cc

**Frame Rate**

• 2-6 frames a second
Descending Thoracic

- Pericardial arteries
- Bronchial arteries
- Esophageal arteries
- Mediastinal arteries
- Posterior intercostal arteries
- Subcostal arteries
- Superior phrenic arteries
Bronchial Arteries

- Supply mainly bronchi and peribronchial connective tissue
- Originate at T4-T9
  - 90% originating at T5-T6

**Views**
- AP

**Injection**
- 20-30ccs for a total of 40-60ccs
- Hand injections for selective runs

**Frame rate**
- 4 frames per second for flush aortagram
- 2 frames per second for selective runs
Bronchial Arteries

**Right bronchial artery (with branches)**

**Originates**
- Right lateral
- Anterolateral
- Directly anterior on the descending thoracic aorta

**Left bronchial arteries (Superior and Inferior)**

**Originates**
- Directly anterior off of descending thoracic aorta
- Can share common origin with right
# Bronchial Arteries

<table>
<thead>
<tr>
<th>Indications for imaging</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hemoptysis</td>
<td>• Embolization</td>
</tr>
</tbody>
</table>

- When embolizing the bronchial arteries, make sure that you are distal to the spinal artery.
Aneurysm

TAA of the Descending Aorta

Risk Factors

- Age
- Male gender
- Family history of TAA
- High cholesterol
- High blood pressure
- Smoking
- Diabetes
- Genetic disorders
## Aneurysm

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Severe or dull pain in the abdomen, chest, lower back or groin</td>
<td>• Monitoring</td>
</tr>
<tr>
<td>• Sharp, sudden pain in the back or abdomen (may signal a rupturing aneurysm)</td>
<td>• Medication</td>
</tr>
<tr>
<td></td>
<td>• Endovascular repair (TEVAR)</td>
</tr>
<tr>
<td></td>
<td>• Surgery</td>
</tr>
</tbody>
</table>
Mycotic Aneurysm

Infectious or mycotic aortitis

• Infection in the wall of the aorta caused by bacteria

Risk Factors

• Bacteria in the bloodstream
• Gallbladder disease
• Tooth abscesses
• Bacterial infections
# Mycotic Aneuysm

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fever</td>
<td>• Antibiotics</td>
</tr>
<tr>
<td>• Fatigue</td>
<td>• Surgery</td>
</tr>
<tr>
<td>• Skin rash</td>
<td>• Endovascular repair</td>
</tr>
<tr>
<td>• Night sweats</td>
<td></td>
</tr>
<tr>
<td>• Weight loss</td>
<td></td>
</tr>
</tbody>
</table>
Dissections

A tear within the inner wall of the aorta which allows blood flow between the layers of the aortic wall.

Risks

- Aortic Insufficiency
- Poor perfusion
- Thrombus
- MI
- Death
# Dissection

<table>
<thead>
<tr>
<th><strong>Risk Factors</strong></th>
<th><strong>Symptoms</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Hypertension</td>
<td>• Chest pain</td>
</tr>
<tr>
<td>• Trauma</td>
<td>• Back pain</td>
</tr>
<tr>
<td>• Connective tissue disorders</td>
<td></td>
</tr>
<tr>
<td>• Male Gender</td>
<td></td>
</tr>
</tbody>
</table>

- Hypertension
- Trauma
- Connective tissue disorders
- Male Gender

- Chest pain
- Back pain
Dissection

Treatment

• Medical management
• TEVAR
• Surgery
Coarctation

Coarctation of the Aorta

- Congenital narrowing of a portion of the aorta

Risk

- If left untreated, can lead to life-threatening heart problems
## Coarctation

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chest pain</td>
<td>• Surgery</td>
</tr>
<tr>
<td>• Shortness of breath</td>
<td>• Angioplasty (PTA)</td>
</tr>
<tr>
<td>• Fainting or dizziness</td>
<td></td>
</tr>
<tr>
<td>• Headache</td>
<td></td>
</tr>
<tr>
<td>• Cold feet or legs</td>
<td></td>
</tr>
<tr>
<td>• Nosebleeds</td>
<td></td>
</tr>
<tr>
<td>• Leg cramps or high blood pressure during exercise</td>
<td></td>
</tr>
<tr>
<td>• Poor growth in children with the disease</td>
<td></td>
</tr>
</tbody>
</table>
Upper Extremity Anatomy (Venous)

- Returns the blood from the upper extremities to the right atrium
- Radial
- Ulnar
- Cephalic
- Basilic
- Brachial
- Axillary
- Subclavian
Upper Extremity Anatomy (Venous)

**Indications for Imaging**
- Upper extremity swelling
- Surgery
- Vein mapping
- Central vein thrombosis

**Views**
- Varies

**Injection**
- Hand injections

**Frame Rate**
- 2 frames a second or “spot” films
Thoracic Anatomy

**Paget-Schroetter**
Compression of subclavian artery, subclavian vein, and brachial plexus in the costo clavicular space.

**Arterial**
- Numbness, loss of pulses, pain radiating to forearm

**Venous**
- Shoulder or neck discomfort, arm edema

**Nerve**
- Brachial plexus tenderness, arm or hand atrophy
Thoracic Outlet Syndrome
Thoracic Anatomy

**Treatment**
- Antiocoagulation
- Catheter-directed thrombolysis
- Catheter directed mechanical thrombectomy
- Surgical thrombectomy
- Angioplasty
- Thoracic outlet decompression (1st rib resection)
Pulmonary Arteries

- Carries deoxygenated blood from the heart to the lungs
- Pulmonary trunk begins at the base of the left ventricle
- Branches into left and right

**Views**

- 40-45 degree ipsilateral for the apex
- 40-45 degree contralateral for the base

**Injection**

- 35cc for 70cc (main)
- 25cc for 50cc (selective)

**Filming rate**

- 3-6 frames per second
Right pulmonary
Pulmonary Arteries

**Indications for imaging**

- AVM
- Congenital abnormalities
- Pulmonary Embolus
Pulmonary Embolus
Arteriovenous Malformation
Pulmonary Arteries

**Contraindications**
- Mean PA pressures greater than 50 mmHg
- Normal mean pulmonary pressure is 9-18 mmHg
- Greater than 25mmHg can indicate Pulmonary Hypertension
- Heart Block
- Contrast Allergy

**Complications**
- Bleeding
- Infection
- Contrast Reaction
- Arrhythmias
- Acute Pulmonary Hypertension
Abdominal Anatomy and Pathology
Abdominal Anatomy

Abdominal Aorta

• Lies between diaphragm and common iliac artery bifurcation
# Abdominal Anatomy

<table>
<thead>
<tr>
<th>Anatomy</th>
<th>Corresponding landmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celiac</td>
<td>Lower Half of T12</td>
</tr>
<tr>
<td>SMA</td>
<td>Upper Half of L1</td>
</tr>
<tr>
<td>Renals</td>
<td>L2- L3 Innerspace</td>
</tr>
<tr>
<td>IMA</td>
<td>L3- 3cm Above Aortic Bifurcation</td>
</tr>
<tr>
<td>Aortic Bifurcation</td>
<td>L4 – Level of Umbilicus</td>
</tr>
</tbody>
</table>
Abdominal Anatomy
### Mesenteric Anatomy

**CELIAC**
- First major mesenteric artery off of aorta
- Gives rise to left gastric
- Celiac axis bifurcates into:
  - Common Hepatic
  - Splenic

**Views**
- Origin: lateral
- Peripheral branches: AP (Varies)

**Injection**
- 6-8ccs for a total volume of 40-60ccs

**Frame Rate**
- 2-4 frames per second
Mesenteric Anatomy

- Rt Hepatic
- Lt Hepatic
- Proper Hepatic
- Lt Gastric
- Common Hepatic
- Splenic
- Celiac
- GDA
Median Arcuate Syndrome
Mesenteric Anatomy

**Hepatic Arteries**
- Common hepatic artery
- Proper hepatic artery
  - Right hepatic
  - Left Hepatic

**Views**
- 30 degree RAO

**Injection**
- 4-6ccs per second for a total volume of 25-35ccs
- 1-3ccs per second for a total volume of 9-12ccs

**Film rate**
- 2 frames per second
Mesenteric Anatomy

Indications for imaging
• Aneurysm or pseudo aneurysm
• Trauma
• Hemobilia
• Surgery

Hepatic Artery as a Conduit for Treatment
• Oncology (HCC)
• Planning
• Treatment
# Mesenteric Anatomy

**Splenic Artery**
- Posterior Gastric Artery
- Short Gastric Artery
- Left Gastroepiploic Artery

**Views**
- AP

**Injection**
- 6-8ccs per second for a total volume of 40-60ccs

**Frame rate**
- 2 frames per second
Mesenteric Anatomy

**Indications for imaging**
- Aneurysm or pseudoaneurysm
- Trauma

**Splenic artery as a conduit for treatment**
- Splenomegaly
- Oncology
- Portal vein evaluation
Mesenteric Anatomy

**LEFT GASTRIC**

- Left hepatic may come off the LGA
- Accessory left hepatic artery may come from the LGA

**Views**

- AP

**Injection**

- 2-3ccs per second for a total volume of 9-15ccs

**Frame rate**

- 2 frames per second
# Mesenteric Anatomy

**Indications for imaging**
- Evaluation of a stomach bleed
- Mallory Weiss tear
- Aneurysm or pseudoaneurysm
- Bleed

**Left Gastric Artery as a conduit for treatment**
- Oncology
- Replaced or accessory left hepatic
Mesenteric Anatomy

**PANCREAS**

- Superior pancreaticoduodenal artery
  - From GDA
- Inferior pancreaticoduodenal artery
  - From SMA
Mesenteric Anatomy

GALLBLADDER

• Cystic artery
  • Branch of the right hepatic artery
  • Supplies the Cystic duct
Mesenteric Anatomy
Mesenteric Anatomy

**Superior Mesenteric Artery**
- Second major mesenteric artery off of the abdominal aorta

**Views**
- Origin: Lateral
- Peripheral: AP (Varies)

**Injection**
- 5cc’s a second for a total volume of 40cc’s

**Frame rate**
- 2 frames per second
Mesenteric Anatomy

- **Inferior pancreaticoduodenal artery**
- First Branch off the SMA
- Anastomosis with the Superior Pancreaticoduodenal artery
- Provides blood to the Head of the pancreas and duodenum
Mesenteric Anatomy

**Middle colic artery**
- Supplies Blood to the Transverse Colon
- Anastomosis with the Right Colic at the Hepatic Flexure
- Anastomosis with the Left Colic at the Splenic Flexure

**Right colic artery**
- Supplies majority of the blood to the Ascending Colon

**Ileocolic artery**
- Supplies Blood to the terminal ileum, cecum, and lower ascending colon
Mesenteric Anatomy

Jejunal Arteries
• Supplies blood to the jejunum

Ileal Arteries
• Provides blood to most of the ileum
Mesenteric Anatomy

- A: Jejunal
- B: Ileal
- C: Middle Colic
- D: Right Colic
- E: Ileocolic
- F: Ileal
Mesenteric Anatomy

**Inferior Mesenteric Anatomy**
- Final mesenteric branch off of the abdominal aorta
- Located between L2-L4

**Views**
- 60-70 degree RAO

**Injection**
- 3ccs for a total volume of 15ccs

**Film rate**
- 2 frames per second
Mesenteric Anatomy

**Left Colic**
- Anastomosis with the Middle Colic at the Splenic Flexure and Sigmoid at the Descending Colon
- Absent in 12% of Patients

**Sigmoidal**
- Anastomosis with the Left Colic and Superior Rectal

**Superior Rectal Artery**
- Terminal of the IMA
- Divides into two terminal branches at the level of S3
Inferior Mesenteric Artery

A. Left Colic
B. Sigmoidal
C. Rectal
Mesenteric Bleeding

Upper GI

Lower GI
Mesenteric Bleeding
Mesenteric Ischemia
Abdominal Aneurysm

• Suprarenal Aortic Aneurysm
  • 7-12%

• Infrarenal Aortic Aneurysm
  • 20% extend into the common Iliac arteries
Abdominal Aneurysm

**Causes**
- Degeneration (atherosclerosis-associated)
  - 90% AAA
- Inflammation
- Infection (Mycotic aneurysm)
- Trauma
- Connective tissue disorders
- Vasculitis
- Congenital disorders

**Risks**
- Rupture
- Embolus
Abdominal Aneurysm

Infrarenal Aneurysm

Treatment

• Monitor
• Surgery
• EVAR
Abdominal Aneurysm

Suprarenal Aneurysm

Treatment

• Monitor
• Surgery
• EVAR
Renal Arteries

- One main renal artery per kidney
- L1-L2 interspace
- Left originates lateral and posterior
- Right originates lateral and anterior

**Views**
- 15 degree LAO for origin
- 30 degree ipsilateral oblique for parenchymal branches

**Injection**
3-5ccs for a total volume of 12-20

**Film rate**
- 2-6 frames per second
Renal Artery Stenosis

**Causes**
- Atherosclerotic disease
- Fibromuscular disease
- Dissection

**Symptoms**
- Elevated blood pressure
- Decreased renal function
Renal Artery Stenosis

Atherosclerosis

• Most common cause of renal artery stenosis
• 30-50% the lesions are bilateral
• Treatment
  • PTA
  • Stenting
Fibromuscular Dysplasia
Renal Oncology

Renal Cell Carcinoma

• Treatment
  • Embolization
  • Resection

Angiomyolipoma (AML)

• Treatment
  • Embolization
Mesenteric Venous Anatomy
Mesenteric Anatomy

**Superior Mesenteric Vein**
- Small Intestine, cecum, ascending colon, and transverse colon all empty into the main SMV

**Inferior Mesenteric Vein**
- Normally enters the splenic vein prior to the splenic and SMV joining together
- Drains the descending colon, sigmoid, and rectum

**Main Portal Vein**
- It bifurcates into the left and right portal vein, which branch out to the different segments of the liver
Portal Vein

- Main Portal Vein
- Inflow from Splenic Vein
- SMV
- Jejunal Veins
IVC Anatomy and Pathology
IVC

• Carries deoxygenated blood from the lower half of the body to the right atrium

• Located posteriorly in the abdominal cavity, on the right side of the spine

• Formed by the joining of the left and right iliac veins
<table>
<thead>
<tr>
<th>Anatomy</th>
<th>Corresponding landmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatic veins</td>
<td>T8</td>
</tr>
<tr>
<td>Inferior phrenic vein</td>
<td>L1</td>
</tr>
<tr>
<td>Renal veins</td>
<td>L1</td>
</tr>
<tr>
<td>Right gonadal vein</td>
<td>L2</td>
</tr>
<tr>
<td>Lumbar veins</td>
<td>L1-L5</td>
</tr>
<tr>
<td>Common iliac veins</td>
<td>L5</td>
</tr>
</tbody>
</table>
Right Hepatic

Left Renal

Right Renal

Left Common Iliac Vein
Circumaortic Renal Vein
Nutcracker Syndrome
May Thurner
Lower Extremity Anatomy and Pathology
Pelvic Anatomy

Common Iliac Artery

- Iliac bifurcation occurs at L4
  - Internal (Hypogastric)
  - External

View
- 30 degree contralateral oblique

Injection
- 10cc’s per second for a total of 20cc’s

Frame Rate
- 2 frames per second
Right common iliac
External iliac
Internal iliac
Pelvic Anatomy

Internal Iliac (Hypogastric)

- **Anterior:**
  - Vescicular, Internal pudendal, obturator, inferior gluteal arteries
  - Others: Middle Rectal, Uterine

- **Posterior:**
  - Lateral sacral, and superior gluteal

**View**
- 40 degree ipsilateral oblique

**Injection**
- 4cc’s per second for a total volume of 12cc’s

**Frame Rate**
- 2 frames a second
Pelvic Anatomy

External Iliac

• Inferior epigastric artery
• Deep circumflex iliac artery
Lower Extremity Anatomy

**Common Femoral Artery**
- Superficial femoral artery
- Deep femoral artery (Profunda)

**View**
- 30 degree ipsilateral oblique

**Injection**
- 3cc’s a second for a total volume of 9cc’s

**Frame Rate**
- 2 frames per second
Lower Extremity Anatomy

Deep femoral artery (Profunda)
- Runs anteriolateral in the thigh
- Supplies
  - Quadriceps
  - Adductors
  - Hamstrings

Superficial femoral artery
- Runs anteriomedial in the thigh
- SFA passes through the adductor canal and becomes the popliteal artery
A: Common Femoral Artery  
B: Superficial Femoral Artery  
C: Profunda
A. Superficial femoral
B. Level of Adductor Canal
C. Popliteal
Lower Extremity Anatomy

**Popliteal artery**
- Continuation of the SFA through the popliteal fossa
- Lies posterior to the femur and deep to the vein
- Major branches
  - Sural Arteries
  - Geniculate Arteries

**View**
- AP

**Injection**
- 3cc’s a second for a total of 12cc’s

**Frame Rate**
- 2 frames per second
A. Popliteal
B. Genicular
C. Tibioperoneal Trunk
D. Posterior Tibial
E. Peroneal
F. Anterior Tibial
Lower Extremity Anatomy

Anterior tibial artery

• Originates laterally and runs in front of the lower tibia
• Crosses the ankle onto the dorsum of the foot
• Terminates as the dorsalalis pedis (DP) artery

Tibioperoneal trunk

• Direct continuation of the popliteal
• Bifurcates into the posterior tibial artery (PT) and peroneal
Lower Extremity Anatomy

**Posterior tibial artery**
- Runs posterior and medial to the flexor compartment
- Passes behind the Medial Malleolus
- Divides into the medial and lateral plantar arteries
- Plantar arch is formed by the lateral plantar artery

**Peroneal**
- Runs between the anterior and posterior tibial arteries
A. Popliteal
B. Tibialperoneal Trunk
C. Anterior Tibial
D. Peroneal
E. Posterior Tibial
A. Posterior Tibial
B. Peroneal
C. Anterior Tibial
D. Plantar Arch
## Lower Extremity Anatomy

<table>
<thead>
<tr>
<th>Indications</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherosclerosis</td>
<td>PTA</td>
</tr>
<tr>
<td>Stenosis</td>
<td>Stent</td>
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<tr>
<td>Occlusion</td>
<td>Atherectomy</td>
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<tr>
<td>Thrombus</td>
<td>Thrombectomy</td>
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<tr>
<td>Embolus</td>
<td>Embolectomy</td>
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<tr>
<td>AV Fistulas</td>
<td>Surgery</td>
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<tr>
<td>Aneurysms</td>
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</tbody>
</table>
Peripheral Arterial Disease

PAD

Claudication

Single level disease

Chronic limb ischemia

Occlusion at two or more levels

Inflow Outflow Run-off
Chronic Disease

- Aorto-iliac (Hips and thighs)
- Femoro-popliteal (Calf pain)
- Tibial-Peroneal (Foot pain or distal ulcers)

Acute Arterial Occlusion

- Pain
- Palor
- Pulsenessless
- Paresthesia
- Paralysis
Atherosclerosis
Claudication
Emboli
Aneurysms
Lower Extremity Venous Anatomy

**Superficial System**
- Lesser saphenous
- Greater saphenous

**Deep System**
- Tibials
- Popliteal
- Superficial femoral
- Deep femoral
Normal  Damaged
Chronic Venous Insufficiency

- Leg swelling
- Skin color and texture changes
- Venous Ulcers
Urinary System

- Peristaltic contractions
- Hydrostatic pressure
- Gravity
Urinary System

• The ureteropelvic junction (UPJ) is the junction between the ureter and the renal pelvis of the kidney.

• The uretrovesical junction (UVJ) is located where the ureter meets the bladder.

• Three areas of narrowing:
  • UPJ
  • Crosses the Iliac artery
  • UVJ
The Liver

Biliary System

• The biliary system is a series of channels and ducts that conveys bile from the liver into the lumen of the small intestine