Anatomy of the Cardiovascular System, Respiratory System, & Lymphatic System

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Outline of Presentation
Anatomy associated with the 30,000 Series CPT

- Cardiovascular System
  - Heart
  - Vessels
- Respiratory System
- Lymphatic System

Cardiovascular System
Cardiovascular System Overview

Basis Overview of the Cardiovascular System

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Mediastinum: Divisions

Mediastinum: The space between the right and left pleural cavities in the midline.

Divisions of the mediastinum:
- Superior mediastinum
- Inferior mediastinum
- Anterior mediastinum
- Middle mediastinum
- Posterior mediastinum
Opening the pericardial sac

Great vessels
1. Superior vena cava
2. Inferior vena cava
3. Pulmonary veins (n=4)
4. Ascending aorta
5. Pulmonary trunk
Clinical Considerations

Pericardial Tamponade

An example:
Blood has completely filled the pericardial cavity

Pericarditis

Fibrinous pericarditis
Evidence of fibrinous exudate can be seen attaching to the visceral and parietal serous pericardium

Purulent pericarditis
Purulent fluid can be seen within the pericardial cavity

Pericardiocentesis - Approaches

Parasternal approach
Needle inserted at intercostal space 5 or 6 to left of sternum. Needle would pass through:
- skin,
- superficial fascia,
- pectoralis major,
- external intercostal muscle,
- internal intercostal muscle,
- thoracodorsal muscle,
- parietal layer of serous pericardium.

Subcostal approach
Needle inserted at superior angle at the left infrasternal angle. Needle would pass through:
- skin,
- superficial fascia,
- rectus sheath and muscle,
- internal intercostal muscle,
- fibrous pericardium; parietal layer of serous pericardium.
There are two types of the valves in the heart:

**Atrioventricular valves**
- Located between atria and ventricles:
  - It has 3 cusps (tricuspid)
  - It has 2 cusps (bicuspid or mitral)

**Semilunar valves**
- Located at the base of the ascending aorta (aortic valve) and
- Located at the base of the pulmonary trunk (pulmonary valve)

Anterior cusp
Posterior cusp
Mitral
Aortic valve
Anterior cusp
Posterior cusp
Right cusp
Left cusp
Pulmonic valve
Anterior cusp
Right cusp
Left cusp
Chordae tendineae
Papillary muscle
Semilunar cusp of aortic valve

Superior view of aortic valve

Sites of Heart Valve Auscultation

1. (aortic) detected at the second intercostal space, right sternal border.
2. (pulmonary) heard at left sternal border in second intercostal space.
3. (mitral) heard at apex in fifth intercostal space.
4. (tricuspid) heard at the lower left aspect of the sternal border.
"DUB" heard with closing of pulmonary & aortic valves

"LUB" heard with closing of AV valves

Valves replacement

- Regurgitation (or leakage of the valve). This means the valve doesn’t close completely, allowing the blood to flow backward through the valve.

- Stenosis (or narrowing of the valve). With stenosis, the valve opening is narrowed and the valve doesn’t open properly, inhibiting the ability of the heart to pump blood across the narrowed valve due to the increased force required to pump blood through the stiff (stenotic) valve(s).

- Atresia. This means the valve opening doesn’t develop at all, preventing blood from passing from an atrium to a ventricle, or from a ventricle to the pulmonary artery or aorta. Blood must find an alternate route, usually through another existing congenital defect, such as an atrial septal defect or a ventricular septal defect.

- When heart valves fail to open and close properly, the heart’s ability to pump blood adequately through the body can be seriously impaired.
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(c) Anterior view

Ascending aorta
Arch of aorta
Left pulmonary artery
Pulmonary trunk
Left atricle
Great cardiac vein
Left coronary artery
Circumflex branch
Left marginal branch
Left ventricle
Tributary to great cardiac vein

Right auricle
Right coronary artery
Anterior cardiac vein
Anterior interventricular branch

Anterior view

Ascending aorta

Obstructions

Triple coronary artery bypass
(d) Anterior view of branches of arch of aorta

- Right common carotid
- Right subclavian
- Trachea
- Brachiocephalic
- Right internal thoracic (mammary)
- Arch of aorta
- Left subclavian
- Left common carotid
- Left carotid (cut)
- Left internal thoracic
- Vagus nerve (recurrent laryngeal branch)
- Phrenic nerve
- Left lung
- Pulmonary trunk
- Esophagus

(e) Anterior view of arteries of abdomen and pelvis

- Diaphragm
- Hepatic vein
- Esophageal hiatus
- Common hepatic
- Spleen
- Celiac trunk
- Right renal
- Inferior mesenteric
- Ureter
- Liver (cut)
- Common hepatic
- Proper hepatic
- Duodenal common
- Superior pancreaticoduodenal
- Liver (cut)
- Right gastroepiploic
- Right gastric
- Inferior vena cava
- Inferior mesenteric
- Right renal
- Inferior mesenteric
- Ureter
- Diaphragm
- Right gastroepiploic
- Right gastric
- Common hepatic
- Proper hepatic
- Duodenal common
- Superior pancreaticoduodenal
- Liver (cut)
- Right gastroepiploic
- Right gastric
- Common hepatic
- Proper hepatic
- Duodenal common
- Superior pancreaticoduodenal
(f) Anterior view of superior mesenteric artery and its branches

- Middle colic
- Ascending colon
- Cecum
- Ileocolic
- Ileum (cut and reflected downward)
- Diaphragm
- Transverse colon (turned upward)
- Descending colon
- Right colic
- Jejunals
- Ileals
- Sigmoid colon

(g) Anterior view of inferior mesenteric artery and its branches

- Ascending colon
- Inferior mesenteric
- Cecum
- Ileum (cut and reflected downward)
- Diaphragm
- Transverse colon (turned upward)
- Descending colon
- Left colic
- Superior rectal
- Sigmoid
- Sigmoid colon

(c) Anterior view of arteries of pelvis and thigh

- Inguinal ligament
- Femoral vein
- Femoral artery
- Abdominal aorta
- Common iliac artery
- External iliac artery
- Internal iliac artery
- Sartorius muscle
- Deep artery of the thigh (deep femoral)
- Adductor longus muscle
Venous System

Caval Venous System
Hepatic Portal Venous System
Pulmonary Circulation

(b) Anterior view of superior vena cava and its tributaries

Right internal jugular
Right subclavian
Right brachiocephalic
Superior vena cava
Aorta
Right subclavian (cut)
Internal thoracic
First rib (cut)
First rib (cut)
Diaphragm

INFERIOR

Left internal jugular
Left subclavian
Left brachiocephalic
Internal thoracic
Sternum

(a) Anatomic view of superior vena cava and its tributaries
(a) Anterior view of veins draining into the hepatic portal vein

- Liver
- Cystic
- Gallbladder
- Duodenum
- Pancreas
- Transverse colon
- Ascending colon
- Cecum
- Appendix

Drain into:
- Superior mesenteric vein
- Splenic vein
- Inferior mesenteric vein

- Spleen
- Short gastric
- Left gastric
- Pancreaticoduodenal
- Right gastroepiploic
- Left gastroepiploic
- Superior pancreaticoduodenal

- Right colic
- Middle colic
- Ileocolic

- Superior rectal
- Middle rectal
- Inferior rectal

(b) Scheme of principal blood vessels of hepatic portal circulation and arterial supply and venous drainage of liver

Blood from:
- Superior mesenteric vein
- Splenic, gastric, inferior mesenteric veins

Mixture of above two

Portocaval anastomoses:
1. Esophageal
2. Paraumbilical
3. Rectal
4. Retroperitoneal

Portal Hypertension
Portocaval anastomoses:
1. Esophageal
2. Paraumbilical
3. Rectal
4. Retroperitoneal

http://medpics.ucsd.edu/images/path_640/gi3/path_gi3_019_0.jpg

Portal Venous System

- SMA
- SMV
- Pancreaticoduodenal veins
- Middle colic vein
- Right colic vein
- Baccal vein
- Cecal vein
- Appendicular vein
- Esophageal veins
- Portal vein
- Short gastric vein
- Left gastric vein
- Left gastro-omental vein
- IMV
- Left colic vein
- Ileocolic veins
- Sigmoid veins
- Superior rectal veins
- Middle rectal vein
- Inferior rectal vein
Respiratory System
(a) Anterior view showing organs of respiration

(b) Parasagittal section

(c) Frontal section showing conchae
A bronchopulmonary segment is a division of the lung.

A bronchopulmonary segment is a portion of lung supplied by a specific tertiary bronchus (also called a segmental bronchus) and arteries. These arteries branch from the pulmonary and bronchial arteries, and run together through the center of the segment.
Lymphatic System

“Loosely” organized small caliber vessels drain “tissue fluid” from peripheral to central. Lymph filtered by lymph nodes along the way.
The spleen, located in the upper left part of the abdomen under the ribcage, works as part of the lymphatic system to protect the body. It stores and cleans blood, filtering out worn-out red blood cells and other foreign bodies from the bloodstream to help fight off infection.