OBJECTIVES: Today's lectures are designed to explain the orientation of the abdominopelvic viscera, the peritoneal cavity, and the mesenteries.

LECTURE OUTLINE - PART 1

I. The abdominopelvic cavity contains the organs of the digestive system, except for the oral cavity, salivary glands, pharynx, and thoracic portion of the esophagus. It also contains major systemic blood vessels (aorta and inferior vena cava), parts of the urinary system, and parts of the reproductive system.

A. The space within the abdominopelvic cavity is divided into two contiguous portions:

1. Abdominal portion - that portion between the thoracic diaphragm and the pelvic brim
   a. The lower part of the abdominal portion is also known as the false pelvis, which is the part of the pelvis between the two iliac wings and above the pelvic brim.

2. Pelvic portion - that portion between the pelvic brim and the pelvic diaphragm
   a. The pelvic portion of the abdominopelvic cavity is also known as the true pelvis.
B. Walls of the abdominopelvic cavity include:

1. The thoracic **diaphragm** (or just “diaphragm”) - located superiorly and posterosuperiorly (recall the dome-shape of the diaphragm)

2. The lower ribs - located anterolaterally and posterolaterally

3. The posterior abdominal wall - located posteriorly below the ribs and above the false pelvis and formed by the lumbar vertebrae along the posterior midline and by the quadratus lumborum and psoas major muscles on either side

4. The anterolateral abdominal wall - formed by muscles and aponeuroses located anterolaterally and described yesterday.

5. Walls of the **false pelvis** - including the lower part of the psoas muscles and the iliacus muscles

6. Walls of the **true pelvis**

C. Peritoneum - the moist internal cellular lining of the abdominopelvic cavity and the outer covering of some segments of the gut and other organs of the digestive system.

1. The **peritoneum** is a membrane consisting of a single cell-thick layer of squamous epithelial cells, histologically known as a mesothelium, which lines the peritoneal cavity.

   a. Where it is in contact with the walls of the abdominopelvic cavity or structures lying on those walls, the peritoneum is designated **parietal peritoneum** (L. parietes = walls).
b. In certain locations, the parietal peritoneum lifts off the body wall and forms double-layered sheets which suspend organs of the gut and are known as **mesenteries**. Between the layers of the mesentery, blood vessels, lymphatics, and autonomic nerves run to or from the body wall and the suspended organs. Examples of mesenteries include:

   (1) The **mesentery proper**, which stems from posterior parietal peritoneum and suspends most of the small intestine

   (2) The **greater omentum**, which attaches the stomach to the transverse colon, to the spleen, and then to the body wall

   (3) The **lesser omentum**, which attaches the liver to the stomach

c. The peritoneum of the mesenteries is continuous with the layer of peritoneum which intimately invests the organs of the gut and is designated **visceral peritoneum** (L. *viscera* = organs).

d. Organs that are covered by visceral peritoneum and are suspended by one or more mesenteries are said to be **intraperitoneal** (but this does not mean they are within the peritoneal cavity).

e. Organs that lie behind the peritoneum and do not have mesenteries are said to be **retroperitoneal**.
2. **Peritoneal cavity** - this is the name of the space that is lined with peritoneum.

a. Because the gut tube and gut-associated organs “push” into the abdominopelvic cavity during development, their outer surfaces become covered with peritoneum (then called visceral peritoneum) and as the organs grow larger the peritoneal layers come into near contact with each other, separated only by the thin layer of peritoneal fluid which normally occupies the peritoneal cavity.

b. Although the peritoneal cavity normally contains only enough fluid to moisten the peritoneum, it has the capacity to contain several liters of fluid when distended pathologically by **ascites fluid** or iatrogenically by peritoneal **dialysis fluid**.

c. The female genital tract has two direct communications with the peritoneal cavity through the Fallopian tubes.

d. Infection of the peritoneal cavity may lead to an inflammation of the peritoneal cavity known as **peritonitis**. This infection is often life-threatening.
LECTURE OUTLINE - PART 2

II. Peritoneal cavity - lined with mesothelium

A. In actuality, the peritoneal cavity or sac is practically obliterated, as it is filled with abdominal organs, which protrude into it and are invested by its mesothelium.

1. Therefore, the parietal (body wall) layer and visceral (organ) layer of peritoneum are often closely opposed with only a thin layer of serous fluid between them.

2. The peritoneal sac can become dilated in pathological conditions.

3. When standing, the lowest points of the peritoneal cavity are:
   a. In males, the rectovesical pouch, between the rectum and bladder
   b. In females, the rectouterine pouch (of Douglas), between the rectum and uterus.

4. Since the uterus is interposed between the bladder and rectum, females have a vesicouterine pouch as well as a rectouterine pouch.

5. Males have a completely closed peritoneal cavity.

6. Females have two connections between the peritoneal cavity and the outside of the body, as the uterine (Fallopian) tubes open into the peritoneal cavity.

7. Mesenteries are double layered reflections of peritoneum which enclose organs and suspend them from the parietal peritoneum of the abdominal wall.

   a. Between the two layers of peritoneum that comprise a mesentery, there is connective tissue containing fat, blood vessels, lymphatics, and nerves.

   b. These vessels and nerves supply the organs suspended by the mesentery.
B. A "walk" around the greater peritoneal sac (female) in a mid-sagittal plane.

When reading this section, it is essential to refer to Fig. 2.19 on page 120 of Grant’s Atlas, 12th Edition, which is reproduced below.

Find the following numbers on the diagram on the next page of this syllabus.

1. Begin your "walk" on the parietal peritoneum of the posterior abdominal wall.
2. Progress inferiorly into the rectouterine pouch (of Douglas).
3. Progress over the visceral peritoneum on the uterus.
4. Enter the vesicouterine pouch.
5. Progress anteriorly over the bladder.
6. Progress superiorly along parietal peritoneum of the anterior abdominal wall.
7. Progress above the liver until you reach the point at which the parietal peritoneum reflects from the diaphragm onto the liver to become visceral peritoneum. This reflection is the anterior layer of the coronary ligament.
8. Progress along the anterior and then the inferior surface of the liver until you reach the mesentery connecting the liver to the lesser curvature of the stomach. This is the lesser omentum, in particular the hepatogastric ligament portion. To the right, the hepatoduoodenal portion of the lesser omentum would be found.
9. Progress along the visceral peritoneum on the anterior wall of the stomach.
10. At the greater curvature of the stomach progress onto the anterior layer of the greater omentum.
11. Make a hairpin curve and progress up the posterior layer of the greater omentum. Realize that the space depicted between the anterior and posterior layers of the greater omentum is in actuality obliterated inferior to the transverse colon. Because of this fusion, the part of the greater omentum between the greater curvature of the stomach and the transverse colon becomes the gastrocolic ligament.
12. Encounter the transverse colon and follow the visceral peritoneum on its posterior wall.

13. Continue onto the posterior layer of the transverse mesocolon.

14. Turn inferiorly, again onto parietal peritoneum of the posterior abdominal wall.

15. Cross the third part of the duodenum, which is retroperitoneal.

16. Progress onto the mesentery proper of the small intestine.

A walk around the Greater Sac of the Peritoneal Cavity
(Refer to the numbered locations described above.)

Median or mid-sagittal plane
From: Grant’s Atlas, Fig. 2.19, 12th Ed.

17. Continue along the visceral peritoneum covering the small intestine and onto the posterior layer of the mesentery. Repeat 16 and 17 several times until you have negotiated all the loops of the small intestine.
18. Return to the posterior parietal peritoneum and continue inferiorly. You could then reach the anterior layer of the sigmoid mesocolon, but that structure must have been folded toward the left and was not drawn on this figure.

19. Continue down the parietal peritoneum covering the posterior abdominal wall until you reach the point at which you started your "walk".

C. **The lesser peritoneal sac is the space posterior to the lesser omentum and stomach** (refer to the previous figure).

1. The epiploic foramen (Foramen of Winslow) is the only connection between the greater sac and the lesser sac.
2. The lesser omentum has two parts.
   a. Hepatogastric ligament - the mesentery connecting the liver to the lesser curvature of the stomach
   b. Hepatoduodenal ligament - the part connecting the liver to the first (peritonealized) part of the duodenum
   c. The free edge of the lesser omentum (hepatoduodenal ligament) encloses three important structures: proper hepatic artery (left), common bile duct (right), portal vein (posterior).

D. The greater omentum has the following parts:

1. Gastrocolic ligament - the part between the greater curvature of the stomach and the transverse colon
2. Gastrolienal ligament - the part between the greater curvature of the stomach and the spleen
3. Gastrophrenic ligament - the part between the greater curvature of the stomach and the diaphragm
4. Lienorenal ligament - the part between the pedicle of the spleen and the kidney

E. Tight recesses around the liver (**ECA, Fig. 2.24C, p.164**)

1. Anterior to the liver, between the diaphragm and the liver is the subphrenic recess.
2. Posterior to the liver are the subhepatic and hepatorenal recesses.
a. These two recesses are continuous with one another and are both parts of the greater sac. In the supine position, the hepatorenal recess (pouch) is a low point and inflammatory fluid would tend to collect there.

b. If inflammatory fluid collects in the hepatorenal recess, the parietal peritoneum on the inferior surface of the diaphragm becomes irritated. Since the central peritoneum of the diaphragm receives its sensory innervation from the phrenic nerves (C3-C5), pain caused by the inflammation will be referred to the shoulderpad area, which represents dermatomes innervated by the supraclavicular nerves (C3-C4). The peripheral peritoneum of the diaphragm receives sensory innervation from intercostal nerves, so pain also could be referred to dermatomes on the thoracic wall.

F. Mesenteries of the liver (ECA, Fig. 2.24A&B, p. 164)

1. Falciform ligament
   a. It is a reflection of anterior parietal peritoneum onto the liver, where it is continuous with visceral peritoneum.
   b. In its inferior free edge, it encloses the round ligament (ligamentum teres) of the liver. This ligament represents the obliterated umbilical vein, which runs from the umbilicus into the liver.

2. As the falciform ligament contacts the liver, it spreads out as visceral peritoneum, with attachments diverging to right and left. The reflection of these diverging layers onto the diaphragm is the anterior layer of the coronary ligament.

3. Posteriorly, a similar reflection forms the posterior layer of the coronary ligament.
   a. Between the anterior and posterior layers of the coronary ligaments, in contact with the diaphragm, is the bare area of the liver. This gap is large on the right side.
   b. Where the anterior and posterior layers of the coronary ligament meet on the right and left sides, the right and left triangular ligaments are formed. The left triangular ligament is elongated.

G. Mesenteries of the small intestine and colon

1. The first part of the duodenum, as mentioned previously, is suspended by the hepatoduodenal ligament part of the lesser omentum and thus is intraperitoneal; the second through fourth parts are secondarily retroperitoneal (i.e., during development they had a mesentery but lost it) and thus have no mesentery.
2. The **mesentery proper** of the small intestine runs diagonally from upper left to lower right quadrants of the posterior abdominal wall and encloses the jejunum and ileum.

3. The ascending and descending colons are secondarily retroperitoneal, although the cecum is mobile.

4. The **phrenicocolic ligament** connects the left colic flexure to the diaphragm.

5. The sigmoid colon has a mesentery, the **sigmoid mesocolon**.

6. The rectum is retroperitoneal.

H. Specializations of peritoneum at the ileocecal junction (Grant’s Atlas, 12th ed., Figs. 2.38A&B, page 139)

1. The **vascular fold** contains the anterior cecal artery, and this vessel must be considered during an appendectomy.

2. Posterior to the vascular fold and above the junction of the ileum and cecum is the **superior ileocecal recess**.

3. The **ileocecal fold** contains no blood vessels and runs between the ileum and the cecum and base of the appendix.

4. The **mesoappendix** is the mesentery of the appendix and contains the appendicular artery.

5. The **inferior ileocecal recess** is between the ileocecal fold and the mesentery of the appendix.

6. The above specializations are significant, since a great deal of surgery occurs in the area of the appendix.

I. Specializations of the gut

1. The entire gut has inner circular and outer longitudinal layers of smooth muscle.

2. However, on the large intestine the outer longitudinal layer of smooth muscle is not totally investing, but rather is arranged in three distinct bands, the **taenia coli**.

3. Because these longitudinal bands are shorter than the overall length of the mucosa, the large intestine is sacculated. The sacculations are called **haustra**.
4. Along the taenia coli are often found tags of fat invested by visceral peritoneum. Such fat tags are called **epiploic appendages** (absent on the cecum and appendix).

J. **Helpful hint** - To orient yourself when looking at a cross section through the abdomen, remember that the **abdominal aorta is to the left** and the **inferior vena cava (IVC) is to the right**.

![](Cross-section at L1 Vertebral Level.png)
Lectures on Abdominopelvic Cavity and Peritoneum

Figures from Grant's Atlas of Anatomy (11th ed.)

3.1A,B,&C, page 184
3.2A&B, page 185 (and pages 190-191)
2.18, page 112
2.19, page 113
2.20A&B, pages 114
2.21A&B, page 115
2.22A&B, page 116
2.23A&B, page 117
2.24, page 118
2.25, page 119
2.49A&B, page 142
2.50A&B, page 143
2.51A&B, page 144
2.54A&B, page 148
2.39D, page 132
2.40A&B, page 133
2.41A&B, page 134
2.42A&B, page 135

Figures from Grant's Atlas of Anatomy (12th ed.)

3.4A,B,&C, page 197
3.3A&B, page 196 (and pages 198-199)
2.17, page 118
2.18A&B, page 119
2.23A, page 124
2.24A&B, page 125
2.19, page 120
2.23B, page 124
2.25, page 126
2.26, page 127
2.45A&B, page 146
2.46A,B,&C, page 147
2.47A&B, page 148
2.52A&B, page 154
2.35A,B,C,&D, page 136
2.36A&B, page 137
2.37A&B, page 138
2.38A&B, page 139

Head to Toe Questions in Gross Anatomy: Continue working on Questions #607-756.