ANATOMY THEME SESSION: Liver, Gall Bladder, Pancreas, Spleen

AIM
To understand the general anatomy of the liver, gall bladder, pancreas and spleen and their visceral and peritoneal relationships.

Learning Objectives
- To understand the location and relationship of the liver including its peritoneal relationships
- To describe the external features, peritoneal attachments and structural and functional lobes of the liver
- To describe the blood supply of the liver and name the structures that pass through the porta hepatis
- To describe the anatomy of the gall bladder and draw the extrahepatic biliary system and its significant relationships
- To describe the anatomy of the pancreas, including its external features, ducts and relationship to the greater and lesser sacs.
- To describe the location, features and relationships of the spleen including peritoneal relationships and vascular supply
- To identify liver, gall bladder, spleen, pancreas and related vessels on various imaging modalities

LECTURER ROLE
- Largely facilitatory: should NOT provide a mini-lecture to the students.
- When students first arrive, to orientate them to the notes and prosections relevant to the activity.
- To answer questions from students.

STUDENT ROLE
- View introductory DVD on the theme session website BEFORE attending the session.
- Make sure to identify all structures mentioned in the notes.
- To ask the tutor questions, but do NOT expect a mini-lecture on the topic.
- Attempt the quiz on the theme session website.

This material has been modified from Sydney Medical Program for teaching purposes of the University of Malaya Medical Program (UMMP) by the Department of Anatomy, Faculty of Medicine, University of Malaya.
**ACTIVITY 1 - Liver, Gall bladder and Biliary System**

1. **Liver.** On isolated livers, *identify external features of the liver* (diaphragmatic and visceral surfaces, inferior border, lobes, fissures) and structures passing through the porta hepatis. Identify the hepatic veins draining into the inferior vena cava. *Differentiate* between the terms anatomical and functional lobes and demonstrate the location of each. On prosections, *identify peritoneal structures* related to the liver including falciform ligament, lesser omentum and layers of the coronary ligament. *On prosections, slide your hand* between the anterior surface of the right lobe of liver and the diaphragm until your fingertips reach a peritoneal reflection. What is the name of this peritoneal ligament? What part of the liver is immediately posterior to this region? Next *place your finger in the epiploic foramen*, and state the structures closely related. *Bring your thumb down to meet your finger* and explain the vessels/ducts you are now compressing.

2. **Gall Bladder & Extrahepatic biliary system.** Examine the gall bladder. It is usually firmly attached to the underside of the liver. Identify the fundus, body and neck. The narrow neck gives way to the cystic duct. What is the function of the gall bladder? *Identify the ducts of the extrahepatic biliary system.* Describe the flow of bile in the extrahepatic biliary system.

   - Would jaundice occur if the cystic duct, but not the bile duct, was blocked? What is a cholecystectomy and what artery is ligated in this procedure? What is the triangle of Calot and why is the identification of this area important?

3. **Portal Vein and tributaries.** On abdominal prosections of pancreas-duodenum, *identify the portal vein and its tributaries.* What two vessels unite behind the neck of the pancreas to form the portal vein?

   - A gallstone commonly lodges at the hepatopancreatic ampulla (of Vater); describe to your friends the effect of a blockage. Cancer of what structure commonly causes obstruction of the bile duct?
ACTIVITY 2 – Pancreas

1. **Pancreas.** On prosections, *identify* the head, neck, body and tail of the pancreas, and on the internal surface of the duodenum, the major and minor duodenal papillae. *Describe* to friends the course of the pancreatic ducts and where each opens into the duodenum. How does cancer of the head of the pancreas cause jaundice?

2. **Relations.** What structures lie anterior and posterior to the pancreas? On abdominal prosections, *identify* the left suprarenal gland and left kidney, splenic artery and vein, left renal vein, superior mesenteric artery and vein and portal vein. Describe their relationships to the pancreas.

3. **Peritoneal relationships.** Is the pancreas intraperitoneal or retroperitoneal? Where does the root of the transverse mesocolon attach to the pancreas? Is the pancreas related to the lesser sac or greater sac or both?

ACTIVITY 3 – Spleen

1. **Isolated spleen.** Identify the superior (notched) border and inferior border, anterior and posterior ends, diaphragmatic and visceral surfaces, identify impressions (gastric, renal, colic), hilum, splenic vessels and peritoneal attachments. Is the spleen intraperitoneal or retroperitoneal?

2. **Spleen in situ.** Identify and feel for the spleen in abdominal prosections beneath the left hemidiaphragm. Which border of the spleen is palpable in splenomegaly? What is an accessory spleen and what is the significance of this in diseases of the spleen?

ACTIVITY 4 – Imaging

1. Plain abdominal films – identify liver shadow below the right hemidiaphragm.
2. CT scans – identify liver, gall bladder, pancreas, spleen
APPENDIX 1: RELATIONSHIPS OF VISCERA

Relationships in textbooks differ slightly. The standard reference used here is Gray’s Anatomy, 38th edition. Note that the list below is selective (not every structure is included). These relationships are not meant to be memorized but to be understood. The best way to learn these relationships during private study is to use texts and atlases and to develop your own sketches.

Liver
Diaphragmatic surface:
diaphragm, anterior abdominal wall (in midline);
through the diaphragm it is related to the pleural cavity and lungs, heart and pericardium;
in its posterior part it is related directly to the diaphragm (at bare area) and IVC.
Visceral surface:
oesophagus, stomach, duodenum, gall bladder, right kidney and suprarenal and right colic flexure.

Gall Bladder
Anterior: anterior abdominal wall (fundus), liver (normally in direct contact)
Posterior: 1st and 2nd part of duodenum, transverse colon

Pancreas
Head: related to the first three parts of the duodenum.
Posterior: IVC and bile duct
Anterior: transverse colon and root of transverse mesocolon.

The superior mesenteric vessels lie anterior to the uncinate process of the head.

Body: related to the 4th part of the duodenum
Posterior: aorta, origin of superior mesenteric artery, left psoas, left renal vessels, left kidney and left suprarenal gland
Anterior: root of the transverse mesocolon attaches to the anterior border so that the region above its attachment is related to the lesser sac and through the lesser sac to the stomach. The region below the attachment is related to the small intestines (jejunum).

Tail: within the lienorenal (splenorenal) ligament (together with splenic vessels)