INSPECTION
CASE

Two elderly women with chronic abdominal pain.

Erythema ab igne:
(heating pad induced skin changes)
STRIAE

- Pregnancy, obesity, chronic ascites, rapid weight gain
- Cushing syndrome striae are often purplish-red, because the thin, fragile skin exposes the underlying venous blood in the dermis.
CASE

- Distended abdomen
- Bulging flanks
- Everted umbilicus
- Prominent veins
- Chronic alcoholic cirrhosis with ascites
ABDOMINAL DISTENTION

• Local or generalized?
• With free ascites, flank bulging stops at the peritoneal reflection.
• Obesity continues around the abdomen.
FLANK BULGING
Patient developed severe abdominal pain with vomiting 4 days ago. Presented with hypotension.
CULLEN SIGN
CULLEN SIGN
TURNER/CULLEN

• Cullen sign; intraperitoneal hemorrhage (originally ruptured ectopic pregnancy)
• Turner sign; retroperitoneal hemorrhage (classically hemorrhagic pancreatitis)
• Neither sensitive or specific
ABDOMINAL VEINS

• The normal flow is away from the umbilicus. Flow direction is determined by alternate stripping of veins.
The Story Goes...

Perseus slew the Medusa by using his shield as a mirror so as not to see her horrible face directly lest he be turned into a stone. Her head (the caput Medusa) was surrounded by a bunch of snakes.
CAPUT MEDUSA

A striking, but rare finding.
A patient has leg swelling and prominent veins on her abdomen. The pattern of flow is on the left.

IVC obstruction
• Lower abdominal veins reverse flow and flow to the lower pressure SVC system (upper abdomen and chest).

• Condition can cause ascites and be confused with cirrhosis.
SVC OBSTRUCTION

• Higher pressure will cause upper abdominal veins to flow towards the umbilicus to escape into the IVC system.

• Veins of neck, chest, and arms also dilate.
AUSCULTATION

- Listen in R and L upper quadrants, epigastric area, and mid pelvis.
- Feel for inguinal nodes at the same time.
BOWEL SOUNDS

• Diagnostic yield is low.
• “Bowel sounds absent” requires long listening.
• Reduced or increased bowel sounds are not reliably detected.
BOWEL SOUNDS

• “Tinkles” (musical sounds of 512 Hz = high C) and “rushes” (3X accelerated bowel sounds) are specific for small bowel obstruction but infrequent.
• Most patients: “bowel sounds present”
LIVER PERCUSSION

• Percuss in midclavicular line using hard percussion (sound easily audible to the examiner while standing up).

• Patient should hold his breath in deep inspiration during percussion of each border.
LIVER PERCUSSION
ULTRASOUND FOR LIVER AND SPLEEN SIZE
• Liver span and position vary depending on body size and habitus.

• So x fingerbreadths below the costal margin doesn’t really tell the whole story
Factors Affecting Liver Size
A Sonographic Survey of 2080 Subjects

Objective. We sought to determine the size of the liver in a nonselected population sample to establish normal reference values and to study potential factors influencing liver size. Methods. A total of 2080 subjects (989 male and 1091 female, age range, 18-96 years) underwent prospective ultrason examination to determine the size of the liver. Subjects also underwent physical examination and completed a short standardized interview questionnaire covering potential factors influencing liver size. Data were evaluated descriptively. The influence of multiple variables on liver size was studied by means of a covariance analysis. Results. The average measured liver diameter (midcoronal line X YZ was 14.0 ± 1.7 cm [median, 13.9 cm; range, 9.4-21.3 cm]; average in male subjects, 14.5 ± 1.6 cm; and average in female subjects, 13.9 ± 1.7 cm). Results of the multivariate analysis showed that the factors body mass index, body height, sex, and age (in male subjects) frequent alcohol consumption were an influence on liver size measured at the midcoronal line. Conclusions. The sonographic measurement of liver size at the midcoronal line was shown to be an easy and practical method for routine use. Only 2.3% (46/2080) of 2080 subjects did the size of the liver measured at the midcoronal line less than 10.1 cm, body mass index and body height are the most important factors associated with the diameter of the liver measured at the midcoronal line. Key words: alcohol; body height; liver; normal value; size; sonography.

Figure 2. Distribution of liver diameters in the MCL in the total collective; 1 indicates male; and 2, female.

Table 4. Factors Influencing Liver Size

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean Increase/Unit (95% CI)</th>
<th>Mean (95% CI)</th>
<th>p</th>
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<tr>
<td>Height</td>
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<td>BMI</td>
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<tr>
<td>Male</td>
<td>NA</td>
<td>14.2 (14.1-14.3)</td>
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<tr>
<td>Alcohol consumption</td>
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<tr>
<td>Total sample</td>
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<td>13.9 (13.8-14.0)</td>
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<tr>
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<td>14.3 (14.2-14.5)</td>
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<td>14.4 (14.3-14.5)</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>NA</td>
<td>14.6 (14.4-14.8)</td>
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</tr>
</tbody>
</table>

CI indicates confidence interval; and NA, not applicable.
*Simultaneous analysis; for univariate analysis, P < .001.


Length of the right lobe > 15.5 cm is 87% accurate in the diagnosis of hepatomegaly

(C) Gornick B, Levinson C. Ultrasound in hepatomegaly; J Clin Ultrasound 1091;8 37-42)
SPLEEN ULTRASOUND

- Typical dimensions are 14cm length x 7 cm width, but variable
- Spleen tends to lose its normal concave shape at the hilum
- Extension below left kidney suggests enlargement
**Spleen Measurements**

Splenomegaly is defined as length $>14\text{cm}$ or width $>7\text{cm}$, however these measurements have a large range of error. Splenomegaly tends to just stand out as abnormal on ultrasound.

**Other clues to splenomegaly**

- Medial aspect of the spleen loses its concave shape
- Extends caudal beyond inferior pole of left kidney
Spleen size generally greater than 14 cm in length or 7 cm in width is enlarged.
PERCUSSION

• Begin with a light percussion survey of all four quadrants of the abdomen, including going across the abdomen.

• This may detect tenderness, as well as flank dullness and central tympany.
FLANK DULLNESS

Ascites

Flank dullness

Central tympany

Diagram showing flank dullness and central tympany in a medical context.
SHIFTING DULLNESS

• Flank dullness with central tympany should prompt the search for “shifting dullness”
• Rotation of the patient causes the border of dullness and tympany to move as the bowel continues to float to the top of the fluid.
SHIFTING DULLNESS

Tympany
FLUID WAVE

• Only detected when a large amount of ascites is present.
• Requires an extra hand.
• A sharp tap with the fingers of one hand is followed after a slight delay by an impulse to the receiving hand.
ULTRASOUND/ASCITES

• Excellent for evaluating ascites

• Several high sensitivity areas to look at:
  • Distal liver tip
  • Morrison’s pouch
  • Perinephric
  • Splenorenal
ULTRASOUND/ASCITES

Liver

Morrison's

Kidney
ULTRASOUND/ASCITES
PALPATION

• A light palpation survey is done first. It may help the patient relax if the knees are flexed.
• Tenderness, rigidity or fullness may be detected
A woman has a hard nodule palpated in her umbilicus.

Paraumbilical node
“Sister Joseph”
PARAUMBILICAL NODES

• Sister Joseph or Sister Mary Joseph’s node.
• Sister Joseph (Julia Dempsey) was first surgical assistant to Dr. Will Mayo at St. Mary’s hospital.
1928 Mayo publication credited her with noticing the association with intrabdominal malignancy.
PALPATION

• After a light palpation survey, a deep survey of all four quadrants is performed.
• Tenderness, rigidity, and fullness are sought. Any masses are further explored.
Liver palpation

• Liver is palpated to:
  • Help determine if it is enlarged (span is maybe more important for this)
  • Determine its consistency (difficult)
  • Detect pulsations
PULSATILE LIVER
Liver palpation

- Standard method is to push the fingers of one or both hands gradually, but deeply, into the abdomen during patient expiration.
Liver palpation

- Hands should be parallel to the rectus muscles
- As the patient inspires, the finger tips feel for the liver.
- The fingers are advanced up the abdomen a small amount with the next expiration.
Spleen Palpation

• This is difficult for most people.
• In a patient with normal auscultatory percussion and standard splenic percussion maneuvers, not a lot of attention should be devoted to palpating the spleen.
SPLEEN PALPATION

• When the spleen enlarges, it moves anteriorly and obliquely downwards into the abdomen.
Spleen palpation

- Place your right hand at the umbilicus on a line pointing toward the left costal margin.
- Push your fingers in only moderately deep during expiration and feel for the spleen during inspiration without moving your fingers very much.
AAA
AORTA PALPATION

• Not a particularly sensitive screening method.
• Not valid in moderately or severely obese.
• Normal aorta is less than 2 cm wide and is rarely palpable below the umbilicus.
AAA
Hydronephrosis

Hydronephrosis is graded based on degree of collecting system dilation from very mild pelvis dilation (A) to dilation of the pyramids and subsequent loss of distinct cortex in severe hydro (E).

Degrees of Hydronephrosis:

- Mild
- Moderate
- Severe
HYDRONEPHROSIS
ACUTE PAIN

- Various terms are used to describe regions of the abdomen. Many physicians intermingle terms from the various systems.
ABDOMINAL REGIONS
ACUTE PAIN

• Abdominal pain may be referred pain from another site.
• In particular, disease in the chest may be referred to the abdomen (and vice versa).
ACUTE PAIN

• As a rule, abdominal pain does not localize until the parietal peritoneum is irritated in a given area.
• Pain in certain areas suggests particular diseases.
ACUTE PAIN

• Costovertebral angle tenderness (for renal tenderness in infection, tumor, or infarction)
• Some controversy about whether to use thumb pressure in the angle or fist percussion from 6 inches away (probably best to do both).
False positive = occasional other inflammatory abdominal conditions or musculoskeletal conditions.
INTRAMURAL PAIN

• Can be hard to distinguish from intrabdominal.
• Palpate the area of tenderness with the patient supine and relaxed. Then palpate with the same degree of pressure while patient puts her chin on her chest or does a partial sit-up.
INTRAMURAL PAIN

• Less tenderness indicates intraabdominal pain (the guarding protects).
• Same tenderness indicates intramural pain.
Direct rebound tenderness, elicited by abruptly withdrawing the examining hand from as deep within the tender area as possible, is thought by many to be “cruel” and not useful.
REBOUND TENDERNESS

• Tenderness elicited by light to moderate percussion over an area gives the same information with less pain.
INDIRECT REBOUND

• A more acceptable maneuver
• Examining hand is pushed into a non-tender area of the abdomen and then abruptly withdrawn. Pain occurring at a different site is a good sign of peritonitis.
INDIRECT REBOUND

- Rovsing sign is a named variant where tenderness in the RLQ is elicited by pressure applied deep into the LLQ (before hand is withdrawn).
- Not very sensitive for appendicitis, but it is very specific.
MURPHY SIGN

• Low sensitivity for cholecystitis, but can add to the strength of a diagnosis.
• Different techniques - deep palpation to liver edge
• Ask patient to take slow deep breaths. A positive sign occurs when the patient experiences pain, often enough to halt the inspiration. Often occurs right at end of inspiration.
OBTURATOR SIGN

• Designed to detect inflammation around the obturator muscle (appendicitis in the right pelvis, pelvic abscess/hemorrhage)
• Positive sign is pain elicited in the lower abdomen when the leg is flexed at the knee and thigh and then rotated inward.
OBTURATOR SIGN
OBTURATOR SIGN
PSOAS SIGN

• Detects iliopsoas irritation from appendicitis (on the right) or from abscess/hematoma/tumor on either side.
PSOAS SIGN

- With patient lying on a side, pull the extended top leg backwards to see if pain is elicited in the low abdomen.
ABDOMINAL X-RAY INTERPRETATION
INDICATIONS FOR ABDOMINAL FILMS

- When bowel obstruction is a concern
- In acute abdomen to r/o free air. However, CT scanning is more sensitive.
- To look for foreign bodies
- To evaluate placement of feeding tubes
- Can be useful in many other cases of abdominal pain.
Sequence:

- Bones first (spine, lower ribs, pelvis)
- Upper quadrants, flanks, midabdomen looking for masses and calcifications
- Then bowel and bowel gas pattern
- STONES, BONES, MASSES & GASSES
CASE

A 40 year old woman complains of persistent upper abdominal pain for 6 weeks
FOUND AT SURGERY!
25 Y/O POST MVA
As spleen enlarges, it may deform colonic gas pattern.
CASE

• 70 year old woman c/o increasing lower abdominal pain over 2 months.
• On exam her abdomen is moderately distended with diffuse tenderness. Bowel sounds are present.
• Labs are notable for a hemoglobin of 10.0 with an MCV of 74.
• Colonoscopy shows a large obstructing sigmoid cancer.
• She refuses therapy
• 4 days later she complains of increasing abdominal pain, nausea and vomiting
26 y/o man with a history of Crohn’s disease and recurrent abdominal pain
AIR FLUID LEVELS

- A few may be normal
- Seen in both obstruction and ileus
- Hard to confidently differentiate between SBO and ileum
CASE

• 23 y/o man is seen after an assault. He complains of severe abdominal pain.
• On exam his abdomen is rigid and mildly distended. No bowel sounds are present. He has tenderness throughout, especially in the epigastric region.
CASE

• A 75 y/o man with a history of ASCVD and PVD presents with acute abdominal pain, fever, lethargy, and hypotension.
• On exam his abdomen is diffusely tender; rare bowel sounds are heard.
• WBC is 14,000 with a left shift. Lactate level is checked and is 4.5. (nl up to 1.5)
CASE

• A 20 year old man returned from a trip from Mexico yesterday. This morning he became progressively lethargic over the course of 1-2 hours.

• On exam his pulse is 80; BP 100/60, Respirations are 8/min. His pupils are pinpoint. His abdomen is mildly distended; rare bowel sounds are heard.
“Double condom sign”

Sometimes seen with body-packing drug smugglers.