1. **ULTRASOUND 001**

A 50 year old male victim of an MVA is brought into the ED. His initial VS are BP 148/90, HR 128, RR 30. Primary survey reveals GCS=15, no cranio-facial injury, C-spine intact, splinting of the left chest wall with decreased BS, and localized abdominal tenderness in the LUQ. You perform a focused abdominal ultrasound exam, and obtain the following image. What is your interpretation of this image?

A. Left hydronephrosis  
B. Hemoperitoneum  
C. Pericardial effusion  
D. Left hemothorax  
E. Fluid filled stomach

The answer is D. This image is an ultrasound of the left upper quadrant showing a normal left spleen and kidney and fluid above the diaphragm in the left hemithorax. In the setting of trauma, any signs of shock are first attributed to blood loss, and the presence of fluid in the chest should be considered hemothorax.


2. **ULTRASOUND 002**

Which of the following statements about the previous patient is TRUE:

A. The patient needs to go straight to the OR for laparotomy  
B. The patient needs immediate placement of a chest tube  
C. Supine chest radiograph is a more sensitive test than FAST for detection of hemothorax  
D. FAST is an excellent modality to screen for retroperitoneal injuries  
E. Tube thoracostomy is contraindicated in this patient.

The answer is B. Tube thoracostomy is indicated for all trauma patients found to have a hemothorax. The presence of >1000cc of blood initially or >200cc/hr for 4 hours are indications for thoracotomy. Upright chest x-ray require 200-300cc to blunt the diaphragm. Supine chest x-rays are not superior to ultrasound for hemothorax.

An 80 year old man had a syncopal episode and awoke with a BP 100/70 and back pain. The following image was obtained in the ED by placing ultrasound probe transversely above umbilicus. What is the most likely diagnosis?

A. The patient has cholecystitis
B. Since there is no free fluid in the abdomen, he has an unruptured abdominal aortic aneurysm (AAA)
C. He has a kidney stone causing left hydroureter
D. He has a pancreatic pseudocyst
E. He has an AAA that has probably ruptured into the retroperitoneum.

The probability of an AAA rupturing increases greatly after 5cm. >70% of AAA rupture into the retroperitoneum. Ultrasound is nearly 100% sensitive in detecting the presence and size of an AAA but cannot detect the actual site of rupture.

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Figure 3 demonstrates what common technical error?

A. Too much gain
B. Too high of a frequency
C. Not enough ultrasound gel
D. Too much power
E. Poor depth control

The answer is A. Gain is an artificial amplification in received echoes by the ultrasound machine, that affects the appearance (and perceived echogenicity) of the ultrasound image. A problem common to beginning sonographers is to increase gain to enhance contrast. When this is done, artifactual reflections can be produced in anechoic structures, leading to misdiagnosis.


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5. ULTRASOUND 005

What are the standard views in a FAST exam?
A. RUQ, Subxiphoid, LUQ, suprapubic
B. RUQ, Parasternal long axis, aorta
C. RUQ, LUQ, LLQ, RLQ
D. Visualizing Morison’s Pouch is sufficient for preliminary screening
E. Bilateral paracolic gutter views

The answer is A. The FAST exam has a sensitivity of 88% for the detection of intraperitoneal hemorrhage when 4 views are obtained in an average duration of 2.5 minutes. Adding other views does not increase sensitivity and significantly increases time. A single RUQ view had a sensitivity of only 82%.

Hilty W, Snooey E, Trauma Ultrasonography, in Simon B and Snooey E (eds): Ultrasound in Emergency and Ambulatory Medicine, ed 1, St. Louis: Mosby, 1997: 151

6. ULTRASOUND 006

A 24 year old female presents with lower abdominal pain and vaginal bleeding. Her quantitative hCG level is 3,279 and her blood type is O+. The cervical os is closed, there is mild bilateral adnexal tenderness and no appreciable pelvic masses. A transvaginal ultrasound was done, demonstrating an empty uterus. What would be the most appropriate action?

A. Admit the patient to the OB/GYN service with the diagnosis of molar pregnancy.
B. Reassure the patient that the pregnancy is progressing as expected and advise reevaluation by OB/GYN within 1-2 weeks.
C. Emergent OB/GYN consultation for ectopic pregnancy.
D. Advise the patient that she has miscarried and recommend return for heavy vaginal bleeding.
E. Treat the patient for endomyometritis

The answer is C. An empty uterus on TV U/S with a quantitative hCG > 2000 is an ectopic pregnancy until proven otherwise.)
A 70 year old male complains of severe right low back pain. He has a heart rate of 116, a blood pressure of 126/82, and mild tenderness to palpation of the abdomen and left flank. The ultrasound was obtained over the patient’s right flank. What would be the most appropriate step to take?

A. Discharge the patient after adequate pain control with analgesics and a urine strainer.
B. Emergent surgical consultation for suspected ruptured abdominal aortic aneurysm
C. Obtain a right lower quadrant ultrasound to exclude the possibility of appendicitis.
D. Treat the patient with analgesics and antibiotics for right-sided diverticulitis.
E. Obtain an arteriogram to exclude the possibility of mesenteric ischemia.

The answer is A. Ultrasound clearly demonstrates hydronephrosis.
An unrestrained driver involved in an auto accident has a heart rate of 126, a blood pressure of 86/50 and no obvious external source of blood loss. Ultrasound images of the right upper quadrant, left upper quadrant, and pelvis were obtained. Based on these findings, what would the next most appropriate step be?
8. ULTRASOUND 008
   A. Obtain a stat CT scan of the abdomen and pelvis.
   B. Obtain radiographs of the pelvis and chest.
   C. Begin vasopressors, titrated to blood pressure response.
   D. Perform a diagnostic peritoneal lavage.
   E. Take the patient immediately to laparotomy.
   The answer is E. The ultrasounds demonstrated hemoperitoneum seen in the right and left upper quadrants. There was no fluid present in the pelvis. Hemoperitoneum seen on ultrasound in an unstable patient is an indication for immediate laparotomy.

9. ULTRASOUND 009
   An ultrasound of the gallbladder is demonstrated in figure 6. What is the correct interpretation of this image?
   A. Gangrenous cholecystitis
   B. Gallbladder cancer
   C. Cholelithiasis
   D. Gallbladder polyp
   E. Choledocholithiasis
   The answer is C. This image demonstrates a stone within the gallbladder that creates distal acoustic shadowing. Gallbladder cancer and polyps do not create shadows.
A 18 year old male presents after suffering a stab wound to the chest. A subxiphoid ultrasound is obtained. His blood pressure is 118/68, heart rate is 90, and respiratory rate is 16. What would be the most appropriate treatment?

A. Transesophageal echocardiography
B. Pericardial window
C. Spiral CT scan of the chest with contrast
D. PA and lateral chest x-ray
E. Tube thoracostomy of the chest.

The answer is B. The image demonstrates pericardial fluid consistent with hemopericardium.
A 30 year old woman presents to the emergency department with abdominal cramping and vaginal bleeding. Her last menstrual period was 7 weeks ago. Physical examination reveals a palpable left adnexal mass. She has a positive pregnancy test with beta-HCG (human chorionic gonadotropin) of 14,000 IU/L. Below is the ultrasound:

All of the following are true for ectopic pregnancy except:

A. Heterotopic pregnancy is increasingly becoming more common as infertility treatment becomes more common
B. Ectopic pregnancy accounts for 15% of all maternal deaths
C. Demonstration of fluid in the cul de sac
D. Endovaginal ultrasound can detect a living embryo in 30% of ectopic pregnancies
E. Ectopic pregnancies occur in the fallopian tubes and on the ovary equally, about 50% each

The answer is E. This patient has an ectopic pregnancy. Ectopic pregnancy occurs in 1:100-1:400 pregnancies and accounts for 15% of maternal deaths. The only sonographic finding that reliably excludes an ectopic pregnancy is a demonstration of an intrauterine pregnancy, since concomitant presence of an intrauterine and an extrauterine pregnancy (heterotopic pregnancy) is extremely rare (except in induced ovulation).

Endovaginal ultrasound can detect a living embryo in 30% of ectopic pregnancies. Presence of an adnexal mass and/or cul-de-sac fluid in a patient with no intrauterine gestation and measurable circulating human chorionic gonadotropin (HCG) are highly specific for the diagnosis ectopic pregnancy. However, absence of these findings does not exclude the diagnosis since up to 30% of women with extrauterine gestations have no sonographic evidence of an adnexal mass or pelvic intraperitoneal fluid. A pseudogestational sac (decidual reaction and anechoic fluid collection in the endometrial cavity) can be seen in 10-20% of ectopic pregnancies and should not be confused with an intrauterine gestation. Ninety-five percent of ectopic pregnancies occur in the fallopian tubes. Ovarian, abdominal, cervical, and interligamentary ectopic are rare.

REFERENCE: