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### SAM Questions

1. Regarding proper ultrasound technique for the detection of low volume, low velocity flow in the testicles, which of the following should be performed:

   A) Maximize the pulse repetition frequency  
   B) Minimize the color gain to background noise limit  
   C) Maximize the wall filter settings  
   D) Prioritize the color information at the expense of grayscale  
   E) Minimize the number of sound pulses per color line (ensemble length, dwell time, packet length) to the frame rate limit  

   The correct answer is D.  

   Explanation: for the optimal detection of low volume, low velocity flow, one should minimize the pulse repetition frequency, maximize the color gain to background noise limit, minimize the wall filter settings, prioritize the color information at the expense of grayscale, and maximize the number of sound pulses per color line (ensemble length, dwell time, packet length) to the frame rate limit.  


2. The most common testicular tumor is a:

   A) Seminoma  
   B) Embryonal carcinoma  
   C) Mixed germ cell tumor  
   D) Teratoma  
   E) Choriocarcinoma.
The correct answer is C.

Explanation: the nonseminomatous germ cell tumors are the considered the most common primary testicular malignancies, accounting for approximately 60% of cases (compared with 40% for seminomas). Pure nonseminomatous tumors are less frequent.


3. Regarding scrotal trauma, which of the following is true:

A) One hundred kilograms of pressure is required to rupture the tunica albuginea
B) Of patients with scrotal trauma severe enough to seek medical attention, 80% have rupture
C) Associated neoplasm may predispose to rupture after a minor injury
D) Aggressive early surgery for rupture has not been shown to reduce morbidity
E) Intratesticular hematoma is easily distinguishable from a neoplasm at the initial ultrasound.

The correct answer is C.

Explanation: It is crucial to realize than a testicular neoplasm may predispose to rupture after a minor injury, and that in the rare instance when a patient with significant testicular trauma does not go to surgery, we are obligated to follow up any focal intratesticular lesion to ensure that it is not a tumor but rather a hematoma. The other choices are all false: 50 kilograms of pressure is required to rupture the tunica albuginea; of patients with scrotal trauma severe enough to seek medical attention, only 20% have rupture; surgical exploration is performed with a very low threshold if there is any question of testicular rupture because early aggressive surgery reduces morbidity and leads to a 90% testicular salvage rate; and testicular neoplasms may closely mimic an intratesticular hematoma at the time of the initial sonogram.

References:
1. What adnexal cyst shares common ultrasound features with "Classic" appearing endometriomas?
   A. Mature cystic teratoma
   B. Peritoneal inclusion cyst
   C. Corpus luteum cyst
   D. Hemorrhagic ovarian cyst
   E. Paraovarian cyst

   The correct answer is D

Explanatory Rationale Question 1
1. Option A is incorrect because mature cystic teratomas are highly variable in echotexture without any features of the "classic" appearing endometriomas which contain diffuse low-level echoes with a "ground glass" appearance. The variable appearances of cystic teratoma include the following: dermoid plug which is an echogenic, often shadowing mural nodule; dermoid mesh which is multiple linear echogenic interfaces within the fluid component of the dermoid; "tip of the iceberg" sign which is a highly echogenic structure with acoustic shadowing related to teeth and bone; a fat fluid level which is nondependent echogenic fatty tissue floating on fluid; and finally, multiple mobile fat spherules which is rare and represents globules of fat within fluid.
2. Option B is incorrect because the typical ultrasound morphology of a peritoneal inclusion cyst is that the cyst follows the contours of the pelvic cavity with the ovary often within the wall of the cyst. Fluid secreted by the ovary becomes entrapped by adhesions and therefore an irregular shape is typical. The cyst fluid may be echogenic or simple and the cyst may contain septae and papillary projections.
3. Option C is incorrect because the corpus luteum cyst generally has a thick, echogenic and hypervascular wall with a small central cystic component rather then the low-level echoes in endometriomas related to repeated hemorrhage over time.
4. Option D is the correct answer. Hemorrhagic ovarian cysts may appear identical to the "classic" endometriomas, because both lesions contain products of hemorrhage. One simple way to differentiate between these cysts is to do a follow-up scan. Hemorrhagic cysts are physiologic lesions and will often resolve or change significantly overtime whereas endometriomas tend to remain relatively stable or increase in size after episodes of repeated bleeding.
5. Option E paraovarian cyst is incorrect because these lesions actually occur external to the ovary and tend to contain only simple, anechoic fluid. These are congenital remnants that arise from the wolffian duct in the mesovarium. They tend to be round or oval rather than irregular in shape and do not distort the adjacent ovary.

Reference:

2. What is one of the most specific clues to the diagnosis of peritoneal inclusion cyst?
   A. anechoic fluid content without proteinaceous debris
   B. non-geometric shape with thin walls and adjacent ovary
   C. very thick internal septations on loculation
   D. movement with the ovary on real-time images
   E. "cogwheel" or "beads on a string" sign
The correct answer is B

Explanatory Rationale Question 2
1. Option A is incorrect because peritoneal inclusion cysts may contain fluid that is relatively simple or fluid with internal echoes and septations. These cysts represent a type of pseudocyst with fluid produced by the ovary, and this fluid occurs following a peritoneal insult such as surgery, trauma, inflammation, etc.
2. Option B is correct in that there are two key ultrasound features of peritoneal inclusion cyst. The first is that these are pseudocysts with entrapped fluid thus they often have an irregular, passive shape that conforms to and is defined by the contours of the surrounding structures. The second feature is that entrapment of the ovary either within or at the peripheral of the lesion is very characteristic. The ovary may even be somewhat compressed and deformed by the contiguous fluid.
3. Option C is incorrect in that the entrapped fluid in peritoneal inclusion cysts may contain thin or thick internal septations. If the adhesions within the cyst become thick and vascular, the cyst can be misconstrued as an ovarian neoplasm.
4. Option D is incorrect because these pseudocysts are inflammatory in nature usually occurring in association with prior surgery, pelvic inflammatory disease or endometriosis, therefore motion is relatively limited and may not be observed on real-time images. Thin septations with a PIC may
5. Option E is incorrect because the “cogwheel” or “beads on a string” signs are both typical features of a hydrosalpinx, not a peritoneal inclusion cyst.

Reference:

Explanatory Rationale Question 3
1. Option A is incorrect. In late menopause, women should never have a hemorrhagic cyst because hormonal influences on the ovary have ceased, therefore any adnexal cyst with such an appearance should be considered neoplastic and surgical evaluation should be considered.
2. Option B is incorrect because the SRU guidelines recommended that cysts greater than 7 cm may be difficult to assess completely with ultrasound therefore further imaging with MR or surgical evaluation should be considered.

The correct answer is C

Explanatory Rationale Question 3
1. Option A is incorrect. In late menopause, women should never have a hemorrhagic cyst because hormonal influences on the ovary have ceased, therefore any adnexal cyst with such an appearance should be considered neoplastic and surgical evaluation should be considered.
2. Option B is incorrect because the SRU guidelines recommended that cysts greater than 7 cm may be difficult to assess completely with ultrasound therefore further imaging with MR or surgical evaluation should be considered.
3. Option C is the correct answer. The SRU guidelines suggested that cysts less than or equal to 1 cm in postmenopausal women do not need further follow-up and may or may not be described in the imaging report at the discretion of the interpreting physician.

4. Option D is incorrect because it is at the option of the reporting physician to decrease the frequency of follow-up of any adnexal cyst in a postmenopausal woman once stability or a decrease in size has been confirmed. Larger cysts should still generally be followed on a regular basis per the SRU guidelines.

5. Option E is incorrect because the equivocal or questionable postmenopausal adnexal cyst seen with ultrasound would be best evaluated with MR rather than CT. MR can determine the contents of most adnexal lesions based on the signal characteristics on various sequences images. Fluid with hemosiderin, fat, and other tissues can often be differentiated rather quickly with MR.

Reference:
Peter Doubilet, MD
Sonography of the First Trimester
SAM Questions

1. Pelvic ultrasound in a woman with hCG of 2500 mIU/ml demonstrates normal adnexa and a small, oval fluid collection in the mid-uterus, with no double sac sign, intradecidual sign, yolk sac, or embryo. The most appropriate next step is:

A. dilatation and curettage (D & C)
B. laparoscopy
C. pelvic MRI
D. follow-up ultrasound
E. treat with intramuscular methotrexate injection

ANSWER: D


Explanatory Rationale: In a woman with a positive hCG, a non-specific saclike fluid collection is highly likely to represent an intrauterine pregnancy. Thus, any approach that might damage an intrauterine pregnancy should be avoided. Instead, the appropriate step is to obtain a follow-up ultrasound to confirm the presence of an intrauterine pregnancy.

2. Ultrasound in the early first trimester demonstrates an intrauterine gestational sac. Which of the following indicates definitive pregnancy failure (miscarriage):

A. Embryo with crown-rump length of 6 mm and no cardiac activity
B. Mean sac diameter of 27 mm and no embryo
C. Empty amnion adjacent to the yolk sac
D. No embryo 6 weeks after the woman’s last menstrual period
E. 8 mm yolk sac

ANSWER: B

Reference: Doubilet PM, Benson CB, Bourne T et al. Early First Trimester Diagnostic Criteria for Nonviable Pregnancy. N Engl J Med (in press) [Note: This will be published prior to the Orlando course in December 2013]

Explanatory Rationale: The Society of Radiologists in Ultrasound held a consensus conference in October 2012 to define criteria for diagnosing pregnancy failure. The only definitive criterion on the list is a mean sac diameter of at least 25 mm with no visible embryo. The other items are suspicious, but not definitive, for pregnancy failure.

3. Ultrasound in the early first trimester demonstrates an intrauterine gestational sac with an embryo and cardiac activity. Which of the following regarding the heart rate is correct?

A. A heart rate below 120 beats per minute is abnormal if the crown-rump length is 3 mm
B. A heart rate below 130 beats per minute is abnormal if the crown-rump length is 7 mm
C. The normal heart rate remains unchanged during pregnancy
D. If the heart rate is slow but reverts to normal on a follow-up scan 1 week later, the prognosis remains guarded
E. The prognosis is related to the presence or absence of cardiac activity, not to the heart rate.

ANSWER: D

References:

Explanatory Rationale: The normal heart rate is above 100 bpm when the crown-rump length is less than or equal to 4 mm, and increases to 120 bpm when the crown-rump length is 5-9 mm. A heart rate below these values indicates a poor prognosis, with high likelihood of embryonic demise by the end of the first trimester. Even if the heart rate reverts to normal on a follow-up scan 1-2 weeks later, the risk of demise by the end of the first trimester remains fairly high (approximately 25%).
1. What is the appropriate management of a patient who has multiple gallbladder polyps less than 5 mm in size?
   A. No further treatment or evaluation
   B. Follow-up ultrasound in 6 months
   C. MR cholangiography
   D. Endoscopic ultrasound
   E. Cholecystectomy

   ANSWER: A

Cholesterol polyps are by far the most common type of gallbladder polyp. They are not true neoplasms but rather enlarged papillary fronds filled with lipid laden macrophages and they are attached to the wall via a slender stalk. The stalk is rarely seen so they typically appear as a mass that is adjacent to the wall but barely attached to the wall. This is referred to as the “ball on the wall” sign. There are usually multiple polyps, although it is not uncommon to detect only the largest one sonographically. Cholesterol polyps are usually 5 mm or less in size and only rarely get bigger than 10 mm. They can be distinguished from gallbladder stones by their lack of a shadow and nonmobile nature, and from sludge balls by their lack of mobility. Their small size and multiplicity help to distinguish them from true neoplasms of the gallbladder wall. Other types of gallbladder polyps occur but are less common than cholesterol polyps. These include adenomas, papillomas, leiomyomas, lipomas, and neuromas. These lesions are true neoplasms and are almost always solitary and are usually larger than cholesterol polyps. Larger polyps may have detectable blood flow on color Doppler. Metastatic disease to the gallbladder is very uncommon but can produce multiple polypoid lesions. Melanoma has the greatest tendency to spread to the gallbladder and detection of gallbladder polyps should be viewed with a high level of suspicion in patients with a history of melanoma. Generally there will be other evidence of metastatic disease in the liver, lymph nodes, or elsewhere in the abdomen.

It has been well established that polypoid lesions of the gallbladder wall that are 5 mm or less require no further evaluation or therapy. Lesions that are between 5 and 10 mm should be monitored to ensure their stability, realizing that the yield of follow-up studies will be very low. If small polyps are multiple, they are almost certainly cholesterol polyps and can be ignored. Lesions that are larger than 10 mm should probably be removed because of the possibility of cancer and the low risk of cholecystectomy. It should be recognized that most polyps that are just slightly larger than 10 mm will still be benign, but as polyps enlarge, the risk of malignancy increases progressively.


2. What is the most common sonographic finding in gallbladder cancer?
   A. Diffuse wall thickening
   B. Focal wall thickening
   C. Polypoid intraluminal mass
   D. Polypoid extraluminal mass
   E. Mass obliterating gallbladder lumen

   ANSWER: E

   The most common sonographic appearance for gallbladder cancer is a soft tissue mass centered in the gallbladder fossa that completely or partially obliterates the lumen. Identification of gallstones within the mass can help to confirm that the origin of the mass is the gallbladder rather than adjacent organs. Approximately 15% to 30% of gallbladder cancers appear as focal or diffuse gallbladder wall thickening. In the vast majority of these cases the thickening is irregular, asymmetric, and eccentric. The least common form of gallbladder cancer is a polypoid intraluminal mass. This form is almost always larger than a centimeter (usually much larger). Size is therefore a good way to distinguish cancer from gallbladder polyps.


3. What is the most common sonographic finding in adenomyomatosis?
   A. Diffuse gallbladder wall thickening
   B. Focal gallbladder wall thickening
   C. Comet tail artifacts
   D. Focal mass in the gallbladder fundus
   E. Rokitansky Aschoff sinuses

   ANSWER: C
Adenomyomatosis is a form of hyperplastic cholecystoses. The etiology is unknown. Pathologically, adenomyomatosis is characterized by mucosal hyperplasia and thickening of the muscular layer of the gallbladder. Mucosal herniations into the muscular layer are called Rokitansky-Aschoff sinuses and they frequently contain cholesterol crystals. Adenomyomatosis is unrelated to gallstones and occurs equally in men and women. Sonographically, the cholesterol crystals deposited in the Rokitansky-Aschoff sinuses result in bright reflections and short comet-tail artifacts arising from the gallbladder wall. The comet-tail artifact is the most common and obvious finding in most cases of adenomyomatosis and is almost exclusively seen along the near wall of the gallbladder. This does not reflect focal disease, but instead occurs because the artifact is only visible when it is displayed in the anechoic background of intraluminal bile behind the near wall, and not visible in the echogenic background of the tissues deep to the back wall. Rarely, large Rokitansky-Aschoff sinuses will be resolved as cystic or hypoechoic spaces in the gallbladder wall. Adenomyomatosis may also appear as diffuse wall thickening, focal segmental annular thickening, or a localized mass. In many cases ultrasound will show such characteristic findings that the diagnosis is unequivocal. However, when the diagnosis of adenomyomatosis is in doubt, MRI can be obtained since it may demonstrate the Rokitansky-Aschoff sinuses and establish the diagnosis more definitively.


