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HIDA Scans for ABR Core Exam Review

All HIDA radiotracers are analogs of what?

Iminodiacetic acid which is very close to lidocaine in chemical structure.

HIDA tracers mimic what physiologic process?

Bilirubin uptake, transport, and secretion.

If a patient has hyperbilirubinemia, what implication does this have for performing a HIDA scan?

You must inject a higher dose of tracer due to competition with the bilirubin for uptake, transport, and secretion.

How lung must a patient fast prior to a HIDA scan?

At least 4 hours but no longer than 24 hours

If a patient has fasted longer than 24 hours what must we do prior to performing a HIDA scan?

Give CCK to cause gallbladder constriction to empty the gallbladder prior to HIDA scan. IF you image without giving CCK the gallbladder is already completely full the HIDA tracer will not be able to enter the gallbladder and you will get non-visualization of the gallbladder on imaging which would give you the false appearance of cystic duct obstruction/acute cholecystitis.

What percentage of patients with acute cholecystitis have cystic duct obstruction?

About 95% of patients with acute cholecystitis have an obstructed cystic duct.

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What is the normal sequence of uptake/excretion that you expect to see on a HIDA scan?

1. Hepatic uptake and blood pool clearance
2. Excretion into biliary ducts
3. Excretion into bowel
4. Excretion into gallbladder *note in some cases you may see gallbladder prior to bowel

The gallbladder normally shows uptake on a HIDA scan within how many minutes?

60 minutes

How many minutes after injection of radiotracer should you typically see hepatic uptake?

5 minutes

What is the rim sign and what does this mean in terms of cholecystitis?

Rim sign looks like a curved are of uptake around the gallbladder fossa due to focal pericholecystic hepatic uptake. This results from reactive hepatic inflammation and hyperemia due to a very inflamed and typically gangrenous gallbladder. On board exams the rim sign suggests that gangrenous cholecystitis is present.

What is the cystic duct sign and what does this mean in terms of cholecystitis?

The cystic duct sign is when you see a small focus “nub” of activity in the proximal cystic duct with no activity distally. This means the cystic duct is obstructed and acute cholecystitis is present.

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Is CCK administration used to evaluate for acute cholecystitis, chronic cholecystitis, or both?

CCK administration is used to evaluate for chronic cholecystitis. CCK is not part of an acute cholecystitis evaluation. You only administer CCK once you see gallbladder filling and the purpose of it is to cause gallbladder constriction and emptying so you can calculate a gallbladder ejection fraction.

What are manifestations of chronic cholecystitis on a HIDA scan?

1. Delayed filling of the gallbladder with no filling at 1 hour but fills by 4 hours
2. Gallbladder ejection fraction < 30% following CCK administration

What is the dose of CCK that is administered for a HIDA scan?

0.02 MICROgrams/kg over 1 hour

When morphine is used during a HIDA scan, what is the dose administered?

0.02 to 0.04 MILLIgrams/kg over 30-60 minutes.

*note MICROgrams of CCK and MILLIgrams of morphine

What does it mean if you see the liver on a HIDA scan but you do not see the biliary tree?

Lack of visualization of the biliary tree has been named the “liver scan sign” and this is an indication of acute obstruction of the common bile duct.

What do you look for to identify that there is persistent blood pool activity on a HIDA scan?

Persistent cardiac activity during the initial 60 minutes of imaging is a top sign of persistent blood pool activity. Always check for cardiac activity on HIDA scans to evaluate for this.

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What does it mean on a HIDA scan if you have persistent blood pool activity with some liver uptake but no bowel activity?

This is a sign of hepatitis and hepatic dysfunction

*If you have no bowel activity but persistent blood pool this is hepatitis/hepatic dysfunction

*If you have no bowel activity but blood pool clears normally this is common bile duct obstruction

How long must you wait on a HIDA scan to see gallbladder activity before you call acute cholecystitis?

4 hours

What if you don't want to wait 4 hours, is there anything you can do to speed this up?

Give morphine to promote gallbladder visualization

What is the mechanism whereby morphine augments gallbladder visualization on a HIDA can?

Morphine constricts the sphincter of oddi which then increases backpressure in the biliary tree to promote gallbladder filling

What opioid does not constrict the sphincter of oddi?

Demerol (meperedine)

After how many minutes is morphine typically administered for a HIDA scan?

You can administer morphine after 30-60 minutes if the gallbladder is not visualized. You then need to image at least 30 more minutes before you would call gallbladder non-visualization and acute cholecystitis. Note an expeditesdprotocol has been proposed whereby you give morphine at the time of initial radiotracer injection but I don't think the boards are likely to ask about this.

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Is there anything else you may consider administering along with morphine if you are performing morphine-augmented imaging?

A booster of radiotracer (50% of the original dose) can optionally be given at time of morphine to make sure that you have enough tracer in the liver for biliary secretion and gallbladder visualization. A potential false negative scan for acute cholecystitis can happen if, when you give morphine, there is no longer sufficient tracer in the liver to subsequently fill the gallbladder.

Can you perform a HIDA scan for acute cholecystitis on a patient who is already on morphine? If so, how will the presence of morphine affect your imaging?

Yes, you can scan if a patient is already on morphine. This does not limit the ability to see gallbladder filling to evaluate for acute cholecystitis. Due to increased sphincter of oddi constriction this may delay transit of tracer into the bowel. Therefore, some say you should wait 4 hours for the morphine to wear off but this is not required but optional.

What are some patient contraindications to give morphine for a HIDA scan?

Increased intracranial pressure in children, severe respiratory depression in a nonventilated patient, allergy to morphine are absolute contraindications. Acute pancreatitis is a relative contraindication as increasing the sphincter of oddi pressure can make the pancreaitits worse.

What does it mean if you have prompt hepatic uptake with delayed excretion into the biliary system? What can cause this?

This means there is no hepatic dysfunction so this is less likely to be due to acute common bile duct obstruction as that does cause some hepatic dysfunction which would manifest with delayed hepatic uptake and delayed biliary secretion. Potential causes of prompt hepatic uptake but delayed biliary excretion are medications to include Dilantin and oral contraceptives.

If sincalide is unavailable, what else can you do to get the gallbladder to contract for ejection fraction calculation?

Give the patient a fatty meal to stimulate gallbladder contraction, then image.

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What is a potential indication for hepatobiliary scintigraphy in a newborn?

Evaluation of biliary atresia versus neonatal hepatitis

How do you tell between biliary atresia and neonatal hepatitis on a HIDA scan?

If you see transit of radiotracer into the bowel this is neonatal hepatitis because you must have a biliary system in order to see transit to the bowel. Biliary atresia will not show bowel activity.

How long do you wait to see bowel activity before you consider the possibility that biliary atresia is present?

AT LEAST 24 hours.

If you don't see bowel activity at 24 hours what is the next step?

Give phenobarbital to supercharge the hepatocytes ability to uptake and excrete the radiotracer and repeat the study. If you still don't see bowel activity after 24 hours then this supports biliary atresia.

What is the name of the surgical procedure used to correct neonatal biliary atresia?

Kasai procedure. You have better outcomes when the Kasai procedure is performed earlier versus later so prompt diagnosis of biliary atresia is important.

What is an indication to perform a HIDA scan in a patient who has had a cholecystectomy?

Evaluation of bile leak. You inject, watch tracer uptake and transit through the liver into the biliary tree and look in the gallbladder fossa, right paracolic gutter, and pelvis for activity to show the bile leak.

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What is the reappearing liver sign and what does this sign mean?

The reappearing liver happens when leaked radiotracer from a bile leak tracks superiorly into the perihepatic space and coats along the surface of the liver giving the appearance that the liver is reappearing instead of washing out like normal. You see an initial decrease in liver activity, followed by a paradoxical increase in activity which is due to tracer AROUND the liver instead of tracer within the liver. This confirms a bile leak.

Focal liver uptake on a HIDA scan is most indicative of which liver lesion?

Focal nodular hyperplasia. Uptake in a liver lesion should make you think of focal nodular hyperplasia for board examinations. This is often most evident on washout images of the liver.