Society of Interventional Radiology
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SURVIVAL GUIDE SERIES

GI/GU/REPRO SERVICE LINE

THE ESSENTIALS OF GI/GU/REPRO PROCEDURES

Brought to you by:

Procedural Education Committee of the GI/GU/REPRO Service Line- Resident and Fellow Section, Society of Interventional Radiology

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ULTRASOUND-GUIDED, COMPUTERIZED TOMOGRAPHY-GUIDED, AND TRANSJUGULAR LIVER BIOPSIES

INDICATIONS[1]

1. Non-focal liver biopsy:
    - A. Diagnosis, grading, and/or staging of:
        - i. Alcoholic liver disease
        - ii. Nonalcoholic steatohepatitis (NASH)
        - iii. Autoimmune hepatitis
        - iv. Chronic hepatitis B and C
        - v. Hemochromatosis (quantitative estimation of hepatic iron)
        - vi. Wilson disease (quantitative hepatic copper)
        - vii. Cholestatic liver secondary to primary biliary cholangitis or primary sclerosing cholangitis
        - viii. Abnormal liver functions tests in a patient with a negative or inconclusive serologic work-up.
    - B. Evaluation for treatment efficacy or drug side effects (i.e. methotrexate for rheumatoid arthritis).
    - C. Liver transplant: post-transplant per protocol or for evaluation of abnormal liver biochemical tests, donor liver, or fever of unknown origin.
    - D. Prior to other organ transplant to exclude cirrhosis
2. Focal liver biopsy performed for diagnosis or staging of malignancy
3. Ultrasound-guided liver biopsy:
    - A. Non-focal liver biopsy routine
    - B. Focal liver biopsy if the lesions is able to be visualized with ultrasound
4. CT-guided liver biopsy
    - A. Anatomy not suitable for Ultrasound guided non-focal liver biopsy
    - B. Lesions unable to be visualized on ultrasound
    - C. Patient body habitus not suitable to ultrasound
5. Transjugular liver biopsy:
    - A. Hepatic and portal pressures needed for diagnosis of portal hypertension
    - B. Coagulopathy or thrombocytopenia
    - C. Ascites

ABSOLUTE CONTRAINDICATIONS[2]

1. Inability of patient to cooperate with procedure.
2. Significant coagulopathy or thrombocytopenia for percutaneous liver biopsy (unless corrected prior to procedure, or performing transjugular approach).
    - A. INR>1.5
    - B. Platelets<50,000
3. Ascites for percutaneous liver biopsy
4. Inability to identify an adequate biopsy site by imaging or inability to catheterize the hepatic veins

RELATIVE CONTRAINDICATIONS

5. NSAID use (including aspirin) within last 7 to 10 days.
6. Patient refusal to accept blood transfusion or inability to provide blood transfusion support.
7. Suspected hemangioma, vascular tumor, or echinococcal cyst.
8. Dilated biliary tree.
9. Anticoagulation

PEROPERATIVE PREPARATION[1,2]

1. Evaluate patient records, history, physical exam, and prior imaging to determine the feasibility of percutaneous and/or transjugular biopsy and to screen all patients for bleeding diatheses.
    A. If screening is negative, the following laboratory tests are needed:
        i. CBC
        ii. PTT (<1.5 * control)
        iii. Platelets (>100,000/mL)
        iv. INR
    B. If screening is positive, the following laboratory tests are needed and may need to be corrected prior to the procedure:
        i. CBC
        ii. PT (<15 seconds)
        iii. INR (<1.5)
        iv. PTT (<1.5 * control)
        v. Bleeding time
        vi. Platelets (>100,000/mL)
2. All patients should be NPO 6 hours prior to the procedures excluding medications.
3. All patients should have a large-bore IV line placed.
4. Evaluate for sedation risks to determine if the procedure can safely be done with moderate sedation
5. Position the patient comfortably while maintaining access to needle entry site, this sometimes requires propping the patient's right side up with towels or a wedge.
6. Image prior to prepping the patient to evaluate for sufficient window
    A. Right upper quadrant ultrasound for ultrasound guided biopsy
    B. Scout CT for CT guided biopsy
    C. Internal jugular vein to ensure patency prior to transjugular biopsy
7. Sterilize the overlying skin with iodinated scrub, alcohol, and/or chlorhexidine wash.
8. Place sterile drapes and towels around field.
9. All operators present require comply with sterile technique: perform sterile scrub or Avaguard, wear sterile gloves, gown, mask, eye protection, and cap..
10. Additional technique-specific considerations
    A. Ultrasound-guided liver biopsy
        i. A preliminary US scan is performed to identify the target and a safe trajectory
        ii. Breathing instructions should be practiced with the patient prior to the procedure if deemed necessary.
    B. CT-guided liver biopsy
        i. Perform a full CT examination of the lesion and surrounding region in the biopsy position to confirm lesion position and plan.
        ii. Place a localizing marker grid over the lesion location before performing the control CT.
        iii. After performing the control CT, determine angle, distance, and identify structures in the projected path of the biopsy needle.
    C. Transjugular Liver Biopsy
        i. Ensure patency of the internal jugular vein (preferably the right)
        ii. Set up pressure measurement device

CONSENT

1. Discuss possible complications/risks including:
    A. Local anesthesia
    B. Moderate sedation

a. If general anesthesia or an anesthesia service is being used to provide procedural sedation the anesthesia team should evaluate the patient prior to the procedure consent for possible anesthesia related complications.

C. Allergic reactions to contrast
    a. If performing via a transjugular approach or using contrast enhanced CT
D. Entry site hematoma
E. Bleeding
    a. Including the risk for bleed requiring further intervention such as angiogram and embolization or surgery
F. Use of hemostatic device and possible allergic reaction
    a. Gelfoam, EtOH, or Onyx
G. Infection or sepsis
    a. Patients with an incompetent sphincter of Oddi are at higher risk due to chronic biliary colonization
H. Damage to adjacent organs
I. Pneumothorax
J. Bile leak and peritonitis
K. Arrhythmias
L. Tumor cell seeding in the needle tract
M. Other risks as appropriate

PROCEDURE[1,2]

1. General principles
    A. If the patient has the capacity and is needed instruct him/her to suspend respiration while the needle is placed and/or advanced.
    B. Choose the shortest path possible while avoiding vital structures including the lung, pleura, gallbladder, pancreas, and dilated biliary and/or pancreatic ducts.
        i. When performing a lesion biopsy, need to cross normal liver parenchyma before entering the lesion
    C. Minimize the number of needle placements to obtain diagnostic tissue.
        i. Important to get enough tissue to be diagnostic so the procedure does not have to be repeated
2. Ultrasound-guided liver biopsy
    A. Demonstrate safe approach to either the lesion or liver parenchyma. The right lobe is often preferred for non-focal biopsies.
    B. Liberally anesthetize the skin and subcutaneous tissue using local 1% lidocaine under continuous ultrasound guidance
        i. If possible make sure to anesthetize the liver capsule
    C. Advanced a 17-gauge coaxial needle into the liver parenchyma or lesion under continuous ultrasound guidance.
        i. Try to puncture the liver capsule only once and adjust trajectory prior to entering the liver
    D. Advance the coaxial needle into the lesion of performing a focal liver biopsy or into the liver parenchyma
    E. Remove the inner stylet and advance the 18-gauge biopsy device co-axially through the 17-gauge guiding needle
    F. Obtain 2-3 core tissue samples, place specimens in formalin, and send to pathology.
        i. If performing a focal liver biopsy consider having a cytology technologist present and perform touch preps to confirm correct location and adequate sample for diagnosis.

G. If infection is being considered, obtain a sample for culture and microbiology.
H. Perform color Doppler ultrasound to evaluate for any bleeding
I. Consider tract embolization (often done prophylactically even with no evidence of bleeding)
    i. Gelfoam pledgets
    ii. Onyx
    iii. For tumors consider tract embolization with EtOH to decrease chance of tract seeding and bleeding complications
J. Remove the biopsy trocar.
K. Repeat the ultrasound to evaluate for hematoma formation. Use color Doppler to look for the flow in the biopsy tract
L. Use pressure to achieve hemostasis and apply sterile dressing to entry site.

3. CT-guided liver biopsy[3]
    A. Procedure is performed very similar to ultrasound guided liver biopsy with the exception of the fact that CT is used for imaging
    B. Obtain a scout image and mark the skin using a grid
    C. After anesthetizing the skin and subcutaneous tissues with 1% lidocaine introduce the 17-gauge coaxial biopsy needle.
    D. Use either intermittent CT or CT fluoroscopy to adjust needle trajectory and advance slowly until in the desired location
4. Transjugular liver biopsy
    A. Under ultrasound guidance liberally anesthetize the skin and subcutaneous tissue using local 1% lidocaine around access site.
    B. Make a 3-5 mm superficial skin incision with a #11 scalpel blade.
    C. Under sonographic observation, use a micropuncture needle to gain access to the right internal jugular vein.
    D. Advance a wire centrally and exchange the needle for the micropuncture sheath using Seldinger technique
    E. Remover the inner dilator and wire and advance a 0.035 wire through the outer sheath into the IVC under fluoroscopic guidance
    F. Remove the outer dilator and dilate the access to 10 French
    G. Place a 10 French Sheath over the wire with the tip terminating in the right atrium
    H. Obtain a pressure measurement through the sheath
    I. Leaving the 0.035 wire in the IVC as a safety wire place a MPA catheter and 0.035 glide wire adjacent through the sheath
    J. Use the MPA and 0.035 glide wire to select the right hepatic vein
    K. Advance the MPA catheter into the right hepatic vein
    L. Remove the wire and inject contrast to confirm positioning and flow within the hepatic vein
    M. Rotate the II 90 degrees to perform a lateral projection – this will confirm position within the right hepatic vein (it should course posteriorly)
    N. The free hepatic pressure should then be obtained and recorded
    O. The MPA catheter can then be wedged into the liver parenchyma with a gently injection of contrast confirming and a wedged pressure obtained
        i. Alternatively the MPA can be exchanged over the wire for a balloon occlusion catheter to perform the free and wedged hepatic pressures
    P. Through the catheter advance a stiff 0.035 wire such as an Amplatz or Rosen
    Q. Remove the catheter and advance the 10 French sheath over the wire with the aid of the inner dilator.
    R. Advance the biopsy set over the wire.
    S. Remove the wire and exchange for the biopsy needle

T. Obtain 3-4 core biopsies each time turning the biopsy device anteriorly (arrow towards 12 o'clock)
U. Remove the biopsy device and sheath
V. Obtain hemostasis with manual pressure at the right internal jugular vein access site

POST-OPERATIVE CARE[1]

1. Most major complications are clinically evident within 2 hours post procedure[4,5]
   A. Vital signs are monitored every 15 minutes for 1 hour, every 30 minutes for the next 2 hours, and every 2 hours after that until the patient is deemed ready for discharge.
2. If the patient experiences minor pain, Tylenol is recommended if the patient can take Tylenol due to intrinsic liver function. Narcotic pain medications can be ordered as needed by the patient.
   a. NSAIDS should be avoided given the blood thinning quality
3. Consider obtaining an expiratory chest X-ray to rule out pneumothorax if the biopsy route was in close proximity or through the pleural space.
4. A clear liquid diet and bed rest is recommended in the first hour. Subsequently, diet and activity can be advanced as tolerated.
5. The patient is advised not to lift heavy weights or participate in strenuous physical activity for 48 hours post procedure.
6. Patient is instructed to keep the access site covered, clean, and dry for 24 hours post procedure.

POSSIBLE EARLY COMPLICATIONS

1. Access site complications in transjugular liver biopsy: eg. Hematoma, accidental carotid puncture, etc.
2. Pneumothorax (depends on access path)
3. Biliary injury or bile peritonitis usually presents early and may be recognized during the procedure.
4. Major hemorrhage usually presents acutely.
5. Sepsis usually occurs within hours of procedure

POSSIBLE LATE COMPLICATIONS

1. AV fistula formation
2. Infection
3. Biliary sepsis
4. Hemorrhage
5. Needle-tract tumor seeding (extremely rare)

FOLLOW UP

1. No routine follow-up is recommended.

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