

Page 118: Thoracentesis

Clinical Scenario

A 65-year-old male patient presents with progressive dyspnea for one week. Physical examination reveals diminished breath sounds and dullness to percussion on the right side. Chest X-ray confirms a large right-sided pleural effusion. Thoracentesis is required for diagnostic and therapeutic purposes.

Requirements

Perform a **thoracentesis** on the patient (medical simulator or model).

Scoring Criteria

(Any violation of aseptic principles deducts 2 points per instance, up to the total score.)

Total: 20 points

I. Procedure**

(1) Preoperative Preparation

1. **Wear a cap and mask** (hair and nostrils covered). *(0.5 points)*
2. **Position the patient**: Seated upright, arms resting on a support, fully exposing the back. *(1 point)*
3. **Confirm the puncture site**:
 - Percuss to locate the effusion (usually at the **7th–9th intercostal space, mid-scapular or posterior axillary line**). *(1 point)*
 - Mark the site with a sterile pen. *(0.5 points)*
4. **Sterilize the area**:
 - Use **iodine solution** (or chlorhexidine) to disinfect the skin in concentric circles (3 times). *(1 point)*
 - Cover with a sterile drape. *(0.5 points)*

(2) Anesthesia and Puncture

1. **Administer local anesthesia**:
 - Use **2% lidocaine** to infiltrate the skin, subcutaneous tissue, and pleura. *(1 point)*
 - Aspirate to confirm no blood return before injecting. *(1 point)*
2. **Perform the thoracentesis**:
 - Insert the **thoracentesis needle** (with a three-way stopcock or syringe) along the **upper edge of the rib** (to avoid neurovascular bundles). *(2 points)*
 - Advance slowly while aspirating until pleural fluid is obtained. *(1 point)*
3. **Control fluid drainage**:
 - For **diagnostic purposes**, collect **50–100 mL** in sterile tubes. *(1 point)*

- For **therapeutic drainage**, remove no more than **1000–1500 mL** at once to avoid re-expansion pulmonary edema. *(1 point)*

(3) Post-Procedure Care

1. Withdraw the needle and apply a **sterile dressing**. *(0.5 points)*
2. Send samples for **biochemical, cytological, and microbiological tests**. *(1 point)*
3. Monitor the patient for complications (e.g., pneumothorax, bleeding). *(0.5 points)*

(4) Questions

1. **What are the contraindications for thoracentesis?** *(1 point)*
- **Answer**: Bleeding disorders, anticoagulant use, skin infection at the site, small/uniloculated effusion, or hemodynamic instability.
2. **How do you confirm the needle is in the pleural space?** *(1 point)*
- **Answer**: Aspiration of pleural fluid or manometry showing negative pressure.

II. Medical Professionalism

1. **Communication**: Explain the procedure to the patient, obtain consent, and address concerns. *(1 point)*
2. **Aseptic technique**: Maintain sterility throughout. *(1 point)*
3. **Patient safety**: Monitor vital signs and post-procedure complications. *(1 point)*

(Note: Deductions apply for unsafe practices or omitted steps.)

Key Points:

- **Avoid the neurovascular bundle** (run along the lower rib).
- **Limit drainage volume** to prevent complications.
- **Always confirm needle placement** before fluid withdrawal.

Page 120: Paracentesis

Clinical Scenario

A 58-year-old male with a history of cirrhosis presents with worsening abdominal distension and discomfort. Physical examination reveals shifting dullness and a fluid wave, confirming **ascites**. Diagnostic/therapeutic paracentesis is indicated.

Requirements

Perform a **paracentesis** on the patient (medical simulator or model).

Scoring Criteria

(Any violation of aseptic principles deducts 2 points per instance, up to the total score.)

Total: 20 points

I. Procedure

(1) Preoperative Preparation

1. **Wear a cap and mask** (hair and nostrils covered). *(0.5 points)*
2. **Position the patient**: Supine, slightly tilted to the side if needed. *(0.5 points)*
3. **Confirm the puncture site**:
 - **Preferred site**: **Left lower quadrant**, 2–3 cm medial and superior to the anterior superior iliac spine (ASIS), avoiding scars and collateral vessels. *(1 point)*
 - Alternative: **Midline**, 2 cm below the umbilicus (if no prior surgery). *(0.5 points)*
 - Percuss to confirm fluid. Mark the site with a sterile pen. *(0.5 points)*
4. **Sterilize the area**:
 - Use **iodine or chlorhexidine** in concentric circles (3 times). *(1 point)*
 - Cover with a sterile drape. *(0.5 points)*

(2) Anesthesia and Puncture

1. **Administer local anesthesia**:
 - Infiltrate **1% lidocaine** into the skin, subcutaneous tissue, and peritoneum. Aspirate to confirm no blood return. *(1 point)*
2. **Perform the paracentesis**:
 - Insert the **paracentesis needle** (or catheter-over-needle) at a **45–90° angle** to the skin. *(1 point)*
 - Advance slowly while aspirating until ascitic fluid flows. *(1 point)*
3. **Fluid collection**:
 - For **diagnostic purposes**: Collect **20–50 mL** in sterile tubes (for albumin, cell count, culture, etc.). *(1 point)*
 - For **therapeutic drainage**: Use a vacuum bottle or gravity drainage. **Limit to 4–6 L/day** to avoid hypotension. *(1 point)*

(3) Post-Procedure Care

1. Withdraw the needle and apply a **sterile dressing**. *(0.5 points)*
2. Send samples for **SAAG (serum-ascites albumin gradient)**, cell count, culture, and cytology. *(1 point)*
3. Monitor for complications (e.g., bleeding, infection, hypotension). *(0.5 points)*

(4) Questions

1. **What is the most common complication of paracentesis?** *(1 point)*
 - **Answer**: Persistent leakage of ascitic fluid (managed with a suture or pressure dressing).
2. **How do you interpret a SAAG ≥ 1.1 g/dL?** *(1 point)*

- **Answer**: Indicates **portal hypertension** (e.g., cirrhosis, heart failure).

II. Medical Professionalism*

1. **Communication**: Explain risks/benefits, obtain consent, and reassure the patient. *(1 point)*
2. **Aseptic technique**: Strict sterility to prevent infection. *(1 point)*
3. **Patient safety**: Monitor vitals and post-procedure complications. *(1 point)*

(Note: Deduct points for unsafe practices, e.g., excessive drainage or poor sterility.)

Key Points:

- **Avoid abdominal scars/collaterals** to reduce bleeding risk.
- **Slow drainage** for large-volume taps to prevent circulatory dysfunction.
- **SAAG** helps differentiate causes of ascites (portal vs. non-portal hypertension).

Here's a simple way to explain paracentesis to the patient:

"We need to remove some fluid from your belly to help you feel better and find out why it's there. Here's what will happen:"

1. I'll clean your skin and numb the area so it won't hurt much.
2. A thin needle will gently drain the fluid.
3. You might feel pressure, but tell me if you feel pain.

Risks are small but include:

- Minor bleeding or infection (we use clean tools to avoid this).
- Rarely, dizziness if we remove too much fluid (we'll go slowly).

Benefits:

- Less belly tightness and discomfort.
- Helps us choose the right treatment.

"Do you have questions? I'll guide you through it."

(Key: Keep it clear, calm, and check for understanding.)

Page 122: Lumbar Puncture (Spinal Tap)

Clinical Scenario

A 30-year-old female presents with severe headache, fever, and neck stiffness. Meningitis is suspected, and a **lumbar puncture** is required for cerebrospinal fluid (CSF) analysis.

Requirements

Perform a **lumbar puncture** on the patient (medical simulator or model).

Scoring Criteria

(Any violation of aseptic principles deducts 2 points per instance, up to the total score.)

Total: 20 points

I. Procedure

(1) Preoperative Preparation

1. **Wear a cap, mask, and sterile gloves** (hair and nostrils covered). *(0.5 points)*
2. **Position the patient**:
 - **Lateral decubitus**: Curled in a fetal position (back arched, knees to chest). *(1 point)*
 - **Sitting**: Leaning forward over a bedside table (alternative for obese patients). *(0.5 points)*
3. **Locate the puncture site**:
 - **L3–L4 or L4–L5** interspace (at eye level with the iliac crests). *(1 point)*
 - Mark the site with a sterile pen. *(0.5 points)*
4. **Sterilize the area**:
 - Use **iodine or chlorhexidine** in concentric circles (3 times). *(1 point)*
 - Cover with a sterile drape. *(0.5 points)*

(2) Anesthesia and Puncture

1. **Administer local anesthesia**:
 - Infiltrate **1–2% lidocaine** into the skin and subcutaneous tissue. *(1 point)*
2. **Insert the spinal needle**:
 - Use a **22G Quincke or atraumatic needle**. *(0.5 points)*
 - Advance midline with the **bevel parallel to spinal fibers** (reduces post-LP headache). *(1 point)*
 - A "pop" sensation indicates entry into the **subarachnoid space**. *(1 point)*
3. **Measure opening pressure** (if needed):
 - Connect a manometer to the needle. Normal: **5–20 cm H₂O**. *(1 point)*

(3) CSF Collection

1. Collect **1–2 mL per tube** in 3–4 sterile tubes:

- **Tube 1**: Cell count/differential.
- **Tube 2**: Glucose/protein.
- **Tube 3**: Microbiology (Gram stain, culture).
- **Tube 4**: PCR (if viral meningitis suspected). *(2 points)*

2. **Remove the needle** and apply a sterile dressing. *(0.5 points)*

(4) Post-Procedure Care

1. Have the patient **lie flat for 1–2 hours** to reduce headache risk. *(0.5 points)*
2. Monitor for complications (e.g., headache, infection, herniation). *(0.5 points)*

(5) Questions

1. **What are contraindications for lumbar puncture?** *(1 point)*
 - **Answer**: Increased ICP (e.g., papilledema, mass lesion), bleeding disorders, or infection at the puncture site.
2. **How do you distinguish traumatic tap from subarachnoid hemorrhage?** *(1 point)*
 - **Answer**: Traumatic tap shows **decreasing RBCs** in sequential tubes; SAH has **uniformly bloody CSF** and xanthochromia.

II. Medical Professionalism

1. **Communication**:
 - *Simple explanation*:
"This test helps find the cause of your symptoms. I'll numb your back, then use a thin needle to collect fluid. You'll feel pressure, but it's quick. Stay still, and afterward, rest flat to prevent a headache." *(1 point)*
2. **Aseptic technique**: Strict sterility to prevent infection. *(1 point)*
3. **Patient safety**: Avoid 穿刺 at high-risk levels (e.g., above L2–L3). *(1 point)*

Key Points:

- **Landmark carefully**: Iliac crests → L4 spinous process.
- **Needle bevel alignment** reduces post-dural headache.
- **Prioritize tubes** for lab tests (cell count first).

Page 123: Bone Marrow Aspiration and Biopsy

Clinical Scenario

A 45-year-old male presents with unexplained pancytopenia and fatigue. A **bone marrow examination** is required to evaluate for hematologic disorders (e.g., leukemia, myelodysplasia).

Requirements

Perform a **bone marrow aspiration and biopsy** on the patient (medical simulator or model).

Scoring Criteria

(Any violation of aseptic principles deducts 2 points per instance, up to the total score.)

Total: 20 points

I. Procedure

(1) Preoperative Preparation

1. **Wear cap, mask, sterile gloves, and gown** (full aseptic technique). *(0.5 points)*
2. **Position the patient**:
 - **Posterior iliac crest** (most common site): Prone or lateral decubitus. *(1 point)*
 - Alternative: **Anterior iliac crest** or sternum (only for aspiration in adults). *(0.5 points)*
3. **Locate the puncture site**:
 - Palpate the **posterior superior iliac spine (PSIS)**. *(1 point)*
 - Mark the site with a sterile pen. *(0.5 points)*
4. **Sterilize the area**:
 - Use **chlorhexidine/iodine** in concentric circles (3 times). *(1 point)*
 - Cover with a sterile drape. *(0.5 points)*

(2) Anesthesia and Puncture

1. **Administer local anesthesia**:
 - Infiltrate **1–2% lidocaine** into skin, subcutaneous tissue, and periosteum. *(1 point)*
2. **Bone marrow aspiration**:
 - Insert the **aspiration needle** (e.g., Jamshidi) with a **twisting motion** until it "gives way" into the marrow cavity. *(1.5 points)*
 - Remove the stylet, attach a **20 mL syringe**, and aspirate **0.5–2 mL** of marrow (patient may feel brief pain). *(1 point)*
3. **Bone marrow biopsy** (if needed):
 - Redirect the needle slightly, advance further, and rotate to core a **1–2 cm** specimen. *(1.5 points)*

(3) Specimen Handling

1. **Aspirate**:
 - Immediately place drops on glass slides for smears. *(1 point)*
 - Transfer remaining aspirate to EDTA tubes for flow cytometry/genetics. *(0.5 points)*
2. **Biopsy**:
 - Fix the core in **formalin** for histopathology. *(0.5 points)*

****(4) Post-Procedure Care****

1. Apply **pressure for 5–10 minutes** to prevent hematoma. ***(0.5 points)***
2. Cover with a sterile dressing. ***(0.5 points)***
3. Monitor for bleeding/infection. ***(0.5 points)***

****(5) Questions****

1. **Why is the posterior iliac crest the preferred site?** ***(1 point)***
- **Answer**: Thick cortical bone reduces risk of perforation; minimal vital structures nearby.
2. **What if you get a "dry tap"?** ***(1 point)***
- **Answer**: Suggestive of fibrosis or packed marrow (e.g., myelofibrosis); proceed to biopsy.

II. Medical Professionalism**

1. **Communication**:
- **Simple explanation**:
* "I'll numb your hip bone, then take a small sample of marrow to check your blood cells. You'll feel pressure and a quick sting during the aspiration. Afterward, we'll apply a bandage, and you'll rest for 10 minutes." ***(1 point)***
2. **Aseptic technique**: Strict sterility to prevent osteomyelitis. ***(1 point)***
3. **Patient safety**: Avoid sternal puncture in children or patients with osteoporosis. ***(1 point)***

****Key Points**:**

- **Aspirate first** before biopsy (blood dilutes the sample if done after).
- **Slide smears must be made immediately** to prevent clotting.
- **Dry tap?** Always attempt biopsy for fibrosis/clotting evaluation.
