

STANDARDIZED PROCEDURE FOR THORACENTESIS

I. Definition

A thoracentesis is a surgical puncture of the chest wall to aspirate fluid or air from the pleural cavity. A pleural effusion is an abnormal accumulation of fluid in the pleural space.

II. Background Information

A. Setting:

X Adults

X Both Inpatient & Outpatient clinical setting

B. Supervision: As delineated in the Standardized Practice Protocol for NP.

C. Indications: To determine the cause of pleural effusion and to remove pleural fluid therapeutically in the event of respiratory distress.

D. Precautions/Contraindications:

Thrombocytopenia, platelets < 20,000

Clotting abnormalities (Prothrombin time (PT), partial thromboplastin time prolongation >1.5 times normal), or anticoagulation therapy

Severe cough or hiccups (uncontrolled)

III. Materials

Sterile gloves,

Prepared thoracentesis tray or:

Stopcock

Blood transfer set

18-20 gauge 2" angiocatheter

4X4 gauze pads, 5 cc syringe with 25- 27 gauge

5/8" needle, & 22 gauge needle

1% lidocaine

Betadine

Hemostat

1 liter evacuated containers

(2) specimen containers

Sterile drapes

IV. Thoracentesis Procedure

A. Pre-treatment evaluation

1. Subjective:
 - a. History of malignancy, pancytopenia, anticoagulant use, pleural effusion.
 - b. Signs and symptoms: Small pleural effusions are usually asymptomatic. Large pleural effusions may cause dyspnea, pleuritic chest pain, and dry cough.
2. Objective:
 - a. Patient evaluation: General appearance, vital signs, fever, pulse oximetry.
 - b. Physical exam: Physical findings are general absent if less than 200-300ml of pleural fluid is present. Findings consistent with the presence of a larger pleural effusion include dullness to percussion, and the decreased whisper or breath sounds. In large pleural effusions that compress the lung, accentuation of breath sounds and egophony may be noted just above the effusion. A pleural friction rub indicates pleuritis. A massive pleural effusion may cause contra-lateral shift of the trachea and bulging of the intercostal spaces.
 - c. Diagnostics: Chest x-ray; PA and lateral. Pleural fluid cause blunting of the costophrenic angles on chest x-ray. Blunting usually indicates that at least 300 ml of fluid is present. If <300 ml fluid is suspected or if the fluid appears to be loculated, a lateral decubitus film is helpful. Thoracentesis generally can be done safely if there is at least 10 mm fluid measurable on a decubitus chest x-ray.

Fluoroscopy or CT scan may be useful before thoracentesis if the fluid collection is < 10 mm thick or not freely moveable on the lateral decubitus x-ray view. Current CBC with platelets and differential, serum LDH, albumin, glucose, PT/PTT, chemistries as clinically indicated.

B. Patient Preparation

1. Explain the purpose, risks/benefits, and steps of the procedure.
 - a. Risks:
 - Pneumothorax, including tension pneumothorax
 - Hemothorax, bleeding
 - Hemorrhage
 - Vasovagal episode
 - Infection (empyema)
 - Unilateral pulmonary edema
 - Laceration of intra-abdominal viscera (puncture of liver or spleen).
 - Subcutaneous emphysema
 - Air embolism
 - Pulmonary laceration

b. Benefits

- Yield information which may be lifesaving or significantly alter treatment
 - Relief of respiratory distress.
2. Obtain consent from the patient or appropriate legal designee.
 3. Check platelet count and/or presence of coagulopathy. Consult with Hematology/Oncology attending physician if platelet count is $< 20,000$, or there is known coagulopathy as to whether platelet transfusion or other intervention is needed prior to thoracentesis.
 4. The patient does not need to restrict food or fluids.
 5. Explain that he/she will receive a local anesthetic to minimize pain during the procedure.
 6. Check patient history for hypersensitivity to the local anesthetic, and betadine.

C. Procedure performed

Procedure performed by a Nurse Practitioner who is currently licensed in the State of California, under the direct or indirect supervision of an attending physician, and who meets the clinical skills outlined below.

1. Position patient in the sitting position with arms and head resting supported on a bedside adjustable table. If unable to sit, the patient should lie at the edge of the bed on the affected side with the ipsilateral arm over the head and the midaxillary line accessible for the insertion of the needle. Elevating the head of the bed to 30 degrees may help.
2. The usual site for insertion of the thoracentesis needle is the posteriolateral aspect of the back over the diaphragm, but under the fluid level. Confirm site by counting the ribs based on chest x-ray and percussing out the fluid level. Mark the top of the dullness by washable ink mark or indenting the skin.
3. Select the thoracentesis site in an interspace below the point of dullness to percussion in the midposterior line (posterior insertion) or midaxillary line (lateral insertion).
4. Sterile technique should be used including gloves, betadine prep and drapes.
5. Anesthetize the skin over the insertion site with 1% lidocaine using the 5 cc syringe with 25 or 27-gauge needle. Next anesthetize the superior surface of the rib and the pleura. The needle is inserted over the top of rib (superior margin) to avoid the intercostals nerves and blood vessels that run on the underside of the rib (the intercostals nerve and the blood supply are located near the inferior margin). As the needle is inserted, aspirate back on the syringe to check for pleural fluid. Once fluid returns, note the depth of the needle and mark it with a hemostat. This gives an approximate depth for insertion of the angiocatheter or thoracentesis needle. Remove the anesthetizing needle.
6. Use a hemostat to measure the same depth on the thoracentesis needle or angiocath as the first needle. While exerting steady pressure on the patient's back with the nondominant hand, use a hemostat to measure the 15- to 18- gauge thoracentesis needle to the same depth as the first needle. While exerting steady pressure on the patient's back with the nondominant hand, insert the needle through the anesthetized area with the thoracentesis needle. Advance the needle until it encounters the superior aspect of the rib. Continue advancing the needle over the top of the rib and through the pleura, maintaining constant gentle suction on the syringe. Make sure you march over the top of the rib to avoid the neurovascular bundle that runs below the rib.
7. Attach the three way stopcock and tubing, and aspirate the amount needed. Turn the stopcock and evacuate the fluid through the tubing.
8. Remove the necessary amount of pleural fluid (usually 100 mL for diagnostic studies), but generally not remove more than 1500 mL of fluid at any one time because of increased risk of pleural edema or hypotension. A pneumothorax from needle laceration of the visceral pleura is more likely to occur if an effusion is completely drained.
9. When draining of fluid is completed, have the patient take a deep breath and hum, and gently remove the needle. This maneuver increases intrathoracic pressure and decreases the chance of pneumothorax. Cover the insertion site with a sterile occlusive dressing.

D. Post Procedure

1. Obtain an upright portable (expiratory) chest x-ray to evaluate the fluid level and to rule out pneumothorax.
2. For specimen handling, fill the tubes with the required amount of pleural fluid. Check that each tube is properly labeled by checking two patient identifiers- full name, date of birth and/or medical record number.
3. Pleural fluid should be sent for appropriate lab tests and may include pH, specific gravity, cell count and differential, protein, LDH, albumin, and glucose, culture and gram stain, acid-fast cultures and smears, fungal cultures and smears, viral culture. If a neoplasm is suspected, send for cytology (generally requires 1 L of fluid in a cytology bottle). Send for amylase if you suspect an effusion is secondary to pancreatitis, and Sudan stain and triglycerides if a chylothorax is suspected.
4. Document the procedure, patient's response, characteristics of fluid and amount, and patient response to follow-up.
5. Provide post-procedural analgesics as needed.

E. Follow-up

Instruct patient to call MD on-call or the clinic for any chest pain, increased cough, shortness of breath, or signs/symptoms of infection.

V. Documentation

Written record reflects: informed consent, patient response, side effects, amount of fluid withdrawn and lab tests sent.

All abnormal findings are reviewed with supervising physician.

VI. Competency Assessment

A. Initial Competence

Under the direct supervision of the attending physician, the Nurse Practitioner will perform the thoracentesis procedure successfully three times and will be evaluated for competence and technical skill. The Nurse Practitioner will demonstrate knowledge of the following:

1. Medical indications and contraindications of thoracentesis
2. Risks and benefits of the procedure.
3. Related anatomy and physiology
4. Consent process
5. Steps in performing the procedure
6. Documentation of the procedure
7. Ability to interpret results and implications in management.

B. Continued proficiency

1. A Nurse Practitioner who is currently licensed in the state of California and who meets the clinical skills as outlined above may perform the thoracentesis procedure. The Nurse Practitioner will demonstrate competence by successful completion of the initial orientation.
2. Each candidate will be initially proctored and signed off by an attending physician. The Nurse Practitioner must perform this procedure at least three times per year. In cases where this minimum is not met, the attending physician must again sign off the procedure for the Nurse Practitioner. The Nurse Practitioner will be signed off by the supervising physician after demonstrating 100% accuracy in completing the procedure.
3. Demonstration of continued competence shall be monitored through the annual evaluation and documentation of successfully performing of successful performing three procedures within the preceding year.