Patient education: Thoracentesis (Beyond the Basics)

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THORACENTESIS OVERVIEW

Thoracentesis is a procedure used to obtain a sample of fluid from the space around the lungs, called the pleural space. This fluid is called pleural fluid and normally exists only as a thin layer in the area between the lungs and chest wall. However, some conditions can cause an increased amount of pleural fluid to collect, called a pleural effusion.

Pleural effusions can be caused by many different conditions, including pneumonia, heart failure, cancer, or tuberculosis. In some cases, blood or other fluid may leak into the pleural space from another part of the body, causing the effusion.

A pleural effusion may be detected during a physical examination or by diagnostic studies that create an image of the chest, such as a chest X-ray, chest computed tomography (CT) scan, or chest ultrasound.

REASONS FOR THORACENTESIS

The main reasons to perform a thoracentesis are to determine the cause of the pleural fluid and to relieve shortness of breath caused by the fluid.

- A **diagnostic** thoracentesis is performed by removing a small sample of pleural fluid (about 2 ounces [60 mL]) to determine the cause of a pleural effusion and to help doctors select the best treatment.

- A **therapeutic** thoracentesis is used to remove a larger volume of pleural fluid (about 20 ounces [600 mL] to 40 ounces [1200 mL]) to relieve symptoms, such as shortness of breath.

By doing laboratory tests on the pleural fluid, the cause of the pleural effusion can usually be determined. Depending on the cause, different treatments may be indicated. For instance, if the pleural fluid is infected, a patient may require insertion of a catheter/collection tube into the pleural space for several days to ensure complete drainage of all infected pleural fluid.

THORACENTESIS PREPARATION

Before a thoracentesis, a chest ultrasound will be done to identify the exact location of the pleural effusion. An ultrasound is preferred because it is more accurate in determining the location of the effusion and the distance from the skin to the fluid collection than a chest X-ray or physical examination.

The doctor will explain the procedure, describe potential complications, and discuss why thoracentesis is necessary. If you have a bleeding disorder or are on medications that affect blood clotting, you may need extra care to minimize the risk of bleeding. Tell your healthcare provider if you have a history of bleeding problems or if you are taking a medicine that decreases blood clotting. In some cases, a blood test will be taken before the procedure to exclude any blood clotting abnormalities caused by disease or medications. Thoracentesis, however, is considered safe for most patients with blood clotting disorders and for those medicated with anticoagulants or antiplatelet agents.

The procedure takes a short time and can be performed at a patient's bedside or in a physician's office.

THORACENTESIS PROCEDURE

During a thoracentesis, your doctor will pass a needle between your ribs into the pleural space, followed by a thin catheter to collect a small sample of the pleural fluid. Examination of the fluid sample can help determine why the fluid developed and what, if anything, should be done to treat it.

A thoracentesis involves the following steps:

- You will be placed in a position that allows the doctor to access the effusion. Usually, you are asked to sit upright during the procedure. It is important to remain still during the procedure so that the fluid does not shift. You should expect the doctor to confirm

with you and the staff that the procedure is being performed on the correct side of your chest.

- Ultrasound guidance is used routinely during the procedure to improve the accuracy and safety of placement of the needle or catheter. In particular, ultrasound is recommended when the fluid is trapped in small pockets around the lung, as small pockets of fluid cannot be localized by physical examination. If ultrasound is not available and thoracentesis must be performed urgently, the doctor will review your chest X-ray and examine the chest closely by listening to the lungs with a stethoscope and tapping on the chest to determine the best area to perform the thoracentesis. Ultrasound guidance, however, is always preferred because of its lower rate of complications.

- After selection of the needle insertion site, the area is cleaned with an antiseptic solution, a small amount of numbing medicine (a local anesthetic, similar to novocaine) is injected with a small needle through the skin and into the deeper tissues between two ribs. This medicine helps minimize discomfort during the procedure.

- For a diagnostic thoracentesis, a thin needle attached to a syringe is inserted where the anesthetic was injected and passed between the ribs into the pleural space where a small sample of fluid is withdrawn.

- For a therapeutic thoracentesis, a slightly larger needle attached to a syringe is inserted where the anesthetic was injected. The needle passes between the ribs into the pleural space, and then a thin plastic tube (called a catheter) is exchanged for the needle. Once the catheter is in place, the needle is removed, and fluid is withdrawn through the catheter into the syringe. If you have been experiencing symptoms from the effusion (eg, shortness of breath), a large amount of fluid may be drained, which allows the lung to expand more fully.

- After the pleural fluid is obtained, the needle or catheter is removed and a small bandage is placed over the site. Your physician will observe you for any symptoms and signs of complications.

THORACENTESIS COMPLICATIONS

In most cases, a thoracentesis is performed without complications. When complications do occur, they are usually minor and resolve on their own or are easily treated.

Patients typically experience the following:

- Pain – There may be some discomfort when the needle is inserted. Using a local anesthetic helps to reduce the pain. Pain generally resolves once the needle is removed.

- Feeling faint – Some people may feel faint or dizzy during or after the procedure. This feeling generally resolves after lying down for a few minutes.

- Chest discomfort – Patients commonly experience chest discomfort, shortness of breath, and cough during or after the procedure. These sensations should resolve quickly.

Other potential complications include the following:

- Bleeding – A blood vessel may be punctured when the needle is inserted through the skin and chest wall, causing bleeding. The bleeding is usually minor and stops on its own, although it may cause bruising around the puncture site. In rare cases, there may be bleeding into or around the lung, requiring drainage of blood collected in the chest by insertion of a catheter or surgery.

- Infection – Infection can develop if bacteria are introduced by the needle puncture. Using disinfectant solution to clean the area and using sterile technique during the procedure minimize this risk making infection a very rare complication.

- Pneumothorax or collapsed lung – Occasionally, the needle used to obtain a fluid sample can puncture the lung. The hole created by the puncture usually seals quickly on its own. If it does not, air can build up around the lung, causing the lung to collapse. This is called a pneumothorax. When a pneumothorax occurs, a chest tube may be used to drain the air from the pleural space and allow the lung to re-expand. A pneumothorax happens in approximately 6 percent of thoracentesis procedures, but in less than 3 percent of procedures when the thoracentesis is performed with the assistance of ultrasound imaging.

  Pneumothoraces that do occur are usually small and resolve on their own. About a third of pneumothoraces become large, continue to expand, or cause shortness of breath. In these patients, a catheter or chest tube is placed through the skin into the pleural space to withdraw the air.

- Liver or spleen puncture – In very rare cases, the liver or spleen may be punctured during thoracentesis. Sitting upright and remaining still during the procedure helps to keep the liver and spleen away from the insertion area and minimizes the risk of this complication. Ultrasound imaging to guide placement of the thoracentesis needle also decreases the risk of these complications.

- Pulmonary edema – Rarely after thoracentesis, a person can experience pulmonary edema, which is the sudden collection of fluid within the lung on the side of the chest where the thoracentesis was performed. Some people may experience shortness of breath or cough, but usually recover quickly. Pulmonary edema tends to occur when a large volume of pleural fluid is removed during a therapeutic thoracentesis.

FOLLOWING THE THORACENTESIS PROCEDURE

After the procedure, the doctor will observe the insertion site for signs of bleeding and assess your breathing for signs of lung collapse (pneumothorax) or other complications. A routine chest X-ray is not necessary for patients who tolerate thoracentesis well. If a pneumothorax is suspected or if the procedure was complicated (multiple needle passes, aspiration of air, difficulty obtaining fluid), a chest X-ray or ultrasound will be obtained. The doctor will examine the fluid, particularly its color and consistency, and will also send the fluid for laboratory tests.

In general, sedating medicines are not used during thoracentesis. If sedating medicines are used, you will need to be observed in the office for a few hours after the procedure, and you will need assistance getting home. Patients should discuss these issues with their physician before the procedure.

WHERE TO GET MORE INFORMATION

Your healthcare provider is the best source of information for questions and concerns related to your medical problem.

This article will be updated as needed on our web site (www.uptodate.com/patients). Related topics for patients, as well as selected articles written for healthcare professionals, are also available. Some of the most relevant are listed below.

Patient level information — UpToDate offers two types of patient education materials.

The Basics — The Basics patient education pieces answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials.

Patient education: Thoracentesis (The Basics)
Patient education: Pleuritic chest pain (The Basics)
Patient education: Pleural effusion (The Basics)
Patient education: How to care for a chest tube or catheter (The Basics)

Beyond the Basics — Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are best for patients who want in-depth information and are comfortable with some medical jargon.

This topic currently has no corresponding Beyond the Basics content.

Professional level information — Professional level articles are designed to keep doctors and other health professionals up-to-date on the latest medical findings. These articles are thorough, long, and complex, and they contain multiple references to the research on which they are based. Professional level articles are best for people who are comfortable with a lot of medical terminology and who want to read the same materials their doctors are reading.

Medical thoracoscopy (pleuroscopy): Equipment, procedure, and complications
Pleural fluid analysis in adults with a pleural effusion
Ultrasound-guided thoracentesis
Imaging of pleural effusions in adults
Management of malignant pleural effusions

The following organizations also provide reliable health information.

- American Thoracic Society

(www.thoracic.org)

- American Lung Association

(www.lung.org/)

- National Heart Lung & Blood Institute

(www.nhlbi.nih.gov/health-topics/thoracentesis)

- National Library of Medicine

(www.nlm.nih.gov/medlineplus/healthtopics.html)

- British Thoracic Society

(https://www.brit-thoracic.org.uk/standards-of-care/guidelines/)

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