



Chest Interventions

What are Chest Interventions?

Chest interventions are minimally invasive procedures used to diagnose and treat pleural effusions, a condition in which there is excess fluid in the pleural space, also called the pleural cavity. This space exists between the outside of the lungs and the inside of the chest wall.

A pleural effusion is caused by several conditions including infection, inflammation, heart failure or cancer. Excess fluid in the pleural space can make it difficult to breathe.

Chest interventions include:

- thoracentesis, in which excess fluid in the pleural space is removed by a needle attached to a syringe and a sample of the fluid is analyzed under a microscope.
- pleurodesis, in which a medication is injected into the pleural space to shrink the cavity and minimize the amount of fluid that can collect there.
- pleural biopsy, in which tissue samples are removed from the pleural membrane, the layer of tissue that lines the pleural cavity, with a hollow needle and analyzed under a microscope.

What are some common uses of the procedure?

Thoracentesis is performed to:

- relieve pressure on the lungs
- treat symptoms such as shortness of breath and pain
- determine the cause of excess fluid in the pleural space.

Pleurodesis is performed to prevent the collection of pleural fluid following thoracentesis.

A pleural biopsy is performed when the cause for excess fluid in the pleural space cannot be determined by thoracentesis. The tissue sample removed from the pleural membrane during a biopsy is further analyzed for evidence of:

- tuberculosis
- cancer cells
- the presence of viral, fungal or parasitic disease.

How should I prepare?

Prior to your procedure, your blood may be tested to determine how well your kidneys are functioning and whether your blood clots normally.

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications, general anesthesia or to contrast materials containing iodine (sometimes referred to as "dye" or "x-ray dye"). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners for a specified period of time before your procedure.

Also inform your doctor about recent illnesses or other medical conditions.

You should tell your physician if you have:

- bleeding problems or take blood thinners, such as aspirin, Lovenox®, Coumadin® or Pradaxa®
- had lung surgery
- lung disease, such as emphysema.

Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the Safety page for more information about pregnancy and x-rays.

You will receive specific instructions on how to prepare, including any changes that need to be made to your regular medication schedule.

You may be asked to remove some or all of your clothes and to wear a gown during the exam. You may also be asked to remove jewelry, eye glasses and any metal objects or clothing that might interfere with the x-ray images.

If sedation is required, you will need to have a relative or friend accompany you and drive you home afterward.

What does the equipment look like?

In these procedures, ultrasound, CT, or x-ray equipment and a biopsy needle may be used.

These procedures are typically performed with ultrasound guidance. Occasionally, CT-guidance will be used.

Ultrasound scanners consist of a console containing a computer and electronics, a video display screen and a transducer that is used to do the scanning. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. Some exams may use different transducers (with different capabilities) during a single exam. The transducer sends out inaudible, high—frequency sound waves into the body and then listens for the returning echoes from the tissues in the body. The

principles are similar to sonar used by boats and submarines.

The ultrasound image is immediately visible on a video display screen that looks like a computer or television monitor. The image is created based on the amplitude (loudness), frequency (pitch) and time it takes for the ultrasound signal to return from the area within the patient that is being examined to the transducer (the device used to examine the patient), as well as the type of body structure and composition of body tissue through which the sound travels. A small amount of gel is put on the skin to allow the sound waves to best travel from the transducer to the examined area within the body and then back again.

The CT scanner is typically a large, box-like machine with a hole, or short tunnel, in the center. You will lie on a narrow examination table that slides into and out of this tunnel. Rotating around you, the x-ray tube and electronic x-ray detectors are located opposite each other in a ring, called a gantry. The computer workstation that processes the imaging information is located in a separate control room, where the technologist operates the scanner and monitors your examination in direct visual contact and usually with the ability to hear and talk to you with the use of a speaker and microphone.

A biopsy needle is generally several inches long and the barrel is about as wide as a large paper clip. The needle is hollow so it can capture the tissue specimen.

One of two instruments will be used:

- A fine needle attached to a syringe or bottle, about the same size as needles used to draw blood.
- A core needle, also called an automatic, spring-loaded needle, which consists of an inner needle connected to a trough, or shallow receptacle, covered by a sheath and attached to a spring-loaded mechanism.

How is the procedure performed?

All chest interventions:

A chest x-ray may be performed before the procedure.

This procedure is often done on an outpatient basis. However, some patients may require admission following the procedure. Please consult with your physician as to whether or not you will be admitted.

You will be positioned on the edge of a chair or bed with your head and arms resting on an examining table.

Your physician will numb the area with a local anesthetic.

The area of your body where the needle is to be inserted will be sterilized and covered with a surgical drape.

Thoracentesis:

The needle is inserted through the skin between two ribs on your back. When the needle reaches the pleural space between the chest wall and lung, the pleural fluid is removed through a syringe or suction bottle.

Thoracentesis is usually completed within 15 minutes.

Pleurodesis:

A pleurodesis procedure is performed following a thoracentesis, usually through a chest tube placed at the time of the thoracentesis.

A medication such as doxycycline is injected into the pleural space, which triggers an inflammatory reaction on the pleural membrane that lines the outside of the lung and the inside of the chest wall. This causes the membranes to stick together, eliminating or reducing the space where excess fluid can collect.

Pleurodesis adds one hour to a thoracentesis procedure.

Pleural Biopsy:

Following the same preparation used for a thoracentesis procedure, a hollow needle is placed through the skin on your back and into the chest cavity. When the needle reaches the chest wall, up to three samples of tissue are removed.

Tissue samples will then be removed using one of two methods.

- In a fine needle aspiration, a fine gauge needle and a syringe withdraw fluid or clusters of cells.
- In a core needle biopsy, the automated mechanism is activated, moving the needle forward and filling the needle trough, or shallow receptacle, with 'cores' of pleural tissue. The outer sheath instantly moves forward to cut the tissue and keep it in the trough. This process is repeated three to six times.

A pleural biopsy is usually completed within 30 minutes.

At the end of the procedure, the needle will be removed and pressure will be applied to stop any bleeding. The opening in the skin is then covered with a dressing. No sutures are needed.

A chest x-ray may be performed after chest interventions to detect any complications.

What will I experience during and after the procedure?

You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected. The arteries have no sensation. Most of the sensation is at the skin incision site which is numbed using local anesthetic.

You will be asked to remain still during the procedure and not to cough or breathe deeply in order to avoid injury to the lung.

You may feel pressure when the needle is inserted into the pleural space.

Thoracentesis:

When the pleural fluid is removed, you may feel a pulling sensation or pressure in your chest. Tell your doctor or nurse if you feel faint or if you have any shortness of breath, chest pain or the need to cough.

Pleurodesis:

The procedure is started the same as a thoracentesis. You will feel more pressure when the chest tube is inserted. Some patients may experience chest pain during and after the introduction of the medication. You will be given pain medicine for this.

Pleural biopsy:

As tissue samples are taken, you may hear clicks. You may also experience a tugging sensation.

You should avoid strenuous activity for 24 hours after returning home, but then usually will be able to resume normal activities.

Who interprets the results and how do I get them?

The interventional radiologist or physician treating you will determine the results of the procedure and will send a report to your referring physician, who will share the results with you.

Your interventional radiologist may recommend a follow-up visit after your procedure or treatment is complete.

The visit may include a physical check-up, imaging procedure(s) and blood or other lab tests. During your follow-up visit, you may discuss with your doctor any changes or side effects you have experienced since your procedure or treatment.

What are the benefits vs. risks?

Benefits

- Thoracentesis is generally a safe procedure.
- No surgical incision is needed.

Risks

- Any procedure where the skin is penetrated carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.

Complications may include:

- pneumothorax or a partial collapse of the lung caused by the needle puncturing the lung allowing air to flow into the pleural space.
- pulmonary edema, which may occur if a large amount of fluid is removed.
- infection and bleeding.
- breathing difficulty.

What are the limitations of thoracentesis?

Chest interventions may not be performed on patients who have an uncorrectable bleeding disorder.

The accuracy of a thoracentesis may be affected by a patient's:

- use of antibiotics.
- inability to remain still.

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