

Vertebroplasty & Kyphoplasty

This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What are Vertebroplasty & Kyphoplasty?

Vertebroplasty and kyphoplasty are minimally invasive procedures for vertebral compression fractures (VCF), which are fractures in vertebra, the small bones that make up the spinal column.

When a vertebra fractures, the usual rectangular shape of the bone becomes compressed and distorted, causing pain. These compression fractures, which may involve the collapse of one or more vertebrae in the spine, are a common symptom and result of osteoporosis.

Osteoporosis is a disease that results in a loss of normal bone density, mass and strength, leading to a condition in which bones are increasingly porous or full of small holes and vulnerable to breaking. Vertebrae can also become weakened by cancer.

In vertebroplasty, physicians use image guidance to inject a special cement mixture through a hollow needle into the fractured bone. In kyphoplasty, a balloon is first inserted through the needle into the fractured bone to restore the height and shape of the vertebra. Once the balloon is removed, the cement mixture is injected.

What are some common uses of the procedures?

Vertebroplasty and kyphoplasty are used to treat pain caused by vertebral compression fractures in the spine.

Typically, vertebroplasty is recommended after simpler treatment, such as bed rest, a back brace or pain medication, have been ineffective, or once medications have begun to cause other problems, such as stomach ulcers. Vertebroplasty can be performed immediately in patients who have severe pain requiring hospitalization or conditions that limit bed rest and medications.

Vertebroplasty is also performed on patients who:

- are too elderly or frail to tolerate open spinal surgery, or who have bones too weak for surgical spinal repair.
- have vertebral damage due to a malignant tumor.
- are younger and have osteoporosis caused by long-term steroid treatment or a metabolic disorder.

Kyphoplasty is performed on patients experiencing painful symptoms or spinal deformities due to vertebral compression fractures resulting from osteoporosis. The procedure should be completed within eight weeks of when the fracture occurs for the highest probability of restoring the spinal bone to its normal height.

How should I prepare?

A clinical evaluation including diagnostic imaging, blood tests, a physical exam, spine x-rays and a radioisotope bone scan or magnetic resonance (MR) imaging will be done to confirm the presence of a compression fracture that is can be treated with vertebroplasty or kyphoplasty.

You may be given bone-strengthening medication during treatment.

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 (also known as “dye” or “x-ray dye”). Your physician may advise you to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or a blood thinner for a specified period of time days before your procedure.

Women should always inform their physician or 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.

On the day of the procedure, you should be able to take your usual medications with sips of water or clear liquid up to three hours before the procedure. You should avoid drinking orange juice, cream and milk.

In most cases, you may take your usual medications, especially blood pressure medications. These may be taken with some water in the morning before your procedure.

You may be instructed not eat or drink anything for several hours before your procedure.

You will need to have blood drawn and tested prior to the procedure to determine if your blood clots normally.

You should plan to have a relative or friend drive you home after your procedure.

You will be given a gown to wear during the procedure.

What does the equipment look like?

In both vertebroplasty and kyphoplasty procedures, x-ray equipment, a hollow needle or tube called a trocar, orthopedic cement, barium powder and a solvent are used.

For kyphoplasty, a device called a balloon tamp is also used.

The equipment typically used for this examination consists of a radiographic table, an x-ray tube and a television-like monitor that is located in the examining room or in a nearby room. When used for viewing images in real time, the image intensifier (which converts x-rays into a video image) is suspended over a table on which the patient lies. When used for taking still pictures, the image is captured either electronically or on film.

The orthopedic cement includes an ingredient called polymethylmethacrylate (PMMA) and resembles toothpaste.

A Foley catheter may be placed in your bladder.

Other equipment used during the procedure includes an intravenous line (IV) and equipment that monitors your heart beat and blood pressure.

How does the procedure work?

Vertebroplasty involves injecting a special cement mixture into the small holes in weakened vertebrae to strengthen the spinal bones making them less likely to fracture again and providing pain relief.

Using image-guidance, a hollow needle called a trocar is passed through the skin into the spinal bone and a cement mixture is then injected into the vertebra.

In kyphoplasty, a balloon is first inserted through the tube and into the fractured vertebra where it is inflated to push the bone back to its normal height and shape. The balloon is then removed and the cement is inserted into the cavity created by the balloon.

How is the procedure performed?

Image-guided, minimally invasive procedures such as vertebroplasty and kyphoplasty are most often performed by a specially trained interventional radiologist in an interventional radiology suite or occasionally in the operating room.

This procedure is often done on an outpatient basis. However, some procedures may require admission. Please consult with your physician.

You will be positioned lying face down for the procedure.

You will be connected to monitors that track your heart rate, blood pressure and pulse during the procedure.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedative medication can be given intravenously. You may also receive general anesthesia.

You may be given medications to prevent nausea and pain and antibiotics to prevent infection.

The area where the hollow needle will be inserted will be shaved, sterilized and covered with a surgical drape.

A local anesthetic will be injected into the muscles near the site of the fracture.

A very small nick is made in the skin at the site.

Using x-ray guidance, a hollow needle called a trocar is passed through the spinal muscles until its tip is precisely positioned within the fractured vertebra. An examination called intraosseous venography may be performed by some interventional radiologists to make sure the needle has reached a safe spot within the fractured bone.

However, most interventional radiologists do not believe in the value of the intraosseous venography and prefer to proceed with vertebroplasty or kyphoplasty directly.

In vertebroplasty, the orthopedic cement is then injected. Medical-grade cement hardens quickly, typically within 20 minutes.

In kyphoplasty, the balloon tamp is first inserted through the needle and inflated, pushing the bone back to its normal height and shape and creating a hole or cavity. The balloon is then removed and the bone cement is injected into the cavity created by the balloon.

Although it is not a common practice, a CT scan may be performed at the end of the procedure to check the distribution of the cement.

The trocar is then removed.

Pressure will be applied to stop any bleeding and the opening in the skin is covered with a bandage. No sutures are needed.

You will remain in the recovery room for an hour following the procedure.

Your intravenous line will be removed.

This procedure is usually completed within one hour. It may take longer if more than one vertebra is being treated.

What will I experience during and after the procedure?

Devices to monitor your heart rate and blood pressure will be attached to your body.

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 intravenous (IV) sedative will make you feel relaxed and sleepy. You may or may not remain awake, depending on how deeply you are sedated.

The treatment area of your back will be cleaned, shaved and numbed.

During the procedure you will be asked questions. It is important for you to be able to tell your doctor whether you are feeling any pain.

The longest part of vertebroplasty and kyphoplasty procedures involves setting up the equipment and making sure the needle is perfectly positioned in the collapsed vertebra.

You may not drive after the procedure, but you may be driven home if you live close by. Otherwise, an overnight stay at a nearby hotel is advised.

Bed rest is recommended for the first 24 hours following vertebroplasty and kyphoplasty, though you may get up to use the bathroom. You will be advised to increase your activity gradually and resume all your regular medications. At home, patients can return to their normal daily activities, although strenuous exertion, such as heavy lifting, should be avoided for at least six weeks.

Check with your doctor if you take blood thinners. You may be able to restart this medication the day after your procedure.

Pain relief will be immediate for some patients. In others, pain is eliminated or reduced within two days. Pain resulting from the procedure will typically diminish within two weeks.

For two or three days afterward, you may feel a bit sore at the point of the needle insertion. You can use an icepack to relieve any discomfort but be sure to protect your skin from the ice with a cloth and ice the area for only 15 minutes per hour. Your bandage should remain in place for several days (even during showers).

Who interprets the results and how do I get them?

Approximately one hour after the procedure, you should be able to walk. The interventional radiologist is often able to advise you as to whether the procedure was a technical success at that point. In some cases, it can take a few days for the doctor to be able to make this assessment.

What are the benefits vs. risks?

Benefits

- Vertebroplasty and kyphoplasty can increase a patient's functional abilities, allow a return to the previous level of activity without any form of physical therapy or rehabilitation and prevent further vertebral collapse.
- These procedures are usually successful at alleviating the pain caused by a vertebral compression fracture; many patients feel significant relief almost immediately. Many patients become symptom-free.
- Following vertebroplasty, about 75 percent of patients regain lost mobility and become more active, which helps combat osteoporosis. After the procedure, patients who had been immobile can get out of bed, reducing their risk of pneumonia. Increased activity builds more muscle strength, further encouraging mobility.
- Usually, vertebroplasty and kyphoplasty are safe and effective procedures.
- No surgical incision is needed—only a small nick in the skin that does not have to be stitched closed.

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.
- A small amount of orthopedic cement can leak out of the vertebral body. This does not usually cause a serious problem, unless the leakage moves into a potentially dangerous location such as the spinal canal.
- Other possible complications include infection, bleeding, increased back pain and neurological symptoms such as numbness or tingling. Paralysis is extremely rare.
- There is a risk of allergic reaction to the contrast material used for intraosseous venography or to help visualize the balloon as it inflates on the x-ray image.

What are the limitations of Vertebroplasty and Kyphoplasty?

Vertebroplasty is not:

- used for herniated disks or arthritic back pain.
- generally recommended for otherwise healthy younger patients, mostly because there is limited experience with cement in a vertebral body for longer time periods.
- a preventive treatment to help patients with osteoporosis avoid future fractures. It is used only to repair a known, non-healing vertebral compression fracture.
- used to correct an osteoporosis-induced curvature of the spine, but it may keep the curvature from worsening.
- ideal for someone with severe emphysema or other lung disease because it may be difficult for such individuals to lie facedown for the one to two hours vertebroplasty requires. Special accommodations may be made for patients with these conditions.
- for patients with a healed vertebral fracture.

Kyphoplasty is not appropriate for:

- patients with young healthy bones or those who have suffered a fractured vertebra in an accident.
- patients with spinal curvature such as scoliosis or kyphosis that results from causes other than osteoporosis.
- patients who suffer from spinal stenosis or herniated disk with nerve or spinal cord compression and loss of neurologic function not associated with a VCF.

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