



# Bone Cancer Early Detection, Diagnosis, and Staging

## Detection and Diagnosis

Catching cancer early often allows for more treatment options. Some early cancers may have signs and symptoms that can be noticed, but that is not always the case.

- [Can Bone Cancer Be Found Early?](#)
- [Signs and Symptoms of Bone Cancer](#)
- [How is Bone Cancer Diagnosed?](#)

## Stages and Outlook (Prognosis)

After a cancer diagnosis, staging provides important information about the extent of cancer in the body and anticipated response to treatment.

- [How is Bone Cancer Staged?](#)
- [Survival Statistics for Bone Cancer](#)

## Questions to Ask About Bone Cancer

Here are some questions you can ask your cancer care team to help you better understand your cancer diagnosis and treatment options.

- [What Should You Ask Your Doctor About Bone Cancer?](#)

## Can Bone Cancer Be Found Early?

Tests are routinely used to detect early stages of some types of cancer (such as breast, cervical, colorectal, and skin cancer) before they cause symptoms. At this time, no

special tests are routinely recommended to detect bone cancers early. The best strategy for early diagnosis is prompt attention to the [signs and symptoms](#) of this disease.

- [References](#)

[See all references for Bone Cancer](#)

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# Signs and Symptoms of Bone Cancer

## Pain

Pain in the affected bone is the most common complaint of patients with bone cancer. At first, the pain is not constant. It may be worse at night or when the bone is used (for example, leg pain when walking). As the cancer grows, the pain will be there all the time. The pain increases with activity and the person might limp if a leg is involved.

## Swelling

Swelling in the area of the pain may not occur until weeks later. It might be possible to feel a lump or mass depending on the location of the tumor.

Cancers in the bones of the neck can cause a lump in the back of the throat that can lead to trouble swallowing or make it hard to breathe.

## Fractures

Bone cancer can weaken the bone it develops in, but most of the time the bones do not fracture (break). People with a fracture next to or through a bone cancer usually describe sudden severe pain in a limb that had been sore for a few months.

## Other symptoms

Cancer in the bones of the spine can press on nerves, leading to numbness and tingling or even weakness.

Cancer can cause weight loss and fatigue. If the cancer spreads to internal organs it may cause other symptoms, too. For example, if the cancer spreads to the lung, you may have trouble breathing.

Any of these symptoms are more often due to conditions other than cancer, such as injuries or arthritis. Still, if these problems go on for a long time without a known reason, you should see your doctor.

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## How is Bone Cancer Diagnosed?

A patient's symptoms, physical exam, and results of [imaging tests](#), and [blood tests](#) may suggest that bone cancer is present. But in most cases, doctors must confirm this suspicion by examining a tissue or cell sample under a microscope (a procedure known as a *biopsy*).

Other diseases, such as bone infections, can cause symptoms and imaging results that could be confused with bone cancer. Accurate diagnosis of a bone tumor often depends on combining information about its location (what bone is affected and even which part of the bone is involved), appearance on x-rays, and appearance under a microscope.

Since a single bone metastasis can have the same signs and symptoms as a primary bone tumor, many doctors require a [biopsy](#) to diagnose a patient's first bone metastasis. After that, additional bone metastases can usually be diagnosed based on x-rays and other imaging tests.

# Imaging tests to detect bone cancer

## X-rays

Most bone cancers show up on x-rays of the bone. The bone at the site of the cancer may appear “ragged” instead of solid. The cancer can also appear as a hole in the bone. Sometimes doctors can see a tumor around the defect in the bone that might extend into nearby tissues (such as muscle or fat). The radiologist (doctor who specializes in reading x-rays) can often tell if a tumor is malignant by the way it appears on the x-ray, but only a biopsy can absolutely determine that.

A chest x-ray is often done to see if bone cancer has spread to the lungs.

## Computed tomography (CT) scans

[CT scans](#) are helpful in staging cancer. They help tell if your bone cancer has spread into your lungs, liver, or other organs. These scans also show the lymph nodes and distant organs where metastatic cancer might be present.

CT scans can also be used to precisely guide a biopsy needle into a suspected metastasis. For this procedure, called a CT-guided needle biopsy, the patient remains on the CT scanning table while a radiologist advances a biopsy needle toward the location of the mass. CT scans are repeated until the doctors are confident that the needle is within the mass. (See the section, “Needle biopsy.”)

## Magnetic resonance imaging (MRI) scans

[MRI scans](#) are often the best test for outlining a bone tumor. They are also particularly helpful for looking at the brain and spinal cord. MRI scans are a little more uncomfortable than CT scans. First, they take longer -- often up to an hour. Also, you have to be placed inside a tube, which is confining and can upset people with claustrophobia (fear of enclosed spaces). The machine also makes a thumping noise that you may find disturbing. Some places provide headphones with music to block this out.

## Radionuclide bone scans

This procedure helps show if a cancer has spread to other bones. It can find metastases earlier than regular x-rays. Bone scans also can show how much damage

the primary cancer has caused in the bone.

For this test, the patient receives an injection of radioactive material called *technetium diphosphonate*. The amount of radioactivity used is very low and causes no long-term effects. This substance is attracted to diseased bone cells throughout the entire skeleton. Areas of diseased bone will be seen on the bone scan image as dense, gray to black areas, called “hot spots.” These areas suggest metastatic cancer is present, but arthritis, infection, or other bone diseases can also cause a similar pattern. To distinguish among these conditions, the cancer care team may use other imaging tests or take bone biopsies.

## **Positron emission tomography (PET or PET) scans**

PET scans use glucose (a form of sugar) that contains a radioactive atom. A special camera can detect the radioactivity. Cancer cells absorb a lot of the radioactive sugar because of their high rate of metabolism. PET scans are useful in looking for cancer throughout your entire body. It can sometimes help tell if a tumor is cancerous or benign. It is being combined with CT scans to better pinpoint some kinds of cancer.

## **Biopsy**

A *biopsy* is a sample of tissue taken from a tumor so that it can be looked at under a microscope. This is the only way to know that the tumor is cancer and not some other bone disease. If cancer is present, the biopsy can tell the doctor if it is a primary bone cancer or cancer that started somewhere else and spread to the bone (metastasis). Several types of tissue and cell samples are used to diagnose bone cancer. It is very important a surgeon with experience in diagnosing and treating bone tumors do the biopsy procedure.

The surgeon will choose a biopsy method based on whether the tumor looks benign or malignant and exactly what type of tumor is most likely (based on the bone x-rays, the patient’s age, and the location of the tumor). Some kinds of bone tumors can be recognized from needle biopsy samples, but larger samples (from a surgical biopsy) are often needed to diagnose other types. Whether the surgeon plans to remove the entire tumor at the time of the biopsy will also influence the choice of biopsy type. The wrong kind of biopsy can sometimes make it hard later for the surgeon to remove all of the cancer without having to also remove all or part of the arm or leg containing the tumor. It also may cause the cancer to spread.

## **Needle biopsy**

There are 2 types of needle biopsies: *fine needle biopsies* and *core needle biopsies*. For both types, a local anesthetic is first used to numb the area for the biopsy. For fine needle aspiration (FNA), the doctor uses a very thin needle attached to a syringe to withdraw a small amount of fluid and some cells from the tumor mass. Sometimes, the doctor can aim the needle by feeling the suspicious tumor or area that is near the surface of the body. If the tumor cannot be felt because it is too deep, the doctor can guide the needle while viewing a CT scan. This is called a *CT guided needle biopsy* and it is often done by an x-ray specialist known as an *interventional radiologist*. In a core needle biopsy, the doctor uses a larger needle to remove a small cylinder of tissue (about 1/16 inch in diameter and 1/2 inch long). Many experts feel that a core needle biopsy is better than FNA to diagnose a primary bone cancer.

## **Surgical bone biopsy**

In this procedure, a surgeon needs to cut through the skin to reach the tumor in order to remove a small piece of tissue. This is also called an *incisional biopsy*. If the entire tumor is removed (not just a small piece), it is called an *excisional biopsy*. These biopsies are often done with the patient under general anesthesia (asleep). They can also be done using a nerve block, which numbs a large area. If this type of biopsy is needed, it is important that the surgeon who will later remove the cancer also be the one to do the biopsy.

- [References](#)

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## **How is Bone Cancer Staged?**

Staging is a process that tells the doctor how widespread a cancer may be. It will show whether the cancer has spread and how far. The treatment and prognosis (outlook) for bone cancers depend, to a large extent, on the cancer's stage when the patient is first diagnosed.

# AJCC Staging System

The American Joint Commission on Cancer (AJCC) system is used to stage all bone cancers. It combines 4 factors to determine stage that go by the initials T, N, M, and G. **T** stands for features of **tumor** (its size and if it is in more than one spot on the bone), **N** stands for spread to lymph **nodes**, **M** is for **metastasis** (spread) to distant organs, and **G** is for the tumor's **grade**. The grade of a tumor is based on how abnormal the cells look when seen under a microscope. The higher the number, the more abnormal the cells appeared. Higher grade cancers tend to grow and spread more quickly than lower grade tumors.

This information about the tumor, lymph nodes, metastasis, and grade is combined in a process called *stage grouping*. The stage is then described in Roman numerals from I to IV (1-4).

## T stages of bone cancer

**TX:** Primary tumor can't be measured

**T0:** No evidence of the tumor

**T1:** Tumor is 8 cm (around 3 inches) or less

**T2:** Tumor is larger than 8 cm

**T3:** Tumor is in more than one place on the same bone

## N stages of bone cancer

**N0:** The cancer has not spread to the lymph nodes near the tumor

**N1:** The cancer has spread to nearby lymph nodes

## M stages of bone cancer

**M0:** The cancer has not spread anywhere outside of the bone or nearby lymph nodes

**M1:** Distant metastasis (the cancer has spread)

- **M1a:** The cancer has spread only to the lung

- **M1b:** The cancer has spread to other sites (like the brain, the liver, etc.)

## Grades of bone cancer

**G1-G2:** Low grade

**G3-G4:** High grade

## TNM stage grouping

After the T, N, and M stages and the grade of the bone cancer have been determined, the information is combined and expressed as an overall stage. The process of assigning a stage number is called *stage grouping*. To determine the grouped stage of a cancer using the AJCC system, find the stage number below that contains the T, N, and M stages, and the proper grade.

**Stage I:** All stage I tumors are low grade and have not yet spread outside of the bone.

- **Stage IA:** T1, N0, M0, G1-G2: The tumor is 8 cm or less.
- **Stage IB:** T2 or T3, N0, M0, G1-G2: The tumor is either larger than 8 cm or it is in more than one place on the same bone.

**Stage II:** Stage II tumors have not spread outside the bone (like stage I) but are high grade.

- **Stage IIA:** T1, N0, M0, G3-G4: The tumor is 8 cm or less.
- **Stage IIB:** T2, N0, M0, G3-G4: The tumor is larger than 8 cm.

**Stage III:** T3, N0, M0, G3-G4: Stage III tumors have not spread outside the bone but are in more than one place on the same bone. They are high grade.

**Stage IV:** Stage IV tumors have spread outside of the bone they started in. They can be any grade.

- **Stage IVA:** Any T, N0, M1a, G1-G4: The tumor has spread to the lung.
- **Stage IVB:** Any T, N1, any M, G1-G4 OR Any T, any N, M1b, G1-G4: The tumor has spread to nearby lymph nodes or to distant sites other than the lung (or both).

Even though the AJCC staging system is widely accepted and used for most cancers, bone cancer specialists tend to simplify the stages into localized and metastatic. Localized includes stages I, II, and III, while metastatic is the same as stage IV.



- [References](#)

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## Survival Statistics for Bone Cancer

Survival rates are often used by doctors as a standard way of discussing a person's prognosis (outlook). Some patients with cancer may want to know the survival statistics for people in similar situations, while others may not find the numbers helpful, or may even not want to know them. If you do not want to read about the survival statistics for bone cancer given in the next few paragraphs, skip to the [next section](#).

The 5-year survival rate refers to the percentage of patients who live *at least 5 years* after their cancer is diagnosed. Of course, many people live much longer than 5 years (and many are cured).

Five-year *relative* survival rates assume that some people will die of other causes and compare the observed survival with that expected for people without the cancer. This is a better way to see the impact of the cancer on survival.

In order to get 5-year survival rates, doctors have to look at people who were treated at least 5 years ago. Improvements in treatment since then may result in a more favorable outlook for people now being diagnosed with bone cancer.

Survival rates are often based on previous outcomes of large numbers of people who had the disease, but they cannot predict what will happen in any particular person's case. Many factors may affect a person's outlook, such as the type and grade of the cancer, the patient's age, where the cancer is located, the size of the tumor, and the treatment received. Your doctor can tell you how the numbers below may apply to you, as he or she is familiar with the aspects of your particular situation.

For all cases of bone cancer combined (in both adults and children), the 5-year relative survival is about 70%. For adults, the most common bone cancer is chondrosarcoma, which has a 5-year relative survival of about 80%. (Survival statistics for Ewing tumors

and osteosarcoma can be found in our documents about those cancers.)

- [References](#)

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## What Should You Ask Your Doctor About Bone Cancer?

As you cope with cancer and cancer treatment, you need to have honest, open discussions with your doctor. You should be able to ask any question no matter how small it might seem. Nurses, social workers, and other members of the treatment team may also be able to answer many of your questions.

- What [kind](#) of bone cancer do I have?
- Has my cancer spread beyond the primary site?
- What is the [stage](#) of my cancer and what does that mean?
- What [treatment](#) choices do I have?
- What do you recommend and why?
- What risks or side effects are there to the treatments you suggest?
- What are the chances of my cancer coming back with these treatment plans?
- What should I do to be ready for treatment?
- Based on what you've learned about my cancer, how long do you think I'll survive?

In addition to these sample questions, be sure to write down some of your own. For instance, you might want more information about recovery times so that you can plan your work schedule. Or you might want to ask about second opinions or about clinical trials. You can find more information about communicating with your health care team in [The Doctor-Patient Relationship](#).

- [References](#)

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