



Diseases and Conditions

Osteomyelitis

By Mayo Clinic Staff

Osteomyelitis is an infection in a bone. Infections can reach a bone by traveling through the bloodstream or spreading from nearby tissue. Osteomyelitis can also begin in the bone itself if an injury exposes the bone to germs.

In children, osteomyelitis most commonly affects the long bones of the legs and upper arm, while adults are more likely to develop osteomyelitis in the bones that make up the spine (vertebrae). People who have diabetes may develop osteomyelitis in their feet if they have foot ulcers.

Once considered an incurable condition, osteomyelitis can be successfully treated today. Most people require surgery to remove parts of the bone that have died — followed by strong antibiotics, often delivered intravenously, typically for at least six weeks.

Signs and symptoms of osteomyelitis include:

- Fever or chills
- Irritability or lethargy in young children
- Pain in the area of the infection
- Swelling, warmth and redness over the area of the infection

Sometimes osteomyelitis causes no signs and symptoms or has signs and symptoms that are difficult to distinguish from other problems.

When to see a doctor

See your doctor if you experience worsening bone pain along with fever. If you're at risk of infection because of a medical condition or recent surgery or injury, see your doctor right away if you notice signs and symptoms of an infection.

Most cases of osteomyelitis are caused by staphylococcus bacteria, a type of germ commonly found on the skin or in the nose of even healthy individuals.

Germs can enter a bone in a variety of ways, including:

- **Via the bloodstream.** Germs in other parts of your body — for example, from pneumonia or a urinary tract infection — can travel through your bloodstream to a weakened spot in a bone. In children, osteomyelitis most commonly occurs in the softer areas, called growth plates, at either end of the long bones of the arms and legs.
- **From a nearby infection.** Severe puncture wounds can carry germs deep inside your body. If such an injury becomes infected, the germs can spread into a nearby bone.
- **Direct contamination.** This may occur if you have broken a bone so severely that part of it is sticking out through your skin. Direct contamination can also occur during surgeries to replace joints or repair fractures.

Your bones are normally resistant to infection. For osteomyelitis to occur, a situation that makes your bones vulnerable must be present.

Recent injury or orthopedic surgery

A severe bone fracture or a deep puncture wound gives infections a route to enter your bone or nearby tissue. Surgery to repair broken bones or replace worn joints also can accidentally open a path for germs to enter a bone. Deep animal bites also can provide a pathway for infection.

Circulation disorders

When blood vessels are damaged or blocked, your body has trouble distributing the infection-fighting cells needed to keep a small infection from growing larger. What begins as a small cut can progress to a deep ulcer that may expose deep tissue and bone to infection. Diseases that impair blood circulation include:

- Poorly controlled diabetes
- Peripheral arterial disease, often related to smoking
- Sickle cell disease

Problems requiring intravenous lines or catheters

There are a number of conditions that require the use of medical tubing to connect the outside world with your internal organs. However, this tubing can also serve as a way for germs to get into your body, increasing your risk of an infection in general, which can lead to osteomyelitis. Examples of when this type of tubing might be used include:

- Dialysis machines
- Urinary catheters
- Long-term intravenous tubing, sometimes called central lines

Conditions that impair the immune system

If your immune system is affected by a medical condition or medication, you have a greater risk of osteomyelitis. Factors that may suppress your immune system include:

- Chemotherapy
- Poorly controlled diabetes
- Having had an organ transplant
- Needing to take corticosteroids or drugs called tumor necrosis factor (TNF) inhibitors.

For unclear reasons, people with HIV/AIDS don't seem to have an increased risk of osteomyelitis.

Illicit drugs

People who inject illicit drugs are more likely to develop osteomyelitis because they typically use nonsterile needles and don't sterilize their skin before injections.

Osteomyelitis complications may include:

- **Bone death (osteonecrosis).** An infection in your bone can impede blood circulation within the bone, leading to bone death. Your bone can heal after surgery to remove small sections of dead bone. If a large section of your bone has died, however, you may need to have that limb amputated to prevent spread of the infection.
- **Septic arthritis.** In some cases, infection within bones can spread into a nearby joint.
- **Impaired growth.** In children, the most common location for osteomyelitis is in the softer areas, called growth plates, at either end of the long bones of the arms and legs. Normal growth may be interrupted in infected bones.
- **Skin cancer.** If your osteomyelitis has resulted in an open sore that is draining pus, the surrounding skin is at higher risk of developing squamous cell cancer.

While you might initially bring your signs and symptoms to the attention of your family doctor, he or she may refer you to a doctor specializing in infectious diseases or to an orthopedic surgeon.

Here's some information to help you get ready for your appointment, and what to expect from your doctor.

What you can do

- **Be aware of any pre-appointment restrictions.** At the time you make the appointment, be sure to ask if there's anything you need to do in advance, such as restrict your diet.
- **Write down any symptoms you're experiencing**, including any that may seem unrelated to the reason for which you scheduled the appointment.
- **Make a list of all medications**, vitamins or supplements that you're taking.
- **Write down questions to ask** your doctor.

For osteomyelitis, some basic questions to ask your doctor include:

- What's the most likely cause of my symptoms?
- Are there other possible causes for my symptoms?
- What kinds of tests do I need? Do these tests require any special preparation?
- What treatments are available, and which do you recommend?
- Will surgery be necessary?
- What types of side effects can I expect from treatment?
- I have other health conditions. How can I best manage these conditions together?
- Is there a generic alternative to the medicine you're prescribing?
- Are there any brochures or other printed material that I can take home with me? What websites do you recommend visiting?

What to expect from your doctor

During the physical exam, your doctor may feel the area around the affected bone for any tenderness, swelling or warmth. If you have a foot ulcer, your doctor may use a dull probe to determine the proximity of the underlying bone.

Your doctor is likely to ask you a number of questions, such as:

- When did you first begin experiencing symptoms?
- Do you have a fever or chills?
- Does anything make your symptoms better or worse?
- Have you had any cuts, scrapes or other injuries lately?
- Have you had any surgery recently?
- Have you ever had a joint replaced? Or have you had surgical correction of a broken bone?
- Do you have diabetes? Do you have any foot ulcers?

Your doctor may order a combination of tests and procedures to diagnose osteomyelitis and to determine which germ is causing the infection.

Blood tests

Blood tests may reveal elevated levels of white blood cells and other factors that may indicate that your body is fighting an infection. If your osteomyelitis was caused by an infection in the blood, tests may reveal what germs are to blame. No blood test exists that tells your doctor whether you do or do not have osteomyelitis. However, blood tests do give clues that your doctor uses to decide what further tests and procedures you may need.

Imaging tests

- **X-rays.** X-rays can reveal damage to your bone. However, damage may not be visible until osteomyelitis has been present for several weeks. More detailed imaging tests may be necessary if your osteomyelitis has developed more recently.
- **Computerized tomography (CT) scan.** A CT scan combines X-ray images taken from many different angles, creating detailed cross-sectional views of a person's internal structures.
- **Magnetic resonance imaging (MRI).** Using radio waves and a strong magnetic field, MRIs can produce exceptionally detailed images of bones and the soft tissues that surround them.

Bone biopsy

A bone biopsy is the gold standard for diagnosing osteomyelitis, because it can also reveal what particular type of germ has infected your bone. Knowing the type of germ allows your doctor to choose an antibiotic that works particularly well for that type of infection. An open biopsy requires anesthesia and surgery to access the bone. In some situations, a surgeon inserts a long needle through your skin and into your bone to take a biopsy. This procedure requires local anesthetics to numb the area where the needle is inserted. X-ray or other imaging scans may be used for guidance.

The most common treatments for osteomyelitis are antibiotics and surgery to remove portions of bone that are infected or dead. Hospitalization is usually necessary.

Medications

A bone biopsy will reveal what type of germ is causing your infection, so your doctor can choose an antibiotic that works particularly well for that type of infection. The antibiotics are usually administered through a vein in your arm for at least four to six weeks. Side effects may include nausea, vomiting and diarrhea. An additional course of oral antibiotics may also be needed for more-serious infections.

Surgery

Depending on the severity of the infection, osteomyelitis surgery may include one or more of the following procedures:

- **Drain the infected area.** Opening up the area around your infected bone allows your surgeon to drain any pus or fluid that has accumulated in response to the infection.
- **Remove diseased bone and tissue.** In a procedure called debridement, the surgeon removes as much of the diseased bone as possible, taking a small margin of healthy bone to ensure that all the infected areas have been removed. Surrounding tissue that shows signs of infection also may be removed.
- **Restore blood flow to the bone.** Your surgeon may fill any empty space left by the debridement procedure with a piece of bone or other tissue, such as skin or muscle, from another part of your body. Sometimes temporary fillers are placed in the pocket until you're healthy enough to undergo a bone graft or tissue graft. The graft helps your body repair damaged blood vessels and form new bone.
- **Remove any foreign objects.** In some cases, foreign objects, such as surgical plates or screws placed during a previous surgery, may have to be removed.
- **Amputate the limb.** As a last resort, surgeons may amputate the affected limb to stop the infection from spreading further.

Hyperbaric oxygen therapy

In people with very difficult-to-treat osteomyelitis, hyperbaric oxygen therapy may help get more oxygen to the bone and promote healing. Hyperbaric oxygen therapy is a means of delivering more oxygen than is normally available in the atmosphere. This is done using a pressure chamber that resembles a large, clear tube.

If you've been told that you have an increased risk of infection, talk to your doctor about ways to prevent infections from occurring. Reducing your risk of infection will also reduce your risk of developing osteomyelitis. In general, take precautions to avoid cuts and scrapes, which give germs easy access to your body. If you do get any cuts and scrapes, clean the area immediately and apply a clean bandage. Check wounds frequently for signs of infection.

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