CONDITION

Avascular necrosis of bone

Learn how avascular necrosis reduces blood flow to bone, what symptoms and risk factors to recognize, and how doctors diagnose, treat, and monitor it.

WHAT IT IS
Bone tissue death from reduced blood flow

BODY SYSTEM
Bones and joints

MAIN SYMPTOMS
Joint pain, stiffness, reduced movement, limping

WHAT CAUSES IT
Reduced or interrupted blood flow

HOW IT IS DIAGNOSED
X-rays and MRI

MAIN TREATMENT
Joint protection, physical therapy, pain relief, or surgery

CAN IT BE CURED?
No, treatment cannot guarantee progression stops

IS IT AN EMERGENCY?
Sometimes, sudden inability to bear weight

LONG-TERM OUTLOOK
May progress to bone collapse, arthritis, and joint replacement

Overview

Avascular necrosis is the death of bone tissue caused by reduced or interrupted blood flow. It is also called osteonecrosis , aseptic necrosis , or ischemic bone necrosis .

Bone is living tissue that needs a steady blood supply. When blood flow is disrupted, bone cells can die. Over time, the weakened bone may develop small breaks and lose its normal shape. If this happens near a joint, the smooth joint surface may collapse and lead to arthritis.

Avascular necrosis can affect almost any bone. It most often involves the upper end of the thigh bone, called the femoral head, where it forms the hip joint. Other possible sites include the knee, shoulder, ankle, wrist, and jaw. More than one bone or both sides of the body may be affected.

The condition can follow an injury that damages nearby blood vessels. It can also develop without a direct injury, including in people who have used corticosteroid medicines or who drink large amounts of alcohol. Sometimes no cause is found.

Early diagnosis matters because treatments that preserve the natural joint tend to work best before the bone has collapsed. Once there is major collapse or advanced arthritis, joint replacement may be the most effective option.

Symptoms

Avascular necrosis may not cause symptoms during its early stages. Some people first learn they have it when imaging is performed for another reason.

Pain is usually the main symptom. Its location depends on the affected bone. Hip osteonecrosis often causes pain in the groin, buttock, or upper thigh. The pain may sometimes feel as though it is coming from the knee.

At first, pain may occur only when standing, walking, or putting weight on the joint. It can become more frequent as the condition progresses. Later symptoms may include pain at rest or during the night.

Other possible symptoms include:

Symptoms can develop gradually over months. In some cases, pain becomes worse more quickly after the weakened bone begins to collapse.

Joint pain has many possible causes, and these symptoms do not confirm avascular necrosis. Arrange a routine medical assessment for persistent joint pain, especially if it is worsening or interfering with movement.

Seek urgent care for sudden severe pain, a new inability to bear weight, or pain after a significant injury. A hot, swollen joint with fever also needs urgent assessment because it may signal an infection or another condition requiring prompt treatment.

- Joint stiffness or reduced range of motion
- Limping or difficulty walking
- Pain when climbing stairs, bending, or rising from a chair
- Trouble using the arm if the shoulder is affected
- Increasing difficulty with work, exercise, or daily activities

Causes and risk factors

Avascular necrosis develops when part of a bone does not receive enough blood. The reason for this loss of blood flow is not always clear.

A broken bone or dislocated joint can tear, stretch, or compress blood vessels. Hip fractures and hip dislocations are important traumatic causes because they may damage blood vessels supplying the femoral head. Osteonecrosis can appear months or even years after the injury.

Nontraumatic risk factors include corticosteroid medicines, such as prednisone. The risk is most strongly linked to higher total exposure, but the relationship is complex. Many people who need corticosteroids like prednisone or hydrocortisone never develop osteonecrosis. These medicines should not be stopped suddenly without medical advice.

Heavy alcohol use is another recognized risk factor. Alcohol may affect fat metabolism and blood vessels, reducing circulation within bone.

Certain medical conditions can also increase risk. These include:

Osteonecrosis of the jaw has a different pattern of risk. It has been associated with radiation to the head or neck and with certain medicines used to treat cancer or reduce bone breakdown. Dental disease or dental procedures may contribute in susceptible people. Jaw osteonecrosis is managed differently from osteonecrosis of the hip or other joints.

Smoking, abnormal blood clotting, and high blood lipid levels may contribute in some cases, but their exact role can vary.

When no injury, medicine, or medical condition explains the loss of blood flow, the condition is called idiopathic osteonecrosis , meaning the cause is unknown.

- Sickle cell disease and some other blood disorders
- Lupus and certain other autoimmune diseases
- Gaucher disease, a rare inherited disorder
- HIV infection
- Organ transplantation
- Decompression sickness, which can occur after rapid changes in pressure
- Some cancer treatments, including radiation involving bone

Diagnosis

A clinician will ask where the pain occurs, when it began, and what activities make it better or worse. The medical history may include previous injuries, corticosteroid exposure, alcohol use,

blood disorders, autoimmune disease, cancer treatment, and organ transplantation.

During the physical examination, the clinician may check how far the joint moves, whether certain movements cause pain, and whether walking or strength has changed. Hip osteonecrosis often causes pain when the leg is rotated.

X-rays are commonly used first. They can show changes in bone shape, collapse, and arthritis. However, an X-ray may look normal during the early stages.

Magnetic resonance imaging, or MRI , can detect early bone changes before they appear on an X-ray. It can also show how much bone is affected and whether nearby joints or the opposite side are involved. MRI does not use ionizing radiation.

Computed tomography, or CT , may provide more detail about bone structure and collapse. Bone scans are used less often when MRI is available but may help in selected situations.

Blood tests do not diagnose avascular necrosis itself. They may be ordered to look for an underlying condition, such as a blood disorder or autoimmune disease.

Doctors often describe osteonecrosis by its stage. Staging considers whether the bone has collapsed, how large the damaged area is, and whether arthritis has developed. These findings help guide treatment.

Treatment and management

Treatment depends on the affected bone, the size and location of the damaged area, the amount of collapse, the person's symptoms, and the underlying cause. Age, activity needs, and general health also matter.

Reducing pressure on the joint may ease pain. A clinician may recommend temporarily limiting high-impact activity or using a cane, crutches, or another support. These steps may reduce stress on the bone, but they usually do not reverse established osteonecrosis by themselves.

Physical therapy can help maintain joint movement and strengthen nearby muscles. Exercise plans need to match the stage of disease. High-impact exercise may not be appropriate for a weakened weight-bearing joint.

Pain medicines may provide symptom relief. Options can include acetaminophen or nonsteroidal anti-inflammatory drugs like ibuprofen or naproxen , depending on a person's health and other medicines. These treatments do not restore the bone's blood supply and should be discussed with a healthcare professional.

Managing an underlying condition is also important. This may involve treatment for a blood disorder or autoimmune disease, reviewing corticosteroid exposure, avoiding tobacco, or

reducing alcohol use. Prescribed corticosteroids should only be changed with the clinician who manages them.

Medicines that affect bone loss, blood clotting, or cholesterol have been studied for some forms of osteonecrosis. Evidence is mixed, and there is no single medicine proven to cure the condition. These treatments are not appropriate for everyone.

Surgery may be considered when symptoms continue, imaging shows a high risk of progression, or the bone has collapsed.

Core decompression removes one or more channels of bone from the affected area. The goal is to reduce pressure inside the bone and encourage new blood vessels to grow. It is generally considered before major collapse.

Bone grafting may be performed with core decompression. A graft uses bone from the patient or a donor to support the damaged area. Some procedures transfer a section of bone along with its blood vessels.

An osteotomy cuts and repositions bone to move body weight away from the damaged area. It is used less often than some other procedures and is suitable only in selected cases.

If the joint surface has collapsed or severe arthritis has developed, joint replacement may provide more reliable pain relief and movement. Hip replacement is the most common example. The damaged joint surfaces are replaced with artificial components.

No treatment can guarantee that osteonecrosis will stop progressing. A shared decision with an orthopedic specialist should consider expected benefits, recovery, risks, and the possibility of later surgery.

Complications

The main complication is progressive weakening and collapse of the affected bone. When the rounded femoral head loses its shape, it no longer moves smoothly within the hip socket.

Damage to the joint surface can cause secondary osteoarthritis. This may lead to chronic pain, stiffness, reduced mobility, and difficulty with daily activities.

Other possible complications include:

Surgery also has risks, including infection, blood clots, bleeding, nerve or blood vessel injury, and the need for another procedure. The risks differ by operation and individual health.

- Loss of joint function
- Muscle weakness from reduced activity

- Problems affecting both hips or several bones
- Need for major reconstructive surgery or joint replacement
- Ongoing pain after treatment

Follow up

Regular follow-up helps the healthcare team assess pain, movement, and changes on imaging. The schedule depends on the affected joint, disease stage, and treatment plan.

Early osteonecrosis may be monitored with repeat examinations and imaging. Report increasing pain, new pain at rest, a worsening limp, or reduced joint movement rather than waiting for the next routine visit.

After surgery, follow instructions about wound care, activity, physical therapy, and weight-bearing. Recovery time varies by procedure.

Contact the surgical team promptly for increasing wound redness, drainage, fever, or worsening pain. Seek emergency care for chest pain, sudden shortness of breath, fainting, or coughing up blood, as these can be signs of a blood clot in the lungs. Sudden calf swelling or pain also needs urgent medical assessment.

People with risk factors for disease in more than one joint should mention any new bone or joint pain during follow-up. New symptoms do not necessarily mean that another area is affected, but they may need assessment.

Sources

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