Avascular necrosis

What is avascular necrosis (AVN)?

Avascular necrosis is a disease resulting from the temporary or permanent loss of blood supply to the bone. Without blood, the bone tissue dies which may cause the bone to collapse. If AVN involves the bones near a joint, it may lead to collapse of the joint surface. Though necrosis can occur in any bone, it most often affects the ends of long bones. It can affect one joint at a time, two or more joints at the same time or different joints at different times.

The amount of disability that results from avascular necrosis depends on several factors:

- What part of the bone is affected;
- How large an area is involved; and
- How effectively the bone rebuilds itself.

Normally, bone continuously breaks down and rebuilds—old bone is torn away and reabsorbed, and replaced with new bone. This process keeps the skeleton strong and helps it to maintain a balance of minerals. In the course of avascular necrosis, however, the bone tissues break down faster than the body can repair them. If the disease progresses and the bone collapses, the joint surface may break down and lead to pain and arthritis. It is important for AVN to be diagnosed and treated as soon as possible.

What causes AVN?

AVN is caused when the blood supply is interrupted and enough blood does not get to the bone. Blood travels to the bone through blood vessels. Enough blood cannot get to the bone if blood vessels get blocked by fat or air, if they become too thick or too small, or if they get too weak. Many things can cause this to happen. Some cancers have this effect on blood vessels and bone. Some of your child's treatments may also have this effect. Corticosteroids (prednisone) in high doses and radiation to a joint may be contributing factors, though we do not completely understand why. Unfortunately, it is not always possible to determine exactly what caused the problem.

What are the symptoms of AVN?

In the early stages of AVN, patients may not have any symptoms. As the disease progresses, most patients experience joint pain—at first, only when putting weight on the affected joint and later even when resting. Pain usually develops gradually and may be mild or severe. If avascular necrosis progresses and the bone and surrounding joint surface collapse, pain may develop or increase quickly. Pain may be severe enough to limit the patient's range of motion in the affected joint. The period of time between the first symptoms and loss of joint function is different for each patient. It ranges from several months to more than a year. If your child has pain in the joints, he or she should see the doctor. The earlier AVN is diagnosed, the easier it is to treat.

How is AVN diagnosed?

Early stages of AVN may look normal on an X-ray, so your doctor may want your child to have a magnetic resonance imaging (MRI) scan, a bone scan, or a computerized tomography (CT) scan. Early signs of AVN are best seen with an MRI. Later stages of AVN can be seen with an X-ray.

How is AVN treated?

Several treatments are available that help prevent further bone and joint damage and help to relieve pain. To determine the most appropriate treatment, the doctor considers the following:

- Age of patient
- Stage of cancer and ongoing cancer treatments
- Stage of avascular necrosis
- Location and amount of bone affected

The goal in treating avascular necrosis is to improve the patient's use of the affected joint and limit further damage to the bone.

Physical therapy

Your child's doctor will probably recommend an evaluation by a physical therapist, who can show your child ways to move with more comfort.

Decrease weightbearing

One of the most important things you can do to slow the progression of AVN is to limit the amount of weight or pressure put on the joint. If the AVN affects the elbow or shoulder, you may need to change the kind of sports or other activities in which your child takes part. For example, swimming would be a better activity than gymnastics.

Most often AVN affects the hips or knees. The doctor may recommend that your child use crutches to limit the pressure or weight put on the bone and joint. This slows damage to the bone and allows natural healing. When combined with medication to reduce pain, decreased weightbearing can be an effective way to avoid or delay surgery.

Range of motion exercises

It is important that your child keep all joints flexible. Often joint stiffness can occur before you even notice. When AVN is diagnosed, the physical therapist will show you exercises to make sure your child does not lose his or her range of motion. If tightness has already occurred, your child may need to see a therapist on a regular basis for a while to stretch out. Staying flexible will help retain movement in your child's joints.

Strengthening exercises

The therapist will recommend different exercises for keeping the muscles around your child's joints strong. The stronger the muscles are, the better able they are to protect the joint.

Increase circulation

- Exercise will help increase blood circulation to the joint. This promotes healing and also relieves pain.
- Heat in the form of hot packs may also help because it causes more blood to flow to the heated area. This is relaxing and also promotes healing. Your doctor or therapist will talk to you about the use of heat at home. Generally, heat before exercise makes exercise more comfortable and leads to better movement.

Surgical options

Core Decompression

Core decompression is a surgery that removes the inner layer of bone. This may reduce pressure within the bone and create an open area for new blood vessels to grow. Sometimes a piece of healthy bone with good blood vessels is put into this area to speed up the process. This procedure works best in the earliest stages of AVN. This should help to relieve pain as well as promote healing. After a core decompression, your child should not put a lot of weight on that bone for several weeks while it heals. The therapist will teach your child how to use crutches.

Osteotomy

An osteotomy is a surgery that involves taking out a piece of bone, usually a wedge, to reposition the bone. This allows the avascular area to bear less weight than an adjacent healthy area. A lengthy recovery period is needed after this surgery, and activity will be limited for 3-12 months.

Arthroplasty

Arthroplasty is sometimes called a joint replacement. The diseased bone is removed and replaced with artificial parts. This treatment may be needed in the late stages of avascular necrosis and when the joint is destroyed.

What can my child do to help?

- Avoid activities that put a lot of stress on the joints. Activities that stress the joints include running, jumping, football, soccer, volleyball and other contact sports that "pound" on the joints. If you are not sure which activities or sports are OK to do, ask the therapist or doctor. Activities that are good for joints with AVN include swimming and bicycling.
- Be consistent with the exercises that have been recommended.
- Listen to the joints! Rest them when they hurt.
- Let the doctor or therapist know when symptoms change.
- Take pain or anti-inflammatory medications as prescribed.

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