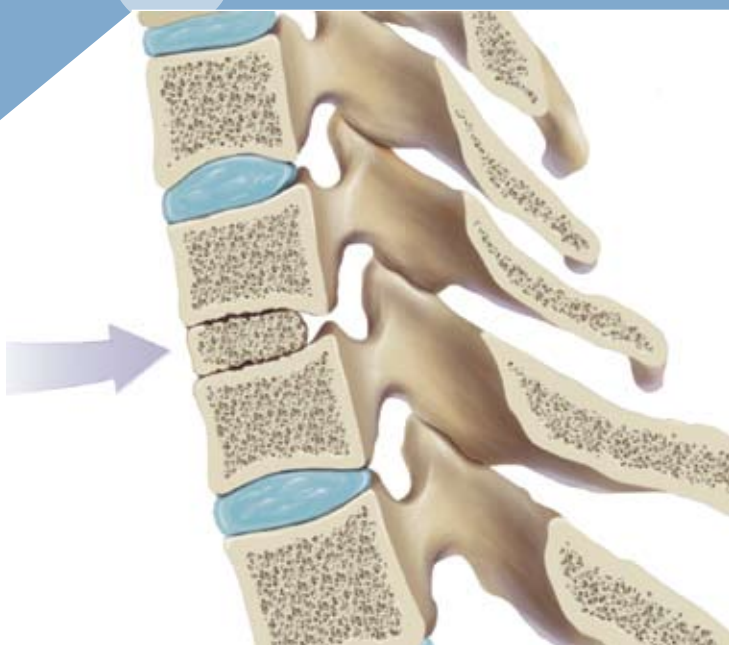


# Bone Graft Alternatives



**North American Spine Society  
Public Education Series**

# What Are Bone Grafts?

Bone grafts are bone that is transplanted from one area of the skeleton to another to aid in healing, strengthening or improving function. Bone or bone-like materials used in bone grafts may come from you, from a donor or from a man-made source. In many cases they are used to fill in an empty space that may have been created in or between the bones of the spine by disease, injury, deformity or during a surgical procedure such as spinal fusion.



Bone graft fills in space between two vertebrae after disc has been removed

# What Types of Bone Grafts Are Available?

Bone grafts that are transplanted directly from one area of an individual's skeleton into his or her own spine are called autogenous bone grafts, or bone autografts. In most cases, these are the preferred bone grafts to use. The graft bone is harvested, or taken, from the bones of the hip, the ribs or the leg. Autograft bone is one of the safest to use due to the low risk of disease transmission. It also offers a better chance of acceptance and effectiveness in the transplant site, since it contains the greatest amount of the patient's own bone growing cells and proteins. Autograft bone provides a strong framework for the new bone to grow into. The downsides of autograft bone are the facts that it adds another surgical site to a spine procedure (and therefore another location to feel postoperative pain and discomfort) and it can increase the cost of the spinal procedure.

Bone graft that comes from a donor is called allograft bone. Allograft bone usually comes from bone banks that harvest the bone from cadavers. The types of allograft bone used for spine surgery include fresh frozen and lyophilized (freeze dried). The bone is cleaned and disinfected to reduce the possibility of disease transmission from donor to recipient. Allograft, like autograft, provides a framework for the new bone to grow on and into. Unlike autograft bone, allograft bone does not always have the same strength properties or the cells and proteins that can influence the growth of new bone. The advantages of allograft bone are the elimination of the harvesting surgical site, the related postoperative pain and the added expense of a second operative procedure. Disadvantages of allograft bone are the slight chance of disease

transmission and a lessened effectiveness since the bone growth cells and proteins are removed during the cleansing and disinfecting process.

### **How safe is allograft bone?**

As bone grafting using allograft bone has become more widely used, the methods of screening donors, bone preparation and storage have been vastly improved in regards to diminishing the chances of disease transmission. Studies indicate that the risk of contacting HIV infection through the use of allograft bone is less than 1 per 1 million uses.

Your surgeon may want to use bone grafting for a number of reasons. Possible reasons include situations where healing may be difficult due to the use of nicotine (which has been shown in medical studies to limit healing of the spine) or the presence of diseases such as diabetes or autoimmune deficiencies. Other possible reasons include a large amount of bone or disc material that is removed during surgery, or spinal procedures that span many levels of vertebrae.

# Who Needs Bone Grafting?

One of the most common uses of bone grafts in spine surgery is during spinal fusion. The use of autogenous bone grafts for spinal fusion has been a standard in the spine community for many years and is considered to be the standard by which other bone grafts are measured. Spinal fusions are performed to relieve pain and provide stability to spines in people who have experienced a vertebral fracture or motion between the vertebrae that causes pain, have a spinal deformity, or who have some types of disc herniations. In certain types of spinal fusion, bone grafts or bone graft alternatives are used to replace the cushioning disc material that lies between the vertebrae. When the bone graft is placed between the vertebrae it creates a framework and support that eventually aids in joining the two bones together. Once the bone “bridge” between the vertebrae is in place, the spine is stabilized and movement and pressure on nerve roots is relieved, thus easing pain.

Bone grafts can also be used in surgical procedures to stabilize the spine after a fracture or to correct deformity.

# What Are Bone Graft Substitutes?

Since both allograft and autograft have drawbacks, scientists have long searched for materials that could be used in place of the transplanted bone. Although most of the substitutes available possess some of the positive properties of autograft, none yet have all the benefits of one's own bone. Investigators hope one day to use these substitutes to simultaneously be able to stimulate bone healing and provide a strong and biologically compatible framework for the new bone to grow into.

Some of these bone graft alternatives include:

**Demineralized Bone Matrix (DBM)**—a product of processed allograft bone. DBM contains collagen, proteins and growth factors that are extracted from the allograft bone. It is available in the form of a powder, crushed granules, putty, chips or as a gel that can be injected through a syringe. DBM is extensively processed and therefore has little risk for disease transmission; however, because of the form it takes it does not provide strength to the surgical site.

**Ceramics**—Ceramics are also used as a substitute for bone grafts. Ceramics offer no possibility for disease transmission, although they may be associated with inflammation in some patients. They are available in many forms such as porous and mesh. Although ceramics may provide a framework for bone growth, they contain none of the natural proteins that influence bone growth.

**Coral**—Bone implants made from coral have shown to be useful in the treatment of bone defects due to trauma, tumors and cysts. It is also used for spinal surgery as either a graft additive,

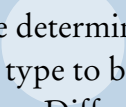
or extender, or as an implant to provide a framework for bone to grow into. The use of these substitutes, under certain conditions, has had promising outcomes.

**Graft Composites**—A newer area of bone graft substitutes, graft composites use combinations of other bone grafting materials and/or bone growth factors to gain the benefits of a variety of substances. Among the combinations in use are a collagen/ceramic composite, which closely reproduces the composition of natural bone; DBM combined with bone marrow cells, which aid in the growth of new bone; and a collagen/ceramic/autograft composite.

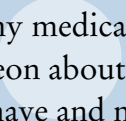
**Bone Morphogenetic Proteins**—Bone morphogenetic proteins (BMPs) are produced in our bodies and regulate bone formation and healing. Scientists have discovered that these proteins can speed up healing as well as limit the negative reaction some people have to donor bone and the nonbone substitutes. Scientists have also discovered how to extract these substances from human or cow bones and even produce them in the laboratory. Currently, the United States Food and Drug Administration has not yet approved these therapies; however, extensive research is being undertaken in both humans and animals to determine their safety and effectiveness.







## Which Type of Bone Graft Is Right for Me?



The determination if bone graft is to be used and the type to be used is best made by your surgeon. Different surgical situations may call for different types of bone grafting and unique bone graft materials. If your surgeon says that he or she would like to use a bone graft on your spine, you should discuss this decision with him or her to determine which bone graft material they feel is best suited for your situation.



As with any medical procedure, you should ask your surgeon about any questions or concerns you may have and make sure all of your questions are answered.







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