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## Bone grafting

*By editor*

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**Bone grafting** is a surgical procedure by which new bone or a replacement material is placed into spaces between or around broken bone (fractures) or holes in bone (defects) to aid in healing.

Bone grafting is used to repair bone fractures that are extremely complex, pose a significant risk to the patient, or fail to heal properly. Bone graft is also used to help fusion between vertebrae, correct deformities, or provide structural support for fractures of the spine. In addition to fracture repair, bone graft is used to repair defects in bone caused by birth defects, traumatic injury, or surgery for bone cancer.

Bone is composed of a matrix, mainly made up of a protein called collagen. It is strengthened by deposits of calcium and phosphate salts, called hydroxyapatite. Within and around this matrix are located the cells of the bones, which are of four types. Osteoblasts produce the bone matrix. Osteocytes are mature osteoblasts and serve to maintain the bone. Osteoclasts break down and remove bone tissue. Bone lining cells cover bone surfaces. Together, these four types of cells are responsible for building the bone matrix, maintaining it, and remodeling the bone as needed.

There are three ways in which a bone graft can help repair a defect. The first is called osteogenesis, the formation of new bone by the cells contained within the graft.

The second is osteoinduction, a chemical process in which molecules contained within the graft (bone morphogenetic proteins) convert the patient's cells into cells that are capable of forming bone. The third is osteoconduction, a physical effect by which the matrix of the graft forms a scaffold on which cells in the recipient are able to form new bone.

New bone for grafting can be obtained from other bones in the patient's own body (e.g., hip bones or ribs), called autograft, or from bone taken from other people that is frozen and stored in tissue banks, called allograft. A variety of natural and synthetic replacement materials are also used instead of bone, including collagen (the protein substance of the white fibers of the skin, bone, and connective tissues); polymers, such as silicone and some acrylics; hydroxyapatite; calcium sulfate;

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and ceramics. A new material, called resorbable polymeric grafts, is also being studied.

These resorbable grafts provide a structure for new bone to grow on; the grafts then slowly dissolve, leaving only the new bone behind.

To place the graft, the surgeon makes an incision in the skin over the bone defect and shapes the bone graft or replacement material to fit into the defect. After the graft is placed into the defect, it is held in place with pins, plates, or screws. The incision is closed with stitches and a splint or cast is used to prevent movement of the bones while healing.

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