

Bone Fractures

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Definition of Bone Fractures

A bone fracture describes a break in the continuity of a bone. When the force applied to the bone exceeds the compressive or tensile strength of a bone, the bone gives into the force and breaks.

Pathophysiology

Initially, the periosteum and blood vessels, marrow and soft tissue surrounding the bone become disrupted. Bleeding occurs from the tissue and the damaged bone. Within the medullary canal, beneath the periosteum, and between the fractured ends of the bone a clot will form. The tissue adjacent to the fracture dies. The dead tissue stimulates the inflammatory response. This response consists of infiltration by leukocytes and mast cells, vasodilation, and exudation of leukocytes and plasma. Several different cytokines are released such as prostaglandins, transforming growth factor-B, platelet-derived growth factor and others that promote healing. Within 48 hours blood flow to that area is increased from the marrow and the surrounding vascular tissue. Bone forming cells are activated to produce subperiosteal pro callus over the broken areas of the bone. These bone forming cells originate from the marrow, periosteum, and endosteum. Healing occurs in three phases: the first phase, the inflammatory phase, lasts about three to four days; the next phase is repair, it overlaps the first phase, and lasts three to four days also; the last phase is remodeling and lasts months to years. The bone is unique in that when it heals it does so with normal tissue instead of scar tissue. The liver is the only other organ not to heal with scar tissue.

Genetics

There is a genetic predisposition for osteoporosis and the major risk factor with people who have osteoporosis is fractures. Approximately 58 million people in the United States are affected by osteoporosis. One in every two women and one in every five men affected by osteoporosis will get a fracture.

There has also been some discussion on a genetic component of osteosarcoma's, specifically with retinoblastoma. People with osteosarcoma sometimes have a risk of pathologic fractures.

Epidemiology

The biggest epidemiologic contributor to fractures is bone density which is why osteoporosis is a high risk factor. With age bone density decreases. Vertebral fractures increase dramatically after age 50 and hip fractures after age 70.

Description of Condition

There are several different classifications of bone fractures:

- Complete/Open (formerly called compound) - This is when the bone is broken all the way and is sticking out of the skin.
- Incomplete/Closed (formerly called simple) - This is when the bone has sustained damage but is still connected at some point and has not broken the skin. These types of fractures occur often in children whose bones are still growing and are sub classified as buckle or torus, greenstick, and bowing.
- Comminuted - This is when there is more than one break in one bone.

They are also classified as to the direction of the fracture in relation to the bone:

- Linear - This is when the break runs parallel to the length of the bone.
- Oblique - This is when the break runs diagonal along the length of the bone.
- Spiral - This is when the break encircles the bone
- Transverse - This is when the break runs straight across the bone.

Signs and Symptoms

Signs and symptoms of fractures depend on the type and location of fractures. Generally speaking there will be immediate pain that is severe, swelling, tenderness, deformity, and possible impaired sensation (numbness). With an open fracture you will also be able to visualize the bone sticking out of the body part.

Diagnosis

- Visual inspection

- Radiography
- Ultrasound
- Magnetic Resonance Imaging

Treatment

Treatment is dependent on what type and location of fracture. Some examples are:

- Immobilization (with a cast or splint)
- Closed manipulation - Movement of the broken bone into proper position and then immobilized. Used when the broken bones are within close alignment and the skin is not broken
- Open reduction - Done is surgery. Allows for direct visualization of the broken bone, alignment, and some type of prosthesis such as pins, screws, nails, etc.
- Traction - Weights are used to provide traction and counter traction. This can be achieve being applied directly to the skin, to the bone, or distal to the broken bone.
- External fixation - A metal apparatus with rods and pins, affixed to the bone, through the skin allowing for stabilization of the bone.

Links

american cancer society (<http://www.americancancersociety.org>) [1] (<http://www.cancer.org>) <http://www.cancer.org>

Related Current Articles

Crilly, R., Cox, L. (2013) A comparison of bone density and bone morphology between patients presenting with hip fractures, spinal fractures or a combination of the two. *BMC Musculoskeletal Disorders*, 14(68), 1-9.

References

Author Unknown. (2005). The prevention and treatment of osteoporosis: A review. *Medscape General Medicine*, 7(2), 73.

McCance, K., Huether, S., Brashers, V., and Rote, N. (2010). *Pathophysiology: The biological Basis for disease in adults and children* (6th ed.). St. Louis, MO: Elsevier Saunders.