

Plain Language Summary

Diaphyseal Femur Fractures

Background

This plain language summary provides an overview for the management of diaphyseal femoral fractures, or simply a broken thighbone, in children whose bones have not reached skeletal maturity, and are still growing.

The thighbone (femur) is the only bone in the upper leg, with the length running from the hip to the knee, making it the longest bone in the body. Additionally, it is also the strongest bone, as it is a weight bearing bone, and serves as a connector for all muscles, and tendons from the hip joint to the knee joint.

What is a diaphyseal femur fracture?

The middle of the femur bone is known as the diaphysis. When the when a fracture happens near the center of the thigh bone, it is called a diaphyseal femur fracture. This type of fracture typically happens in high-impact instances, such as accidents involving a car, as a large amount of force is required to break this bone. Strong evidence supports, that this type of injury in children under three years of age, may be caused by child abuse, and the child should be evaluated for such.

There are many types of thigh bone fractures, with the common types being:

- **Transverse Fracture:** The break is a straight level line across the bone
- **Oblique Fracture:** The break is angled across the bone
- **Spiral Fracture:** The break looks like a corkscrew, and typically occurs from a twisting action. This type of fracture can result from a high impact sports injury, such as skiing, softball, soccer, and football; wrestling injuries caused by twisting the bone; physical violence, and child abuse. It may be difficult to realign a spirally fractured bone.
- **Comminuted Fracture:** The bone is broken into several pieces.

- **Opened Fracture:** There is an open wound or break in the skin near the broken bone.

How are diaphyseal femur fractures diagnosed?

Your doctor will examine your injury. This exam may include looking for swelling, deformity, and pain. Additionally, your child may be unable to stand or walk, and may not be able to move their hip or knee due to pain. Additionally, x-rays will be taken. The doctor may also take an x-ray of the healthy leg as a comparison. The doctor will also examine the growth plate (growth area) on the x-ray for damage, as this part of the bone allows the femur to grow.

What is the treatment for a diaphyseal femur fracture?

Treatment may vary, depending upon age of the child, weight, and fracture type. Occasionally, the fracture (broken bone) will not cause the bones to shift, and leg will usually heal in a cast. However, when the bones shift with the break they sometimes need to be put back into place (realignment), it is called a reduction. There are two types of methods used for reduction. The first type is a closed reduction, meaning your orthopaedic surgeon will, while using something to sedate your child, to alleviate the pain, move the bones back into place without the need to operate.

Following realigning the bones, the leg will need to be casted, either immediately, or within 24 hours of realignment. In children under six-months of age, limited evidenced supports using a brace (Pavlik Harness) or a spica cast as they both have similar outcomes. A spica casts are used to keep the hips, knees, and thigh bone still so the fracture can heal. The cast typically begins under the rib bones and extends down the broken leg. The cast may also be applied to the uninjured leg. Additionally, in children aged sixth months to five years, under certain conditions (e.g., bone shortening under approximately a half-inch),

moderate evidence also supports spica casting. Limited evidence also supports using a waterproof cast liner for the spica cast, as the liner helps with unexpected cast changes, as well assists with fewer skin irritations, such as rashes, on the infant or child's skin.

If the shortening of the bone is too much, or the bone cannot be properly realigned in a spica cast, the leg may need to be placed in traction (a weight and counterweight system) to assist with properly realigning the thigh bone prior to applying the spica cast.

When a break is too severe to be corrected via a closed reduction procedure, the child may require surgery to realign the bone and stabilize the fracture. This is called open reduction. If possible, the doctor may use flexible intramedullary nails to repair and stabilize the fracture. Strong evidence supports the use of flexible intramedullary nails to treat children between the ages of five to eleven years old diagnosed with a diaphyseal femur fracture. A flexible intramedullary nail is a rod that is placed into the center of the bone. This procedure may result in a quicker return to activity, as it allows earlier mobilization by stabilizing the broken bone.

If the broken bone has too many pieces to be repaired with flexible nails, other options are available. These include plates, screws, and pins. External fixation may also be used to keep the

bones in place. An external fixator is a frame that is used on the outside of the leg to hold the broken bones in the correct position. Metal pins or screws are inserted into the bones via small incisions in the skin, and the muscles and/or tendons, both above and below the fracture site. The portion of the pins that are visible on the outside of the leg are then attached to the frame.

What happens following treatment for a diaphyseal femur fracture?

Following a diaphyseal femur fracture, your child may be in pain for a while. The doctor will provide information that may help reduce this pain. Over-the-counter medications such as Advil or Motrin (ibuprofen), and Tylenol (acetaminophen) may help. Your surgeon may also prescribe a combination of alternating both Tylenol and Motrin, as it may more effectively control pain levels. Additionally, the doctor may instruct you to prop pillows under the broken leg to keep it raised. This will help to reduce swelling, as this can also cause discomfort.

Following the removal of the cast, the child may need physical therapy to improve the muscle strength, motion and flexibility of your leg. This will be determined by the doctor, and by other factors, such as the age of the child, and the severity of the break.