Femur Fractures

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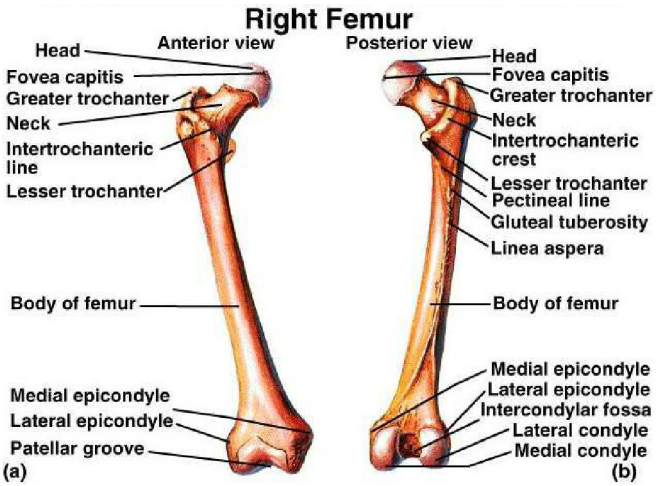
The femur is the largest and strongest bone in the body. It is capable to absorbing a huge amount of energy and resisting all but the greatest amount of trauma without damage. In spite of the femur's strengths it is not immune to injury and when the femur is injured the situation may become life threatening.

The femur is the long bone that makes up the upper leg. It is cylindrical in shape and is surrounded by large muscles that provide the femur with some protection. The proximal femur connects to the pelvis at the femoral head. This ball and socket connection creates the hip joint. The head of the femur connects to the shaft or the main body of the femur through the femoral neck. The shaft of the femur is almost perfectly round with a slight anterior curve. At the distal end of the shaft, the femur forms another joint and connects to the lower leg through the knee. The femur receives a large amount blood flow and when it is injured it can bleed profusely. The muscles around the femur can also bleed significantly when damaged by broken bones.

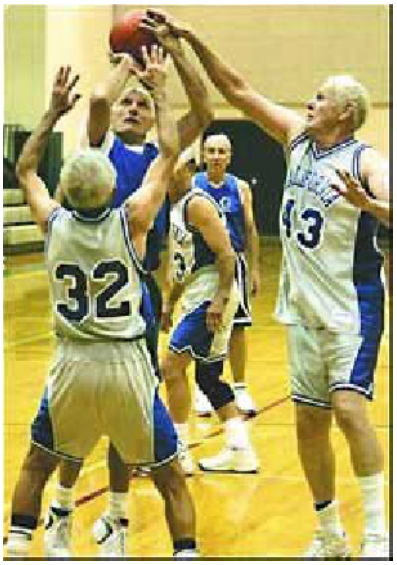


In this article our objectives will be to

- Learn how an injury can occur.
- Learn what happens to the body when an injury occurs.
- Review the signs and symptoms of a femur fracture.
- Discuss the treatment options that are available.

How does an injury occur?

Since the femur is such a strong bone with ample protection supplied by large muscle it can only be injured by significant force or by being weakened by age or disease. Femur fractures are seen most commonly in two age groups. The first age group is individuals that are less then 25years old. The most common mechanism of injury for this age group is on and off-road vehicular accidents. Victims in this age group are also more likely to take part in high impact sports. Individuals who participate in low impact sports are not free of risk. Sports that put repetitive stress on the femur such as running or tennis are at risk of stress fractures and femoral neck fractures. Since these fractures are caused by trauma they referred to as traumatic fractures.



The second age group is individuals older then 65 years old. While this age group is not the only group to suffer from bone weakening cancer and osteoporoses it is the

group that has the greatest occurrence of this problem. Chronic diseases and age weakens the bones and this is reason that this age group is at high risk of femur fracture. Disease may weaken the entire bone and fractures may occur in the hip and femoral neck as well as the mid-shaft. In most cases active individuals are mostly affected. The fractures occur after falls or as a result of repetitive stress being placed on the bone. An individual who has a history of bone weakening disease does not need to be active to suffer a fracture. In some cases, fractures can occur in bed bound patients while the patient is being moved for bathing or sheet changing. In cases where a fracture has occurred in the absence of significant trauma the fracture would be called a pathologic fracture.

How is the body affected by the fracture?

In cases of traumatic fracture, a great amount of force is required to break the femur. Attention should be given to the body as whole to find and treat other injuries before treating the patient for an isolated injury.

When the femur fractures it may break in different ways. The way the bone fractures may determine the way the body is affected. A fracture that is;

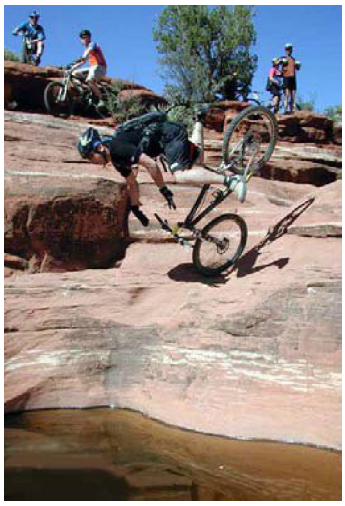
- Simple will have one fracture line and the bone will be broken into 2 pieces.

- Comminuted or compound will have more then one fracture line and the bone is broken into more then two pieces.

Both fractures may have sharp ends that damage the powerful muscles that surround the femur. When these muscles are injured by the broken bone ends they may contract causing the femur to be displaced and worsen the injury. A fracture can also be categorized as closed or open if the skin is broken by the fractured bone. In the case of a closed fracture, the injured muscle and the femur itself may bleed up to 1 liter of blood into the thigh. If the skin is opened by the fracture then bleeding can be much greater.

In cases of pathological fracture, traumatic forces are not present so displacement and significant soft tissue damage may be absent as well. Caregivers should handle this patient with care to prevent causing soft tissue injury as a result of patient movement. In this patient, the injured leg may be shortened or the foot rotated. Swelling may or may not be present since most of the swelling is caused by soft tissue injury.

Assessment



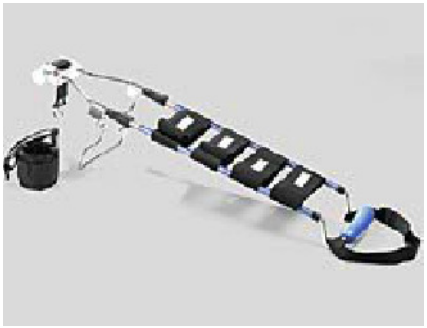
Upon arrival to an accident scene a scene assessment should be done to determine the mechanism of injury and estimate the traumatic forces present in the accident. Deformity will be the most obvious and often the most dramatic sign to be found. Deformity may not always be present. The site will be tender to touch with swelling that may be significant. The injured leg may be shortened and in most cases externally rotated but the foot can be rotated in either direction depending on how the forces were applied. While crepitus should not be actively sought it may be present. In some rare cases no signs will be found and the only symptom will be pain. Fractures that occur as a result of repetitive force or an impacted fracture that collapse's on itself like a telescope may not be displaced and can even be stable enough for the victim to walk on. In situations such as these, a good history may be the best tool that can be used in the pre-hospital environment. As in all cases of orthopedic injury, pulses distal to the injury should be checked to insure vascular integrity.

Treatment

Femur fractures often occur in situations where other injuries are possible. Providing care for all of the patient's injuries is critical for the best possible

outcome. As with all fractures splinting is the standard for femur fractures. The splint of choice is the traction splint. There are many forms of the traction splint available but the two most common splints at this time are the Hare traction splint and the Sager traction splint. Both splints work by applying traction to the injured leg so that the bone ends are separated and immobilized to minimize soft tissue damage and pain.

The Hare traction splint is the most common traction splint seen in pre-hospital care. Invented in 1960 by Glenn Hare, the Hare traction splint was an improvement on the Thomas half ring device that was invented in 1875. Glenn Hare went on to found DynaMed and introduced the Hare traction splint in the mid 60's. The Hare traction splint is available in adult and pediatric sizes. To use the Hare traction splint two rescuers trained in its use must be present. After one of the rescuers has manually applied traction and lifted the leg the Hare traction splint can be placed under the leg. The splint is anchored under the ischium and after hitch is applied to the ankle the bone ends are pulled apart using a winch. The leg is immobilized after using elastic bands that secure the leg to the frame of the splint. The Hare traction splint is a stable device that has stood the test of time but is does have some drawbacks. The splint's size makes it difficult to immobilize two legs at once and



moving a patient with traction splint in place can be a challenge. The splint is anchored under the leg in the area of the hip it can block the femur's movement and keep it from becoming in-line. This occurs most often when the proximal third of the femoral shaft is fractured.

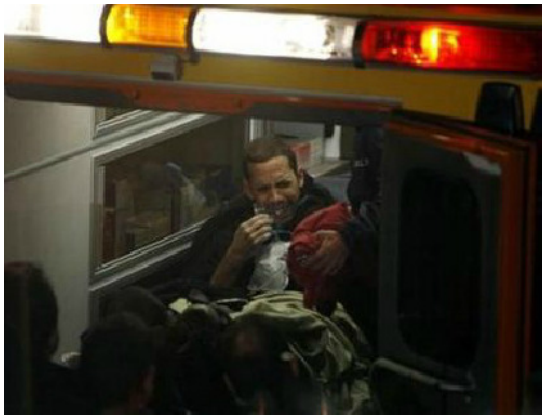
In 1972 Joseph Sager and Dr. Anthony Borscneck addressed this problem and invented the Sager traction splint. The Sager traction splint is placed between the legs and anchors against the ischial tuberosity like a bicycle seat. In a manner similar to the Hare traction the other end of the device is attached to an ankle hitch. The splint is then extended until the desired amount of traction is achieved. The Sager splint is equipped with a scale to measure the amount of traction that is being applied in lbs/kg. The rescuer should apply lbs/kg of traction that is equal to 10% of the patient's weight. Elastic bands are then used to secure both legs together. The patient can be easily moved with the splint in place since it is placed between the legs and out of the way. The Sager splint can be used on adults and children older than 4 years of age. An infant splint is also available. With the bilateral model, both femurs can be splinted at once or one at a time. The

greatest benefit of the Sager traction splint is that it can be applied quickly by one trained rescuer leaving others available to care for other injuries.

Contraindications do exist for the traction splint. The leg should not have any other fractures present. Using the traction splint when other fractures are present in the same leg will compromise the splints ability to provide traction. Fractures in the hip, femoral head and femoral neck can be worsened by a traction splint since the force is applied in a direction that is not inline with these structures. Injuries in the knee can also be compounded by traction so the traction splint should not be used when the knee is injured or when the femur is fractured in the distal portions of the bone. In treating traumatic fractures where the traction splint is contraindicated the leg should be immobilized to prevent movement that may cause soft tissue injury.

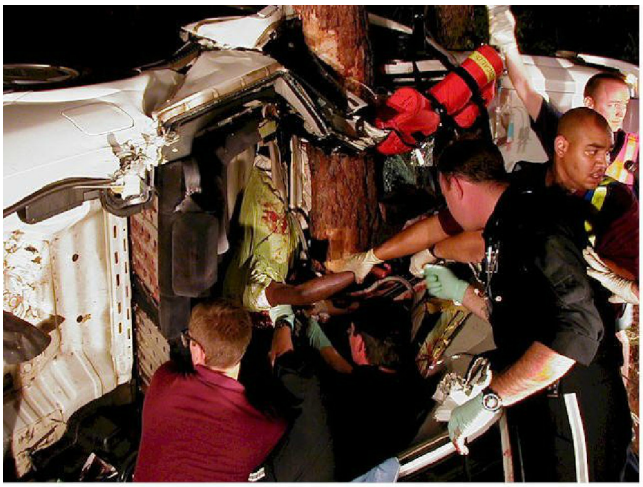
When treating a pathological fracture common sense should be used. If the leg is straight and can be splinted than traction splint should be used to prevent soft tissue injury. If the patient has contractures of the legs or the patient is unable to lie on their back then the leg should be immobilized in the position found.

Since a femur fracture is capable of so much blood loss fluid replacement should be a high priority. Bilateral large bore IV's provide a efficient route for volume resuscitation. IV's also provide a route for pain medication. Under the current SPEMS pain management protocol (P-15) a hemodynamically stable patient can be given pain medication for orthopedic injuries without a medical control order. Morphine is the first line medication for controlling pain. Adults can be given 2-6 mg every 10 minutes. The pediatric dose is 0.1 mg/kg to a max of 3mg. Medical control should be contacted before a repeat dose is given to pediatrics. In patients over the age of 60 you should consider giving a half dose. In the case that the patient has an allergy to Morphine, Demerol can be given in its place. Adults receive 50 mg of Demerol slow IV push, children should receive 1mg/kg to a max of 50mg and patients older then 60 should receive half the adult dose. 25 mg of Phenergan can be given in conjunction with the Morphine or Demerol to prevent nausea. Again, in victims older then 60 you should half the dose. Children younger the 2 years of age should not be given Phenergan.



Conclusion

Accident scenes are often cluttered with emotion, confusion and drama that can distract the rescuer from important tasks. Scenes that have victims who are suffering from grossly deformed fractures can be some the most difficult. Avoiding tunnel vision can be challenging if not impossible but it must be done for the benefit of all. In the case of the femur fracture treating the patient as a whole is essential. Providing Oxygen, stabilizing fractures, replacing the lost volume and minimizing pain should be the Medics goal in cases such as these. We should remember that these fractures are most often caused by trauma and the damage done can only be fixed in surgery so minimizing scene time and rapid transport should be in the back of our minds as we care for these patients. Regardless of the outcome, our satisfaction comes from knowing that we did all we could do and provided the patient with the best chance of survival. Once that is done we can walk away knowing we were successful.



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