What is limb alignment?
The lower limb includes the femur (thigh bone) and the tibia (shin bone). The joint between these two bones is the knee joint. Normally, a straight line drawn from the center of the hip bone to the center of the ankle will trace through the center of the knee. A tibial deformity can result in either a knock-kneed (valgus) or bow-legged (varus) knee (figure 1). In a valgus knee, the tibia bends outward, so instead of bearing weight evenly throughout the knee, the slightly bent leg bears too much weight on the outside of the knee. In a varus knee, the tibia bends inward, so the slightly bent leg bears too much weight on the inside of the knee. Both of these misalignments can cause the cartilage in the knee to break down, leading to degenerative knee arthritis.

What are the symptoms of a varus/valgus knee?
Usually, a varus or valgus knee can be determined through external observation and measurements. Those with a varus or valgus knee often suffer from osteoarthritis, as the knee then exerts increased pressure on the inside (medial aspect) or outside (lateral aspect) of the knee. Arthritis of the medial aspect of the knee (as is seen in patients with varus alignments) is the most common form of degenerative arthritis; the most common indication of degenerative knee arthritis is pain and/or swelling of the knee joint.

What are the treatment options for medial knee arthritis associated with a varus knee deformity?
Non-surgical condition management centers on reducing the stress load on the painful region and/or reducing the inflammation associated with cartilage wear. This includes weight reduction, medications by mouth, knee joint injections, and physical therapy to address muscle strength of the lower limb and pelvis. The use of a medial unloader brace can be tried. An osteotomy (osteo = bone, otomy = to cut) is an operation that tries to unweight the painful side of increased load by “realigning” the knee.

Who is a candidate for a proximal tibial osteotomy?
The candidate must have a reasonable BMI (under 35) with continued satisfactory knee motion. A varus alignment on x-ray will be present with medial-sided early knee arthritis, with little to no arthritis in the outside compartment of the knee or in the kneecap compartment. The patient must be compliant with the post-op rehabilitation orders, and be able to use crutches.

What is the goal of surgery?
The ultimate goal of a proximal tibial osteotomy is to reduce pain, and thereby increase the function of weight-bearing knee activities. In select cases of focal cartilage wear or injury, a cartilage procedure is performed as well. It is very common for cartilage restoration procedures to be paired with a proximal tibial osteotomy. By individualizing the patient’s treatment, the goal is to help the patient return to his or her desired activities, and improve the long-term health of the knee.

What is the technique for performing a proximal tibial osteotomy?
Pre-operatively, careful calculations of the knee alignment are made, and the degree of corrective “re-alignment” is determined. For this kind of operation, an “opening wedge” procedure is used (figure 2). During the operation, a 6-8 inch incision is made on the medial side of the knee. Then, with the use of fluoroscopic (x-ray) guidance, a surgical fracture is made on the medial side of the proximal tibia (f). While retaining the lateral
bony hinge, this “fracture” is then wedged open to the predetermined angle of correction. This correction is then fixed with a metal or hard plastic plate and screws inserted into the tibia. This arrangement secures the tibia in its new corrected position. After fixation of the plate and screws, a bone graft is placed in the area of the opening wedge.

What is rehabilitation like post-operatively?
Rehabilitation is divided into four phases. The first phase (0-4 weeks) works on regaining range of motion. The second phase (4-6 weeks) focuses on mobilization and regaining muscle strength. The third phase (6-12 weeks) works to develop strength and proper mechanics. The final stage (12+ weeks) aims to prepare the patient to return to his or her activity level prior to the injury. It is necessary to follow the rehabilitation programs carefully so as to allow the bone graft to heal properly. Please refer to the patient protocol sheet for a more thorough description.

What are the complications of a proximal tibial osteotomy?
The overall complication rate following a proximal tibial osteotomy is low. Anesthesia complications, bleeding, and infections are rare (less than 1%). One particular complication associated with this kind of procedure is called nonunion, which is when the bone graft does not heal as planned. Nerve palsy, or weakness, can also occur. Furthermore, there is a risk of recurrence of the deformity; this is often induced by extreme stress on the joint, such as weight gain, or incomplete initial correction of the deformity.

What is the general outcome of a proximal tibial osteotomy?
The outcome of proximal tibial osteotomy has a 95% success rate of decreased knee pain and improved knee function following the operation. Many patients are able to maintain active lifestyles and semi-laborious jobs. Because the procedure it is typically performed on younger active patients, it often delays the need for a total joint replacement for at least 10 years, with 20 or more years of continued pain relief reported in the literature.