Dr. Noyes Follows-Up on Previous Study of Femoral-Fibular Knee Reconstruction

In the orthopedic world, Dr. Frank Noyes is an important name. He has been a front runner in developing new surgical techniques for a variety of orthopedic injuries. In this article, long-term results from an ongoing (and previously reported on) study are published.

The topic? Chronic knee instability treated with a femoral-fibular posterolateral reconstruction. This is the most commonly used surgical technique to stabilize a knee with multiple ligaments that are damaged. Without this important soft tissue support, posterolateral (back and side) instability of the knee joint occurs.

To be more precise, the soft tissues being replaced are the fibular collateral ligament, the popliteus muscle tendon-ligament (PMTL), the popliteofibular ligament, and the posterolateral (joint) capsule.

Without these structures, the knee slides around and can partially dislocate (called subluxation) or fully dislocate. That's what we mean by knee instability. Together, these soft tissues work to keep the knee joint from hyperextending (extending beyond a neutral position), externally rotating too far, or opening (gapping) too much along the side.

And that's why it's important to do more than just repair damage to this area. In this procedure, a piece of the Achilles tendon from the back of the heel is used to replace torn ligaments along the back (posterior) and side (lateral) aspect of the knee. The surgeon actually has to reconstruct this group of four ligaments and capsule that make up the back/side corner of the knee joint.

Dr. Noyes performed this femoral-fibular reconstructive technique for multiple ligamentous damage to the knee. Twenty-one (21) patients (males and females) were treated with this procedure. Early results were reported in 1995. At the time of the surgery, patients were between the ages of 15 and 43.

Now more than 10 years later, long-term results are compared to the early outcomes.

For those who are unfamiliar with the first study, the femoral-fibular procedure is briefly reviewed. Photographs taken during surgery help the reader understand exactly what was done during the operation. Drawings show the reader more clearly what is seen in the photos.

Basically, tunnels were drilled into the femur (thigh bone just above the knee) and into the fibula (small bone along the outside of the lower leg bone and located just below the knee joint). The Achilles tendon graft (taken from a tissue bank, not from the patient) was threaded through the tunnels with just the right amount of tension to mimic the natural ligamentous function.

After surgery, each patient went to rehab under the supervision of a physical therapist. Patients were instructed how to protect the graft from overload and stretching until healing had taken place. A special removable half-cast was used to keep the leg from extending past neutral while still allowing partial knee flexion.

The therapist guided the patients through a series of daily exercises to restore motion, strength, and function. After a month in the bivalved cast, patients were placed in a special brace that could be locked to prevent excess motion. The brace could be unlocked when the surgeon felt the knee was ready for weight.

Phase two of the rehab program involved gradually increasing weight, stress, and load on the joint (and thus on the graft). Activities were re-introduced but not all activities were allowed. For example, swimming and bicycling were okay but high-impact or vigorous activities were not advised.

Before sharing the long-term results, it is helpful to review what happened in the first study. Results were measured using X-rays, subjective (patient reported) symptoms, motion, strength, and function. Two specific tests (the International Knee Documentation Committee (IKDC) and Cincinnati Knee Rating System) were used before and after surgery to assess joint stability.

Three-fourths of the patients had a normal or near normal result. Five patients had a failed outcome early on (during the first four months after surgery). Those five patients had already undergone at least one (and often more than one) previous failed knee surgery.
How are all the patients doing now? Well, the good news is that 71 per cent report being able to participate in low-impact activities without pain or problems. Arthritis seems to be the most difficult long-term post-operative problem. About 28 per cent have arthritic symptoms (pain, stiffness, loss of motion) either with daily activities or with sports participation.

What conclusions did Dr. Noyes come to from this long-term study on femoral-fibular reconstruction for knee instability following multiple ligament injury? First, the success rate was good enough to consider this procedure a good treatment option. This technique does restore lateral joint gapping needed for normal movement. But it prevents abnormal lateral joint opening when stress is applied.

Second, from other studies in this area, it's clear that just replacing the popliteus muscle tendon-ligament (PMTL) without taking care of other areas leads to failure in a majority of cases.

Third, the femoral-fibular reconstruction is a fairly simple procedure. The way the graft is put in and looped around actually makes a double graft. The extra strength of this configuration tied into the fibular collateral ligament (FCL) works well. The placement of the femoral-fibular graft forms a solid foundation for the complete reconstructive procedure.

As a result, all three posterolateral structures are restored allowing for normal (or near normal) motion, function, and stability. This reconstructive procedure mimics the natural knee and that's important for both daily activities and recreational sports.