

Kirt M. Kimball MD

(Drkimball.com)

## **ACL**

### **Anterior Cruciate Ligament Rupture and Reconstruction**

#### **My team:**

Surgeon: Kirt M. Kimball MD

Physician Assistant: Doug Fillmore PA-C, A.T.C.

Contact number: 801.373.7350

Executive Assistant: Sydney Bills

Contact number: 801.373.7350

Surgical Scheduler: Carrie Nye

Contact number: 801.229.6336

Office assistant for surgical prior authorizations: Donald Dunn

Contact number: 801.229.6331

Orthopedic Division Office Administrator: Dick Johnson

Contact number: 801.229.6326

#### **Communication and problem solving:**

If there is an emergency, call 911

For routine questions and non-emergency concerns call the office or specific numbers listed above and ask for the appropriate person:

1<sup>st</sup> call and ask for Sydney

2<sup>nd</sup> if Sydney not available, call or ask for Doug (my PA)

3<sup>rd</sup> ask for me

4<sup>th</sup> ask for the “on-call” physician for after hour concerns

#### **My Locations:**

##### **Provo Office**

1055 North 500 West (Across the street from Utah Valley Hospital)

Suite 121

Provo, Utah 84604

801 373-7350

##### **Orem Office**

800 North 700 West (Next to Timpanogas Hospital)

Suite 100

Orem, Utah 84057

801 373-7350

**My Schedule: (usually)**

*Monday:* Provo office from 9:00 a.m. until 5:00 p.m.

*Tuesday:* Surgery at Timpanogas Hospital and Central Utah Surgical Center

*Wednesday:* Orem office from 9:00 a.m. until 5:00 p.m.

*Thursday:* Surgery at Utah Valley Regional Medical Center

*Friday:* Variable schedule: Orem office or surgery

**My ACL Experience:**

My practice is limited to the knee and shoulder conditions. I am the orthopedic surgeon for the BYU Athletic Dept. I treat high demand athletes from all over the state and beyond.

Recent reports indicate that almost 90% of ACL reconstructions done in America are done by surgeons who, on average, do 10 ACL surgeries per year. I perform 120 to 150 ACL reconstructions per year.

Approximately 40% of my ACL's are done using **Patellar Tendon Autografts** (because of the number of high demand athletes I treat), another 40% are performed with Hamstring Autografts (**Double Bundle Anatomic technique**) and the remaining 20% are performed with **Allografts** usually in a "revision" setting.

- I am Board Certified by the American Academy of Orthopedic Surgeons.
- I am a Fellow of the American Orthopedic Society for Sports Medicine
- I have earned Certificate of Added Qualification in Orthopedic Sports Medicine.

**What is an ACL tear?**

When you twist your knee or fall on it, you can tear a stabilizing ligament that connects your thighbone to the shinbone. An anterior cruciate ligament (ACL) unravels like a braided rope when it's torn and does not heal on its own. When the ACL tears it usually literally "explodes" thus one often but not always hears or feels a "pop" at the moment of rupture. Fortunately, reconstruction surgery can restore stability to an ACL deficient knee.

**Ligaments:** are tough, non-stretchable fibers that hold your bones together. The cruciate ligaments in your knee joints crisscross to give you stability especially when twisting or turning.

Often the ACL will tear by changing direction rapidly, slowing down from running or landing from a jump. I have even seen the ACL tear in mid-air with no contact at all. Young people (age 15-25) who participate in basketball, soccer and football that require pivoting are especially vulnerable. You may hear a popping noise when your ACL tears although some hear nothing at all. Your knee gives out and soon begins to hurt and swell.

**First treatment includes:** rest, ice, compression and elevation (RICE) plus a brace to immobilize the knee, crutches and pain relievers. Evaluation by a knee specialist will usually quickly define the diagnosis.

**The next step** is to have a physical examination and X-rays help determine the extent of damage to your knee. If the ACL is torn, surgery usually will be necessary. The ACL is reconstructed rather than repaired. The reconstruction employs a tissue graft to create a new ACL ligament. There are three common graft choices when performing this reconstruction.

In a few cases when the ACL is torn cleanly from the bone it can be repaired although this is rare and accounts for less than 1% of ACL tears. Less active people may be treated nonsurgically with a program of muscle strengthening however the knee will remain unstable.

**My Approach** to this common and very serious problem is based on years of experience with thousands of ACL reconstructions done by others and myself. It is estimated that over 100,000 ACL reconstructions are performed in the United States annually.

### **Why does the ACL need to be reconstructed?**

It is important to understand that when the ACL tears it usually literally explodes. Thus it is not a repairable ligament which can merely be reattached or sutured. Rather it must be reconstructed or "remade" using other tissue. My approach is based on the following information:

Often times the only apparent injury to the knee is rupture of the ACL however there are always other components to the injury which may not be recognized. The most common of these are the bone contusions (bruises) which are usually apparent on an MRI though not apparent on plain x-ray. Thus, when treating the ACL rupture, it is important to consider the other parts of the knee which may be injured whether obvious or subtle.

### **When to Reconstruct the ACL:**

Rupture of the ACL is a very traumatic event to the knee. The injury provokes a serious inflammatory reaction in addition to extensive bleeding into the joint. For this reason I don't recommend performing the surgery close to the time of injury. Experience has taught that surgery done too early often leads to postoperative arthrofibrosis. This means the knee gets stiff and it becomes very difficult to regain full range of motion. I believe it is important to delay surgery until the appropriate "environment" has been established in the knee. A patient is ready for surgery when nearly full range of motion returns and good quadriceps contraction is present. Usually 2-3 weeks is adequate time for the knee to be prepared for surgery.

Social factors often affect timing of surgery. As long as you are careful, it may be appropriate to delay surgery until it fits better in your personal schedule. I recently took

care of a young lady who tore her ACL 2 weeks prior to her planned wedding. Of course, surgery was delayed until sometime after the honeymoon.

It is possible to wait too long before performing surgery. An ACL deficient knee is unstable and will buckle or give out if certain loads are applied to it. These episodes of instability can cause further damage to the knee thus it is appropriate to have the knee stabilized surgically prior to exposing it to possible further injury. If one elects to defer surgery, then bracing, activity restriction and caution is appropriate to protect the knee from further injury.

### **Can I play without reconstructing the ACL?**

Often a highly motivated athlete will hope that he or she can play in spite of the ACL rupture. The hope is that a brace can make up for the torn ACL ligament and enable the athlete to continue to compete in spite of the injury. In my experience this rarely if ever is successful. Even currently constructed custom braces are rarely effective in stabilizing an unstable knee if the athlete is a skill player that requires cutting, pivoting and similar forces. If the knee gives-out in the brace, additional injury may occur such as the tearing of one or both menisci. If you have to try, you must do so at your own risk. Failure is the rule rather than the exception when trying to compete on an unstable knee.

### **Graft Selection issues:**

When reconstructing an ACL one must decide what type of tissue to use to fabricate a new ligament. Biologic grafts can be either native tissue (**autografts**) or acquired cadaver tissue (**allografts**). Experience with prosthetic or artificial ligaments has led to failures.

**Autografts:** Patellar tendon, quadriceps tendon, and semitendinosus/gracilis bundled tendons are the primary autografts in use.

- Patellar tendons grafts are still the gold standard in high demand athletes and have the advantages of bone-to-bone fixation at both ends, high ultimate tensile strength and high graft stiffness. When this graft heals to bone, the entire tendinous portion is essentially anchored at both ends. Multi-stranded grafts require healing of all strands to achieve their potential. Patellar tendon grafts may allow earlier return to sport.

As I treat a large number of high level athletes at the professional and college level, I pattern my graft selection after the patterns used on NFL players.

In a recent 2009 survey of all NFL Team Orthopedic surgeons, when asked about reconstructing the ACL on an NFL player:

-100% of those surgeons preferred patellar tendon auto grafts

-0% preferred hamstring grafts

-0% preferred Achilles allograft (cadaver graft)

**Pros: Patellar Tendon (BTB) (Autologous)** This graft has high tensile strength, high stiffness of the tissues and allows early bone to bone healing at both ends of the graft. Some studies have suggested a higher incidence of residual pain at the donor site however other studies have concluded this not to be the case.

This is the most common graft selected when treating high level, high contact athletes at professional, college and other levels.

**Cons:** I discourage the use of this graft if the patient spends a lot of time on his/her knees such as occurs in plumbers, tile setters, carpet layers etc. The scar at the donor site is right in the front of the knee may be annoying and uncomfortable in that situation.

**Pros: Semitendinosus/gracilis bundled tendons (Hamstring)** This graft is made up by harvesting your semitendinosus and gracilis tendons (hamstring tendons), weaving them into a rope like structure and then implanting that "rope" into the knee in place of the ruptured ACL. It is a strong graft but since it is made up of multiple strands its ultimate strength is dependent on healing of all the strings with exactly the same tension on each strand. Healing of the tendon strands to the bone also occurs at a slightly slower rate than with a bone-to-bone graft.

**Cons:** Cosmetically this graft is more pleasing as the scar is not directly in the center front of the knee. This graft tends to loosen a bit over time and may have a higher failure rate in high demand athletes.

**Allograft (Cadaver graft):** Multiple allograft choices have become popular, particularly in the revision setting. These include bone-patellar tendon-bone, quadriceps tendon, hamstring tendon, Achilles tendon, and both anterior and posterior tibialis tendons.

**Pros:** The advantages of allograft use are less surgical time, less surgical morbidity, faster rehabilitation, and flexibility in graft preparation. The disadvantages include the risk of viral and/or bacterial infection, slower incorporation of allograft tissue, immunologic reactions, and a paucity of long-term outcome data. Cadaver grafts are also more expensive than using your own tissue.

**Cons:** Recently, the tissue bank industry has undergone increased scrutiny because of reports of infections related to grafts. The transmissions of HIV and hepatitis C to several patients have been reported and the transmissions of bacterial infections to more than 20 patients by an infected allograft have now been documented to have occurred within the past several years. At least one death has occurred because of infection transmitted by an osteochondral allograft.

In reality, hundreds of thousands of various types of allografts are used safely in the U.S. each year. Although there is risk, the risk is very small.

**I recommend:**

- My approach is to use your own tissue if at all possible. If not, then an allograft can be a good choice.
- Recent studies have indicated an alarmingly high rate of graft failure when allograft is used as a primary graft in 18-25 year olds thus using your own tissue seems more important than ever.

**Anatomic or Double Bundle ACL Reconstructive Surgery:**

-Recent advances in understanding of the complex function and anatomy of the ACL has reaffirmed the importance of performing ACL reconstruction in a fashion which most accurately restores not only the function but to the degree possible, the actual anatomy of the injured ligament.

The normal ACL is made up of two major bundles:

**1-anterior medial (AM)**

**2-posterior lateral (PL).**

The **AM** bundle contributes primarily to control translation of the knee in flexion. The **PL** bundle, on the other hand, contributes more to controlling rotational stability as the knee approaches full extension.

Traditional ACL reconstruction techniques applied to high demand athletes (such as foot ball players, soccer players and other athletes which involve high torque exposure) has been done employing a large single bundle graft centered as nearly possible at the anatomic sites of attachment on the tibia and femur. Graft choices primarily include:

- **Patellar Tendon Auto-graft (BTB)**
- **Hamstring Auto-graft (HS)**
- **Variety of Allograft (Cadaver)**

The selected graft is attached to the femur and tibia by implanting the ends of the graft in bone tunnels created at or near the anatomic site of attachment of the normal (uninjured) ligament on the femur and the tibia.

There are a myriad of factors to consider when selecting type of graft to be used as well as the method of fixation of the graft to the bone. As with most choices in life, each has its advantages and disadvantages.

**Double Bundle Method:**

Recent improved understanding of the unique anatomy of the ACL has led surgeons around the world to develop methods of reconstructing the ACL in a more anatomic fashion than has been traditionally employed. **This "anatomic" method is also referred to as the "double bundle" method as it employs two smaller bundles (or grafts) rather than one large "single bundle" (graft).**

When performing ACL reconstruction with Hamstring Autograft or Hamstring Allograft, **I employ double bundle technique.**

The "anatomic" method has not been in use for very long and thus we have limited experience with the results of this method especially on high demand athletes. However, early results are certainly promising and the rationale behind the method certainly makes sense.

When performing Patellar Tendon (BTB Autograft) or Cadaver (Allograft) reconstructions I position the graft in the anatomic position.

**Summary:** The goal of treatment is to provide a painless knee with stability and normal muscle function and coordination. The challenge is to perform the reconstructive procedure with high success and minimal morbidity. To accomplish this requires a combination of a skilled surgeon, appropriate graft selection and careful attention to the details of rehabilitation. In my experience, a highly motivated patient is almost as important as having a skilled surgeon.

**Where:**

Your surgery will be performed in an outpatient setting. I perform this procedure at:

- Utah Valley Regional Medical Center
- Central Utah Surgical Center

The choice of facility is determined by your schedule, my schedule and the provider options on your health insurance policy

**Type of Anesthesia:**

Your surgery will most likely be performed under general anesthesia. Under some circumstances a spinal anesthetic may be used. You will be able to discuss these options with the anesthesiologist when you come to the outpatient surgical facility.

- A femoral nerve block will be offered as well. This is an injection of a Novocain-like medication near the femoral nerve in your upper thigh. It has a numbing affect and will diminish the postoperative pain for anywhere from 6 to 24 hours. In some circumstances parts of the nerve block may last longer however full recovery is expected.

**Night before surgery:**

- It is imperative that you have nothing to eat or drink for at least 6 hours prior to surgery.
- If you are an early morning surgery, then you should have nothing to eat or drink after midnight.
- The hospital or surgical center will call you the evening before surgery to give you further instructions and tell you what time to come to their facility.
- Your leg will be scrubbed with antiseptic soap at the time of surgery. It is wise to do the same at home the night before surgery. If you have a pimple or other site of infection either on the injured leg or any other part of your body, Dr. Kimball will likely delay your surgery until that infection is resolved. When in doubt, ask the doctor. Infection is a terrible complication that is better avoided.

**Day of surgery:**

- You will arrive at the center, do some more paper work and then be prepped for surgery.
- I will be there and will speak to you before the surgery and ask any last minute questions you or those with you may have.
- You will be asked to mark the extremity that will receive the surgery.

-The surgery will be done under a general anesthesia supplemented with a femoral nerve block. The ACL portion of the surgery takes me about 45 minutes. Any associated meniscus repair, ligament repair or treatment of cartilage damage will obviously add to the length of the procedure.

**Recovery Room:**

After the surgery you will awaken in the Recovery Room.

- Your leg will feel numb or heavy because of the nerve block.
- You will have a somewhat bulky brace on your leg and a “polar-care” unit designed to circulate ice water around the surgical site.
- Once you are sufficiently awake you will get up on crutches, take some fluids or food, empty your bladder and when you are ready, will be discharged home. You will need someone to drive you home and be with you at least the first 24 hours.

**Rehabilitation:**

Your recovery and rehabilitation begins almost as soon as you get home.

- Exercising your calf muscles reduces the risk of blood clot.
- It is **OK** to get up and around on crutches.
- It is **OK** to put weight on your foot but you must not try to walk without the crutches until you have sufficient strength to do so safely. Usually crutches are needed for 7-10 days.

With rare exceptions, I like to start your rehabilitation the day after surgery. You will be scheduled to start with a physical therapist that has special expertise in ACL recovery. We will discuss with you an appropriate choice of physical therapist based on where you live, your insurance coverage and my experience with the therapists in your neighborhood. Not all physical therapists are the same.

Your initial physical therapy will focus on helping control swelling, get your range of motion back and initiate muscle function.

- Once you are sufficiently strong, you will discard your crutches. This usually occurs in 7-10 days however it is not a race and you should use crutches or a crutch until you are comfortable without them. Most are walking pretty normally within 2-4 weeks.
- Once the acute phase of physical therapy is over the focus switches to muscle rehabilitation. It is important to remember that although the ACL graft is strong, it is not strong enough to allow cutting or twisting activities during the first few months.
- Exercise should be focused and aggressive, but controlled so as to not damage either the surgery or the somewhat delicate surfaces in your knee joint.

The speed of rehabilitation will vary if you have significant additional injuries such as a meniscal repair or additional ligament damage other than the ACL. Chondral surface injuries will also alter the course of recovery.

**Return to Sport:**

The earliest one can safely return to sport following ACL reconstruction is about 5 months. However, ultimately the limiting factor is your level of strength and rehabilitation. Women are often successful in returning to soccer and similar sports at 5-6 months, but men usually take longer.

Protecting your ACL reconstruction with a custom ACL brace is recommended for at least the first year following returning to sport. In some sports, it is advised to always use such a brace when exposed to high-risk activities such as skiing.