PENINSULA
BONE AND JOINT CLINIC

ACL
RECONSTRUCTION

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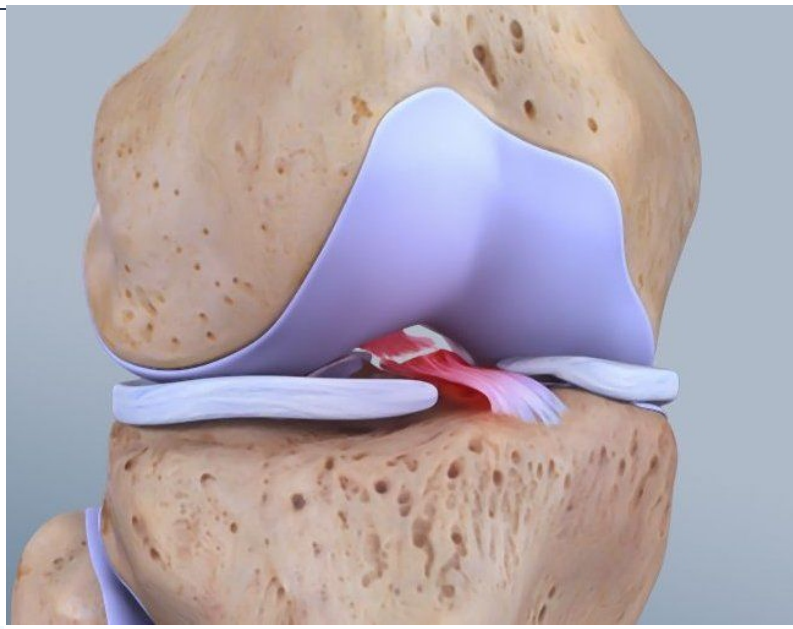
Anatomy and Biomechanics

The knee is a hinge joint between the femur and tibia bones. It is held together by four important ligaments. The most important ligament for knee stability is the Anterior Cruciate Ligament (ACL). The purpose of this ligament is to keep the tibia from sliding forward on the femur and also plays a major role in rotational stability of the knee. For this reason, the ACL is most susceptible to injury when rotational or twisting forces are placed on the knee. Although this can happen during a contact injury most ACL tears happen when athletes come to a stop and pivot or when landing from a jump.

After the ACL is torn the knee is less stable and it becomes difficult to maintain a high level of activity without the knee buckling or giving way. It is particularly difficult to perform the repetitive cutting and pivoting that is required in many sports.



Diagnosis

ACL tears often occur during sports participation but can also occur during a slip and fall that results in a hyperextension or twisting injury. Patients will often state that they felt or heard a pop or ripping sensation associated with the injury. Usually swelling will occur within 24hrs of the initial injury. Clinical examination for ACL injury is performed to assess loss of knee stability. The Lachman and Anterior Drawer test are most common. A Magnetic Resonance Image (MRI) is usually performed when injury is suspected to confirm the diagnosis and assess the knee for additional soft tissue or bony injury.

Treatment Options

Regardless of how the ACL is torn we will work with you to determine the best course of treatment. The initial treatment usually involves, rest, ice, and activity modification in order to decrease the initial swelling of the knee. Some people may elect to use a sports brace and restrict their activity rather than undergo surgery to reconstruct the ACL. If a non-surgical approach is taken the patient must understand that it is imperative that he or she maintain good strength and avoid sports or activities that require pivoting or cutting. ACL reconstruction surgery is generally recommended for active, healthy patients who wish to return to sports and activities that require cutting or pivoting, such as football, soccer, basketball, volleyball, skiing, and gymnastics.

Surgery

ACL reconstruction surgery is not a primary repair procedure. This means that the ligament ends cannot simply be sewn back together. The new ACL must come from another source and grafted into place in the knee. We perform a matched anatomic reconstruction using the location points from your native tendon to reconstruct your new ACL graft. There are a few different options as to what tissue is used for the ACL graft. Most patients in our office will have either a hamstring (autograft) or cadaver (allograft) tissue used for reconstruction. We will discuss the rational for our recommendation and work with you to achieve the best surgical plan to reach your goals.

During the procedure tunnels are drilled through the tibia and femur bones and the new ACL graft is passed through them and anchored into place. Regardless of what type of graft is used ACL reconstruction is an outpatient surgery procedure that will allow you to return home the same day of the procedure.

Anesthesia

General anesthesia will be required to perform the surgery. In addition, the anesthesiologist will discuss performing a nerve block in the pre-operative area prior to surgery. It is a highly effective way to decrease pain in the first 24-36 hours after surgery. It will help reduce the amount of pain medication required although we do advise starting pain meds prior to the block wearing off to smooth the transition.

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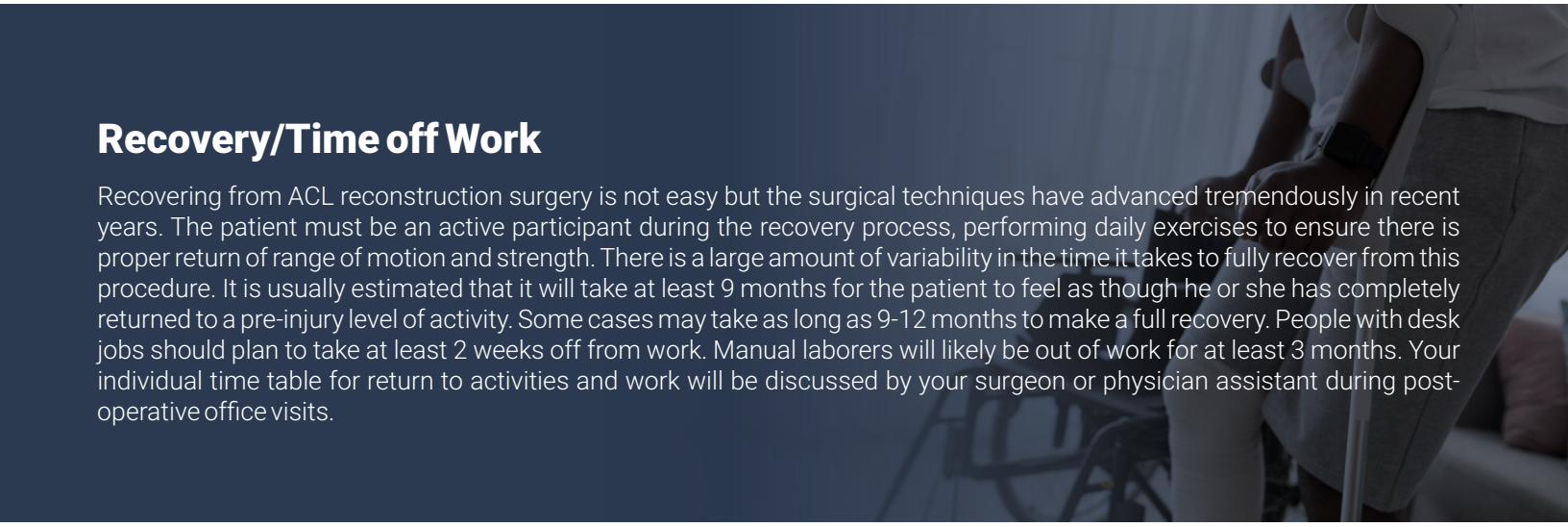

Recovery/Time off Work

Recovering from ACL reconstruction surgery is not easy but the surgical techniques have advanced tremendously in recent years. The patient must be an active participant during the recovery process, performing daily exercises to ensure there is proper return of range of motion and strength. There is a large amount of variability in the time it takes to fully recover from this procedure. It is usually estimated that it will take at least 9 months for the patient to feel as though he or she has completely returned to a pre-injury level of activity. Some cases may take as long as 9-12 months to make a full recovery. People with desk jobs should plan to take at least 2 weeks off from work. Manual laborers will likely be out of work for at least 3 months. Your individual time table for return to activities and work will be discussed by your surgeon or physician assistant during post-operative office visits.

Post-Operative Visits

Your first post-op visit to the doctor's office will be approximately 7-10 days after the operation. At this visit your stitches will be removed and you will review the surgery with the surgeon or physician assistant. At this time you will most likely be cleared to begin Physical Therapy. You should also plan to check in with your surgeon at 6, 12, and 24 weeks after the operation.

At Home

You should remove your post-op dressing 2 days after the operation and place band aids over the incisions. The dressing is no longer necessary after two days as long as the incision is dry. Do not remove the strips of tape (steri-strips) that are across your incision. Allow them to fall off on their own or to be removed at your office visit. You may shower after 2 days, but use a water resistant dressing or band aids until your sutures are removed. It is best to use a shower bench if possible to avoid weight bearing on the surgical leg. Sponge baths are another alternative. Do not soak or submerge the knee under water.

Medication

We will prescribe you pain medicine for use after the operation. Typically, this will be sent electronically to your pharmacy at the pre-operative visit or prior to your scheduled surgery. We typically prescribe a combination of Norco (pain medication) and Ibuprofen (pain and inflammation) to be used in concert. Every patient has a different response to pain stimulus and we may adjust as needed. We want to limit narcotic pain medication as much as possible. It can worsen nausea, constipation, and lead to dependency with long term use. We encourage you to utilize the ibuprofen only as soon as pain is tolerated. Pain medication can only be refilled during regular office hours as an electronic prescription. Do not call at the end of the day, evening or weekend expecting a pain medication refill. We are a surgery office and not a pain management clinic. We do not prescribe long-term use narcotic medication.

Ice

You must use ice on your knee after the operation for management of pain and swelling. Ice should be applied 3-5 times a day for 10-20 minutes at a time. Always maintain one layer between ice and the skin. Some patients prefer to use “ice machines” after surgery. These are not covered by insurance and do not require a prescription. They are an excellent convenience item but not deemed necessary. They can be purchased on-line, borrowed from a friend, or we can direct you to a vendor for direct purchase.

Crutches

It is very important for you to use crutches after the surgery as instructed. Putting too much weight on your knee in the early phases of recovery can create excessive and persistent swelling, poor gait mechanics and may cause undue stress on the healing ACL graft. You may put your leg on the ground for balance while wearing the brace. You may start to wean from the use of your crutches at 2 weeks post op and start to walk with the brace locked straight. You may progress to weight bearing as tolerated out of the brace at 3 weeks post operatively. In all cases proper gait pattern must be achieved in order to discontinue use of assistive device and brace.

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Brace

After surgery we require you to wear a large hinged knee brace when walking. Generally it is recommended that you keep the brace locked in extension while walking and when sleeping for the first three weeks after the operation. It is recommended that you unlock the brace when sitting to allow your knee to move and bend. Allowing the brace to be unlocked while walking is generally based on how well you recover muscle tone in your leg. You will need this brace for a minimum of three weeks after surgery but may need to use this brace up to six weeks after the operation.

Driving

After ACL reconstruction you will not be allowed to drive as long as you are taking narcotic pain medicine. If you had surgery on your left leg you may drive an automatic transmission car soon as you are no longer taking narcotics. If you had surgery on your right leg we will let you know when you are clear to drive. Driving is generally not permitted when your leg is weak enough that you still need to use the post-operative brace which is approximately 3 weeks.

Risks and Complications

Risks of major complication is inherently low for arthroscopic outpatient surgery, however there are inherent risks to all surgical procedures including reaction to anesthesia or medications, bleeding, and infection. ACL surgery can result in post operative knee stiffness, localized numbness on the skin, failed reconstruction, blood clots, and complications related to the orthopedic implants used to perform the procedure.

Rehabilitation

**The following is an outlined progression for rehab. Time tables are approximate and advancement from phase to phase as well as specific exercises performed should be based on each individual patient's case and sound clinical judgment by the rehab professional. **

Phase 1 (0-2 Weeks)

Goals

- Control Pain and Swelling
- Protect Healing Tissue
- Begin to Restore Range of Motion (ROM) Especially Full Extension
- Establish Good Quadriceps Activation

Precautions

- WBAT with Crutches for 2 weeks
- Brace locked in extension with ambulation and sleeping
- Bledsoe Brace unlocked 0-90° or full range as directed when non-weight bearing

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Recommended Exercises

Range of Motion

- Heel Slides 2 Sets of 20 Repetitions
- Assisted Knee Flexion/Extension 2 Sets of 20 Repetitions
- Heel Prop (passive extension) or Prone Hang 5 Minutes Belt Stretch (Calf/Hamstring) Hold 30 Seconds 3-5 Repetitions
- Ankle Pumps without resistance at least 2 Sets of 20 Repetitions Cycle (minimal resistance) 10-15 minutes Daily
- Quad Sets 2-3 Sets of 20 Repetitions

Strength

- SLR *(no Lag)* 2-3 Sets of 10-20 Repetitions
- Hip Abd/Add/Extension (against gravity) 2-3 Sets of 10-20 Repetitions
- Standing or Prone Hamstring Curls (unless Hamstring Graft) 2-3 Sets of 10-20 Repetitions
- T-Band Ankle Pumps 2-3 Sets of 20-25 Repetitions

Guidelines

Use exercise bike daily if possible for 10-15 minutes. Perform Range of Motion exercises 3-5 times a day. Perform Strengthening exercises 1 time a day.

Phase 2 (2-6 Weeks)

Goals

- Continued protection of healing tissue
- Continue to improve ROM Normalize gait mechanics
- Begin to establish return of lower extremity strength especially quadriceps

Precautions

- Wean crutches as appropriate.
- OK to begin closed chain exercises, but maintain weight bearing restrictions with gait
- Bledsoe brace 0-90° with ambulation

Must stress proper gait

Recommended Exercises

Range of Motion

- Continue ROM exercises from Phase 1 until normal ROM is achieved
- Cycle with increased resistance

Ensure Proper Patellar Mobility

Strengthening

- Continue Quad Sets (as needed for VMO activation)
- Continue 4 way SLR program (add ankle weight as needed)
- Hamstring Curls (Allograft Only)
- Standing Terminal Knee Extension
- Mini Squat and/or Wall Slide
- Leg Press
- Heel Raises
- Single Leg Stance

Minimize effusion before progressing closed chain exercise

Guidelines

Perform all ROM and strengthening exercises once a day. Do 2-3 sets of 15-20 repetitions. Cycle daily if possible.

Phase 3 (6-12 Weeks)

Goals

- Avoid patellofemoral pain
- Continue to maximize return of ROM and flexibility
- Establish closed chain strength and proprioception

Precautions

- Continue to stress proper gait
- No pivoting or lateral movements
- No running

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Recommended Exercises

Range of Motion and Flexibility

- Continue ROM exercises from phase 1 if necessary
- Add Lower Extremity stretching (Hamstring, Quadriceps, Calf, Glutes, Adductors, ITB, etc)

Cardio

- Cycle with progressive resistance
- Elliptical at 8 Weeks
- Swimming at 6-8 Weeks

Strengthening

- Continue Progression of 4 way SLR and Hamstring Curls with Ankle Weights
- Gym Equipment (Leg Press, Ham Curl, Multi-Hip) Squats to 90°
- Begin Single Leg strengthening Step Up Progressions (Forward Step Ups)
- Static Forward/Backward Lunge
- Single Leg Stance Proprioception
- Static Balance on Bosu/Wobble Board/Foam/Etc Star Drill (single leg stance with reach)

Guidelines

Perform ROM and stretching exercises once a day until normal ROM is achieved. Hold stretches for 30 seconds and perform 2-3 repetitions of each. Cardio exercise is recommended 3-5 times a week for 20-30 minutes. Perform strengthening exercises 3-5 times a week. Do 2-3 sets of 15-20 Reps. Strict attention must be paid to form

Phase 4 (12-16 Weeks)

Goals

- Continue to avoid patella femoral pain
- Progress with single leg strengthening
- Achieve adequate ROM and strength to begin jogging and plyometric training

Precautions

- Straight ahead running only
- No pivoting or cutting
- No sports

Recommended Exercises

ROM and Stretching

- Continue daily stretching

Cardio

- Continue cycle, elliptical, swimming
- Begin return to running progression at 12 weeks post op (outlined by P.T. or Doctor)

Strengthening

- Continue SLR Program and Gym Equipment Progression
- Continue Step-Up Progressions (lateral step-ups, cross over step-ups)
- Dynamic Lunge
- Lateral Lunge
- Progressive Single Leg Strengthening (single leg squat, split squat, single leg dead lift)

Proprioception

- Dynamic Balance (Bosu/Foam/Etc)

Dynamic Progressions

- Begin Plyometric/Jumping Progression (see page 6)

Guidelines

- Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
- Cardio program is recommended 3-5 times a week for 20-40 minutes
- Perform strengthening/proprioception exercises 3 times a week. Do 2-3 sets of 15-20 Reps.
- Perform plyometric/jumping exercises 2 times a week

Phase 5 (16-24 Weeks)

Goals

- Maintain adequate ROM, flexibility and strength
- Continue progressive/dynamic strengthening, proprioceptive, plyometric and agility training
- Achieve adequate strength to begin return to sport progressions (pending surgeon's clearance)

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Precautions

- Limited and controlled lateral movements
- Gradual return to sport pending surgeon's clearance (6 months or greater)
- Work with surgeon or Physical Therapist to develop specific return to sport progression

Recommended Exercises

Stretching

- Continue daily lower extremity stretching

Cardio

- Continue cardio program and progress intensity and duration

Strengthening

- Continue strengthening program from phase 4 (increase load and decrease volume)

Proprioception

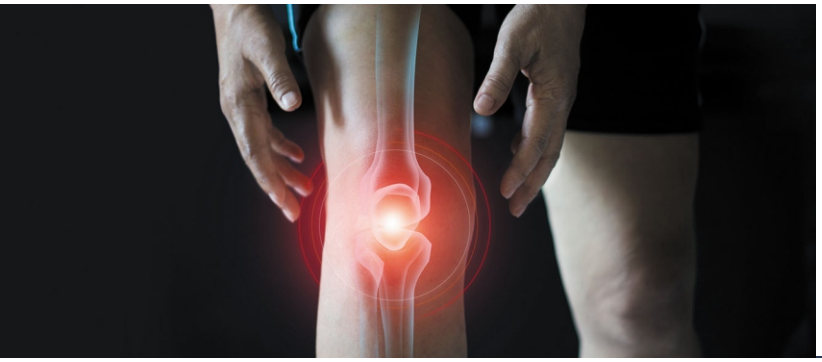
- Continue and advance proprioceptive training (increase difficulty of drills)

Dynamic Progressions

- Progress plyometric/jumping program
- Begin speed/agility program

Guidelines

- Perform stretching program daily. Hold stretches for 30 seconds and perform 2-3 repetitions of each.
- Cardio program is recommended 3-5 times a week for 20-40 minutes
- Perform strengthening/proprioception exercises 3 times a week. Do 2-3 sets of 15-20 Reps.
- Perform plyometric/jumping/agility exercises 2 times a week
- Perform return to sport activities as directed by P.T. or Doctor



Jumping/Plyometric Progression

Simple Double Limb (12-16 Weeks Post Op)

- Double Leg Hops (forward and backward over line)
- Box Jump (6-8 inches max)

Focus on sticking each landing with good form in frontal and sagittal planes. Stress a soft landing with good eccentric control.

Complex Double Limb (16-20 Weeks Post Op)

- Double Leg Jump (for distance)
- Double Leg Jump (for height)
- Double Leg Jump (with 90□ or 180□ turn)
- Double Leg Lateral Jump/Lateral Box Jump (side to side)
- Depth Jump (6-8 inches max)

Focus on sticking each landing with good form in frontal and sagittal planes. Stress a soft landing with good eccentric control.

- Combination Jumps (begin at 18-20 weeks post op)
- Repetitive Double Leg Jumps (distance, height, lateral, turns)
- Jump for Distance into Jump for Height
- Box Jump to Depth Jump
- Depth Jump to Jump for Distance/Height

String jumps together. Focus on quickly moving from jump to jump.

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Single Limb (20-24 Weeks Post Op)

Heiden Hop

- Bounding
- Single Leg Jumps (distance, height, lateral, 90°/180° turn)
- Single Leg Box Jumps (6-8 inches max)
- Single Leg Depth Jumps (6-8 inches max)

Focus on sticking each landing with good form in frontal and sagital planes. Stress a soft landing with good eccentric control.

Combination Jumps (Single Leg)

- Repetitive Single Leg Jumps (distance, height, lateral, 90°/180° turn)
- Jump for Distance into Jump for Height
- Box Jump to Depth Jump
- Depth Jump to Jump for Distance/Height

String jumps together. Focus on quickly moving from jump to jump.

Speed/Agility Progression

****Work with P.T. to establish proper warm-up and cool down before and after each workout agility session.****

Forward/Backward Sprinting (16-20 Weeks)

- **Week 1:** Sprint 50-100 yards at ½ speed 10 reps.
- **Week 2:** Sprint 50-100 yards at ½ speed 5 reps. Sprint 50-100 yards at ¾ speed 10 reps
- **Week 3:** Sprint 100 yards at ½ speed 2 reps. Sprint 100 yards at ¾ speed 5 reps. Sprint 50-100 yards at full speed 5 reps. Backpedal 50 yards at ½ speed 5 reps.
- **Week 4:** Sprint 100 yards at ½ speed 1 rep. Sprint 100 yards at ¾ speed 2 reps. Sprint 50 yards at full speed 5 reps and 100 yards at full speed 5 reps. Backpedal 50 yards at ¾ speed 5 reps.

Basic Change of Direction (20-24 Weeks)

**Begin each workout with sprinting and backpedaling 50 yards (2 reps at ½ speed, 5 reps at full speed)*

- **Week 5:** T drill 3 reps at ½ speed, forward/backpedal shuttle 5/10/20 yard 3 reps at ½ speed
- **Week 6:** T drill 3 reps full speed, forward/backpedal shuttle 5/10/20 yards 3 reps full speed, box drill with shuffling 3 reps at ½ speed
- **Week 7:** Box drill with shuffling 3 reps at full speed, 10 yard shuttle run (quick direction change) 3 reps at full speed, Z drill 6 reps at ¾ speed
- **Week 8:** Box drill with cuts 3 reps at full speed, 10 yard shuttle run (quick direction change) 3 reps at full speed, Z drill 6 reps at full speed

Advanced Drills (24 Weeks and Beyond)

*Begin each workout with sprinting and backpedaling 50 yards (2 reps at ½ speed, 5 reps at full speed)

Work with P.T. to develop sport specific drills. Perform drills from previous weeks with use of ball, stick, etc. Perform drills seen in typical sports practice with supervision.

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