PROFESSIONAL ORTHOPAEDICS
SPORTS MEDICINE & ARTHROSCOPY

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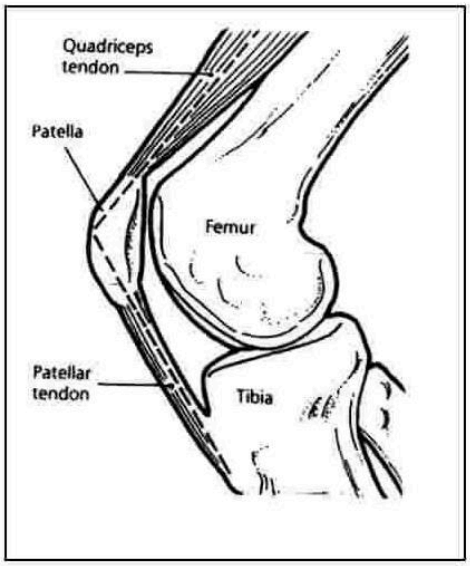
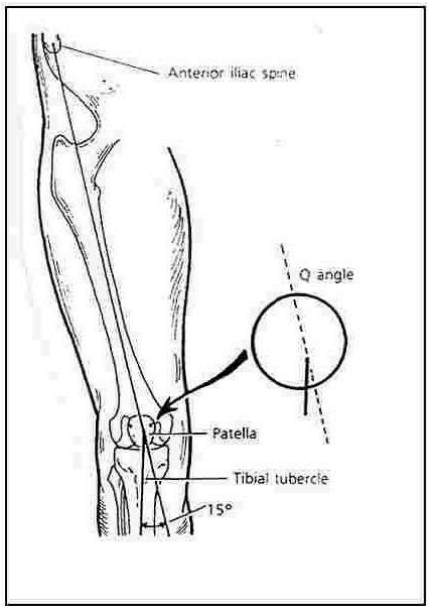
PATELLA INSTABILITY AND REALIGNMENT

The knee joint is composed of two different articulations. There is the tibofemoral joint, which is the femur (thigh bone) meeting with the tibia (shin bone). This is what most people think of when they think of the knee. But no less important is the articulation between the patella (knee cap) and the femur. The patella slides in a groove in the femur called the trochlea. When the quadriceps muscles contract the knee extends (straightens) and the patella slides in the trochlea. The patella protects the knee from direct blows and also creates a fulcrum that increases the biomechanical efficiency of the quadriceps.



Patellofemoral Alignment



The Q-angle (quadriceps angle) is a measurement that describes the alignment of the patella with respect to the tibia and the femur. If a line is drawn along the femur to the center of the patella and another is drawn from the center of the patella to the insertion of the patella tendon into the tibia, then the angle between these two lines is called the Q-angle. If the Q-angle is greater than 15 degrees there may be a tendency of the patella to move toward the outside of the knee. This lateral tracking may lead to injury of the patellofemoral joint surfaces over time. As well, the patella can partially dislocate (sublux) or completely dislocate from a sideways blow to the knee or an outward rotation of the leg and foot (thereby increasing the Q-angle).

Diagnosis of Patellofemoral Instability

Pain in the front of the knee and a sensation of "looseness" of the kneecap are common complaints. If the patella subluxes or dislocates the knee will "give way" or buckle.

If this condition is suspected, Dr. Mc Millan may order x-rays of your knee that will show the position of the patella in the trochlear groove. Patella tracking can be tested during the physical examination in the office. Dr. Mc Millan may ask you to extend your knee while he holds your tibia rotated first inward and then outward. If your knee feels better when you extend the knee while your foot is held internally rotated (decreasing the Q-angle) and feels worse when you extend the knee with your foot externally rotated (increasing the Q-angle), then you may have lateral patellar instability.

Treatment of Patella Instability

Non-operative treatment

Non-operative treatment consists of the following:

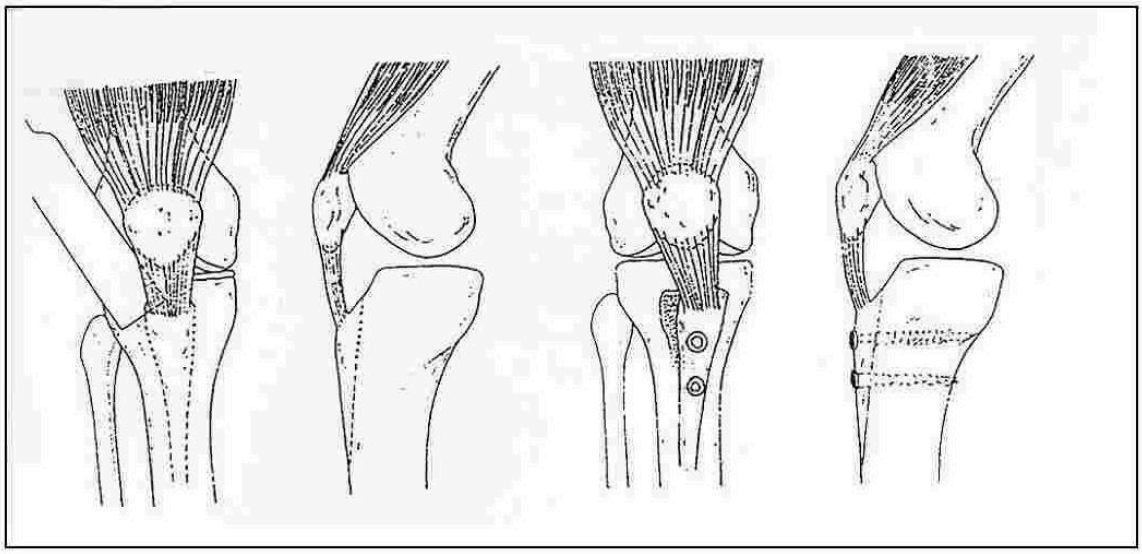
- Bracing and lateral knee supports to help hold the patella in place
- Exercises to strengthen the quadriceps muscle
- Activity modification (staying away from sports that require excess pivoting – basketball, soccer, tennis, etc.)

Operative Treatment

Operative treatment is intended to re-align the patella and decrease the Q-angle. This can be done either by treating the structures around the patella (proximal realignment) or the structures where the patella attaches to the tibia (distal realignment).

Proximal Realignment

This consists of making small incisions around the patella and relaxing the restraining structures on the outside of the patella and tightening the structures on the inside of the patella. This procedure is often used in young patients who still have open growth plates. In older patients it is often combined with a distal procedure.



Distal Realignment

This consists of making a small incision over the upper tibia. Dr. Mc Millan will then use a bone-cutting instrument to cut the tibial tubercle (the point at which the patella tendon attaches to the tibia) so that the bone and tendon can be moved medially (toward the inside of the leg). This piece of bone is then reattached to the tibia using two screws. Sometimes these screws can become tender and, if necessary, they can be removed about six months after the operation. This is usually a minor procedure.

Risks and Benefits of Surgery

Results of both proximal and distal patella realignment surgery are good when performed on appropriately selected patients. This is often why Dr. Mc Millan will have you try extensive non-operative treatment prior to undertaking any surgery. In patients who have pre-existing injury to the patellofemoral joint surfaces (such as condromalacia patella, or patellofemoral syndrome), knee pain and crepitus may persist. In most cases, however, knee function and pain both improve after surgery.

The risks include but are not limited to:

- Infection
- Blood clots

- Nerve injury or numbness at the front of the knee
- Continued pain
- Delayed bone healing
- Knee stiffness or loss of motion
- Need for additional surgery

Postoperative Instructions

You will wake up in the operating room with a brace and ice pack in place. You will also have white compression stockings on both legs. These are to help prevent blood clots and should be worn for the first two weeks following surgery.

The knee brace is used to help protect the repair. The immobilizer can be removed for washing and sleeping but should be used when you are up and walking for the first six weeks after surgery. You should use crutches for the first week to take excess pressure off the knee. You can bear full weight and walk on the operated leg unless instructed otherwise by Dr. Mc Millan.

You will be sent home with a prescription for pain medication. In addition to the pain medication you should take one adult strength aspirin every day for 14 days, in order to help prevent blood clots. The pain medication can make you constipated. If this is the case, take an over the counter stool softener such as Colace while taking the pain medication.

You will be sent home from the recovery room after a few hours. You will need someone else to drive you home.

Activities and advice for in the hospital and while at home:

1. Please call with any concerns: (609) 747-9200
2. Apply ice to the knee, as it will be quite helpful. After two days, you can change the dressing to a smaller one to allow the cold to better get to the knee. Be sure to leave the little pieces of tape (steri-strips) in place.
3. After two days it is okay to shower and get the wound wet, but do not soak the wound as you would in a bath tub or hot tub.
4. After knee surgery there is a variable amount of pain and swelling. This will dissipate after several days. Continue to take the pain medicine you were prescribed as needed. Remember it is called pain control, not pain elimination. If you notice calf pain or excessive swelling in the lower leg, call your doctor.
5. It is important to look out of signs of infection following joint replacement surgery. These can include: fever (temperature > 101.5^0, chills, nausea, vomiting, diarrhea, redness around your incision, or yellow or green drainage from your incision. Should any of these be present please contact Dr. Mc Millan's office immediately.

6. You should start your physical therapy approximately 5 days after your surgery.
7. You will have an office visit scheduled approximately 10-14 days after your surgery.

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REHABILITATION AFTER PATELLA REALIGNMENT SURGERY

Phase I: immediate post-op phase (0-2 weeks after surgery)

Goals:

1. Protect the reconstruction
2. Ensure wound healing
3. Attain and maintain full knee extension
4. Gain knee flexion (bending) to 90 degrees
5. Decrease knee and leg swelling
6. Promote quadriceps muscle strength
7. Avoid blood pooling in the leg veins

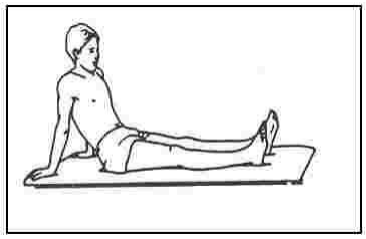
Activities:

1. Brace/crutches/weight bearing: your knee brace is set to allow you to bend and straighten your knee. Use it when walking or out of bed, but it may be removed for range of motion exercises.
2. Your nurse or therapist will demonstrate the proper form for walking with crutches:
    a. Put the crutches forward about one step's length
    b. Put the injured leg forward in line with the crutch tips
    c. Touch the foot of the injured leg to the floor and put as much weight down as is comfortable (brace on and locked)
    d. While bearing weight on the injured leg, take a step through with the uninjured leg.
3. Elastic stockings: wear an elastic stocking below the knee until your first postoperative visit. Do at least 10 ankle pump exercises each hour to help prevent blood clots. Take one adult aspirin daily for the first two weeks
4. It is okay to remove your bandage on the second morning after surgery but leave the small pieces of white tape (steri-strips) across the incision. You can wrap an elastic bandage (ACE wrap) around the knee at other times to control swelling. You may shower and get your incision wet (unless there is any drainage from your incisions). Do not soak the incision in a bathtub or hot tub until the stitches have been removed.

Exercises

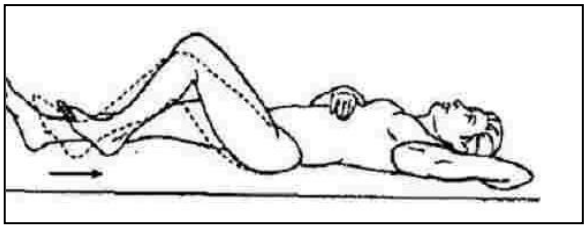
Program: 7 days per week, 3-4 times per day.

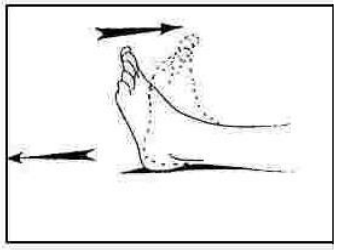
Quadriceps setting	1-2 sets	15-20 reps
Heel slides	1-2 sets	15-20 reps
Ankle pumps	10 per hour	



Quadriceps Setting
Lie or sit with knee fully straight. Tighten and hold the front thigh muscle making the knee flat and straight (this should make your knee flatten against the bed or floor). Hold 5 seconds for each contraction.

Heel Slides
Done to regain the bend in your knee. While lying on your back, use your muscles to slide your heel backward to bend the knee. Keep bending the knee until you feel a stretch in the front of the knee. Hold this bent position for five seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight you may repeat the quadriceps setting exercise.





Ankle Pumps
Move the ankle up and down to help stimulate circulation in the leg.

Phase II: early rehabilitation phase (weeks 2-6 after surgery)

Goals:

1. Protect the repair – avoid falling
2. Ensure wound healing
3. Maintain full knee extension
4. Initiate passive knee flexion exercises
5. Decrease swelling in the knee and leg
6. Activate quadriceps muscle
7. Avoid blood pooling in the leg

Activities:

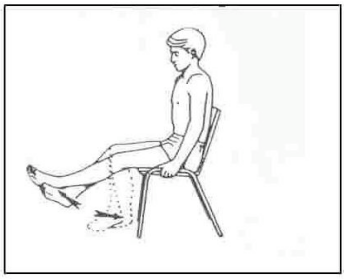
1. Continue to use ice to decrease swelling. It should be used for 20 minutes at least three times per day.
2. Brace/crutches: Use the knee immobilizer when you get out of bed and walk. The brace is set to be locked in full extension when you are walking. Unless instructed otherwise by Dr. Mc Millan, you can put full weight on your leg while walking. If you need extra support it is okay to continue using the crutches. Gradually wean to using one crutch in the arm opposite the side of your surgery, and then to no support over the first few weeks.
3. You may stop wearing the compression stockings and can stop taking the aspirin.
4. You will have a visit with Dr. Mc Millan at 10-14 days after surgery. If your wound is dry, you will likely be able to get the wound wet in a bath or hot tub at this point. Irrespective of whether your right or left leg was operated on, it is unlikely you will be allowed to drive at this point.

Exercises

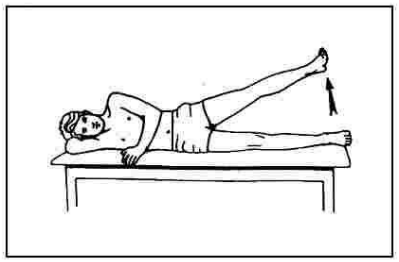
The following exercises will be demonstrated to you by your physical therapist. He or she will also give you a home exercise program. You should strive to do your home exercise program at least 3-4 times per day, every day. The success of your reconstruction depends on your rehab.

Exercises:

- Quadriceps setting
- Heel slides
- Sitting knee flexion
- Hip Abduction
- Standing toe raises
- Ankle pumps

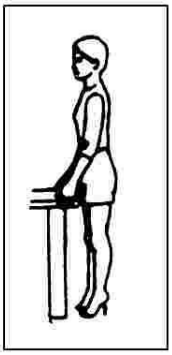


Sitting Knee Flexion
While sitting in a chair or over the edge of the bed, support the operated leg with the uninvolved leg. Lower the operated leg, with the unoperated leg controlling, allowing the knee to bend. **Do not go past 60^0 of bend at the knee.** Hold for 5 seconds and slowly relieve the stretch by lifting the foot upward with the uninvolved leg to the straight position.



Hip abduction
Lie on your unoperated side. Keep your knees fully extended (straight). Raise the operated limb upward to a 45^0 angle. Hold for one second then lower slowly.

Standing Toe Raises
With the knee brace on, use a table for support and balance. Tighten the quadriceps to hold the knee fully straight. Rise up on your "tip toes" while maintaining the knees in full extension. Hold for one second then lower slowly to the starting position.



Phase III: progressive strengthening and neuromuscular control phase (weeks 6-12 after surgery).

Goals:

1. Restore full knee range of motion
2. Walk normally
3. Regain full muscle strength

Activities:

1. The brace can be discontinued after you see Dr. Mc Millan at your 6 week visit. Concentrate on walking with a heel to toe gait without a limp. In some cases, use of the brace will continue if your knee requires a longer period of protection.
2. Continue to use ice for 20 minutes after each workout
3. You are cleared to drive when bearing weight on your operative leg is comfortable and you have good control of the leg. If your left leg was operated on, you should be clear to drive at this point.

Precautions When Exercising

- Avoid pain at the patellar tendon site
- Avoid pain and/or crepitus at the patella
- Build up resistance and repetitions gradually
- Perform exercises slowly avoiding quick direction change and impact loading
- Exercise frequency should be 2 to 3 times a week for strength building
- Be consistent and regular with the exercise schedule

Exercises:

Range of motion/strengthening:

- Quadriceps setting
- Heel slides
- Straight leg raises
- Short arc lifts
- Standing hamstring curl
- Standing toe-raises- single leg
- Hip abduction
- Wall slides
- Single leg strengthening progression

Cardiovascular conditioning can begin at this phase:

- Stationary bicycle
- Walking
- Elliptical trainer
- Water workout

DO NOT perform any of the following exercises:

- Knee extension weight lifting machine
- Lunges
- Running
- Stairmaster
- Jumping
- Step exercises with impact
- Pivoting or cutting

Phase IV: advanced activity phase (weeks 12 onward)

Goals:

1. Normalize lower extremity strength
2. Enhance muscular power and endurance
3. Improve neuromuscular control
4. Perform selected sport-specific drills

Activities

1. Walking/stairs: You should be walking without the use of the knee brace of crutches. If you feel confident walking on the operated limb, have good strength and full knee motion you can use the operated leg to walk up stairs. It is not recommended that you lower yourself down stairs on the operated limb until you have completed the "step up-down progression".
2. Buy an elastic knee sleeve (made of neoprene or rubber) at a sporting goods store or pharmacy. It should have an opening for the kneecap and velcro straps, but does not need hinges on the side. You may already have one of these from prior to your surgery. Use this support if you are on your feet for a prolonged period of time.
3. Avoid the following exercises as they place undue stress on your knee:
    a. Leg extension machine
    b. Stairmaster or stair climber machines
    c. Deep knee lunges or squats past 90^0 of knee flexion
    d. High impact exercises
4. Avoid pain at the patellar tendon site, as well as crepitus (crunching) at the patella
5. Build up resistance and repetitions gradually
6. Perform exercises slowly and avoid quick direction changes
7. Avoid impact loading
8. Exercise frequency should be at least 2-3 times per week for strength building
9. Be consistent and regular with exercise schedule

Exercises

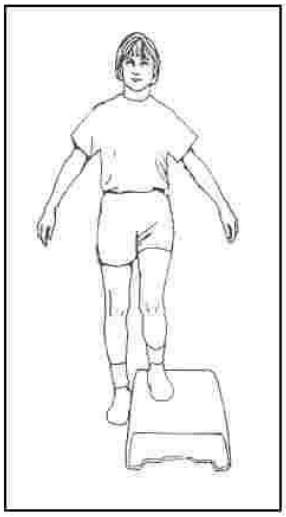
- Continue strengthening drills
  - Squat to chair
  - Wall slides
  - Hip abduction and adduction
  - Hip flexion and extension
  - Single limb toe raises
  - Seated leg press
  - Hamstring curls
  - Step up-down progression (see below)
  - Core exercises

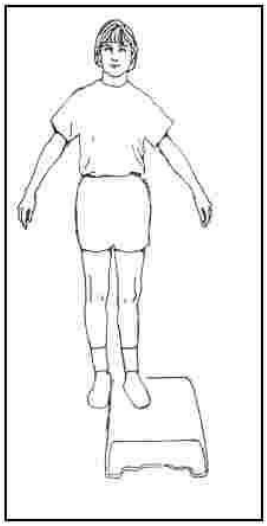
- Stretching
  - Calf
  - Hamstring
  - Quadriceps

Step Up-Down Exercises

It is important to begin the development of single-leg strength. Make sure you can do the following exercises without pain. The instructions below estimate a time period of 6-8 weeks for you to progress through the whole program. This time line will vary, though, for different people and knees depending on the presence or absence of knee problems.

Place the operated foot on a stool or step. Maintain balance, if necessary, by holding on to the wall or a chair. Standing sideways to the step, slowly step up onto the stool and slowly straighten the knee using the quadriceps muscle. Slowly lower the opposite foot to touch the floor. Do not land on the floor, just gently touch the floor and repeat the step up.





Progression:

- Start with 3" step
- Start with 3 sets of 5 repetitions for the first two weeks.
- If pain free, add one repetition per set, per workout until you can do 3 sets of 10 repetitions (usually 2 more weeks).

- If pain free, progress to step of 6" in height

- Repeat this progression starting with 3 sets of 5 for two weeks.
- If pain free add one rep per set until you can 3 sets of 10.
- If pain free, progress to a step 9" in height
- Repeat progression with 3 sets of 5 and advance to 3 sets of 10 as before.

*****Note: DO NOT continue to raise the height of the step if there is pain or crepitus at the kneecap.**

Return to sports

Progressive walk/jog at 12 weeks after surgery
Progressive run/agility drills at 16-20 weeks after surgery
Return to sports at 20-24 weeks after surgery.
During the first year it is a good idea to wear your knee sleeve while playing sports.