BOSTON SPORTS MEDICINE & RESEARCH INSTITUTE

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KNEE JOINT RESURFACING SURGERY

Here are guidelines that will help you in preparing for knee resurfacing surgery.

PREOPERATIVE INSTRUCTIONS

WITHIN A FEW WEEKS BEFORE SURGERY:

Dr. Gill will see you in the office. He will do a preoperative history and physical examination and complete the necessary paperwork. It is recommended that you utilize a stationary cycle to maintain your knee range of motion and improve the overall function of the knee prior to surgery.

SEVERAL DAYS PRIOR TO SURGERY:

Wash the knee several times a day with soap or Hibiclens solution to get it as clean as you can. This decreases the risk of infection. **Be careful not to get any scratches, cuts, sunburn, poison ivy, etc**. The skin has to be in very good shape to prevent problems. You do not need to shave.

THE DAY BEFORE SURGERY:

Please be in touch with Dr.Gill's office to confirm the exact time that you should report to the hospital for surgery. **You can have nothing to eat or drink after midnight on the day before surgery**. It is very important to have a completely empty stomach prior to surgery for anesthesia safety reasons. If you have to take medication, you can do so with a sip of water early in the morning prior to surgery (but later tell the anesthesiologist you have done so).

DAY OF SURGERY:

- Bring any crutches, brace, ice machine or imaging studies that you may have received.

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KNEE JOINT CARTILAGE

The knee joint consists of three bones that move together to allow motion at the knee. These bones are the femur, the tibia and the patella. Cartilage is a specialized tissue in the joint which caps and covers the bones where they meet. Cartilage is a smooth, slippery tissue that allows the bones to slide against one another with minimal friction.

Knee cartilage defect

A variety of events can damage cartilage; some include trauma (injury), infection, inflammation, osteonecrosis (dead bone) and malalignment. A traumatic injury can cause an isolated defect just like a golfer creates a divot in the grass. Malalignment can cause damage to the joint surface similar to the way the tires on a car lose their tread if the wheels are not properly aligned. Damaged articular cartilage can be very painful and may inhibit activity levels as a result. Cartilage defects of a large enough size may be problematic. They typically cause pain, may increase in size, and risk spreading damage to surrounding areas of normal, undamaged cartilage.

SURGERY:

Knee cartilage defect repaired with implant

Joint resurfacing with an implant is a procedure designed to create a new congruent joint surface. The implant is a system designed to match the shape and contour of the individual patient's cartilage surface. It is a "patch" for an area of damaged cartilage designed to protect the remaining, normal cartilage in an attempt to prevent further damage.

Appropriate rehabilitation of the knee after surgery is critical to the success of the operation. Continuous Passive Motion (CPM), where the knee is moved gently by a machine for 10 out of 24 hours a day for 2 weeks, limiting weight earing on the joint for a period of up to 6 weeks, and strict adherence to an aggressive physical therapy program following surgery all appear to enhance the success of the procedure**.**

AFTER SURGERY:

Prior to surgery, a **continuous passive motion (CPM) machine** will be delivered to your home. This is a small apparatus that sits on the bed onto which your knee rests. The CPM very slowly bends and straightens out the knee. You will be able to adjust the CPM with a **hand-controlled unit**. Start the machine from 5 degrees hyperextension to 40 degrees and advance to 100 degrees as tolerated.

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The **dressing** should be changed the day following surgery and can be removed at two days. The wound is sealed with steri-strips (small pieces of tape on the skin). You **can shower** on the second day following surgery, but be careful standing in the shower so that you **do not fall**. It is better to have a small stool to be able to sit on. However, you can get the leg wet and wash it. Do not submerge the knee under water in a bath, hot tub or swimming pool.

If you develop calf pain or excessive swelling in the leg, call Dr. Gill's office.

Cold Therapy

The **cold therapy unit** is a knee sleeve that is put on the knee to keep it cold. You can use this as often as you want to cool down the knee to reduce swelling and pain. Check your skin every time that you remove the wrap to make sure that it is intact.

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Knee Joint Resurfacing/Replacement Rehabilitation Protocol

PHASE 1: 0 – *2 weeks* after surgery

You will go home with **crutches, cold therapy unit and a CPM machine**.

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

ACTIVITIES:

CONTINUOUS PASSIVE MOTION (CPM)
Use the CPM machine at home as much as possible for the first 2 weeks after surgery. Do not wear the brace when in the CPM machine. **You should use the machine at least 10 hours per day**. You may move the machine to a sofa, the floor or onto a bed as you change positions and locations. You should use the machine at night while sleeping; slow down the machine at night to facilitate sleeping.

Extension (knee straight) on the machine should be set at **minus five** degrees at all times to help your knee extend. **It is very important that you straighten the knee completely!** The machine should be programmed to include an extension pause of 5 seconds (in other words, when the knee is straightened out, it pauses in the straight position to allow you to stretch it out straight). This flexion setting will start at around 30 – 40 degrees and should be gradually increased to 90 degrees as you can tolerate more bending of your knee. Your goal should be 100 degrees flexion by 48-72 hours.

BRACE/CRUTCHES

For femoral condyle implants, you can put about 50% of normal weight on your operated leg (without pain), with crutches, when walking. 50% weight bearing with crutches will be necessary for the first 6 weeks after surgery. Dr. Gill will have you use a brace, in some cases, which will allow motion from 0° (straight) to 90° of flexion (bend).

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For patellar and trochlear groove implants, you can put your full weight, as tolerated without pain, on your operated leg with crutches, when walking. You will go home with a knee immobilizer brace to use when walking, until your post-operative office visit 2 weeks after surgery.

Dr. Gill will give special instructions in some cases.

You should step up and down stairs using the unaffected leg only at this time for both types of implants.

For instructions about walking with crutches, go to:
http://www.bostonsportsmedicine.com/protocols

See 'Crutch Walking and Adjustment'.

COLD THERAPY UNIT (COLD APPLICATION)

If you are experiencing pain, swelling, or discomfort, we suggest icing for 15-20 minutes with at least a 60-minute break in between. Use your cryocuff or place ice in a zip lock bag and/or in a towel and apply to the injured area. Never place ice directly on the skin.

WOUND CARE

Remove your bandage on the second morning after surgery but leave the small pieces of white tape (steri strips) across the incision.You may now shower and get your incision wet, but **do not** soak the incision in a bathtub or Jacuzzi until the stitches have been removed.

ASPIRIN / ELASTIC STOCKINGS

Take an aspirin each morning, wear an elastic stocking (TED) below the knee, and do at least 10 ankle pump exercises each hour to help prevent phlebitis (blood clots in the veins).

FREE/MACHINE WEIGHTS

Upper Body/Trunk Only

We suggest that you do not use any lower extremity free or machine weights. If you are doing free or machine weights for the upper body and trunk, we suggest a very light resistance of 3 sets of 15-20 repetitions. Do not place yourself in a compromising position with your recently operated knee.

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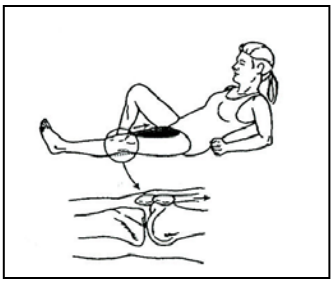
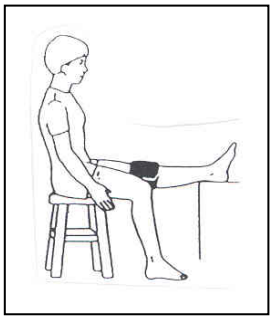
EXERCISE PROGRAM

QUADRICEPS SETTING - **to maintain muscle tone in the thigh muscles and straighten the knee.**

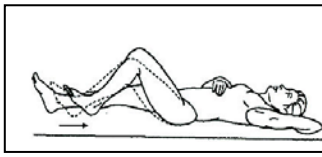


Lie on your back with the knee extended fully straight as in figure. Tighten and hold the front thigh muscle making the knee flat and straight. If done correctly, the kneecap will slide slightly upward toward the thigh muscle. The tightening action of the quadriceps should make your knee straighten and be pushed flat against the bed or floor.
Hold 5 seconds for each contraction. Do 20 repetitions three times a day.



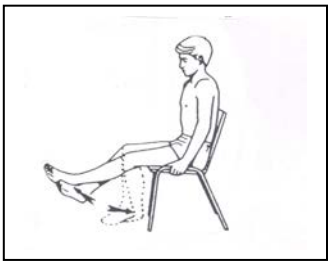
HEEL PROP- to straighten (extend) the knee.
Lie on your back with a rolled up towel under your heel or sit in a chair with the heel on a stool as shown in the figure. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a weight (2 to 5 pounds) on the thigh, just above the kneecap.
Try to hold this position for **5 minutes, three times a day. While maintaining this extended position, practice quadriceps setting.**

HEEL SLIDES - to regain the bend (flexion) of the knee.



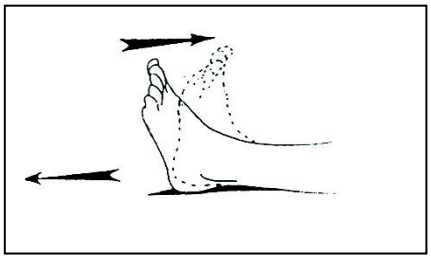
While lying on your back, actively slide your heel backward to bend the knee. Keep bending the knee until you feel a stretch in the front of the knee. Hold this bent position for 5 seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight, you may repeat the quadriceps setting exercise.
Repeat 20 times, three times a day.

SITTING HEEL SLIDES - to regain the bend (flexion of the knee).



When sitting in a chair, slide the heel backward as if trying to get the foot underneath the chair (figure 5). Hold 5 seconds and slowly relieve the stretch by sliding the foot forward. You can help with the opposite foot if necessary. Repeat 20 times, three times a day.

ANKLE PUMPS - to stimulate circulation in the leg.



You should do at least 10 ankle pump exercises each hour.

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OFFICE VISIT

Please return to see Dr. Gill approximately **ten to fourteen days** after your surgery. At this time, your sutures will be removed and your progress will be checked.

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Knee Joint Resurfacing/Replacement Rehabilitation Protocol

Phase Two: 2 to 6 weeks after surgery

Goals:

1. Protect the knee from overstress and allow healing
2. Regain full motion
3. Begin muscle strengthening

BRACE/CRUTCHES

For femoral condyle implants, you can put about 50% of normal weight on your operated leg (without pain), with crutches, when walking. 50% weight bearing with crutches will be necessary for the first 6 weeks after surgery. Dr. Gill will have you use a brace, in some cases, which will allow motion from 0° (straight) to 90° of flexion (bend).

For patellar and trochlear groove implants, you can put your full weight, as tolerated without pain, on your operated leg with crutches, when walking. You will go home with a knee immobilizer brace to use when walking, until your post-operative office visit 2 weeks after surgery. At that time, if you have good control of your knee, you can walk without crutches or knee immobilizer.

You should continue to step up and down stairs using the unaffected leg only at this time for both types of implants.

For instructions about walking with crutches, go to:
http://www.bostonsportsmedicine.com/protocols

See 'Crutch Walking and Adjustment'.

Continuous Passive Motion (CPM) Machine
Unless otherwise instructed by your doctor, the CPM can be discontinued at this time

Exercise Program
The following exercise program should be followed as directed by Dr. Gill or the physical therapist. Do the exercises daily unless otherwise noted. Ankle weights can be used for resistance and strengthening.

You can view a video clip of most of the listed exercises by going to the Boston Sports Medicine and Research Institute website:
http://www.bostonsportsmedicine.com/protocols_therapy_videos.html

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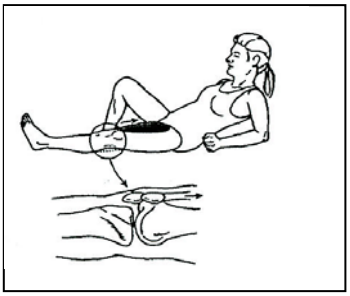
STATIONARY BICYCLE

Utilize a stationary bicycle to move the knee joint and increase knee flexion. If you cannot pedal all the way around, then keep the foot of your operated leg on the pedal, and pedal back and forth until your knee will bend far enough to allow a full cycle. Most people are able to achieve a full cycle revolution backwards first, followed by forward. You may ride the cycle with no resistance for 20 to 30 minutes a day. Set the seat height so that when you are sitting on the bicycle seat, your knee is fully extended with the heel resting on the pedal in the fully bottom position. You should then actually ride the bicycle with your forefoot resting on the pedal.

WATER WORKOUT (optional)

Utilize an Aqua jogger floatation vest to run in deep water with **no foot contact** to the pool floor or swim flutter kick only for up to 20 minutes 2 or 3 times a week

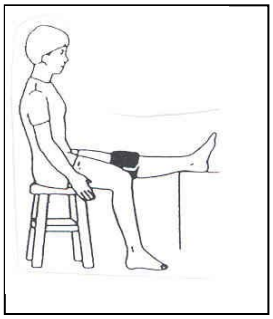
QUADRICEPS SETTING - **to maintain muscle tone in the thigh muscles and straighten the knee.**



Lie on your back with the knee extended fully straight. Tighten and hold the front thigh muscle making the knee flat and straight. If done correctly, the kneecap will slide slightly upward toward the thigh muscle. The tightening action of the quadriceps should make your knee straighten and be pushed flat against the bed or floor.

Hold 5 seconds for each contraction. Do 20 repetitions three times a day until you can fully straighten your knee equal to the unoperated side.

HEEL PROP- to straighten (extend) the knee.



Lie on your back with a rolled up towel under your heel or sit in a chair with the heel on a stool as shown in the figure. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a weight (2 to 5 pounds) on the thigh, just above the kneecap.

Try to hold this position for **5 minutes, three times a day. While maintaining this extended position, practice quadriceps setting.**

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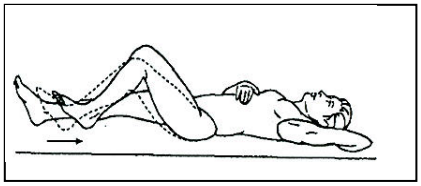
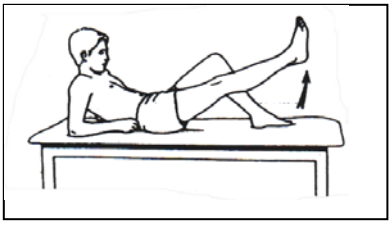
HEEL SLIDES - to regain the bend (flexion) of the knee.

While lying on your back actively 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 5 seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight, you may repeat the quadriceps setting exercise. Continue this exercise until you can fully bend your knee equal to the unoperated side.
Repeat 20 times, three times a day.



STRAIGHT LEG LIFT

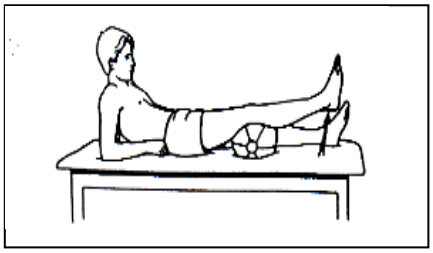
Tighten the quadriceps muscle so that the knee is flat, straight and fully extended. Try to raise the entire operated limb up off of the floor or bed.If you are able to keep the knee straight raise the limb to about 45 degrees, pause one second and then lower slowly to the bed. Relax and repeat.



If the knee bends when you attempt to lift the limb off of the bed, **do not** do this exercise. Keep trying to do the quadriceps setting exercise until you can lift the limb without letting the knee bend. Repeat 20 times.

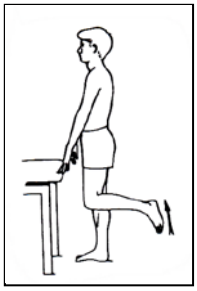
SHORT ARC LIFT

With the knee bent over a rolled up towel or blanket, lift the foot so that the knee fully straightens. Hold the knee locked in extension for 5 seconds, then slowly lower. Repeat 20 times.



STANDING HAMSTRING CURL

Stand facing the wall, using the wall for balance and support.
while standing on the unoperated limb
bend the knee of the operated side and
raise the heel toward the buttock. Hold this
flexed position for one second. Slowly lower the
foot back to the floor. Keep the thighs aligned as illustrated. Repeat 20 times.



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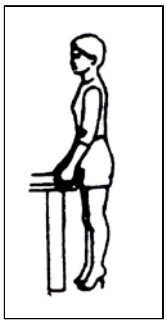
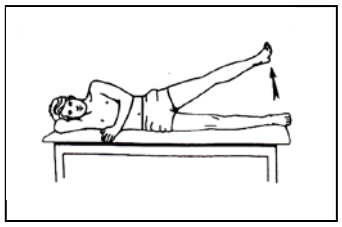
STANDING TOE RAISE



Stand facing a wall, hands on the wall for support and balance. keep the knees extended fully. Tighten the quadriceps to hold the knee fully straight. Raise up on 'tip-toes' while maintaining the knees in full extension. Hold for one second, then lower slowly to the starting position. Repeat 20 times.

HIP ABDUCTION



Lie on your unoperated side. Keep the knees fully extended. Raise the operated limb upward to a 45 degree angle as illustrated. Hold one second, and then lower slowly. Repeat 20 times.

OFFICE VISIT

Please make an appointment with Dr. Gill's office at 3-4 months after surgery.

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Knee Joint Resurfacing/Replacement Rehabilitation Protocol

Phase three: 6 to 12 weeks after surgery onward

Goals:

1. Regain full muscle strength
2. Gradual return to full activity

Brace/Crutches and Weight Bearing

Patients with femoral condyle implants can progress to full weight bearing without crutches with Dr. Gill's approval.

Exercises

Range of Motion and Strengthening Exercises

Days per Week: 3 Times per Day: 1

Cycling

Days per week: 3-4 Times per day: 1

Stationary or outdoor (mountain or road bikes) 30-45 minutes
(Stay on flat terrain and remain on seat) Progressive moderate resistance
Indoors - Brace off
Outdoors - Brace on

Stretching Exercises

Days per week: 5-7 Times per day: 1-2

Hamstring Stretch 3-5 reps holding for 15-30 sec

Quadriceps stretch 3-5 reps holding for 15-30 sec

Calf Stretch 3-5 reps holding for 15-20 sec

Special Note:

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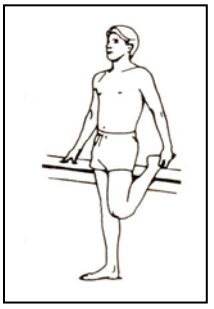
Please progress to the exercises in the following sections only with the supervision and instruction of your physical therapist. Some of these exercises may be not-indicated in some cases. Consult Dr. Gill's office and your physical therapist if you are unsure.

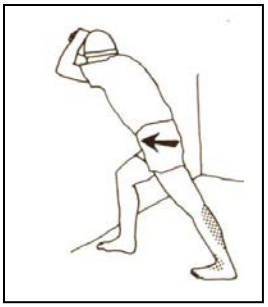
You can view a video clip of most of the listed exercises by going to the Boston Sports Medicine and Research Institute website:
http://www.bosotnsportsmedicine.com/protocols_therapy_videos.html

Hamstring Stretch
Perform this stretch in the position illustrated at the right. Bend slowly forward at the hips, keeping the knee fully extended until you feel gentle stretch in the back of your thigh and knee. Hold the stretch for 15 to 20 seconds and repeat 3 to 5 times.



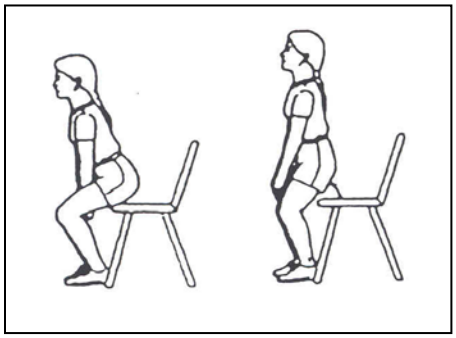
Quadriceps Stretch
This stretch is performed in the position illustrated at the right. Lean gently backward as if bringing you heel toward the buttock. When a stretch is felt in the front of the thigh and knee, hold 15 to 20 seconds for 3 to 5 repetitions.

Calf/Achilles Stretch
In the position illustrated, keep the heel flat on the floor and the knee fully extended. Lean forward at the hips with the arms supporting your weight. When you feel a gentle stretch in the back of your calf and knee, hold for 15 to 20 seconds, 3 to 5 repetitions.



Straight Leg Lift
Side Abduction Leg Lift
Short Arc Lift (30 degrees or less)
Standing Hamstring Curls
Add 1 lb. per week to reach 5 lbs.
3 sets of 15 repetitions

Squat to Chair
In the chair squat exercise, you lower your buttocks toward the chair until your buttocks touch the chair. Do not sit or rest at the chair, but instead immediately and slowly return to the standing and starting position. Remember to keep your head over your feet and bend at the waist as you descend. **For patellar/trochlear patients**, do only a partial squat about 1/3 way to the chair. The angle at the knee should not exceed 30 degrees to avoid excess stress on the healing implant. Do not do this exercise if there is pain or grinding at the kneecap. After the first week, you may hold dumbbells while



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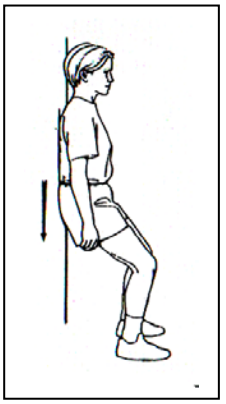
performing this exercise and the wall slide. Start with 3 to 5 pounds each hand. You may add 2 to 3 pounds per week until you reach 10 pounds in each hand. 3 sets of 10 to 15 repetitions.

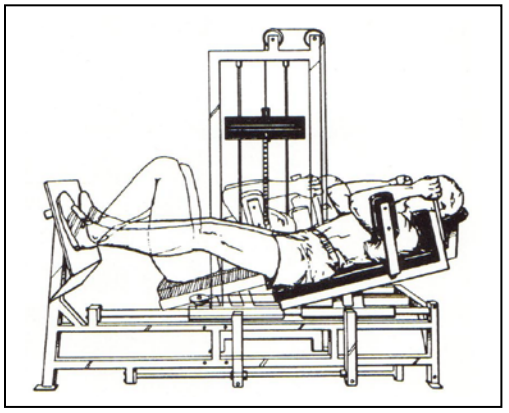
Wall Slides



Stand upright with your back and buttocks touching a wall. Place the feet about 12 inches apart and about 6 inches from the wall. Slowly lower your hips by bending the knees and slide down the wall until the knees are flexed about 30 degrees (illustration). Do not slide down deeper than 30 degrees at the knee to avoid kneecap problems (this instruction is especially important for patellar and trochlear resurfacing. Pause for five seconds and then slowly slide back up to the upright starting position. Do 3 sets of 10 to 15 repetitions.

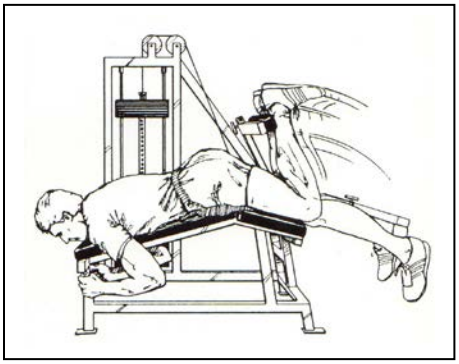
The following exercises can be added after 12 weeks post-surgery

Seated Leg Press



Use an amount of weight that feels easy enough to perform 20 repetitions as the starting weight for this exercise. Use this weight for the first week before raising the weight. The weight may be increased by about 5 pounds every 7 to 10 days thereafter, as long as you can perform 20 repetitions per set for 3 sets. In this exercise, avoid letting the knees **snap** or drop suddenly into extension when reaching the fully straightened position. Avoid starting the exercise with the knees excessively bent. Do not bend the knee so far that your calves and back of thighs touch. Adjust the seat position to limit the excursion of the machine.

Resisted Hamstring Curls



If you have access to a hamstring curl machine (illustration), you may start using it. As with the leg press, start with a reasonable weight and use that weight for the first week. You may increase the weight by 3 to 5 pounds every 10 days as long as you can perform 3 sets of 20 repetitions slowly, with good form. If you do not have access to a hamstring machine, continue doing the standing hamstring curl adding an ankle weight for resistance. Start with 3 to 5 pounds and add 1 pound per week until you build to 10 pounds for 3 sets of 15 repetitions.

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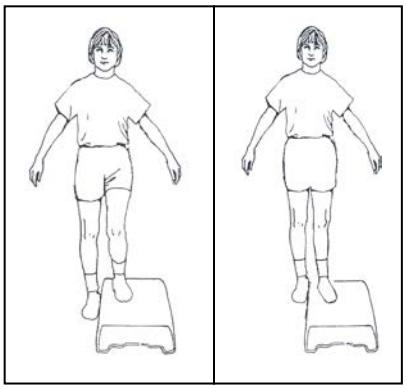
Step Up- Down Exercise



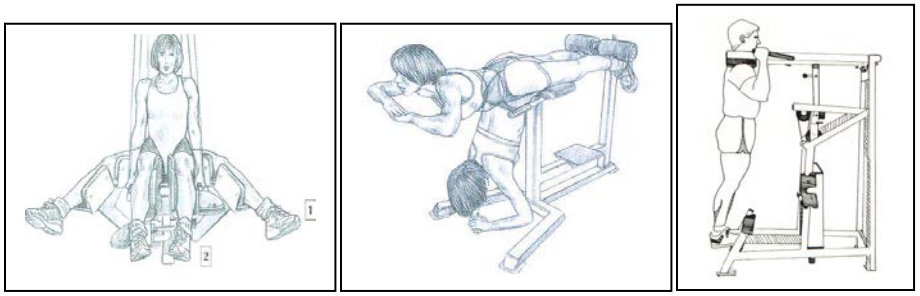
Place the foot of the operated limb on a stool or step. Maintain balance, if necessary, by holding onto the wall or a chair (illustration). Standing sideways to the step, slowly lower the opposite foot to touch the floor. Do not land on the floor, just touch gently and then step up onto the stool by straightening the knee using the quadriceps muscles. Try to keep an upright posture and avoid bending forward during the exercise. When doing a step up-down, you should position your thigh so that your kneecap is in line with the tip of your shoe, or your second toe.
Do 3 sets of 10 to 15 repetitions.

Progression for Step Up-Down Exercise

Start with a step of 3 inches in height. Start with 3 sets of 5 repetitions. Add one repetition per set, per workout, until you can do 3 sets of 10 (about 2 weeks) If pain free, progress to a step of 6 inches in height. Repeat the above progression starting with 3 sets of 5 repetitions.Add one repetition per set, per workout, until you can do 3 set of 10 (about 2 weeks). If pain free, progress to a step of 9 inches in height (the height of a standard stair). Repeat this process of progression from 3 sets of 5, to 3 sets of 10 (about 2 weeks).

Additional Weight Training

Hip Abductor/Adductor machine
Roman Chair
Calf Raise Machine



Precautions When Exercising

- Avoid pain at the patellar tendon
- 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

Principles of Strength Training

- Warm-up prior to exercising by stationary cycling or other means
- You are “warmed –up” when you have started sweating
- Gently stretch all muscle groups next
- Do exercises involving multiple muscle groups first and individual muscle groups last

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- Do aerobic workouts ***after*** strength workouts
- Cool-down by stretching after finishing exercise

The following exercises can cause injury to the knee and should be done with caution:

1. Knee extension weight lifting machine
2. Running
3. Jumping
4. Pivoting or cutting
5. Lunges
6. Stairmaster
7. Step exercises with impact

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Rehabilitation after Knee Joint Resurfacing Surgery

Post-op Phase	Weight bearing status	Use of brace	Passive ROM and Active ROM	Strength training	Return to running and sports	Recommended Restrictions
Phase One **0 to 2 weeks**	Patellar /trochlear groove implants are FWB with crutches and immobilizer Femoral condyle implants are PWB with crutches	Postoperative knee immobilizer for Patellar /trochlear groove implants Femoral condyle implants will require a brace, in some cases, which will allow motion from 0° to 90° (per MD)	CPM 10 hours /day for the first 2 weeks after surgery Stationary bike starting the 3rd postop week	Isometric Quad and knee extension, active and assisted knee flexion, heel prop, ankle pumps	none	Emphasize compliance with weight bearing restrictions, brac use and CPM
Phase Two **3 to 6 weeks**	Patellar /trochlear groove implants are progressive to FWB Femoral condyle implants are PWB with crutches	Patellar/trochlear implants wean immobilizer see Phase 1	Full ROM CPM discontinued after 2 weeks. Stationary bike	Active exercises: SLR, SAQ, standing HS curl, Side lying Abduction, calf raises	none	No stair master o Impact exercises Avoid pivoting a varus/valgus stresses Limit OC and CC knee extension a to 0-30 for patellar/trochlear
Phase Three **6 to 12 weeks**	Femoral condyle implants are progressive to FWB	Brace discontinued	Hamstring stretch Calf stretch Quadriceps stretch	Progressive ankle weight resistance Partial squats Partial wall slides	none	Limit OC and CC knee extension a to 0-30 for patellar/trochlear
Phase Four **12 weeks onward**	FWB	No brace	Stretching and flexibility exercises	Limited gym strength circuit. Single-leg closed chain exercises as tolerated.	Per surgeon	Caution against excessive joint loads

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