

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:

Your doctor 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 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 your doctor'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:

Surgery is performed in the Wang building at MGH and at the Orthopedic Ambulatory Surgery Center at Mass General West in Waltham.

- For surgery at MGH main campus in Boston: Report directly to the **Surgical Day Care Unit** on the third floor of the **Wang Ambulatory Care Building at Massachusetts General Hospital** two hours prior to surgery.
- For surgery at the surgery center at MGH West in Waltham: Report directly to the **Ambulatory Surgery Center** on the **second floor of Mass General West**.

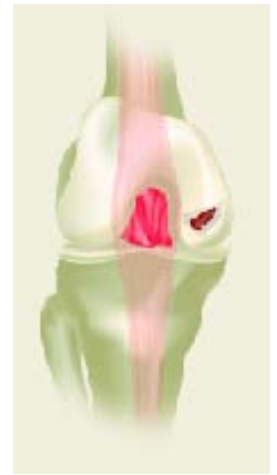


KNEE JOINT CARTILAGE

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.

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.



Knee cartilage defect

SURGERY:

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 bearing 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.



Knee cartilage defect repaired with implant

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 0 to 50 degrees and advance to 100 degrees as tolerated.

The **dressings** 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 your doctor.

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.

For 2 weeks following surgery, it is best to be in the CPM for at least 10 out of 24 hours a day. You can get up whenever you want to but it is best to get up more frequently for short periods of time.



Important:

Please read the information on 'Antibiotic Prophylaxis for Dental Patients with Total Joint Replacements' in the back of this protocol package

Contacts:

MGH Sports Medicine Main Telephone Number: 617-726-7500

MGH Sports Physical Therapy: 617-643-9999

Website: <http://www.mghsportsmedicine.org/>

Knee Joint Resurfacing 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.

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. Your doctor 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.

Your doctor 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://www2.massgeneral.org/sports/protocols/Crutch%20Walking%20and%20adjustment.pdf>
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

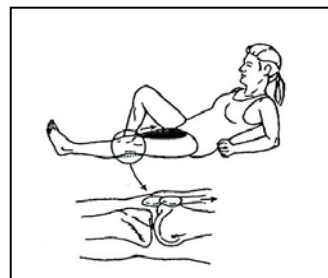
We suggest that you do not use any lower extremity free or machine weights. If you are doing free or machine weights for the upper body and trunk, we suggest a very light resistance of 3 sets of 15-20 repetitions. Do not place yourself in a compromising position with your recently operated knee.

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.

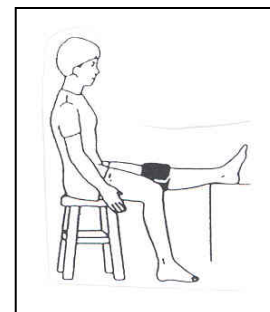
Hold 5 seconds for each contraction. Do 20 repetitions three times a day.



HEEL PROP- to straighten (extend) the knee.

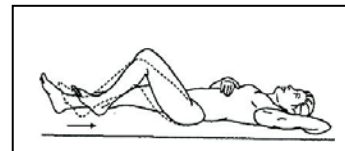
Lie on your back with a rolled up towel under your heel or sit in a chair with the heel on a stool as shown in the figure. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a weight (2 to 5 pounds) on the thigh, just above the kneecap.

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.



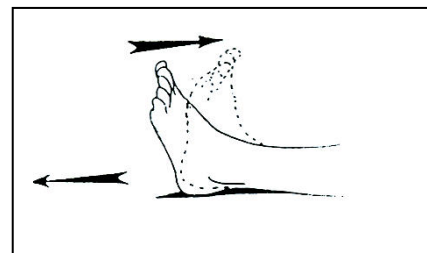
SITTING HEEL SLIDES - to regain the bend (flexion of the knee).

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.



You can view a video clip of most of the listed exercises by going to the MGH Sports Medicine website: http://www.massgeneral.org/sports/protocols_therapy_videos.html

OFFICE VISIT

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

Contacts:

MGH Sports Medicine Main Telephone Number: 617-726-7500

MGH Sports Physical Therapy: 617-643-9999

Website: <http://www.mghsportsmedicine.org/>

Knee Joint Resurfacing 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. Your doctor 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

Your doctor will give special instructions in some cases.

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://www2.massgeneral.org/sports/protocols/Crutch%20Walking%20and%20adjustment.pdf>

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 your doctor 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 MGH Sports Medicine website: http://www.massgeneral.org/sports/protocols_therapy_videos.html

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.

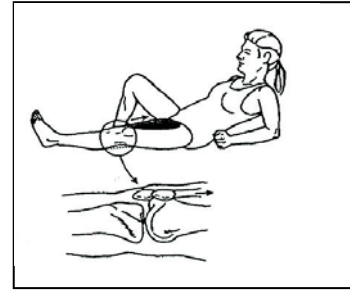
WATER WORKOUT (optional)

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. See figure in phase 1.

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.

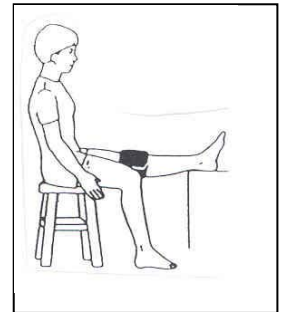
Hold 5 seconds for each contraction. Do 20 repetitions three times a day until you can fully straighten your knee equal to the unoperated side.



HEEL PROP- to straighten (extend) the knee.

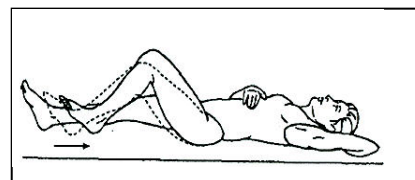
Lie on your back with a rolled up towel under your heel or sit in a chair with the heel on a stool as shown in the figure. Let the knee relax into extension (straight). If the knee will not straighten fully, you can place a weight (2 to 5 pounds) on the thigh, just above the kneecap.

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



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

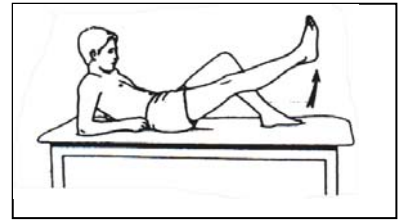
While lying on your back actively slide your heel backward to bend the knee. Keep bending the knee until you feel a stretch in the front of the knee. Hold this bent position for 5 seconds and then slowly relieve the stretch and straighten the knee. While the knee is straight, you may repeat the quadriceps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

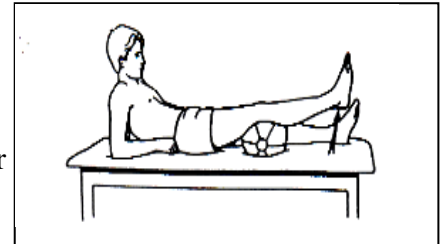
Tighten the quadriceps muscle so that the knee is flat, straight and fully extended. Try to raise the entire operated limb up off of the floor or bed. If you are able to keep the knee straight raise the limb to about 45 degrees, pause one second and then lower slowly to the bed. Relax and repeat.

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.



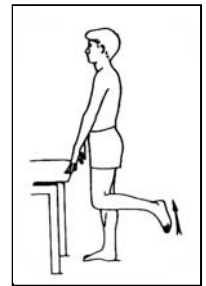
SHORT ARC LIFT

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.



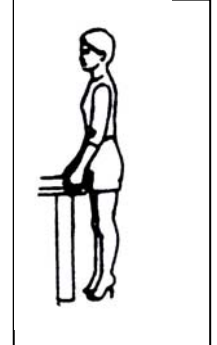
STANDING HAMSTRING CURL

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.



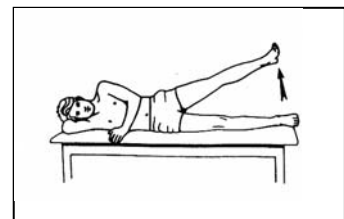
STANDING TOE RAISE

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 the doctor at 12 weeks after surgery.

Contacts:

MGH Sports Medicine Main Telephone Number: 617-726-7500

MGH Sports Physical Therapy: 617-643-9999

Website: <http://www.mghsportsmedicine.org/>

Knee Joint Resurfacing Rehabilitation Protocol

Phase three: Six to twelve 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 the surgeon'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)
(Stay on flat terrain and remain on seat)
resistance

30-45 minutes
Progressive moderate

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:

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 you doctor and physical therapist if you are unsure.

You can view a video clip of most of the listed exercises by going to the MGH Sports Medicine website: http://www.massgeneral.org/sports/protocols_therapy_videos.html

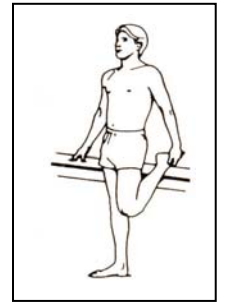
Hamstring Stretch

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.



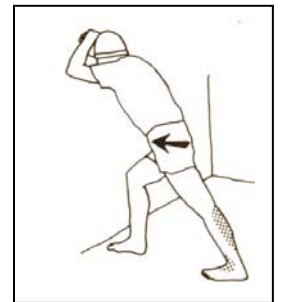
Quadriceps Stretch

This stretch is performed in the position illustrated at the right. Lean gently backward as if bringing your 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)

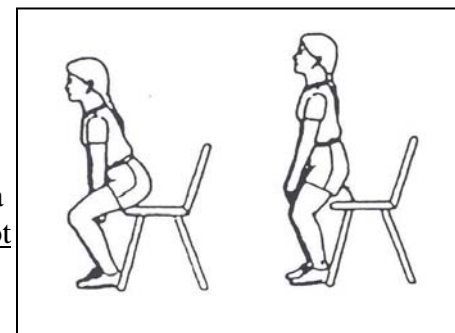
Standing Hamstring Curls

Add 1 lb. per week to reach 5 lbs.
3 sets of 15 repetitions

Squat to Chair

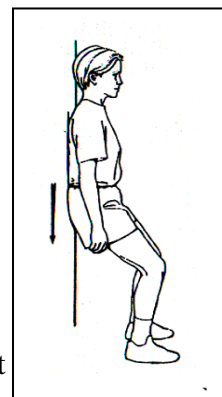
In the chair squat exercise, you lower your buttocks toward the chair until your buttocks touch the chair. Do not sit or rest at the chair, but instead immediately and slowly return to the standing and starting position. Remember to keep your head over your feet and bend at the waist as you descend. **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 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

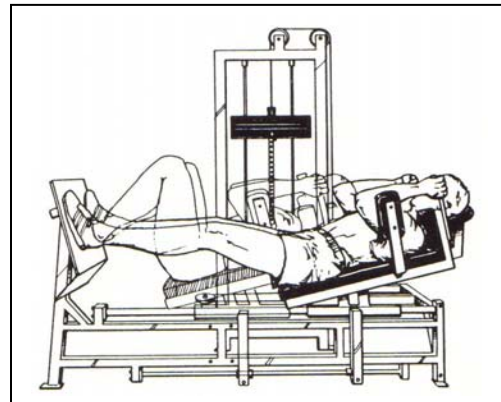
Stand upright with your back and buttocks touching a wall. Place the feet about 12 inches apart and about 6 inches from the wall. Slowly lower your hips by bending the knees and slide down the wall until the knees are flexed about 30 degrees (illustration). Do not slide down deeper than 30 degrees at 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

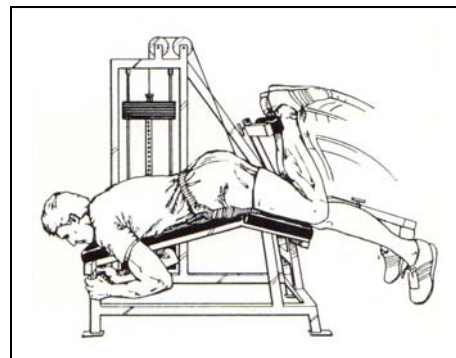
Seated Leg Press

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.



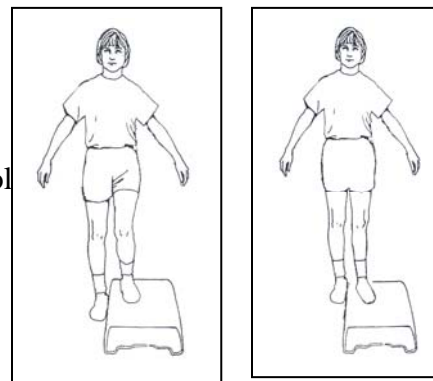
Resisted Hamstring Curls

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.



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.

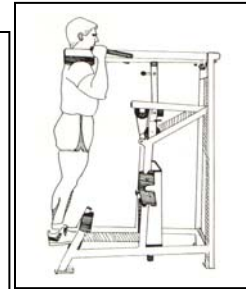
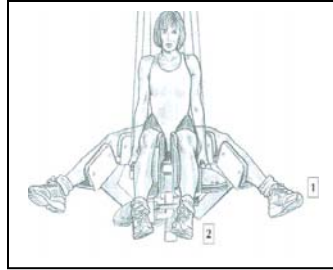


Progression for Step Up-Down Exercise

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
- 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

Contacts:

MGH Sports Medicine Main Telephone Number: 617-726-7500

MGH Sports Physical Therapy: 617-643-9999

Website: <http://www.mghsportsmedicine.org/>

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 3 rd postop week	Isometric Quad and knee extension, active and assisted knee flexion, heel prop, ankle pumps	none	Emphasize compliance with weight bearing restrictions, brace 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 or Impact exercises Avoid pivoting and varus/valgus stresses Limit OC and CC knee extension arc 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 arc 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

ADVISORY STATEMENT

Antibiotic prophylaxis for dental patients with total joint replacements

AMERICAN DENTAL ASSOCIATION;
AMERICAN ACADEMY OF
ORTHOPAEDIC SURGEONS

Approximately 450,000 total joint arthroplasties are performed annually in the United States. Deep infections of these total joint replacements usually result in failure of the initial operation and the need for extensive revision. Owing to the use of perioperative antibiotic prophylaxis and other technical advances, deep infection occurring in the immediate postoperative period resulting from intraoperative contamination has been reduced markedly in the past 20 years.

Patients who are about to have a total joint arthroplasty should be in good dental health prior to surgery and should be encouraged to seek professional dental care if necessary.

Antibiotic prophylaxis is not routinely indicated for most dental patients with total joint replacements.

Patients who already have had a total joint arthroplasty should perform effective daily oral hygiene procedures to remove plaque (for example, by using manual or powered toothbrushes, interdental cleaners or oral irrigators) to establish and maintain good oral health. The risk of bacteremia is far more substantial in a mouth with ongoing inflammation than in one that is healthy and employing these home oral hygiene devices.¹

Bacteremias can cause hematogenous seeding of total joint implants, both in the early postoperative period and for many years following implantation.² It appears that the most critical period is up to two years after joint placement.³ In addition, bacteremias may occur in

ABSTRACT

Background and Overview.

In 1997, the American Dental Association and the American Academy of Orthopaedic Surgeons convened an expert panel of dentists, orthopaedic surgeons and infectious disease specialists and published their first Advisory Statement on Antibiotic Prophylaxis for Dental Patients with Prosthetic Joints. This represented the first time that national health organizations had gone on record on this topic. This 2003 advisory statement is the first periodic update of the 1997 statement. In addition, the organizations have created a new patient handout (included at the end of the statement) that dentists may share with their patients. The 1997 Advisory Statement has been well-used by dentists and orthopaedic surgeons. Following their standard protocols for periodic review of existing advisory statements, the ADA and AAOS and their expert consultants recently reviewed the 1997 statement.

Conclusions and Clinical

Implications. The 2003 statement includes some modifications of the classification of patients at potential risk and of the incidence stratification of bacteremic dental procedures, but no changes in terms of suggested antibiotics and antibiotic regimens. The statement concludes that antibiotic prophylaxis is not indicated for dental patients with pins, plates or screws, nor is it routinely indicated for most dental patients with total joint replacements. However, it is advisable to consider premedication in a small number of patients who may be at potential increased risk of experiencing hematogenous total joint infection.



the course of normal daily life⁴⁻⁶ and concurrently with dental and medical procedures.⁶ It is likely that many more oral bacteremias are spontaneously induced by daily events than are dental treatment-induced.⁶ Presently, no scientific evidence supports the position

TABLE 1

PATIENTS AT POTENTIAL INCREASED RISK OF EXPERIENCING HEMATOGENOUS TOTAL JOINT INFECTION.*	
PATIENT TYPE	CONDITION PLACING PATIENT AT RISK
All patients during first two years following joint replacement	N/A†
Immunocompromised/immunosuppressed patients	Inflammatory arthropathies such as rheumatoid arthritis, systemic lupus erythematosus Drug- or radiation-induced immunosuppression
Patients with comorbidities‡	Previous prosthetic joint infections Malnourishment Hemophilia HIV infection Insulin-dependent (type 1) diabetes Malignancy

* Based on Ching and colleagues,¹² Brause,¹⁶ Murray and colleagues,¹⁷ Poss and colleagues,¹⁸ Jacobson and colleagues,¹⁹ Johnson and Bannister,²⁰ Jacobson and colleagues²¹ and Berbari and colleagues.²²
 † N/A: Not applicable.
 ‡ Conditions shown for patients in this category are examples only; there may be additional conditions that place such patients at risk of experiencing hematogenous total joint infection.

that antibiotic prophylaxis to prevent hematogenous infections is required prior to dental treatment in patients with total joint prostheses.¹ The risk/benefit^{7,8} and cost/effectiveness^{7,9} ratios fail to justify the administration of routine antibiotic prophylaxis. The analogy of late prosthetic joint infections with infective endocarditis is invalid, as the anatomy, blood supply, microorganisms and mechanisms of infection are all different.¹⁰

It is likely that bacteremias associated with acute infection in the oral cavity,^{11,12} skin, respiratory, gastrointestinal and urogenital systems and/or other sites can and do cause late implant infection.¹² Any patient with a total joint prosthesis with acute orofacial infection should be vigorously treated as any other patient with elimination of the source of the infection (incision and drainage, endodontics, extraction) and appropriate therapeutic antibiotics when indicated.^{1,12} Practitioners should maintain a high index of suspicion for any unusual signs and symptoms (such as fever, swelling, pain, joint that is warm to touch) in patients with total joint prostheses.

Antibiotic prophylaxis is not indicated for

dental patients with pins, plates and screws, nor is it routinely indicated for most dental patients with total joint replacements. This position agrees with that taken by the ADA Council on Dental

Any perceived potential benefit of antibiotic prophylaxis must be weighed against the known risks of antibiotic toxicity; allergy; and development, selection and transmission of microbial resistance.

Therapeutics¹³ and the American Academy of Oral Medicine¹⁴ and is similar to that taken by the British Society for Antimicrobial Chemotherapy.¹⁵ There is limited evidence that some immunocompromised patients with total joint replacements (Table 1) may be at higher risk of experiencing hematogenous infections.^{12,16-23} Antibiotic prophylaxis for such patients undergoing dental procedures with a higher bacteremic risk (as defined in Table 2) should be considered using an empirical regimen (Table 3). In addition, antibiotic prophylaxis may be considered

when the higher-risk dental procedures (again, as defined in Table 2) are performed on dental patients within two years post-implant surgery,³ on those who have had previous prosthetic joint infections and on those with some other conditions (Table 1).

Occasionally, a patient with a total joint prosthesis may present to the dentist with a recom-

TABLE 2

INCIDENCE STRATIFICATION OF BACTEREMIC DENTAL PROCEDURES.*	
INCIDENCE	DENTAL PROCEDURE
Higher incidence [†]	Dental extractions Periodontal procedures, including surgery, subgingival placement of antibiotic fibers/strips, scaling and root planing, probing, recall maintenance Dental implant placement and replantation of avulsed teeth Endodontic (root canal) instrumentation or surgery only beyond the apex Initial placement of orthodontic bands but not brackets Intraligamentary and intraosseous local anesthetic injections Prophylactic cleaning of teeth or implants where bleeding is anticipated
Lower incidence ^{‡§}	Restorative dentistry [¶] (operative and prosthodontic) with/without retraction cord Local anesthetic injections (nonintraaligamentary and nonintraosseous) Intracanal endodontic treatment; post placement and buildup Placement of rubber dam Postoperative suture removal Placement of removable prosthodontic/orthodontic appliances Taking of oral impressions Fluoride treatments Taking of oral radiographs Orthodontic appliance adjustment

* Adapted with permission of the publisher from Dajani AS, Taubert KA, Wilson W, et al.²³
[†] Prophylaxis should be considered for patients with total joint replacement who meet the criteria in Table 1. No other patients with orthopedic implants should be considered for antibiotic prophylaxis prior to dental treatment/procedures.
[‡] Prophylaxis not indicated.
[§] Clinical judgment may indicate antibiotic use in selected circumstances that may create significant bleeding.
[¶] Includes restoration of carious (decayed) or missing teeth.

TABLE 3

SUGGESTED ANTIBIOTIC PROPHYLAXIS REGIMENS.*		
PATIENT TYPE	SUGGESTED DRUG	REGIMEN
Patients not allergic to penicillin	Cephalexin, cephadrine or amoxicillin	2 grams orally 1 hour prior to dental procedure
Patients not allergic to penicillin and unable to take oral medications	Cefazolin or ampicillin	Cefazolin 1 g or ampicillin 2 g intramuscularly or intravenously 1 hour prior to the dental procedure
Patients allergic to penicillin	Clindamycin	600 milligrams orally 1 hour prior to the dental procedure
Patients allergic to penicillin and unable to take oral medications	Clindamycin	600 mg intravenously 1 hour prior to the dental procedure*

* No second doses are recommended for any of these dosing regimens.

mentation from his or her physician that is not consistent with these guidelines. This could be due to lack of familiarity with the guidelines or to special considerations about the patient’s medical condition that are not known to the dentist. In this situation, the dentist is encouraged to consult

with the physician to determine if there are any special considerations that might affect the dentist’s decision on whether or not to premedicate, and may wish to share a copy of these guidelines with the physician if appropriate. After this consultation, the dentist may decide to follow the

physician's recommendation or, if in the dentist's professional judgment antibiotic prophylaxis is not indicated, may decide to proceed without antibiotic prophylaxis. The dentist is ultimately responsible for making treatment recommendations for his or her patients based on the dentist's professional judgment. Any perceived potential benefit of antibiotic prophylaxis must be weighed against the known risks of antibiotic toxicity; allergy; and development, selection and transmission of microbial resistance.

This statement provides guidelines to supplement practitioners in their clinical judgment regarding antibiotic prophylaxis for dental patients with a total joint prosthesis. (Editor's note: The patient handout on page 899 can be duplicated to provide patients with an overview of these guidelines.) It is not intended as the standard of care nor as a substitute for clinical judgment, as it is impossible to make recommendations for all conceivable clinical situations in which bacteremias originating from the oral cavity may occur. Practitioners must exercise their own clinical judgment in determining whether or not antibiotic prophylaxis is appropriate. ■

Address reprint requests to the ADA Council on Scientific Affairs, 211 E. Chicago Ave., Chicago, Ill. 60611.

The ADA/AAOS Expert Panel that developed the original of this statement consisted of Robert H. Fitzgerald Jr., M.D.; Jed J. Jacobson, D.D.S., M.S., M.P.H.; James V. Luck Jr., M.D.; Carl L. Nelson, M.D.; J. Phillip Nelson, M.D.; Douglas R. Osmon, M.D.; and Thomas J. Pallasch, D.D.S. The staff liaisons were Clifford W. Whall Jr., Ph.D., for the ADA, and William W. Tipton Jr., M.D., for the AAOS. The ADA and the AAOS reviewed and updated this statement in 2003.

Dentists and physicians are encouraged to reproduce the above Advisory Statement for distribution to colleagues. Permission to reprint the Advisory Statement is hereby granted by ADA and AAOS, provided that the Advisory Statement is reprinted in its entirety including citations and that such reprints contain a notice stating "Copyright © 2003 American Dental Association and American Academy of Orthopaedic Surgeons. Reprinted with permission." If you wish to use the Advisory Statement in any other fashion, written permission must be obtained from ADA and AAOS.

1. Pallasch TJ, Slots J. Antibiotic prophylaxis and the medically compromised patient. *Periodontol* 2000 1996;10:107-38.
2. Rubin R, Salvati EA, Lewis R. Infected total hip replacement after dental procedures. *Oral Surg Oral Med Oral Pathol* 1976;41(1):13-23.
3. Hansen AD, Osmon DR, Nelson CL. Prevention of deep prosthetic joint infection. *Am J Bone Joint Surg* 1996;78-A(3):458-71.
4. Bender IB, Naidorf IJ, Garvey GJ. Bacterial endocarditis: a consideration for physicians and dentists. *JADA* 1984;109:415-20.
5. Everett ED, Hirschmann JV. Transient bacteremia and endocarditis prophylaxis: a review. *Medicine (Baltimore)* 1977;56:61-77.
6. Guntheroth WG. How important are dental procedures as a cause of infective endocarditis? *Am J Cardiol* 1984;54:797-801.
7. Jacobson JJ, Schweitzer SO, DePorter DJ, Lee JJ. Antibiotic prophylaxis for dental patients with joint prostheses? a decision analysis. *Int J Technol Assess Health Care* 1990;6:569-87.
8. Tsevat J, Durand-Zaleski I, Pauker SG. Cost-effectiveness of antibiotic prophylaxis for dental procedures in patients with artificial joints. *Am J Public Health* 1989;79:739-43.
9. Norden CW. Prevention of bone and joint infections. *Am J Med* 1985;78(6B):229-32.
10. McGowan DA. Dentistry and endocarditis. *Br Dent J* 1990;169:69.
11. Bartzokas CA, Johnson R, Jane M, Martin MV, Pearce PK, Saw Y. Relation between mouth and haematogenous infections in total joint replacement. *Br Med J* 1994;309:506-8.
12. Ching DW, Gould IM, Rennie JA, Gibson PI. Prevention of late haematogenous infection in major prosthetic joints. *J Antimicrob Chemother* 1989;23:676-80.
13. Council on Dental Therapeutics. Management of dental patients with prosthetic joints. *JADA* 1990; 121:537-8.
14. Eskinazi D, Rathburn W. Is systematic antimicrobial prophylaxis justified in dental patients with prosthetic joints? *Oral Surg Oral Med Oral Pathol* 1988;66:430-1.
15. Cawson RA. Antibiotic prophylaxis for dental treatment: for hearts but not for prosthetic joints. *Br Dent J* 1992;304:933-4.
16. Brause BD. Infections associated with prosthetic joints. *Clin Rheum Dis* 1986;12:523-35.
17. Murray RP, Bourne MH, Fitzgerald RH Jr. Metachronous infection in patients who have had more than one total joint arthroplasty. *J Bone Joint Surg Am* 1991;73(10):1469-74.
18. Poss R, Thornhill TS, Ewald FC, Thomas WH, Batte NJ, Sledge CB. Factors influencing the incidence and outcome of infection following total joint arthroplasty. *Clin Orthop* 1984;182:117-26.
19. Jacobson JJ, Millard HD, Plezia R, Blankenship JR. Dental treatment and late prosthetic joint infections. *Oral Surg Oral Med Oral Pathol* 1986;61:413-7.
20. Johnson DP, Bannister GG. The outcome of infected arthroplasty of the knee. *J Bone Joint Surg Br* 1986;68(2):289-91.
21. Jacobson JJ, Patel B, Asher G, Wooliscroft JO, Schaberg D. Oral *Staphylococcus* in elderly subjects with rheumatoid arthritis. *J Am Geriatr Soc* 1997;45:1-5.
22. Berbari EF, Hanssen AD, Duffy MC, Ilstrup DM, Harmsen WS, Osmon DR. Risk factors for prosthetic joint infection: case-control study. *Clin Infect Dis* 1998;27:1247-54.
23. Dajani AS, Taubert KA, Wilson W, et al. Prevention of bacterial endocarditis: recommendations by the American Heart Association. From the Committee on Rheumatic Fever, Endocarditis and Kawasaki Disease, Council on Cardiovascular Disease in the Young. *JAMA* 1997;277:1794-801.

See accompanying sidebar.

Your joint replacement, dental procedures and antibiotics

AMERICAN DENTAL ASSOCIATION
AND AMERICAN ACADEMY OF
ORTHOPAEDIC SURGEONS

For the first two years after a joint replacement, all patients may need antibiotics for all high-risk dental procedures. After two years, only high-risk patients may need to receive antibiotics for high-risk procedures.

The bacteria commonly found in the mouth may travel through the bloodstream and settle in your artificial joint. This increases your risk of contracting an infection. Ask your dentist about preventive antibiotics for all dental procedures with a high risk of bleeding or producing high levels of bacteria in your blood. Your dentist and your orthopaedic surgeon, working together, will develop an appropriate course of treatment for you.

You may need preventive antibiotics before all high-risk dental procedures if

- you had a joint replacement less than two years ago.

- you've had previous infections in your artificial joint.
- you have an inflammatory type of arthritis, type 1 diabetes or hemophilia.
- you have a suppressed immune system or are malnourished.
- you have a history of prior or present malignancy.

These dental procedures have a high risk

of bleeding or producing high levels of bacteria in your blood:

- all dental extractions;
- all periodontal procedures;
- dental implant placement and replantation of teeth that were knocked out;
- some root canal work;
- initial placement of orthodontic bands (not brackets);
- certain specialized local anesthetic injections;
- regular dental cleanings (if bleeding is anticipated).

One of these preventive antibiotics may be prescribed for you:

- **if you are not allergic to penicillin:** 2 grams of amoxicillin, cephalexin or cephadrine (orally) **OR** 2 grams of ampicillin or 1 gram of cefazolin (intramuscularly or intravenously) 1 hour before the procedure.
- **if you are allergic to penicillin:** 600 milligrams of clindamycin (orally or intravenously) 1 hour before the procedure.

These guidelines were developed by the American Academy of Orthopaedic Surgeons and the American Dental Association. They are designed to help practitioners make decisions about preventive antibiotics for dental patients with artificial joints. They are not a standard of care or a substitute for the practitioner's clinical judgment. Practitioners must exercise their own clinical judgment in determining whether or not preventive antibiotics are appropriate. Pediatric doses may be different.

Date of joint surgery _____

Orthopaedic surgeon _____

Phone number: () _____

Unlike other portions of JADA, this page may be clipped and copied as a handout for patients, without first obtaining reprint permission from the American Dental Association Publishing Division. Any other use, copying or distribution, whether in printed or electronic form, is strictly prohibited without prior written consent of the ADA Publishing Division.