

Home Therapy Exercises After Total Hip Replacement



Recovery after Surgery

To see the full benefit of hip replacement, therapy will be a necessary part of the rehabilitation process. Therapy can **reduce swelling, decrease pain, improve range-of-motion, build strength, challenge balance, and develop endurance**. The majority of patients are able to return to sedentary jobs and activities such as driving within **4-6 weeks** while more demanding occupations may take longer.

It is recommended you dedicate **30-60 minutes** each day for exercises. You can break up your exercise routine and do some exercises in the morning and others in the afternoon or perform different groups of exercises on different days.

The American Association of Hip and Knee Surgeons (AAHKS) has outlined a home exercise program for you after your hip replacement. This handout accompanies our patient exercise videos that you can find at www.AAHKS.org/HipKnee. Exercises will focus on stretching, strengthening, endurance, and balance. The hip rehabilitation program is broken down into three phases: **Weeks 1-3, Weeks 4-6, Weeks 7 and Beyond**. You can print the accompanying schedule to keep track of your progress.

This program starts with a warm-up period of stretching followed by more specific exercises for the hip muscles. We recommend using over-the-counter anti-inflammatory medications such as ibuprofen, naproxen, meloxicam or a pain reliever such as acetaminophen before or after exercising to help with swelling and discomfort. Please follow your physician's guidance and the dosing directions on the package. We recommend brief warm-up and cool-down periods before and after exercising.

These exercises are a general guide to rehabilitation after total joint replacement. After completing the eight-week program, you should continue a "maintenance exercise program" two to three days a week to keep your muscles strong and to keep a healthy lifestyle. Frequent follow up appointments will be required to check your progress. Please keep in mind that your surgeon may have you follow certain **hip precautions** depending on your particular hip surgery. **PLEASE CHECK WITH YOUR SURGEON BEFORE STARTING ANY OF THE FOLLOWING EXERCISES TO BE SURE YOU EXERCISE IN A SAFE MANNER.**

DISCLAIMER

PLEASE USE THE EXERCISES AS A GUIDE AS IT IS ULTIMATELY BETWEEN YOUR AND YOUR SURGEON TO DECIDE WHICH THERAPY SETTING IS RIGHT FOR YOUR RECOVERY AFTER HIP REPLACEMENT. YOUR SURGEON MAY RECOMMEND ALTERATIONS TO THIS ROUTINE. IF YOU EXPERIENCE ANY ABNORMAL DISCOMFORT, DIZZINESS, OR FEELINGS OF PASSING OUT, PLEASE STOP EXERCISING AND CONTACT YOUR PHYSICIAN AS SOON AS POSSIBLE.

Summary Of Hip Exercises



	<u>WEEKS 1-3</u>	<u>WEEKS 4-6</u>	<u>WEEKS 7+</u>
<i>STRETCHES</i>	Hamstring Stretch	Hamstring Stretch	Hamstring Stretch
	Calf Stretch Heel Cord	Calf Stretch Heel Cord	Calf Stretch Heel Cord
	Secondary Calf Stretch	Secondary Calf Stretch	Secondary Calf Stretch
<i>STRENGTHENING</i>	Glute Sets	Quad Arcs	Hip-Abduction / Adduction
	Ankle Pumps	Prone Knee Bends	Mini-Squats
	Thigh Squeezes	Straight Leg Raise	Step-ups
	Quad Sets	Hip Abduction / Adduction	Bridges
	Quad Arcs	Heel Slides	
	Prone Knee Bend	Mini-Squats	
	Calf Raises		
<i>ENDURANCE</i>	Walking	Treadmill	Treadmill
		Elliptical	Elliptical
		Stationary Bicycle	Stationary Bicycle
<i>BALANCE</i>	Eyes Open	Eyes Open / Eyes Closed	Eyes Open / Eyes Closed



HIP EXERCISES

STRETCHES

Hamstring Stretch	5
Calf Stretch	6

STRENGTHENING

Glute Sets	9
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Thigh Squeezes	11
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Mini-Squats	21
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ENDURANCE

Treadmill / Elliptical / Stationary Bicycle	24
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BALANCE

Eyes Open / Eyes Closed Standing Balance	26
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Stretching helps to prevent injury by getting the muscles ready for a workout. Typically, patients are advised to spend **5-10 minutes** stretching before exercising. A heating pad or warm towel can be used to help relax the muscles in preparation for stretching. The following stretches can also be performed in-between exercises to keep the muscles from getting tight. A good stretching routine can also help to break up scar tissue that will form after your hip replacement. It is recommended that your exercise program begin and finish with stretches. Ice can be applied to the hip or sore muscles after exercising.

GENERAL TIPS FOR STRETCHING EXERCISES

- ✓ Warm-up by walking 5-10 minutes to get your muscles ready for the exercise program.
- ✓ Remember to stretch in a slow and controlled manner, avoid rapid motions.
- ✓ Perform each stretch until you experience a **“tolerable discomfort”** in the muscle; adjust the stretch to your comfort.
- ✓ Try to hold the position for **10-30 seconds** (as indicated for each exercise).
- ✓ Slowly return to the original starting position.
- ✓ Take a deep breath and **relax for 5 seconds** between repetitions.
- ✓ Cool-down—5-10 minutes of icing or slow walking to finish workout.

Note: You can expect some muscle soreness when you first start a stretching program.

HAMSTRING STRETCH SEATED



The hamstrings are a group of muscles on the backs of your thighs. It is important to stretch these muscles because they can become tight after knee replacement. This stretch is also used during warm-ups to get your muscles ready for other exercises. There are a few ways to perform a hamstring stretch. It is important to try to relax during stretching exercises. Do not hold your breath. Instead, focus on taking slow deep breaths while trying to stretch a little bit further. **Remember to keep your toes pointed toward the ceiling at all times. Please check with your surgeon before attempting this stretching exercise.**



1. Begin by sitting in a hardback chair, prop your leg on a stool or chair directly in front of you.
2. While keeping your back straight, slowly reach for your toes while at the same time keeping your knee straight (you will feel a stretch along the muscles in the back of your thigh).

3. Try to hold the stretch for **30 seconds**.
4. Slowly return to the starting position.



This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	1	30 seconds

CALF STRETCH

HEEL CORD



This exercise stretches the calf muscles. These muscles can become tight after hip replacement. This stretch is also used during warm-ups to get your muscles ready for other exercises. You will need to **lean next to a wall or door** to complete this stretch. There are a few ways to perform the calf stretch. It is important to try to relax during stretching exercises. Do not hold your breath. Instead focus on taking slow deep breaths while trying to stretch a little bit further. Start by placing your toes on the bottom of the wall/door with your heel on the ground. Be sure to keep your toes pointed forward the entire time.



1. Start by placing your toes on the bottom of the wall/door with your heel on the ground. Be sure to keep your toes pointed forward at all times.
2. Remember to keep your knee straight and then lean forward until you feel stretch in the back of your calf.
3. Try to hold the stretch for **30 seconds**.
4. Slowly return to the starting position.

This exercise should be performed on both legs

SETS	REPETITIONS	HOLD
3	1	30 seconds

SECONDARY CALF STRETCH



The second part of the calf stretch is shown below. This exercise stretches the calf muscles differently compared to the first stretch. This stretch is also used during warm-ups to get your muscles ready for other exercises. You will need to **lean next to a wall or door** to complete this stretch. It is important to try to relax during stretching exercises. Do not hold your breath. Instead focus on taking slow deep breaths while trying to stretch a little bit further.

1. Stagger your stance with one foot in front of the other.
2. Keep the toes of both feet pointed forward while your hands are on the wall/door. Be sure to keep your **back knee** straight with the heel on the ground the entire time.
3. Now slowly lean forward until you feel a stretch in the back of your calf.
4. Try to hold the stretch for **30 seconds**.
5. Slowly return to the starting position.



This exercise should be performed on both legs

SETS	REPETITIONS	HOLD
3	1	30 seconds



It is normal for your leg muscles to atrophy (shrink) before and after joint replacement surgery. Exercises can help muscles regain strength as well as improve the nerve signals to improve strength and function. As your swelling decreases, muscle strength improves. It is important to exercise the leg muscles in different ways to improve overall function. Exercise bands or ankle weights can be added to most of these exercises to increase the degree of difficulty

GENERAL TIPS FOR STRENGTHENING EXERCISES

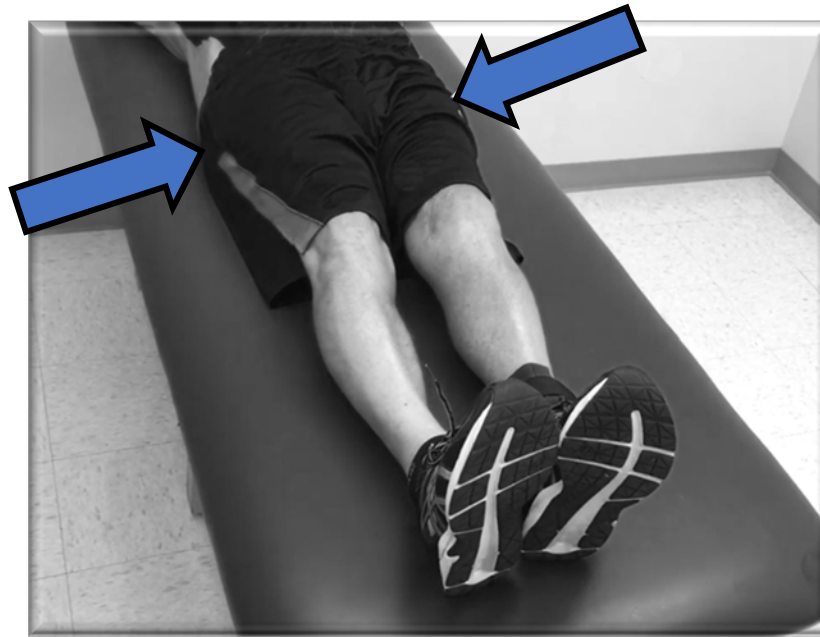
- ✓ Strengthening exercises are usually performed **after warm-up and stretching**.
- ✓ Please use the “**sets, repetitions, hold**” as a guide during exercising.
- ✓ Remember to control the muscles to slowly return to the original starting position.
- ✓ Take a deep breath and **RELAX FOR 5 SECONDS** between repetitions.
- ✓ It important to take 5-10 minutes to cool-down after exercising. This should include stretches and applying ice to sore muscles.

Note: Slight muscle discomfort can be expected - these exercises **should not cause pain**. If you experience pain, back off and modify your technique. If pain is still present, we recommend holding off with the specific painful exercise.

PLEASE CHECK WITH YOUR SURGEON BEFORE STARTING ANY OF THE FOLLOWING EXERCISES TO BE SURE YOU EXERCISE IN A SAFE MANNER.



This exercise works the buttock muscles and helps with your circulation after surgery. To perform this exercise, we recommend lying on your back on a soft surface or mat.



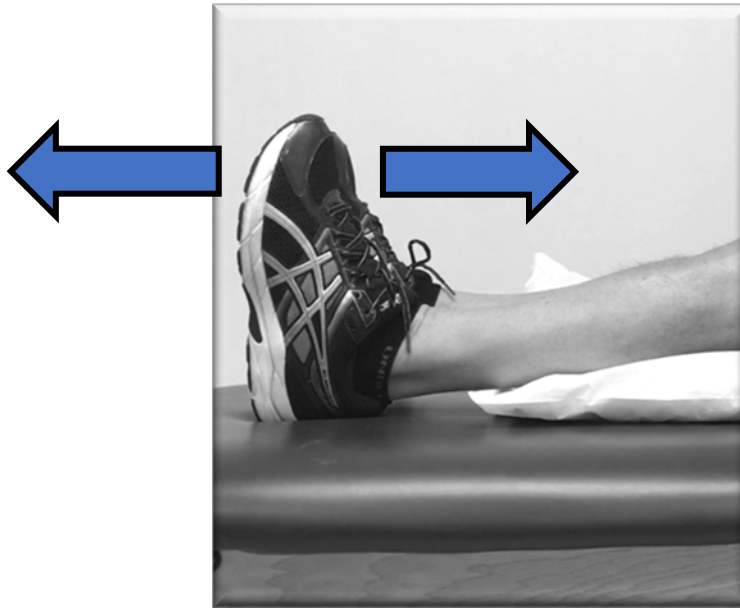
1. Your legs should be straight out in front of you.
2. Next, slowly squeeze your buttocks together without raising off the surface.
3. Hold the muscle contraction for **5 seconds**.
4. Slowly relax your muscles – your legs should not move during this exercise.

SETS	REPETITIONS	HOLD
3	10	5 seconds

ANKLE PUMPS



This exercise works the calf muscles and helps with your circulation after surgery. To perform this exercise, we recommend lying on your back on a soft surface or mat. Place a small towel or pillow behind your knee. Remember to keep your knee straight and your toes pointed toward the ceiling.



1. Begin by pulling your toes back toward you (like taking your foot off a gas pedal).
2. Next point your toes away from you (like pushing on a gas pedal). You will feel your calf muscles tighten.
3. Hold each position for **3 seconds** before slowly relaxing and returning to the starting position.

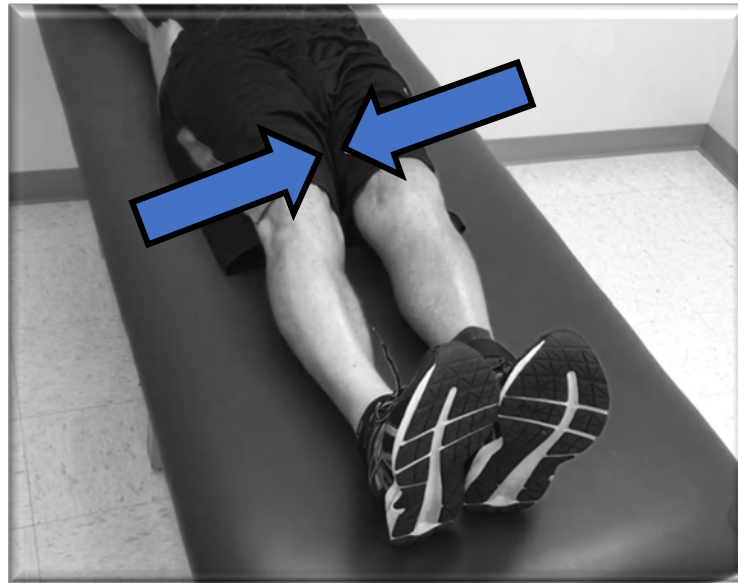
This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	3 seconds

THIGH SQUEEZES



This exercise works the inner thigh muscles (adductors) and helps with your circulation after surgery. To perform this exercise, we recommend lying on your back on a soft surface or mat.

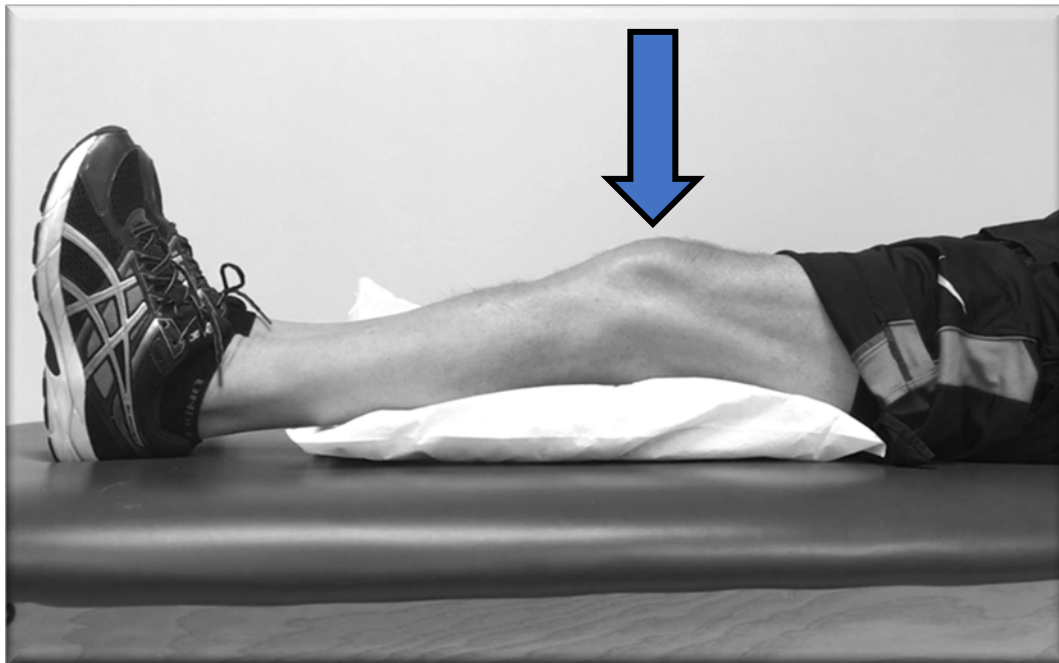


1. Begin with your legs together and straight out in front of you.
2. Next, slowly squeeze your thigh muscles together (you will feel the muscles on the inside of your thigh tighten).
3. Hold the muscle contraction for **5 seconds**.
4. Slowly relax the inner thigh muscles. Your legs should not move during this exercise.

SETS	REPETITIONS	HOLD
3	10	5 seconds



The Quadriceps are a group of muscles on the front of your thigh. This exercise helps to wake up the muscles for the first few weeks after surgery. To perform this exercise, we recommend lying on your back on a soft surface or mat. Place a small towel or pillow behind your knee.



1. Keep your toes pointed toward the ceiling and slowly push the back of your knee down into the towel/pillow. You will feel your thigh muscles tighten.
2. Hold the muscle contraction for **5 seconds** before slowly relaxing and returning to the starting position.

This exercise should be performed on both legs.

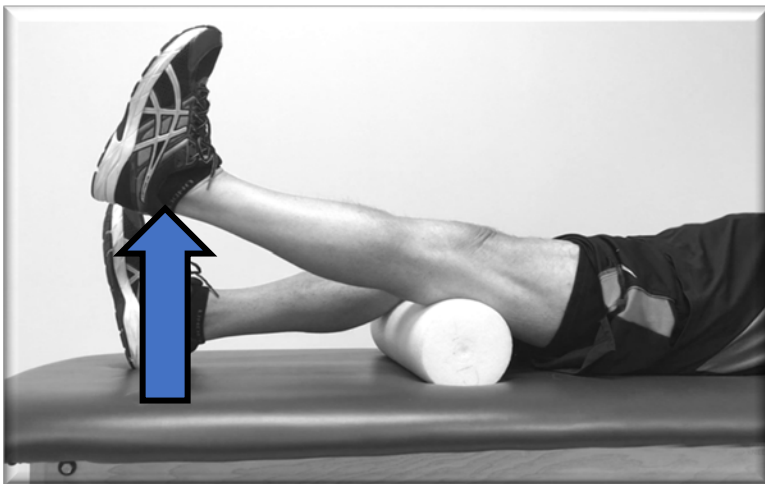
SETS	REPETITIONS	HOLD
3	10	5 seconds



The Quadriceps are a group of muscles on the front of your thigh. This exercise helps to wake up the muscles for the first few weeks after surgery. To perform this exercise, we recommend lying on your back on a soft surface or mat. For this exercise, place a rolled up towel or pillow behind your knee that allows your knee to rest in a comfortable bent position.



1. With your toes pointed toward the ceiling, slowly straighten your knee while keeping the back of your knee on the towel/pillow. You will feel your thigh muscles tighten.
2. Try to hold the muscle contraction for **5 seconds** with the knee straight.
3. Next slowly relax the thigh muscles and allow the leg to return to the starting position.



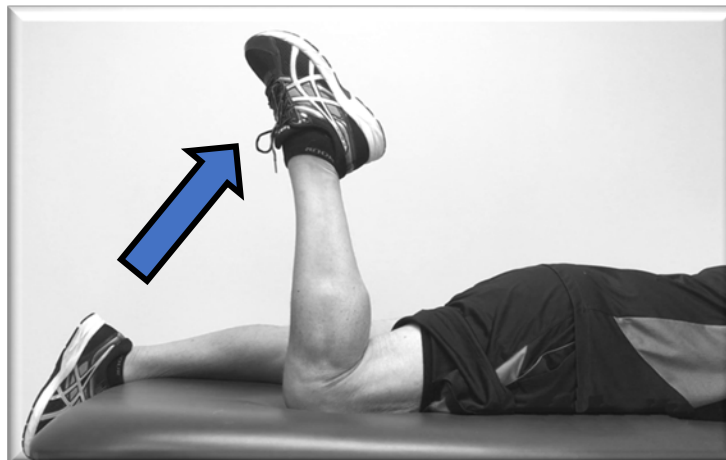
This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	5 seconds

PRONE KNEE BENDS



This exercise works the hamstring muscles on the back of your thigh. To perform this exercise, we recommend lying on your stomach on a comfortable surface. Keep the front part of your thigh in contact with the surface at all times. Ankle weights or exercise bands can be added to increase the degree of difficulty. Please make sure you are comfortable with getting into this position with your hip replacement.



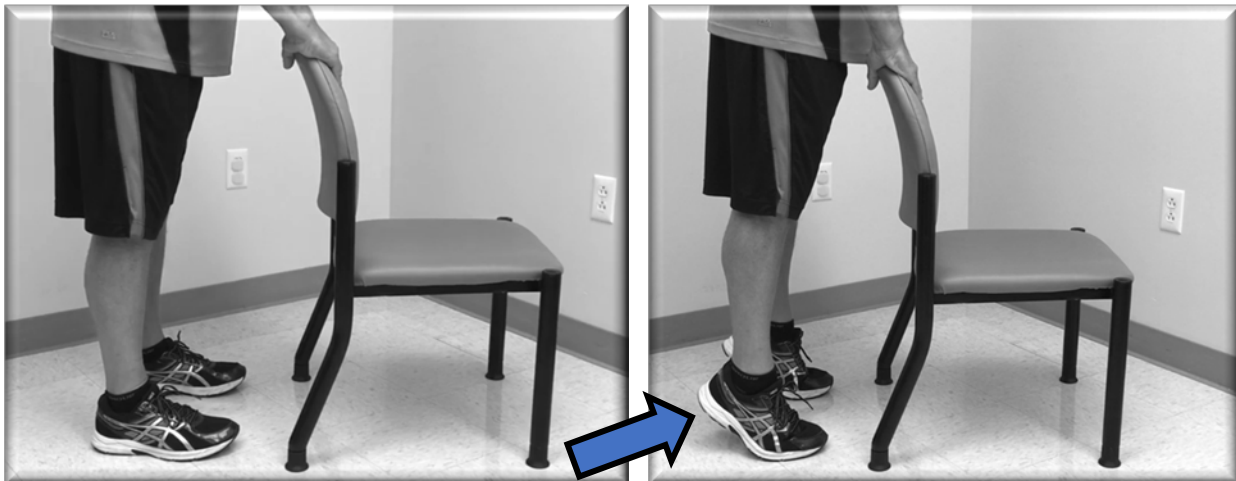
1. Point your toes away as if you were pushing on a gas pedal.
2. Slowly bend your knee up until your lower leg points towards the ceiling.
3. Hold the bend for **5 seconds** before slowly returning your leg to the starting position.

This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	5 seconds



This exercise works the calf muscles. To perform this exercise, we recommend using a chair, counter or railing for balance. Begin by spacing your feet shoulder-width apart.



1. Push up onto your toes to raise both heels off the ground.
2. Hold for **5 seconds** before slowly lowering your heels back to the ground.

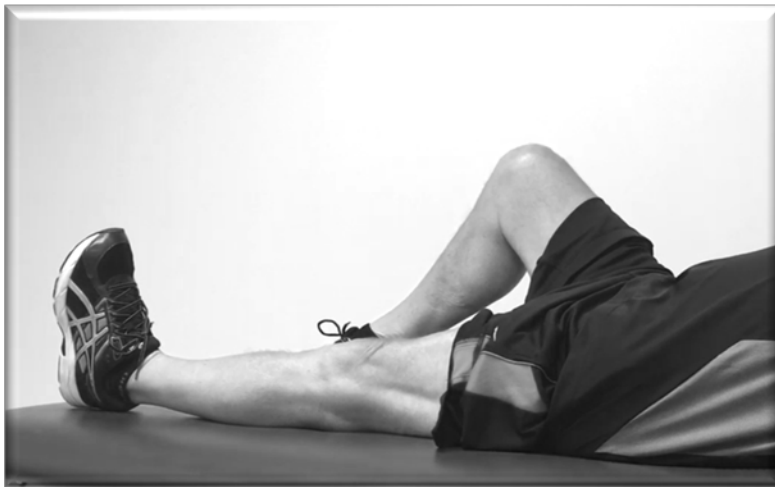
As you get stronger, you can do these standing on one leg at a time.

SETS	REPETITIONS	HOLD
3	10	5 seconds

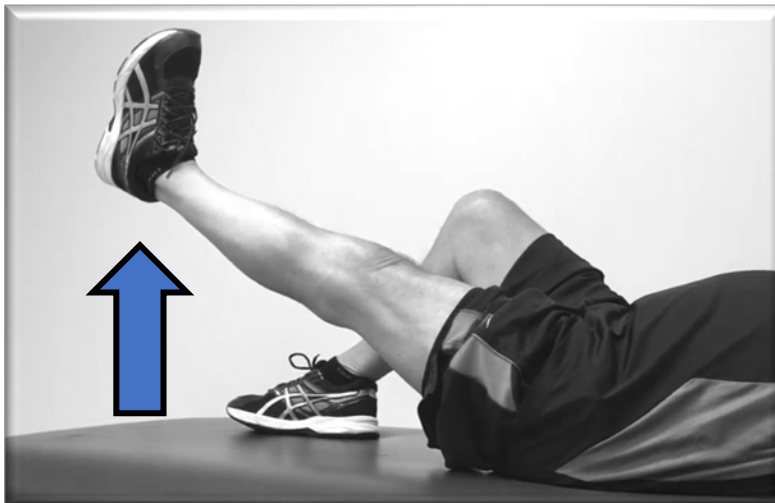
STRAIGHT LEG RAISE



This exercise works the quadriceps (thigh) muscles. To perform this exercise, we recommend lying on your back on a soft surface or mat. To take pressure off your back, your opposite leg should be comfortably resting in a bent position with the foot on the ground.



1. Begin by tightening your thigh muscles with your toes pointed toward the ceiling.
2. Slowly lift your entire leg off the ground while keeping your knee straight.
3. Try to bring your leg up until your thighs are at the same level.
4. Try to hold your leg up for **5 seconds** and then slowly return your leg to the starting position.



This exercise should be performed on both legs.

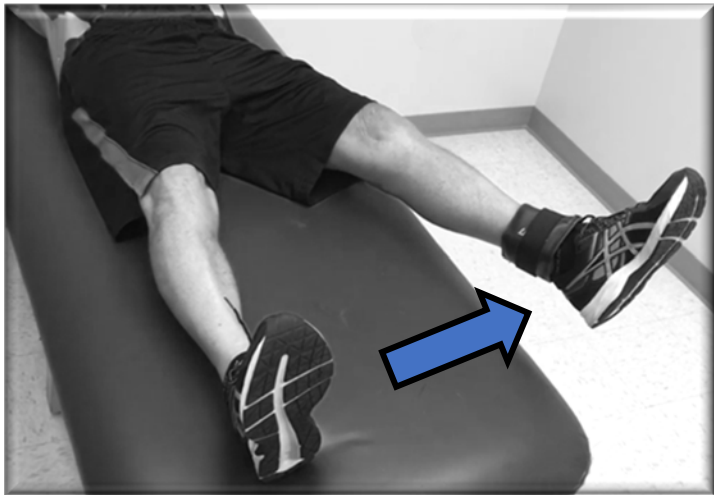
SETS	REPETITIONS	HOLD
3	10	5 seconds

HIP ABDUCTION / ADDUCTION SUPINE



This exercise works the muscles on the inside (adductors) and outside (abductors) of your hip. The exercise can be performed in three different positions. We recommend starting with the exercises lying on your back. When that becomes easy then progress to the exercises in standing, and finally for a more challenging exercise you can perform the exercises while lying on your side. Removing your shoes before attempting this exercise can allow your leg to slide easier.

Lying on Your Back (supine)



1. Remember to keep your toes pointed toward the ceiling and your knee straight.
2. Slowly move your leg out to the side until a comfortable stretch is felt in your groin.
3. Next slowly move your leg back to the starting position.

Ankle weights or exercise bands can be added to increase the degree of difficulty.

This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	none

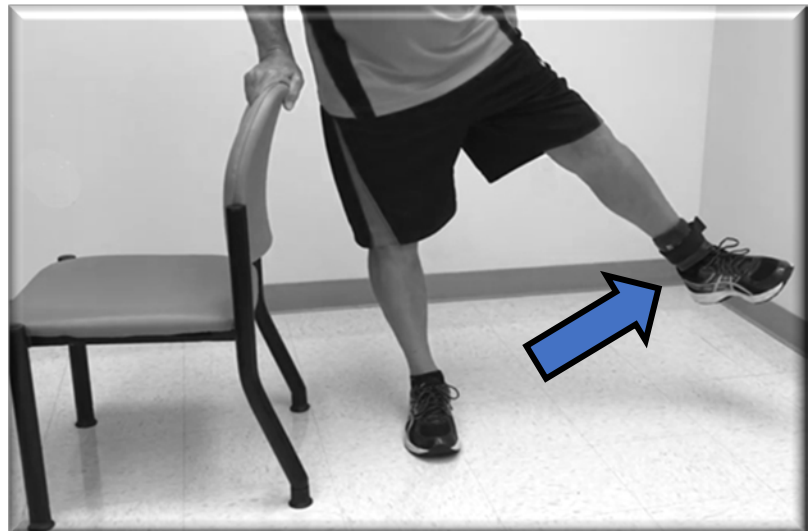
HIP ABDUCTION / ADDUCTION STANDING



When performing this exercise, we recommend using a chair, counter or railing for balance. Remember to keep your back straight for this exercise.

Standing

1. Begin by slightly rotating your toes toward the side.
2. While keeping your knee straight, slowly move your leg out toward the side. You will feel the muscles on the side of your hip tighten.
3. Try to hold the end position for **5 seconds** before slowly returning your leg to the starting position.



Ankle weights or exercise bands can be added to increase the degree of difficulty.

This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	5 seconds

HIP ABDUCTION / ADDUCTION SIDELYING



This position modification is the most difficult for this exercise. You should only progress to this exercise after the supine and standing exercises become too easy. To perform this exercise, we recommend lying on your side on a comfortable surface. Begin by lying on your side with your lower leg resting on the ground with the knee slightly bent.



Sidelying

1. Start by rotating your toes so they are pointing toward the ceiling.
2. While keeping your knee straight, slowly raise your leg toward the ceiling until a comfortable stretch is felt in your groin. You will feel your outer hip muscles tighten.
3. Try to hold the end position for **5 seconds** before slowly returning your leg to the starting position.

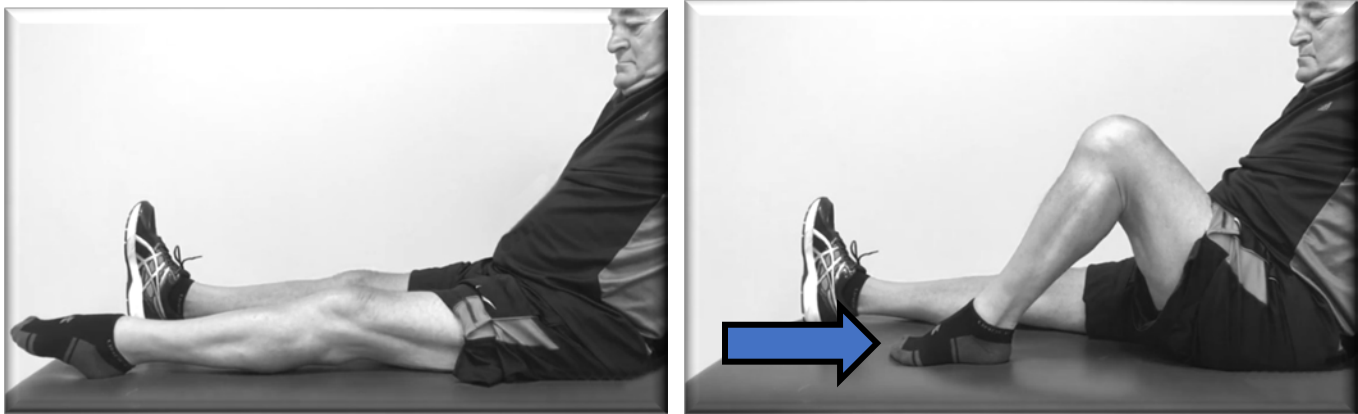
Ankle weights or exercise bands can be added to increase the degree of difficulty.

This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	5 seconds



This exercise works the quadriceps (thigh) and hamstring muscles. To perform this exercise, we recommend lying on your back on a soft surface or mat. We also recommend performing this exercise while **wearing socks** so your foot can slide easier. Remember to keep your knee pointing toward the ceiling at all times.



1. Slowly bend your knee and slide your heel back toward your buttock until a comfortable stretch is felt at the front of your knee.
2. Try to hold the position for **5 seconds** before slowly pushing your knee straight until the back of your knee rests against the surface.

A strap can also be used to help slide your heel further to increase the stretch on the knee.

This exercise should be performed on both legs.

SETS	REPETITIONS	HOLD
3	10	5 seconds

MINI-SQUATS



This exercise works several muscle groups including the quadriceps (thigh muscles), hamstrings, and calf muscles. It is important to protect your back, therefore we recommend using a smooth surface such as a wall during this exercise. Be sure to have a chair, countertop or railing close by for balance if needed. Begin with your feet about shoulder-width apart and about 18 inches from the wall.



1. Start by slowly bending your knees and sliding your back down the wall until your knees are at a **comfortable bend**.
2. Try to hold the position for **5 seconds** before slowly straightening your knees and sliding your back up the wall.
3. **Be sure to concentrate and keep your knees directly over your toes at all times during the exercise.**

To increase the difficulty, you can use an exercise ball between your back and the wall.

SETS	REPETITIONS	HOLD
3	10	5 seconds

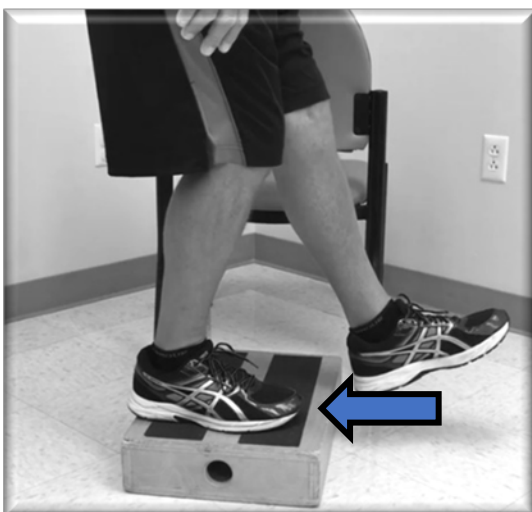


This exercise works several muscle groups including the quadriceps (thigh muscles), hamstrings and calf muscles. Be sure to have a chair, countertop or railing close by for balance if needed. In the beginning, you can start with a **4-inch step** and then progress to a **6-inch**, then **8-inch**, then **10-inch** and finally a **12-inch** step.

Start with the leg with the hip replacement on the step (the step leg).



1. Begin by shifting your weight to the step leg as if you were to climb the stairs. The goal is to bring your opposite leg up to match the step leg. **Do not place weight on the opposite leg.**
2. Hold for **5 seconds**.
3. Now slowly lower your opposite leg back to the floor by controlling the muscles of your step leg. You will feel the hip and thigh muscles contract during this exercise.



This exercise can be attempted in different directions. Try stepping in different directions such as forward, backward, and to the side to work different muscles.



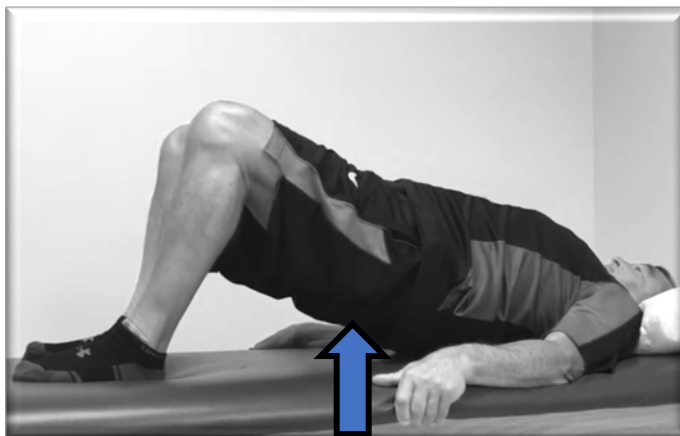
SETS	REPETITIONS	HOLD
3	10	5 seconds



This exercise works the thigh and hip muscles in addition to the abdominals and low back muscles. To perform this exercise, we recommend lying on your back on a firm comfortable surface. Both knees should be comfortably bent with your feet flat on the floor and about **shoulder-width** apart at all times during this exercise.



1. While keeping your hands at your sides, begin by slowly lifting your bottom off the ground by tightening your leg and stomach muscles.
2. Keep lifting as high as you can until your stomach is in line with your knees.
3. Hold for 5 seconds.
4. Next slowly return to the starting position.



SETS	REPETITIONS	HOLD
3	10	5 seconds



After a hip replacement, it is also important to work on endurance exercises. Endurance is the ability to work over a period of time. Think of it as another form of strengthening during your recovery process that will allow you to perform your day-to-day activities without getting too tired. Endurance exercises can be anywhere between a few minutes to one hour or more. Walking, bicycling and swimming build endurance by improving nerve impulses to your muscles and as well as improving your cardiovascular health. These types of exercise usually start about four to six weeks after your hip replacement. Continuing these exercises two to three days a week will not only keep your hip replacement working well, but these exercises are a key for maintaining a healthy lifestyle. We currently do not recommend running or high impact exercises after your hip replacement.

Treadmill Walking – The treadmill is a good starting point to improve your walking after hip replacement. The idea is to walk at a comfortable pace while still keeping the “heel-toe” pattern. Sometimes walking in front of a mirror can help you keep a smooth and even gait pattern. Most people usually start at a speed of two to three miles per hour. Once comfortable, you can increase the speed and incline in a safe responsible manner.

Elliptical – The elliptical machine is unique in that it simulates a normal walking pattern. You can adjust the resistance for a more difficult workout. Some machines also allow you to change the incline or decline resistance. It is important to gradually work up to a comfortable pace. Remember to complete exercises by going forward as well as going backwards on the elliptical to work different muscle groups.

Stationary Bicycle – The stationary bicycle (and for some a recumbent bicycle) are important to build strength and endurance. This machine is unique in that you can alter the resistance as well as adjust the seat position during a workout. For instance, moving the seat closer to the pedals will work more of the hip and thigh muscles. On the contrary, moving the seat further from the pedals will work more of the lower leg muscles. Remember to spend part of your time pedaling forward as well as backward to work different muscle groups.

Walking Outside – Begin with flat surfaces and then progress to uneven surfaces including hills and inclines/declines. Walking on different surfaces is a great way to build endurance. Hiking is an excellent exercise because of the uneven nature of the ground and hills which can also challenge your balance.

Stair Climber – The stair climber adjusts the pedal resistance and speed as you lift and lower your legs as if you were climbing a never-ending set of stairs. You can adjust your step length where short steps work more of the lower leg and calf muscles and long steps work more of the thigh and hip muscles.

Rowing – A rowing machine uses both upper and lower body muscles for more of a complete body workout. The key is to find a comfortable resistance and pace and to perform the exercises at a moderate pace to keep up your heart rate.

(continued)



OVERALL INSTRUCTIONS FOR ENDURANCE EXERCISES

We recommend starting at a **low resistance** and a comfortable pace for **5 minutes**. Over the next few weeks as the exercise gets easier, you can add 5 minutes to the exercise to make it more challenging. We recommend being able to exercise at your current resistance level for 20 minutes before increasing the resistance.

GENERAL TIPS FOR ENDURANCE EXERCISES

- ✓ These exercises are usually started **four to six weeks** after your hip replacement.
- ✓ Endurance exercises are performed after a warm-up and stretching period.
- ✓ It important to take 5-10 minutes to cool-down after exercising. This should include stretches and applying ice to sore muscles.

REMEMBER IF YOU EXPERIENCE ANY ABNORMAL DISCOMFORT, DIZZINESS, OR FEELINGS OF PASSING OUT, PLEASE STOP EXERCISING AND CONTACT YOUR PHYSICIAN AS SOON AS POSSIBLE.



It can take three months or more for your body to adjust to your new hip replacement. Initially your hip replacement leg will feel longer than the opposite side. This is because your muscles have to learn how to “work” with your new hip joint. The perception of a leg length difference will smooth out with time.

Balance and coordination exercises can help challenge your body during the recovery period. These types of exercises are necessary for a complete recovery. To perform these exercises, we recommend having a chair, countertop or railing nearby.

Tandem Standing – During this exercise, place one foot in front of the other so that the heel of one foot is touching the toes of the opposite foot. Be sure to stand straight with your head looking forward. Now try to maintain your balance for 30 seconds. Be sure to challenge your balance again by switching your feet to the opposite position.

Single-Leg Standing – Once you feel comfortable with tandem standing, you can try balancing on one leg while standing on a foam pad or pillow to further challenge your balance. Again aim for standing on one leg for 30 seconds at a time. Be sure to practice on both feet.

When these exercises get easier, try to balance for 10 more seconds until you get up to 1-2 minutes of balancing at time. To make it even more challenging, try the same exercise with your eyes open and then your eyes closed.

GENERAL TIPS FOR BALANCE EXERCISES

- ✓ These exercises are usually started **4-6 weeks** after your hip replacement.
- ✓ Balance exercises are performed at the end of your workout session.
- ✓ We suggest being able to maintain your balance for at least **30 seconds** with your eyes open before attempting the same exercises with your eyes closed. **Eyes-closed exercises really challenge your balance – be sure to have a chair, railing or countertop close by if you lose your balance.**
- ✓ It is important to take 5-10 minutes to cool-down after exercising. This should include stretches and applying ice to sore muscles.

REMEMBER IF YOU EXPERIENCE ANY ABNORMAL DISCOMFORT, DIZZINESS, OR FEELINGS OF PASSING OUT, PLEASE STOP EXERCISING AND CONTACT YOUR PHYSICIAN AS SOON AS POSSIBLE.

At-Home Exercises Following Hip or Knee Replacement Surgery

Members of the American Association of Hip and Knee Surgeons have put together this basic rehabilitation program for you to use after hip or knee replacement surgery. Please use these exercises only as a guide as **it is ultimately between you and your surgeon to decide which therapy setting is right for your recovery after joint replacement.**

These exercises can be performed in a graduated fashion in the weeks following your joint replacement as outlined in the plan. If you experience any abnormal discomfort, dizziness or feelings of passing out, please stop exercising and call your physician's office immediately.

Companion Videos

Demonstrations of these exercises along with a library of articles on hip and knee replacement can be found at www.AAHKS.org/HipKnee.



This guide has been written and peer reviewed by the AAHKS Patient and Public Relations Committee and the AAHKS Evidence Based Medicine Committee. Links to this guide or content used from the exercises must be given proper citation to the American Association of Hip and Knee Surgeons. Images are copyrighted and may not be used outside of this guide without permission. Contact aahksstaff@aaahks.org.

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