

T.T.T

CO.RE 

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THE BASICS

This program sets out the rehabilitation required to get the best result from your tibial tubercle transfer with a safe but progressive exercise plan. For those of you who have more time available, I have added progression exercises where appropriate.

The mechanics of a joint do not get any simpler than the knee. It is a simple hinge joint. It bends and it straightens. The muscles that bend the knee are the hamstrings at the back of your thigh. The muscles that straighten the knee are the quadriceps at the front of your thigh.

When I talk to patients about rehabilitation, I tell them to think about it in two parts. Rehabilitation involves **stretching** and **strengthening**.

a) Stretching

Stretching involves moving a joint using external forces. The early phases of rehabilitation are mostly about stretching. It must be done early before scar tissue forms, causing stiffness. So it is time critical – you cannot put it off until next week when you are feeling better. Stretches are a low load, long duration activity. The mantra is “stretch and hold”.

b) Strengthening

Strengthening involves moving a joint using your own muscles. Early on a reconstruction cannot withstand substantial strength work. We will build in strength work as the reconstruction heals. In this case we are strengthening the medial quadriceps (VMO muscles on the inner half of the knee) and the gluteus medius (buttock muscle). To see an increase in the strength of a muscle you must load it to a point of (at least mild) fatigue on a daily basis for three months. To build strength those exercises must get harder during that three month period. This is called progressive overload.

The program has been designed so that access to a gym is not required, as the exercises need to be undertaken on a daily basis. An exercise bike would be useful.

Of all the areas of physical rehabilitation, knee cap rehabilitation is without doubt the one where I commonly see things done poorly. The majority of failures in patellofemoral rehabilitation are due to:

1. Failure to progress the exercises
2. Failure to do an adequate volume of exercise

Keep this in mind as you work through your rehabilitation.

THE FIRST WEEK

1. WOUND MANAGEMENT

The dressings applied in hospital generally do not need to be changed. They are waterproof. Leave them in place until your postoperative wound check with the nurse at seven to ten days. Keep your wounds dry for the first week.

2. SWELLING

The basic principle is RICE: rest, ice, compression and elevation. You will have a Tubigrip compression bandage from the hospital and this should stay on for the first week at least. It can be worn for as long as the swelling continues.

Some form of ice should be applied for fifteen to twenty minutes, three times a day. This can be as simple as a bag of frozen peas but there are newer devices such as the “Game Ready” which are excellent.

3. BRUISING

It is normal to get bruising at the surgery site. Gravity may cause that bruising to come out at the back of the knee or commonly even down at the ankle. Some people get a bruise at the thigh from the tourniquet used in surgery. Ice and compression should settle things. The physiotherapist can help with ultrasound and massage for severe bruising.

4. CRUTCHES

Crutches should be used for four weeks following tibial tubercle transfer. During that period you are “partial weight bearing”. That is to say you take some weight, but not your full weight. In the first week you will just be taking enough weight to balance. You will gradually increase to the point where by the end of four weeks you are taking almost full weight and ready to come off the crutches. Do not take full weight before the end of four weeks.

Do not at any stage swing the leg through the air, what we call “non-weight bearing”. This leads to rapid muscle wasting.

5. KNEE BRACE

A knee brace will not normally be required after tibial tubercle transfer. If you have had a combined tibial tubercle transfer and medial patellofemoral ligament reconstruction, then you will be in a brace and you should be following the MPFL rehabilitation protocol program.

At the end of four weeks, it may assist your rehabilitation to wear a small patellofemoral knee brace (Genu Lux style brace).
read my pain relief advice sheet.

6. PAIN RELIEF

We need to get your pain under control so that you can do the exercises appropriately. Regular Panadol and anti-inflammatories may be all that is required. Stronger analgesics are to be taken intermittently. You can read my pain relief advice sheet.

7. SLEEP

Never sleep with a pillow under your knee. This leads to stiffness.

8. COMPRESSION STOCKINGS

You will have been supplied with some short compression stockings in the hospital and it is advisable to wear these for a couple of weeks. They help prevent deep vein thrombosis and reduce swelling in the foot and ankle. They should be worn at all times and removed only for showering.

9. HYDROTHERAPY

Hydrotherapy or pool based exercises should not commence until four weeks post surgery.

10. EXERCISE FREQUENTLY

In this phase it is quite likely that your knee will be painful and your ability to undertake big rehabilitation sessions will be restricted. Do small sets of exercises frequently. Remember that most knee cap rehabilitation programs fail because of inadequate volume of work. If the knee is too sore to do a big workout, do lots of small workouts.

11. TURN THE FOOT OUT

One of the major objectives of the rehabilitation program is to strengthen the inner quadriceps muscles or VMO's. These muscles are activated when exercises are performed with the foot turned outwards slightly. Wherever possible throughout this program do your exercises with the foot externally rotated approximately twenty degrees.

12. HOW HARD DO I PUSH?

Three simple rules:

- a)** Gritting your teeth is okay, but tears in the eyes is not;
- b)** You must be able to do tomorrow what you did today. If you wake up so sore you need a rest day – you did too much.
- c)** A pain score of 3 out of 10 is ok, no more.

13. PHYSIOTHERAPY

This program is meant to be conducted under the supervision of a physiotherapist where possible. Physio review every two weeks is advisable initially.

14. FOOTWEAR AND ORTHOTICS

Wear a good quality sports shoe with medial arch support. If you have a flat foot, you should consider off the shelf or custom made soft orthotics. This will improve patella tracking.

STAGE ONE -

WEEK ONE TO FOUR (DAYS 1 TO 28)

We are going to start with **stretching** and then progress on with some gentle **strength** work.

During this early phase, it is likely that your knee will be swollen and sore. It may not be possible to undertake long rehabilitation sessions. In this phase you should do small sets of exercises frequently. Remember that one of the commonest causes of failed patellofemoral rehabilitation is an inadequate volume of exercise. Doing frequent sessions, even hourly if necessary, will allow you to get the volume of exercise done without causing severe pain.

I suggest you start each session with a stretching exercise we call drop and dangle. Before the session, you can take a couple of Panadol tablets, make a coffee, get yourself a magazine and spend the first five minutes doing this drill which involves sitting on a high bench or table and simply letting gravity bend the knee. Complete your stretching drills and then move on with the strength work. The strength program throughout a patellofemoral rehabilitation program focuses on two main muscle groups, the quadriceps (specifically VMO) and gluteus medius at the hip. The exercises are rounded out with some hamstring and calf work. At the end of the session, ice the knee for fifteen minutes.

Objectives by the end of this phase

By the end of this phase, you should have achieved the following:

- The knee should be fully straight
- The knee should be bending to 90 degrees easily
- Over 200 straight leg raises a day

WEEK ONE TO FOUR (DAYS 1 TO 28)

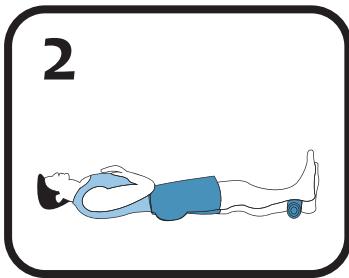
STRETCH



1. Drop and dangle

Sit on a high bench or table with your leg dangling over the edge. Get a coffee and a magazine. For a few minutes, let gravity bend your knee.

You can progress this exercise with assisted knee flexion. Use your good leg over the top of the bad leg to push it back further. Push and hold for ten seconds then release. Repeat.



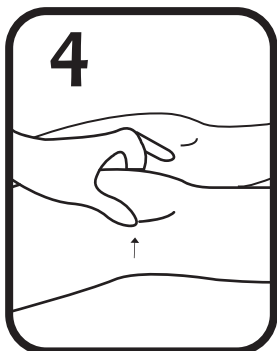
2. Heel prop

This is an extension stretch. Place a rolled up towel under your ankle while lying flat. Relax for a few minutes and let gravity straighten the leg.



3. Calf stretch

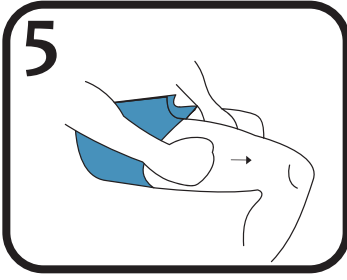
Stand facing a wall with your hands on the wall. Place the leg back keeping the knee straight, heel on the ground. Lean forward feeling the stretch in the back of your calf. Hold for ten seconds. Repeat x3.



4. Medial patellofemoral glides

Sit with the leg straight out in front with the thigh relaxed. Push the outer side of the knee cap inwards towards your good leg and hold for ten seconds. Repeat x3.

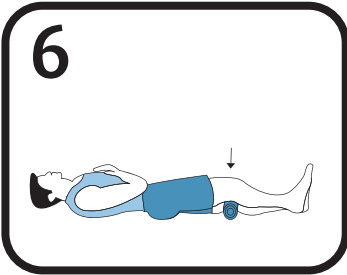
5. ITB massage



The ITB or iliotibial band runs down the full length of the outer side of your thigh. In a seated relaxed position, use your fist or a tennis ball to massage the ITB along the length of your thigh. Push in firmly. Do this for a few minutes.

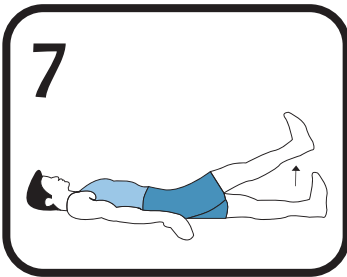
STRENGTHEN

6. Quads setting



Use a rolled up towel under your knee. Turn the foot outwards slightly. Push the back of the knee into the towel. Feel the quadriceps muscles at the front of your thigh tighten, particularly the VMO. Hold for 5 to 10 seconds and relax. Repeat x10.

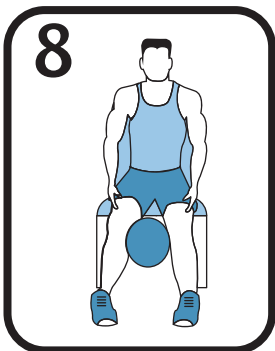
7. Straight leg raises



Lie flat with your leg straight. Turn the foot out. Lift the heel twenty centimetres off the bed. Hold for one second and lower. Repeat x10 (aim to be doing at least two hundred per day).

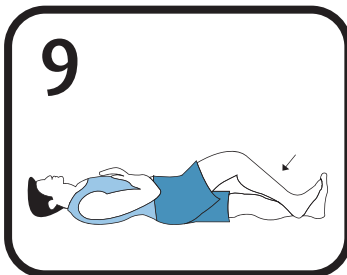
Progression: Hold for three to five seconds.

8. Seated ball squeeze



Sit with a ball or cushion between your knees. Squeeze the knees together and hold for ten seconds. Relax. Repeat x10.

9. Static hamstring strengthening



Lying down, bend the knee to approximately 30 degrees and push the heel down into the floor. Hold for 5 to 10 seconds and relax. Repeat x10.

EXERCISES 10 – 15

START IN WEEK 3 (DAY 15)



10. One quarter squats with a chair

Standing feet shoulder width apart and foot slightly turned out, with your hands on the back of a chair, bend the knees to 45°. Hold for a second then straighten up. Repeat x10.

Progression – go deeper.



11. One quarter lunges with a chair

Stand with the operated leg in front and the foot turned slightly outwards. Support yourself with two hands on the back of a chair. Slowly take your weight forward, bending your front knee until it is over the toes. Hold for a second then straighten. Repeat x10.

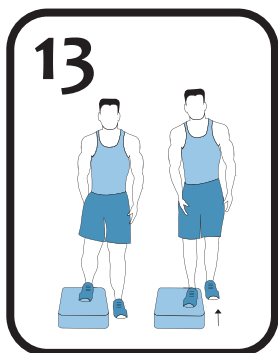
Progression – take the rear knee closer to the floor.



12. Single leg stance (eyes open)

Balancing on the sore leg, bend the knee slightly, hands on hips. Balance for ten seconds. Repeat x3.

Progression – hold longer, close eyes.

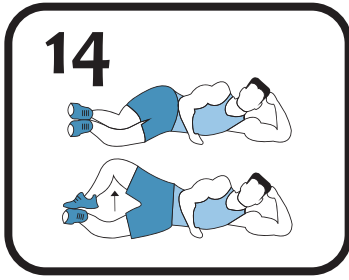


13. Hip hitch

This exercise is best done on a small step. Balance on the step with your good leg. The injured leg is off the side of the step. Keeping the body still, hitch your hip up, hold for 3 seconds and lower. Repeat x10.

Progression – hold for longer.

14. Clams



Lay on your side with the good leg down and injured leg uppermost. Bend the knees to 90 degrees. Slowly lift the knee as far as possible. Hold for a second and lower back to the ground. Repeat x10.

Progression - hold at top for longer.



15. Double leg heel raise

Stand feet together with one hand on a wall or table for balance. Raise up on your toes lifting both heels as far off the ground as possible. Hold for a second and lower. Repeat 3 sets of 10 or until the calf fatigues.

Progression: Hold for longer at the top of each calf raise.

ICE

STAGE TWO -

WEEK FOUR TO TEN (DAYS 29 TO 70)

You won't be able to do all of these exercises as soon as you come off the crutches. Equally, you may be doing these exercises comfortably after a month and in that case you can progress on to stage three at the end of week 8 rather than the end of week 10 if your symptoms permit.

As pain reduces, the exercise sessions get fewer and longer. Do the full exercise program at least once a day as soon as pain permits. Twice a day is ideal.

The exercises must be combined with one general cardio exercise session per day, lasting a minimum of 20 minutes:

- (a)** Walk
- (b)** Exercise bike
- (c)** Pool walk +/- swim (not just swim)
- (d)** Cardio machine in gym (rowing ergo, cross trainer, elliptical, recumbent bike)

Time for some tough love. You have probably stacked on a few kilos in the painful first phase. Knee cap pain cannot be cured if you are overweight. No other treatment will work if we don't do this. So -

- (a)** Find a diet that has reduced caloric intake. 1250 calories a day is a low calorie diet. If you are not hungry all day, you are eating too much.
- (b)** Start a dietary logbook. Download an app and record everything you eat each day.
- (c)** Buy some digital scales that record percentage body fat. See my advice on ideal body weight here. Weigh yourself daily before breakfast.

Re-read the last paragraph. It's that important.

Get a patellofemoral Genu Lux style brace if you don't already have one. Wear it during exercises and as much as you wish.

Orthotics. Good joggers, with off the shelf arch supports or custom soft orthotics, are a part of the management. Wear them all day if possible.

Objectives by the end of this phase

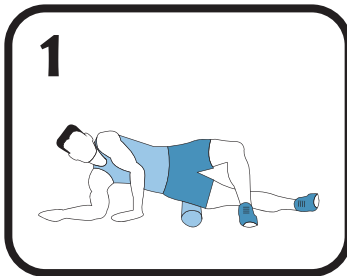
By the end of this phase you should have achieved the following:

- 1.** Be able to walk without a limp.
- 2.** Ride an exercise bike.

WEEKS FOUR TO TEN EXERCISES

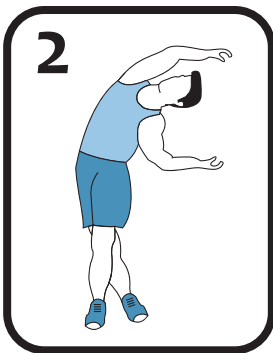
(DAYS 29 TO 70)

1. ITB Roller



The roller massages and stretches the ITB. The roller is on the ground. You lay on your side, injured leg down and upper leg balanced. Use your arms to pull your body up and down for the length of the ITB, which runs from the hip to the knee.

2. ITB doorway stretch



This exercise can be done standing, or in a doorway if you find it difficult to balance. The leg to be stretched goes behind the good leg. Both feet are facing forward. Bend sideways as far as possible to feel the stretch on the outer thigh and running all the way down to the knee. Stretch and hold for 10 seconds. Repeat x3.

3. Calf stretch

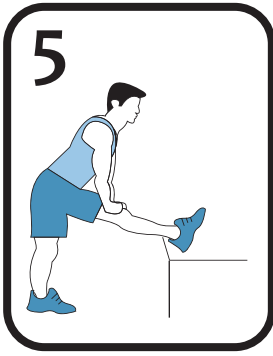


Stand facing a wall with your hands on the wall. Place the leg back, keeping the knee straight. Heels on the ground. Lean forward feeling the stretch in the back of your calf. Hold for 10 seconds. Repeat x3.

4. Quadriceps stretch

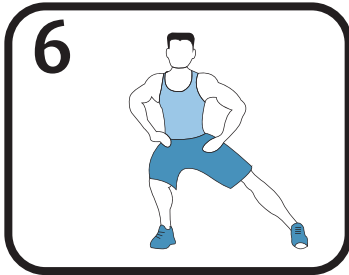


Reach back to grab the ankle of your injured leg and pull your heel to the buttock. Use the opposite arm to balance against a wall or pole if necessary. Make sure that your knee points directly towards the ground and that your hips are pushed forward. Bending at the waist or letting the knee come out to the side will negate the stretch. Hold for 10 seconds. Repeat x3.



5. Hamstring stretch - standing

Stand on 1 leg. Other leg straight out on chair or bench. Lean forward into the stretch. Hold for 10 seconds. Repeat x3.



6. Hip adductor stretch

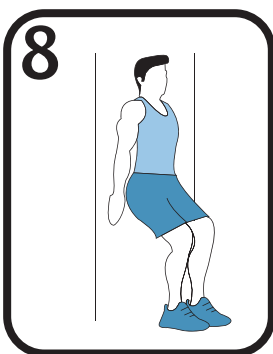
Stand with a very wide stance, hands on hips. Move your weight over one foot, feeling the stretch in the opposite groin. Hold for 10 seconds. Repeat x3.



7. Hip flexor stretch

Assume a full lunge position with both hands on top of your front thigh. Lean forward with your hips keeping your body upright until you feel a stretch along the front of the back leg thigh. It is very important to push the pelvis forward and keep the body upright or the stretch is lost. Hold for 10 seconds. Repeat x3.

STRENGTHEN



8. One quarter wall squats

Stand with your back against the wall or use a fit ball between back and wall. Feet shoulder width apart, toes turned slightly out. Squat slowly down to approximately 45 degrees, pause and straighten. Repeat x10. Progression - Go deeper.



9. One quarter lunges

Stand with both feet together, hands on hips. Take a comfortable long step forward with the injured leg, putting the foot to the ground with the toes turned slightly outwards. Slowly take your weight forward bending your front knee until it is over the toes. The rear knee will be halfway to the floor. Pause and then step back, feet together and straighten. Repeat x10.

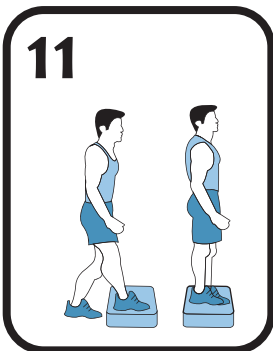
Progression - Go deeper.



10. Single leg stance (eyes closed)

Balancing on the sore leg, bend the knee slightly, hands on hips. Balance for 10 seconds. Repeat x3.

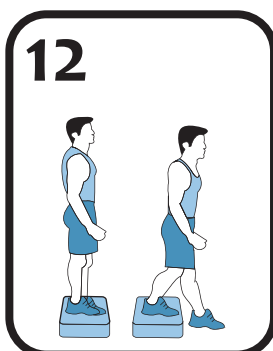
Progression - Hold for longer.



11. Step ups

Stand facing a small step. Start with a height of approximately 5cms. The foot of the leg to be exercised remains on top of the step throughout. The back foot is brought from the ground up onto the step until weight is evenly distributed between both feet. Pause and take the same foot back to the ground again, completely unweighting the foot on the step and taking your full weight on the back leg on the floor. Repeat x10. Change legs.

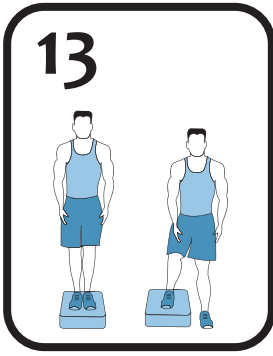
Progression - increase the height of the step to 20cms over time.



12. Step Downs

Stand 2 feet on a step, one hand on wall for balance. Start with 5cm step. The leg being exercised stays up on the step throughout. The other leg steps down. Take full weight on the down leg then step back up. Finish 2 feet together, weight even. Repeat x10. Change legs.

Progression - increase the height of the step to 20cms over time.



13. Side steps

Start by standing two feet on top of a small step, 5cms initially. The leg to be strengthened stays on the step. The opposite leg is lifted off the side of the step and put on the ground taking full weight to that leg. Then lift this leg back up on the step to stand on two feet, weight evenly distributed. Repeat x10. Change legs.

Progression - Increase the height of the step to 20cm over time.



14. Standing hamstring curls

Stand with hands on hips or supported with a table or chair. Pull the heel of the injured leg up as far as possible towards your buttock. Hold for a count of 3 then lower. Repeat x10.

Progression - Bridges (see phase 3).



15. Single leg heel raise

Stand on one leg. Use a hand on a wall for balance. Raise up on your toes, lifting the heel as far off the ground as possible. Pause and lower. Repeat for 3 sets of 10 or until the calf fatigues.

Progression - hold at the top of the lift for longer.

ICE

STAGE THREE -

WEEK ELEVEN & SIXTEEN (DAYS 71 TO 112)

The progression from stage two to stage three is quite a big one. Use my “Guide to Progression” to decide if you are ready.

You can always blend the transition, bring it in gradually, try out some of the new exercises and see how you go. But as I have said before – you must progress for success.

Recall the following points from phase two:

- You are still meant to do the full exercise program at least once every day, twice a day if pain and time permit
- Continue with a daily **general** exercise session, now progressing to 30 to 60 minutes:
 - a)** Power walk
 - b)** Cycling on the road or exercise bike
 - c)** Pool walking, swimming, water running or fins
 - d)** Cardio machines in the gym– rowing ergo, cross trainer, elliptical, recumbent bike
- Weight loss continues
- Wear the brace for exercise if you find it beneficial
- Your therapist can instruct you on some proprioceptive exercises including the wobble board and mini-tramp

Objectives by the end of this phase

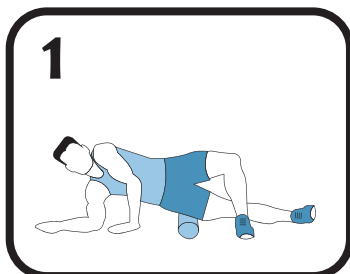
- No swelling
- Full range of motion
- Near normal quads strength
- Be able to ride a bike for 30 minutes at moderate resistance

WEEKS ELEVEN TO SIXTEEN

EXERCISES (DAYS 71 TO 112)

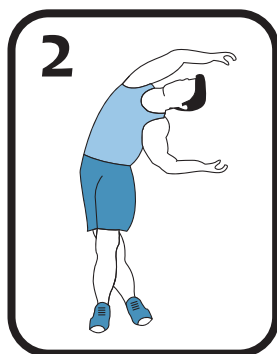
STRETCH

1. ITB Roller



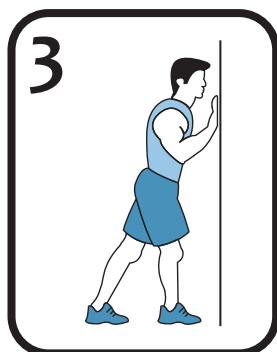
The roller massages and stretches the ITB. The roller is on the ground. You lay on your side, injured leg down and upper leg balanced. Use your arms to pull your body up and down for the length of the ITB, which runs from the hip to the knee.

2. ITB doorway stretch



This exercise can be done in a doorway if you find it difficult to balance. The leg to be stretched goes behind the good leg. Both feet are facing forward. Bend sideways as far as possible to feel the stretch on the outer thigh and running all the way down to the knee. Stretch and hold for 10 seconds. Repeat x3.

3. Calf stretch



Stand facing a wall, with your hands on the wall. Place the leg back, keeping the knee straight. Heels on the ground. Lean forward feeling the stretch in the back of your calf. Hold for 10 seconds. Repeat x3.

4. Quadriceps stretch



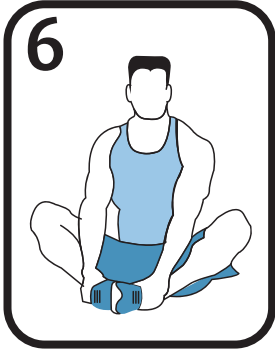
Reach back to grab the ankle of your injured leg and pull your heel to the buttock. Use the opposite arm to balance against a wall or pole if necessary. Make sure that your knee points directly towards the ground and that your hips are pushed forward. Bending at the waist or letting the knee come out to the side will negate the stretch. Hold for 10 seconds. Repeat x3.

5. Hamstring stretch (figure four)



Sit on the ground with your injured leg extended in front of you. Bend the non-injured knee so that the bottom of that foot rests against your inner thigh. With a straight back, bend at the hips lowering your chest towards your knee. Reach as far as your toes if possible. Hold for 10 seconds. Repeat x3.

6. Hip adductor stretch (seated butterfly stretch)



Remain sitting on the ground. Bring both your feet in so that the soles of your feet are touching. Slide them towards your body. Keep your back straight. Lean forward to bring your chest towards the ground while holding your feet. Hold for 10 seconds. Repeat x3.

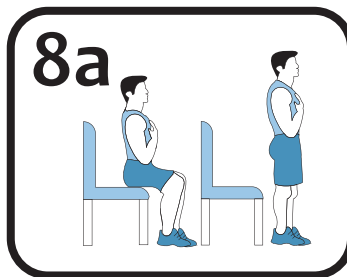
7. Hip flexor stretch



Assume a full lunge position with both hands on top of your front thigh. Lean forward with your hips keeping your body upright until you feel a stretch along the front of the back leg thigh. It is very important to push the pelvis forward and keep the body upright or the stretch is lost. Hold for 10 seconds. Repeat x3.

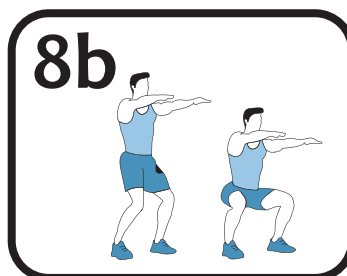
STRENGTHEN

8. Squats



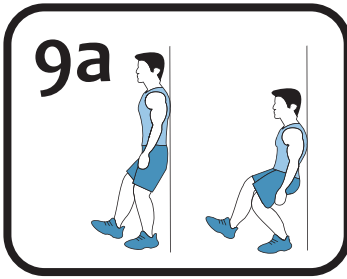
We are aiming to be able to do full squats in this phase but start with an exercise called “sit to stand” and progress on to squats.

a. Sit to stand – sit forward on a seat with your hands on your hips. Bend at the waist, keeping your back completely straight. Push straight up. Pause and return back to a seated position. Repeat x10.



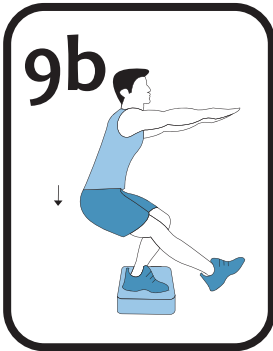
b. Full squat – essentially we are doing the same action without the chair. Start in the standing position with your hands by your side. Keep your back straight as you go down. Cross your arms in front of you as you lower to keep your balance. Try to get to a point where the thighs are almost horizontal to the ground. Push smoothly upwards to the standing position. Repeat x10

9. Single leg squats – ADVANCED LEVEL EXERCISE



Again there is a simple progression here from hard to very hard.

a. Single leg wall squats – stand on one leg with your back against the wall, toes turned out as always. Lower smoothly into a squat position aiming for 40 to 60 degrees of knee bend (no more). The knee should come out over your toes. Pause and straighten up. Repeat for a set of 10.



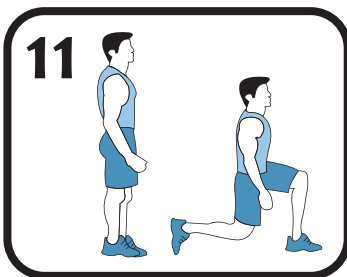
b. Single leg box squat – this is a progression from single leg wall squats and is a very important patellofemoral rehabilitation exercise. You will see this exercise coming in a number 9 out of 10 on my list of all time best home VMO exercises. Stand 2 feet on a box. The leg being exercised stays on the box throughout. The opposite leg “steps down” towards the ground but does not take any weight. Go as low as you can, then bring it back up on the box. Finish with weight on both legs evenly. Repeat x10.



10. Wall sit

Lean against the wall and go into a squat position. Try and make a 90/90 bend at the knees and the hips. Hold for 30 seconds. Repeat x3.

Progression – hold for one minute.

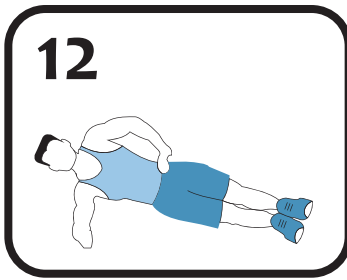


11. Full lunge

Start feet together, hands on hips. Take a large step forward with the injured leg landing with the toes turned slightly out. Lower the rear knee until it touches the ground lightly then return back to the standing position. Repeat x10.

Progression – walking lunges. As you come up with the rear leg, step forward to continue into the next lunge on the opposite side. Repeat for 10 continuous reps each side (20 steps).

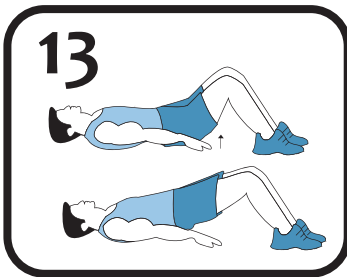
12. Side planks



Lie on one side. Raise the upper body by supporting it on your forearm. The whole body remains a straight line with the lower body supported on the outside of the bottom foot. Both legs together. Hold for 15 to 60 seconds. Repeat x3.

Progression- side plank with leg lift. Lift the top leg up for the duration of the hold.

13. Bridge



Lie on your back with your knees bent. Push your bottom up so that your weight comes to rest across the top of your shoulders. The knees, hip and shoulders form a straight line. Hold for 15 to 60 seconds and lower. Repeat x3.

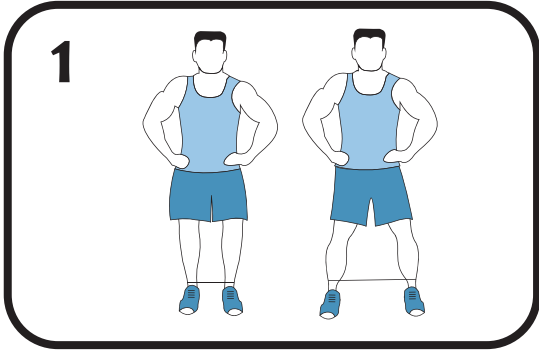
Progression - Bridge with a leg lift. Straighten one knee to hold that leg off the ground for the duration of the hold. Alternate legs.

14. Single leg heel raise on a step



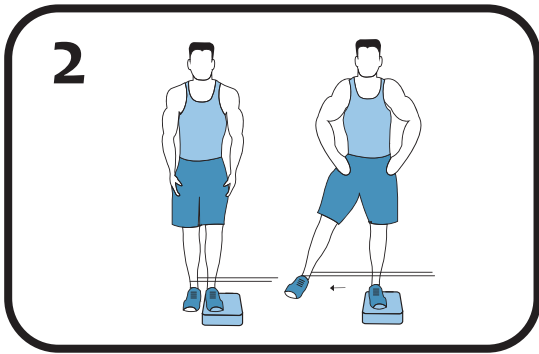
Stand on one leg on a step with your hand on the wall for balance. Rise up on the ball of your foot as high as you can. Pause and then slowly lower the heel to come down below the level of the step. Repeat 3 sets of 10 or until the calf fatigues.

THE RABANDS (ADVANCED)



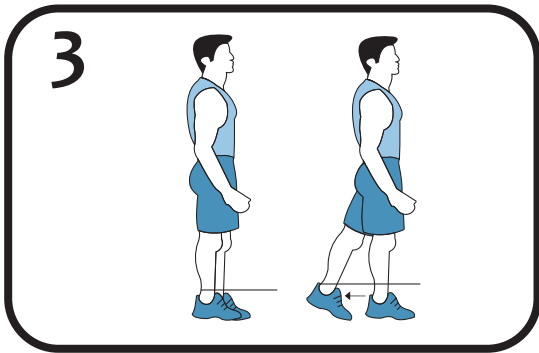
1. Crab walk

Stand feet shoulder width apart and put a theraband looped around both ankles or feet. Have enough tension to keep the theraband in place. Do a side shuttle, 10 steps to the right then 10 steps to the left. Repeat x3.



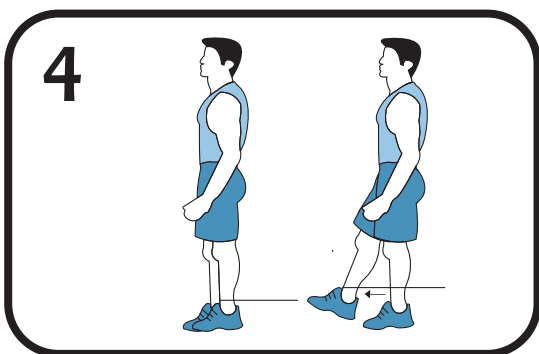
2. Clock face

You will need a small step next to a wall. Stand with your good leg on the step, side on to the wall, and use one hand for balance against the wall. Place a theraband looped around both ankles. The leg being exercised steps sideways to the 3 o'clock position then back to centre 5 times, then 4 o'clock, 5 o'clock, 6 o'clock. Repeat x3.



3 Therabands - hip - extension

Repeat 3 sets of 10



4 Therabands - hip - flexion

Repeat 3 sets of 10

GYM

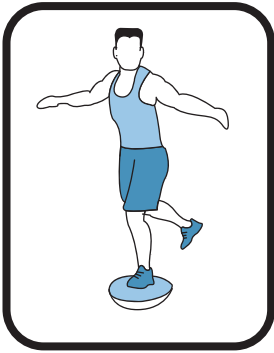


Leg press - double leg/single leg

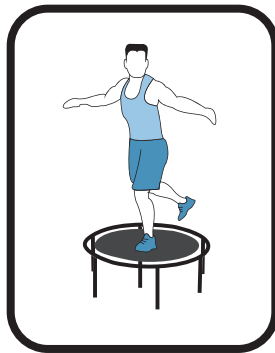
This is the only gym based exercise in the program, and it is here because it is such a great exercise. Start with a double leg press, both feet turned slightly out on the plate. Do a weight that allows you to do 3 sets of 15 repetitions. Progression - do this with a single leg.

PROPRIOCEPTION

To be done under therapist supervision



Wobble Board



Mini Tramp

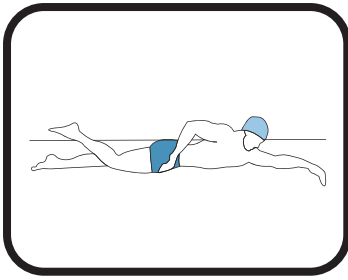
RUNNING



You can commence straight line running after fourteen weeks. Be aware that running is not a compulsory part of the program and I would only include it if it is an exercise that you regularly do and wish to return to. Do not run if you are overweight. Lose weight before running, don't run to lose weight.

Only run for a maximum of 2 sessions a week. Start with some 100m repeats, progress to 200m, 400m, 1km etc. If running causes pain and swelling, back off a bit.

SWIMMING



Swimming can come into the program now. Start with a flutter kick and progress to a normal kick. Swimming is great for cardio fitness and weight loss but it does not help build lower body strength particularly and is a supplement to the program rather than a core exercise. If you are at the pool, do some lane walking which will put more load on the legs. Swim with fins or do some deep-water running as alternatives.

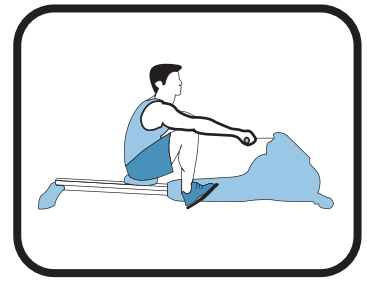
CARDIO EQUIPMENT



Powerwalk



Cross trainer

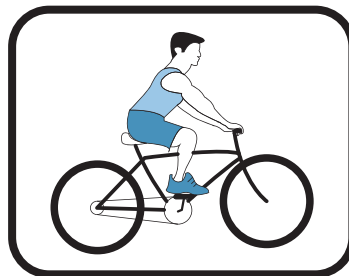


Ergo rower

BIKE



Exercise bike



Cycling on the road

STAGE FOUR -

WEEK SEVENTEEN +

This is where we start a return to sport program – CO.RE Return to Sport. It combines high level functional exercises, injury prevention, explosive strength building, and running technique.

Allow two months on this program as a minimum before returning to competitive sport.

It should be combined with some sport specific skills. There is a list of suggestions in the program.

When can I play sport?

- **Cycling**
 - Exercise bike at 6 weeks
 - Road cycling at 10 weeks
- **Swimming**
 - Pool walking at 4 weeks
 - Swim with flutter kick at 6 weeks
 - Swim with normal kick at 10 weeks
- **Running**
 - Straight line jogging approximately 14 weeks
- **Cardio gym equipment** - 8 to 10 weeks
- **Golf** - 3 to 4 months
- **Competitive sport** - 6 to 12 months

POST-OPERATIVE PROBLEMS

1. Deep vein thrombosis (DVT)

A small deep vein thrombosis in the calf veins is not that uncommon following cruciate ligament reconstruction and may often go unrecognized. Larger clots cause quite tight painful swelling in the calf and require investigation and treatment. Generally speaking, deep vein thrombosis is an inconvenience but if treated, does not have any long term implications for the result of your cruciate reconstruction. If you experience excessive calf pain and swelling, you should come back for review and an ultrasound scan will be organized.

2. Knee stiffness

Knee stiffness is rarely a problem if you are diligent with your stretching program. Full straightening is more important than the bending. If you are starting to fall behind schedule, you should push the stretches harder and spend longer doing them. Remember – “stretch and hold”.

3. Recurrent swelling

Some swelling in the knee is to be expected in the first six to twelve weeks. Intermittent episodes of swelling can continue in the first year of recovery.

Expect to experience increased swelling when you return to work, particularly if you are on your feet all day. Swelling is also associated with an increase in your rehabilitation effort such as when you return to running. Swelling is treated with compression, ice, elevation and anti-inflammatories.

4. Clicking in the knee

Clicking of the knee after tibial tubercle transfer is very common and is almost always caused by the knee cap. After injury and surgery, there is significant wasting of the quadriceps muscles. The knee cap is not held as firmly into the groove at the front of the knee (trochlea) and can make an audible click when it re-centres under load. Clicking generally resolves once quadriceps strength returns. It is safe to ignore painless clicking.

5. Skin numbness

An area of numb skin below the incisions is quite common. It will resolve over a twelve month period.

6. Tenderness over the screws

Once the swelling settles, some people can feel the screws and they can cause irritation when kneeling. It is safe to remove the screws twelve months after surgery and this is a minor day case procedure.

FREQUENTLY ASKED QUESTIONS

1. Will I need crutches?

Crutches are required for four weeks after surgery. During this time you will be partial weight bearing which means that you must take some weight on the leg immediately. It will build up gradually so that you are ready to take full weight four weeks after surgery. Do not take full weight before this time.

2. Will I need a brace?

A full length knee brace will not be required after tibial tubercle transfer surgery. Once the swelling has settled, usually at the time you come off the crutches, a small patellofemoral brace (Genu Lux style brace) may be of assistance with progressing your rehabilitation.

3. What physiotherapy will I require?

It is desirable to have a physiotherapist supervise your recovery. Their job is to instruct you on the exercises to perform and confirm that you are doing them correctly. I would advise that you see a physiotherapist every two weeks in the initial three months.

4. How soon can I drive after surgery?

If you have had surgery on the left leg, you can drive an automatic vehicle once you are off crutches, at four weeks post surgery. If you have had right leg surgery, it will be six weeks before you are fit to drive.

5. When can I go back to work?

Tibial tubercle transfer is a reconstructive operation which involves cutting bone. I would advise a minimum of two weeks off work completely to allow the wounds to heal and the swelling to settle. You could potentially resume an office based position after fourteen days, but you will still be in a splint and on crutches at that stage. For most people, a minimum of four weeks off work is required for an office based position.

High demand physical occupations resume three months post surgery. If your occupation involves ladders, scaffolding, or roofs, then these duties should be held off until four months post surgery.

TOP 10 VMO EXERCISES

It is not possible to totally isolate the VMO (vastus medial obliquus). When we talk about VMO exercises, we are really talking about quadriceps exercises with a focus on the VMO. In order to push more of the load onto the VMO, wherever possible do these exercises with your foot turned out slightly (external rotation). Here are my top ten VMO exercises from easy to hard.

1. Quads setting in external rotation (isometric)
2. Straight leg raise with external rotation
3. Seated ball squeeze
4. Wall squats (double leg/single leg/fit ball)
5. Wall sits
6. Step up, step down
7. Lunges (one quarter/full/walking)
8. Single leg box squat
9. Bulgarian split squat
10. Box jumps (plyometrics)

TOP 10 GLUT MEDIUS EXERCISES

Here are my top ten gluteus medius exercises, from easy to hard.

1. Single leg stance
2. Side lying clams
3. Hip hitches
4. Side steps
5. Theraband abduction or clockface
6. Romanian deadlifts
7. Side planks
8. Side planks with a leg lift
9. Single leg squat on box
10. Lateral hopping (plyometrics)

GUIDE TO PROGRESSION

When do you move on to the next phase of your tibial tubercle transfer rehabilitation? You should not be more than one or two weeks behind or ahead of schedule. Here are three guidelines:

1. The soreness guide

<i>SYMPTOMS</i>	<i>ACTION</i>
Soreness at start of exercise continues throughout the session	Take a day off and drop back a level
Soreness before exercise due to previous days training	Take a day off, stay at current level
Soreness at the start of the exercise, relieved during the session	Stay at level, continue to exercise
No soreness during exercise session	Consider advancing to next level

2. The functional guide – if you have reached the goals for that particular phase as outlined in the rehabilitation program, you are ready to progress to the next level.

3. The timeline progression – estimated timeframes for each phase are included in the protocol.

So I advise that you use a combination of all three methods to make a best guess as to whether you are ready to progress.

Remember that you must **progress for success.**

KNEE TERMINOLOGY

ACTIVE	A movement initiated by your own muscles. This movement will build strength.
ANTERIOR	Front.
CLOSED KINETIC CHAIN (CKC)	Exercise where the foot is fixed or planted.
CONCENTRIC	Contracting and shortening a muscle (the usual form of exercise).
GRAFT	Tissue used to make the new ACL.
EXCENTRIC	Contraction while lengthening a muscle (a controlled release).
EXTENSION	The action of straightening your knee.
FEMUR	Thigh bone
FLEXION	The action of bending your knee.
ISOMETRIC	Contracting a muscle without shortening it (ie. no movement of the joint) – also called static.
OPEN KINETIC CHAIN (OKC)	Exercise where the foot is free, not fixed
PASSIVE	A movement initiated by external forces, a stretching exercise.
PATELLA	Kneecap.
POSTERIOR	Back.
PRONE	Lying on your abdomen.
RANGE OF MOTION (ROM)	How far you can move a joint in any one direction (measured in degrees).
STATIC	See “Isometric”.
SUPINE	Lying on your back.
TIBIA	Shin bone.