maci®

Accelerated Rehabilitation Guidelines for the Knee Using MACI®

(matrix-induced autologous chondrocyte implant)

Exercise Companion Guide







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Introduction

This Companion Piece has been designed to help articulate/visualize the types of exercises used within the *Accelerated Rehabilitation Guidelines for the Knee Using MACI® (matrix-induced autologous chondrocyte implant).* As an e-Companion resource, we hope that you can utilize the built-in flexibility of Adobe Acrobat when working with your patient. The resource has been designed with "additional note" fields so you can customize your therapy regimen for your patient, including "Sets", "Reps", and other pertinent advice. Ideally one could print out the "Phase" that the patient is working in and provide to the patient for their "home-based" supplementary rehabilitation, or alternatively e-mail this section to them for their personal review. E-mail in Acrobat can be done by simply selecting the pages you want to e-mail and "print" them in Acrobat. This will produce the necessary file that you can send to your patient. We hope you find this Companion Piece a helpful tool in your goal of improving your patient's post-operative outcome following MACI implant.

Refer to *Accelerated Rehabilitation Guidelines for the Knee Using MACI® (matrix-induced autologous chondrocyte implant)* for detailed instructions and guidance around the MACI implant accelerated rehabilitation program.

Acknowledgements

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Accelerated Rehabilitation Guidelines for the Knee Using MACI® (matrix-induced autologous chondrocyte implant): Exercise Companion Guide

Introduction

Acknowledgements

1 Postoperative Timeline: Accelerated Rehabilitation Guidelines for the Knee Using MACI Implant

3 Phase One: 0-7 days postsurgery MACI Land-based Exercises

5 Phase Two: Weeks 2-3 postsurgery

12 Phase Three: Weeks 4-6 postsurgery

19 Phase Four: Weeks 7-12 postsurgery

27 Phase Five: Months 3-6 postsurgery

31 Phase Six/Seven: Months 6-12 postsurgery

The following document has been provided as a general guideline for rehabilitation following MACI® (matrix-induced autologous chondrocyte implant). The exercises described in these Guidelines are only to be applied under the responsibility of a certified healthcare professional. No suggested exercise should be carried out unless, in the healthcare professional's judgment, such exercise is medically justified.

The emphasis of this guideline is to protect the graft site, allowing regeneration of the cartilage, and return the patient to an optimal level of function. Notwithstanding the foregoing, the information provided in this document is intended for educational purposes. It is not a substitute for medical care nor should it be construed as medical advice. Consultation with the patient's treating surgeon is recommended prior to implementing a rehabilitation program. Individual results may vary. Although the content of these Guidelines has been created with great care neither Genzyme nor the authors accept any liability for any direct, indirect, or consequential damages resulting from the use of these Guidelines and the exercises described herein.

Accelerated Rehabilitation Guidelines for the Knee Using MACI® (matrix-induced autologous chondrocyte implant)

Postoperative Timeline	
Week 1 (Phase 1)	**WB Status** • TF joint: ≤ 20% BW • PF joint: 20-30% BW **Ambulatory Aids** • TF joint: 2 crutches used at all times • PF joint: 2 crutches used at all times **Knee ROM** • TF joint: passive & active ROM from 0-30° • PF joint: passive & active ROM from 0-20° **Knee Bracing** • TF joint: 0-30° • PF joint: locked at full knee extension • Hospital/Clinic – Phase 1 exercises
Week 2-3 (Phase 2)	**WB Status** • TF joint: ≤ 20% BW (week 1-2) to 30% BW (week 3) • PF joint: 20-30% BW (week 1-2) to 50% BW (week 3) **Ambulatory Aids** • TF joint: 2 crutches used at all times • PF joint: 2 crutches used at all times **Knee ROM** • TF joint: active ROM from 0-30° (week 2) to 0-90° (week 3) • PF joint: active ROM from 0-30° (week 2) to 0-60° (week 3) **Knee Bracing** • TF joint: 0-30° (week 1-2) to 0-45° (week 3) • PF joint: locked at full knee extension • Initial postoperative review (pain, swelling & wound) • Education on appropriate WB & crutch ambulation • Review home-based exercise program • Hydrotherapy – Phase 1-2 exercises • Clinic – Phase 1-2 exercises • Remedial massage, soft tissue and patella mobilisation, CPM and cryotherapy
Week 4-5 (Phase 3)	**WB Status** • TF joint: 40% BW (week 4) to 50% BW (week 5) • PF joint: 75% BW **Ambulatory Aids** • TF joint: 2 crutches used at all times • PF joint: 1 crutch used at all times **Knee ROM** • TF joint: active ROM from 0-110° (week 4) to 0-125° (week 5) • PF joint: active ROM from 0-90° (week 4) to 0-120° (week 5) **Knee Bracing** • TF joint: 0-60° (week 4) to 0-90° (week 5) • PF joint: locked at full knee extension • Hydrotherapy – Introduce Phase 3 exercises • Clinic – Introduce Phase 3 exercises • Remedial massage, soft tissue mobilisation and patella mobilisation • CPM and cryotherapy as required

KEY
BW = body weight
CPM = continuous passive motion
CKC = closed kinetic chain
OKC = open kinetic chain
PF = patellofemoral
ROM = range of motion
TF = tibiofemoral
WB = weight bearing

Table 1. Generic progression of postoperative weight bearing (WB), knee range of motion (ROM) status and exercise rehabilitation.

Week 6-7 (Phase 3-4)	**WB Status** • TF joint: 60% BW (week 6) to 80% (week 7) • PF joint: full WB
	Ambulatory Aids • TF joint: 1 crutch used at all times • PF joint: 1 crutch as required
	Knee ROM • TF joint: active ROM from 0-125° (week 6) to 0-135° (week 7) • PF joint: active ROM from 0-125° (week 6) to 0-135° (week 7)
	Knee Bracing • TF joint: full knee flexion • PF joint: no brace • Hydrotherapy – Introduce Phase 4 exercises • Clinic – Introduce Phase 4 exercises • Remedial massage, soft tissue mobilisation and patella mobilisation
Week 8-10 (Phase 4)	**WB Status** • TF & PF joint: full WB as tolerated
	Ambulatory Aids • TF & PF joint: 1 crutch as required
	Knee ROM • TF & PF joint: full active ROM as tolerated
	Knee Bracing • TF joint: full knee flexion • PF joint: no brace • Hydrotherapy – Phase 1-4 exercises • Clinic – Phase 1-4 exercises • Commence proprioceptive/balance activities • Remedial massage, soft tissue mobilisation & patella mobilisation
Week 11-12 (Phase 4)	• Hydrotherapy – Phase 1-4 exercises • Clinic/gym – Phase 2-4 exercises • Progress proprioceptive/balance activities • Introduce cycling, walking, resistance and CKC activities
3-6 Months (Phase 5)	• Clinic/gym – Introduce Phase 5 exercises • Progress proprioceptive/balance activities • Progress to more demanding CKC exercises, rowing ergometry and elliptical trainers
6-9 Months (Phase 6)	• Clinic/gym – Introduce Phase 6 exercises • Progress proprioceptive/balance activities • Increase difficulty of OKC & CKC exercises (i.e., step ups/downs, modified squats) • Introduction of controlled mini trampoline jogging
9-12 Months (Phase 7)	• Clinic/gym – Introduce Phase 7 exercises • Progress proprioceptive/balance activities • Increase difficulty of OKC & CKC exercises (i.e., lunges/squats on unstable surfaces) • Introduction of agility drills relevant to the patient's sport • Return to competitive sport suggested after 12 months • Graded increase in stress based on maturation of chondral repair

Phase One: 0-7 days post-surgery
MACI Land-based Exercises

During the days immediately following postsurgery, it is important to maintain joint mobility and muscle tone without placing undue stress on the implant area. Prior to discharge, the patient also must be proficient in and comfortable with all aspects of home exercise and functional activities.

Patient Reminders:

- Apply cryotherapy as standard oedema control (20 minutes with ice, at least 3 times per day)
- WB restrictions and knee bracing

Contraindications

1. Excessive load bearing (> 20% of patient BW) especially in combination with knee flexion
2. Ambulation without crutches and a protective knee brace
3. Generation of shear forces within the knee
4. Knee flexion beyond 30°
5. Active knee extension (especially against resistance)

Additional Notes:





Static Quadriceps

Sets: _____ Reps: _____

- Focus on quadriceps, actively contract musculature. Hold for 5 seconds then release.
- To accentuate vastus medialis, turn foot laterally 45°.
- These exercises may be aided by the use of electrical muscle stimulation devices.



Co-contractions

Sets: _____ Reps: _____

- Initiate hamstrings contraction, focusing on pushing heel into bed (Do NOT lift the heel off the bed).
- Subsequently, actively contract the quadriceps.
- Focus on maintaining both hamstring and quadricep contraction together. Hold for 2 seconds, then release.



Foot Pumps

Sets: _____ Reps: _____

• Actively dorsi- (pull toes back) and plantar-flex (push toes out) both feet in an alternating fashion.



Continuous Passive Motion (CPM)

Maximum Range: 0 - 30° Time: _____

- The Continuous Passive Motion (CPM) machine is designed to passively flex and extend the affected knee within an early desired range of 0-30°, or as per specific instructions given by the orthopaedic specialist.

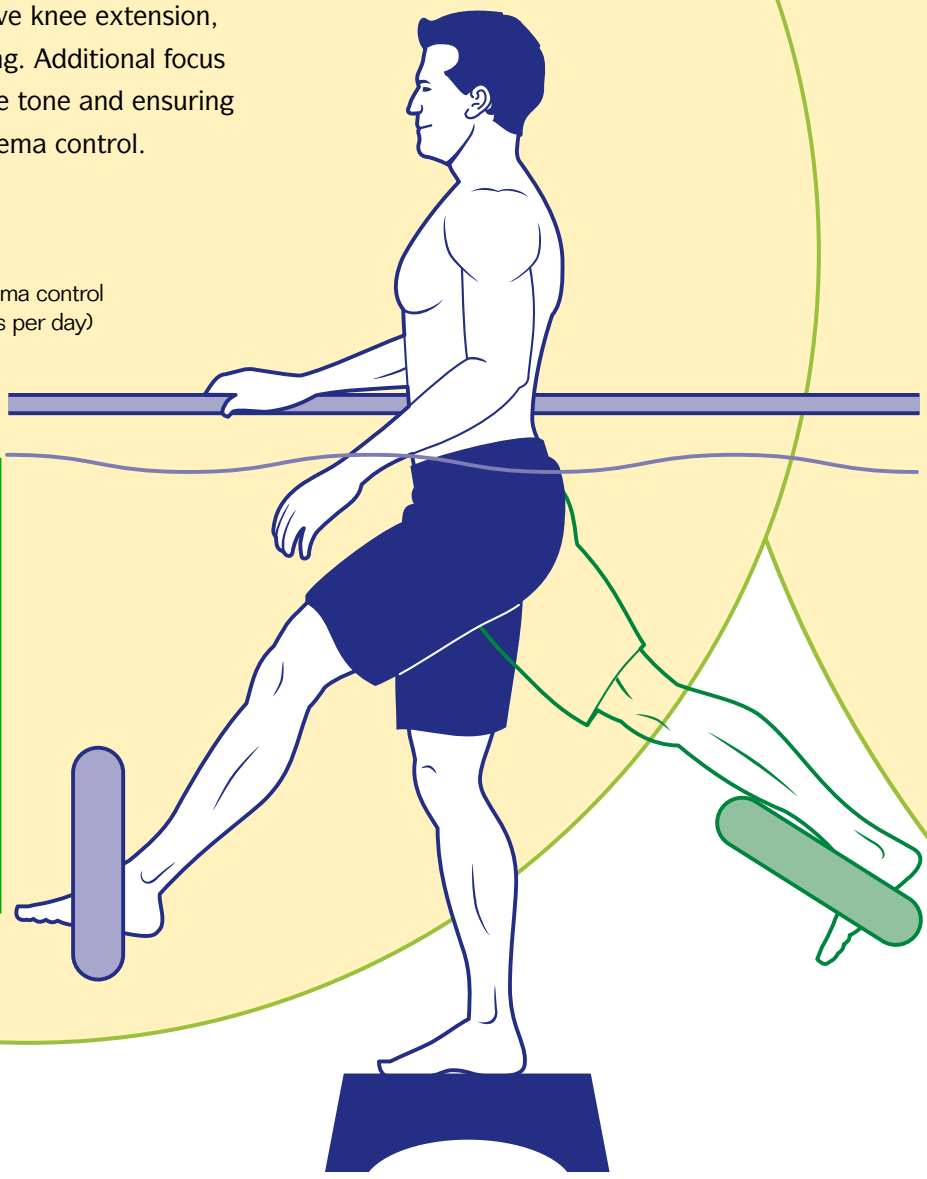
Phase Two:
Weeks 2-3 postsurgery

During these first weeks, the patient should achieve pain-free and full passive knee extension, as well as limited weight bearing. Additional focus is placed on maintaining muscle tone and ensuring proper wound healing and oedema control.

Patient Reminders:

- Apply cryotherapy as standard oedema control (20 minutes with ice, at least 3 times per day)
- WB restrictions and knee bracing

Additional Notes:





Passive (Facilitated) ROM Heel Slides

Sets: _____ Reps: _____ Max Range: _____

- Whilst sitting upright on a stable surface, wrap a towel/belt around the foot.
- Use the towel/belt to pull the foot toward you as the knee bends passively to the desired range of motion.

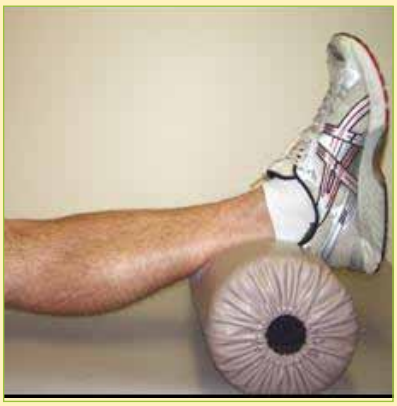




Active ROM Heel Slides

Sets: _____ Reps: _____ Max Range: _____

- Place a sock or tie a plastic bag on the foot of the operated limb.
- Actively slide your heel towards your bottom until you feel the knee become “tight” (do NOT push your knee into pain).



Passive Leg Extension (straight leg)

Sets: _____ Reps/Time: _____

- A small sized roller/pillow is placed proximal to the ankle joint.
- Focus on relaxing the lower limbs, as the now elevated leg passively extends the knee joint.



Theraband Calf Contractions

Sets: _____ Reps: _____

- Wrap the theraband (red, green or blue) around the ball of the foot, holding the ends in your hands.
- With the leg straight, use the resistance provided by the band to actively plantar-flex (push toes out) the foot.
- Dorsi-flex the foot (pull toes back) with control back to the start position.



Isometric Thigh Adduction

Sets: _____ Reps: _____

- Lie on your back with both knees flexed to a maximum of 60°, and a pillow between them.
- Squeeze the pillow by pushing both knees together.
- Hold the contraction for 3 seconds, and then relax.



Patella Mobilisation

Sets: _____ Reps: _____

- Using the thumb and forefinger, locate the medial and lateral borders of the patella.
- Ensuring the quadriceps muscle is relaxed, and the knee fully extended, carefully move the patella side-to-side, holding for 10 seconds medially.
- Repeat this process proximal and distal to the body.





Side Lying Thigh Adduction

Sets: _____ Reps: _____

- Lie on the affected side.
- Place the non-affected leg over and in front of the affected leg, resting it on a large roller/pillow.
- Whilst maintaining the affected knee fully extended, lift the thigh vertically.
- Hold at the top of lift for 2 seconds, and then lower slowly.



Straight Leg Raise

Sets: _____ Reps: _____

- Bend knee of non-affected side to flatten lumbar spine.
- Lock knee of the affected side and lift the leg to a height parallel to the bent knee.
- Lower the leg with control.



Prone Thigh Extension

Sets: _____ Reps: _____

- Lie on your stomach.
- Lift the operated leg from the bed, and hold the position for 2 seconds, then lower slowly.
- Focus on maintaining knee extension, and correct orientation of the pelvis (both anterior superior iliac spine (ASIS) remain aligned and flat against the bed).





Side Lying Leg Abduction

Sets: _____ Reps: _____

- Lie on the non-affected side.
- Whilst maintaining a straight leg, squeeze the gluteal musculature (muscles that make up the buttocks) and slowly abduct (lift) the affected leg as far as comfortably possible.
- Lower the leg with control, ensuring the pelvis is stable throughout.



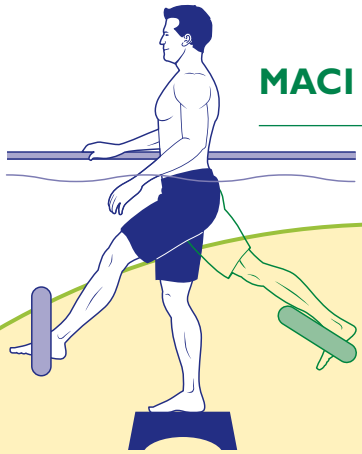


'Theraband' Thigh Abduction

Sets: _____ Reps: _____

- Lie on your back.
- Bend both knees and place your feet flat on the bed.
- Wrap the theraband around your knees and open your knees against the band resistance.
- Hold the contraction for 3 seconds, and then return to start position slowly.

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MACI Hydrotherapy Exercises

Phase Two:
Weeks 2-3 postsurgery | continued

During these first weeks, the patient should achieve pain-free and full passive knee extension, as well as limited weight bearing. Additional focus is placed on maintaining muscle tone and ensuring proper wound healing and oedema control.

Patient Reminders:

- Apply cryotherapy as standard oedema control (20 minutes with ice, at least 3 times per day)
- WB restrictions and knee bracing

Additional Notes:




Deep Water Walking (forwards, backwards, sideways)

Sets: _____ Reps: _____

- Walk forward and backward in the deep end of the pool (chest level), with emphasis on bilateral heel-to-toe motion.
- Patient may also walk side-to-side.
- Patients who have difficulty with gait or lack confidence in the water may use the guide rail.




Hip Flexion and Extension

Sets: _____ Reps: _____

- Stand with the weight on the unaffected leg, using the rail as support.
- In an alternating fashion, flex and extend the thigh of the affected leg.
- Emphasis is placed on correct upright posture, with abdominal bracing. For additional resistance, a floatation device can be used at the ankle.





Hip Abduction and Circumduction

Sets: _____ Reps: _____ Range: _____

- Stand with the weight on the unaffected leg, using the rail as support.
- In an alternating fashion, abduct (lift) and circumduct (circle) the thigh of the affected leg.
- Emphasis is placed on correct upright posture, with abdominal bracing. For additional resistance, a floatation device can be used at the ankle.



Calf Raises

Sets: _____ Reps: _____

- Stand supported by the rail with weight evenly distributed
- Begin with calf raises on the flat surface of pool, progressing to a step (dependent on weight bearing status).
- Motion is paused for 2 seconds at end of range.



Knee and Hip Flexion (no resistance)

Sets: _____ Reps: _____ Range: _____

- Stand stationary on the unaffected leg.
- In lifting the knee and maintaining a 'vertical' lower leg, the patient performs knee flexion to approximately 60°.
- The knee is then extended, with motion paused for 2 seconds at beginning and end of range.



Stretch - Hamstrings

Sets: _____ Reps: _____ Range: _____

- Sit with the weight fully supported, with the operated knee fully extended on a ledge and also supported.
- Whilst keeping the knee extended and the back straight, flex the trunk forward toward the toes.
- The exercise should be to the point of 'stretch', not 'pain'.

Phase Three:
Weeks 4-6 postsurgery

During Phase Three, the patient increases weight-bearing and range-of-motion activities, as appropriate, while augmenting strengthening exercises.

Patient Reminders:

- Apply cryotherapy as standard oedema control (20 minutes with ice, at least 3 times per day)
- WB restrictions and knee bracing

Additional Notes:







Figure ‘4’ Gluteal Lifts

Sets: _____ Reps: _____

- Lie on the non-affected side.
- Slide the affected (top) leg up the non-affected (bottom) leg, bending the knee as far as comfortable.
- Ensure the upper body is facing slightly downward.
- Whilst keeping the foot of the affected (top) leg in contact with the non-affected (bottom), squeeze the gluteal musculature (muscles that make up the buttocks) and raise the knee as far as possible.
- Ensure the pelvis is stabilized throughout.



½ Seated Straight Leg Raises

Sets: _____ Reps: _____

- Rest upon elbows in a ½ seated position, and bend knee of non-affected side to flatten the lumbar spine.
- Lock the knee of affected side and lift the leg to a height parallel to the thigh of the bent knee.
- Lower the leg under control.



45° Straight Leg Raises

Sets: _____ Reps: _____

- Bend the knee of the non-affected side to flatten the lumbar spine.
- Lock the knee of affected side, and externally rotate the thigh by pointing the toes outward 45°.
- Lift leg to a height just below the opposite bent knee, lower under control.





Standing Calf Raises

(dependent on weight bearing status)

Sets: _____ Reps: _____

- Stand with your weight evenly distributed, and place your toes and ball of your feet on step.
- Rise up as high as you can on your toes, keeping your knees extended or only slightly bent.
- Hold this position for 2 seconds, before returning to the start position. Inhale as you return to the start position.





Supine Cable Thigh Extension

Sets: _____ Reps: _____ Load: _____

- Bend the knee of the non-affected side to flatten the lumbar spine.
- Lock knee of affected side, and attach the cable to the foot or lower leg.
- Allow the leg to raise with the weight under control, to a height level with the non-affected side.
- When squeezing the gluteal and hamstring musculature, bring the affected leg down with control.





Seated Thigh Adduction

Sets: _____ Reps: _____ Load: _____

- Sit on the machine, placing the feet in the foot rests, with the thighs pressing against the thigh pads.
- Grip the handles of the machine. While exhaling, pull the legs in together until they touch.
- Hold this position for 2 seconds before returning to the start position. Inhale as you return to the start position.





Seated Thigh Abduction

Sets: _____ Reps: _____ Load: _____

- Sit on the machine, placing the feet in the foot rests, with the thighs pressing against the thigh pads.
- Grip the handles of the machine. While exhaling, push the legs apart as far as they can go.
- Hold this position for 2 seconds before returning to the start position. Inhale as you return to the start position.



Modified Cycle Ergometry (week 5-6)

Time: _____ RPM: _____ Load: _____

- Sit on the modified cycle with the feet in the foot straps and the arms on the arm rests.
- Perform a cycling motion with the legs, maintaining an appropriate speed.



Supine Sit-ups

Sets: _____ Reps: _____

- Lie of the bed with the knees flexed to 90° and a ball/pillow squeezed gently between the knees.
- Using abdominal musculature, lift the upper torso off the bed. For additional difficulty, alternatively twist the trunk to the left and right sides at the upmost point of the sit-up.



Seated Trunk Flexion (weight supported)

Sets: _____ Reps: _____ Load: _____

- In a seated, weight-supported position, pre-activate (tighten) your abdominal musculature.
- Flex your trunk against the machine resistance as far as is comfortably possible.
- Exhale as you flex your trunk, and inhale as you return to the starting position.



Stretch - Hamstrings

Sets: _____ Reps: _____ Hold: _____

- Sit on the side of the bed with your affected leg fully extended, and the back straight.
- Whilst keeping the back straight, bend forward at the hips until the stretch is felt down the back of the thigh.
- The exercise should be to the point of 'stretch', not 'pain'.



Stretch - Calf (dependent on weight bearing status)

Sets: _____ Reps: _____ Hold: _____

- Stand on a step with the heel of the operated leg hanging over the edge of the step.
- Lower the heel down below the step until you feel a stretch in the calf. The exercise should be to the point of 'stretch', not 'pain'.



Phase Three:
Weeks 4-6 postsurgery | continued

During Phase Three, the patient increases weight-bearing and range-of-motion activities, as appropriate, while augmenting strengthening exercises.

Patient Reminders:

- Apply cryotherapy as standard oedema control (20 minutes with ice, at least 3 times per day)
- WB restrictions and knee bracing

Additional Notes:




Knee and Hip Flexion (resistance)

Sets: _____ Reps: _____ Load: _____

- Stand on the unaffected leg, with a floatation device under the arch of the foot of the affected leg.
- In lifting the knee and maintaining a 'vertical' lower eg, the patient performs knee flexion to approximately 60°.
- The knee is then extended, with motion paused for 2 seconds at beginning and end of range.




Squats

Sets: _____ Reps: _____ Load: _____

- Whilst holding the guide rails for support, perform a squat movement. The trunk and back should remain straight, with the gaze directed forward.
- The body is lowered by flexing the thighs and hips.
- The knees and thighs are then extended and the body is elevated to neutral.



Stretch - Calf

Sets: _____ Reps: _____ Hold: _____

- Stand on a step with the heel of the affected leg hanging over the edge of the step.
- The heel is lowered below the step until a stretch is felt in the calf. The exercise should be to the point of 'stretch', not 'pain'.





Shallow Water Walking (forwards, backwards, sideways)

Time: _____

- Walk forward and backward in the shallow end of the pool (hip level), with emphasis on bilateral heel-to-toe motion.
- Patient may also walk side-to-side.
- Patients who have excessive knee pain or have difficulty with gait may use the guide rail, or return to a deeper aspect of the pool.



Cycling

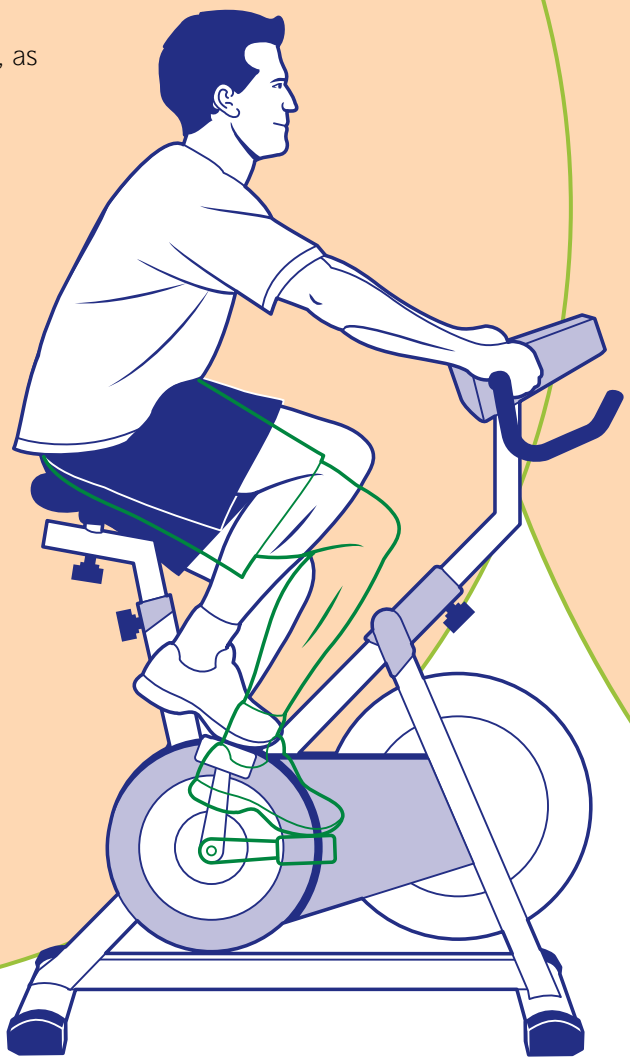
Time: _____

- Whilst holding the guide rails for support, lift the legs off the floor, so that the trunk and lower limbs are suspended in the water.
- A cycling motion is then initiated with the legs.
- Emphasis is placed on improving knee and hip range of motion and muscular coordination.

Phase Four:
Weeks 7-12 postsurgery

In Phase Four, the patient works towards movement independent of ambulation devices and knee braces. Focus is also placed on becoming thoroughly proficient with the rehabilitation exercises, as clinic visits become less frequent.

Additional Notes:






Thigh Extension

Sets: _____ Reps: _____ Load: _____

- Place the foot of non-operated limb in the centre of the footplate, and the operated leg over the thigh pad so that it is positioned halfway between the knee joint and the hip.
- Exhale and move your thigh backwards until your hip is fully extended.
- Hold this position for 2 seconds before returning to the start position. Inhale as you return to the start position.




Thigh Flexion

Sets: _____ Reps: _____ Load: _____

- Place foot of non-operated limb in the centre of the footplate, and the operated leg behind the thigh pad so that it is positioned halfway between the knee joint and the hip.
- Exhale and move your thigh forwards until your hip is flexed to 90°.
- Hold this position for 2 seconds before returning to the start position. Inhale as you return to the start position.




"Spider Kills"

Sets: _____ Reps: _____

- Sit on the edge of a chair with the affected knee flexed (70 to 90°). Palpate the vastus medialis ("teardrop" muscle).
- Lift the toes and apply pressure down through the heel, whilst simultaneously eliciting a quadriceps/hamstring co-contraction.
- Slowly turn the toes out, holding the final position for 3 seconds. Inhale as you return to the start position.




Cycle Ergometry (week 9-12)

Time: _____ Load: _____

- Sit on the stationary cycle with the feet in the foot straps and the arms on the arm rests.
- Perform a cycling motion with the legs, maintaining an appropriate speed.




Seated Leg Curls (week 8)

Sets: _____ Reps: _____ Load: _____

- Sit on the leg flexion machine with your legs straight, and your ankles resting on the pad.
- Exhale as you flex your knees to move the pad downward as far as comfortably possible.
- Inhale as you return to the starting position.




Passive Range of Motion

(row ergometer) (week 9-10)

Time: _____

- Sit on the row ergometer, with both feet flat on the floor.
- Actively slide the body forward until the knee becomes "tight" (do NOT push your knee through a painful range).
- Ensure the knees and feet remain in a straight line.




Seated Leg Curls (single leg) (week 9)

Sets: _____ Reps: _____ Load: _____

- Sit on the leg flexion machine with your legs straight, and your ankles resting on the pad.
- Exhale as you flex the knee of your operated leg to move the pad downward as far as comfortably possible.
- Inhale as you return to the starting position.



Stretch – Quadriceps (week 9-10)

Sets: _____ Reps: _____ Hold: _____

- Stand holding the back of a chair for balance.
- Place the foot of your affected leg on a chair or stool behind you.
- Stand up tall, and push hips forward until stretch is felt in the front of the thigh.
- The exercise should be to the point of 'stretch', not 'pain'.



Balance Exercises (double leg)
(dependent on weight bearing status)

Sets: _____ Time: _____

- Stand on the unstable surface, with equal weight distributed between each leg. Focus on maintaining an upright and stable position.
- Progress from; 1) foam/pillow, to 2) the inflatable disc and 3) the wobble board. To increase difficulty, close eyes for 15-30 seconds whilst maintaining a stable position.



Seated Balance (single leg)

Sets: _____ Time: _____

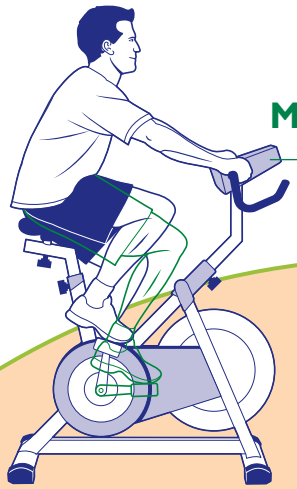
- Sit on a stable chair, so that the knees and hips are flexed to 90°.
- With the foot of the affected leg in the centre of the balance device, maintain balance, with emphasis on correct upright posture and abdominal bracing. Close eyes for additional difficulty.



Seated Theraball Balance (with hip flexion)

Sets: _____ Time: _____

- Sit on the theraball, so the knees and hips are flexed to 90°.
- Whilst maintaining balance, flex the hip of the unaffected thigh so as to bear weight on the affected leg.
- Focus on maintaining balance, with emphasis on posture and abdominal bracing. Close eyes for additional difficulty.



Phase Four:
Weeks 7-12 postsurgery | continued

In Phase Four, the patient works towards movement independent of ambulation devices and knee braces. Focus is also placed on becoming thoroughly proficient with the rehabilitation exercises, as clinic visits become less frequent.

Additional Notes:





Thigh Abduction and Adduction

Time: _____

- Hold the guide rails for support, and lift the legs off the floor so that the trunk and lower limb are suspended in the water.
- Whilst maintaining knee extension, abduct (push out) the thighs to their end of range, and then adduct (bring back) them to neutral in an alternating fashion.





Thigh 'Scissor' Kicks

Time: _____

- Hold the guide rails for support, and lift the legs off the floor so that the trunk and lower limb are suspended in the water.
- Whilst maintaining knee extension, perform a "scissorlike" movement of the legs by reciprocally flexing and extending the thighs.



Balance (single leg)

Sets: _____ Reps: _____ Time: _____

- Standing stationary, flex the unaffected thigh so as to bear weight on the affected leg.
- Attempt to maintain balance assisted by the guide rail (if needed).
- Emphasis is placed on correct upright posture, with abdominal bracing.



Stretch - Quadriceps

Sets: _____ Reps: _____ Hold: _____

- Stand on the unaffected leg, and place the foot of the affected leg on the ledge behind.
- Whilst standing up tall, push the hips forward until a stretch is felt in the front of the thigh.
- Bend the supporting leg to increase the stretch.
- The exercise is to the point of 'stretch', not 'pain'.



Forward Lunge

Sets: _____ Reps: _____

- From a stationary position, step out in front of the body with the affected limb, accepting your body weight.
- Emphasis is placed on correct upright posture, with abdominal bracing.
- The knee of the front leg should not progress further forward than the toes.



Forward Step Ups

Sets: _____ Reps: _____

- Stand facing the step, and proceed to step up onto the box with the affected leg.
- Emphasis is placed on maintaining balance, with correct upright posture, and abdominal bracing.
- The pool rail may be used for support.



Lateral Step Ups

Sets: _____ Reps: _____

- Stand perpendicular to the step, and proceed to step up onto the box side ways.
- Emphasis is placed on maintaining balance, with correct upright posture, and abdominal bracing.
- The pool rail may be used for support.



‘Patter’ Kick (week 12)

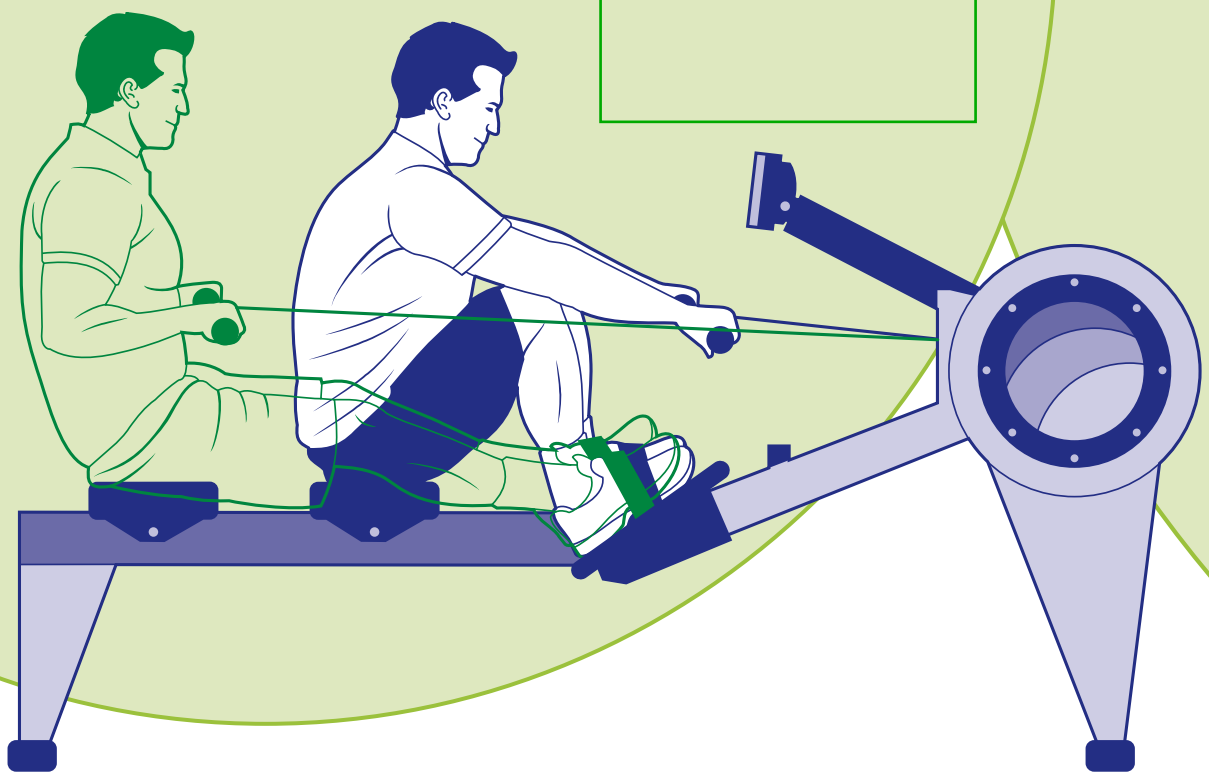
Time: _____

- With the aid of a floatation device, the patient executes a kicking action sufficient to maintain motion across the pool surface.
- Emphasis is placed on keeping the body horizontal.

Phase Five:
Months 3-6 postsurgery

During these months, the majority of patients return to work either on a part-time or full-time basis. Therefore, patients either continue to attend the outpatient clinic once or twice per week independently (though group supervised), or should continue with their prescribed gym and home rehabilitation program independently.

Additional Notes:







Bridging

Sets: _____ Reps: _____

- Lie on your back with the knees bent to 90°, feet flat on the floor, and the arms resting by the sides.
- With an exhalation, lift the pelvis and trunk from the floor, until the trunk and thighs are aligned.
- Hold the position for 3-10 seconds, breathing normally.
- Slowly lower the trunk and pelvis to the floor.





'Theraball' Bridging

Sets: _____ Reps: _____

- Lie on your back, and place the heels on the top of the theraball. Rest the arms by the sides.
- With an exhalation, lift the pelvis and trunk from the floor, until the trunk and thighs are aligned.
- Hold the position for 3 seconds, breathing normally.
- Slowly lower the trunk and pelvis to the floor.





Inner Range Quadriceps (theraband)

Sets: _____ Reps: _____

- Stand facing the wall, with the involved knee slightly bent, and the theraband just above the knee.
- Allow the tubing to act as resistance, and gently pull the knee back straight, taking the heel to the ground.
- Hold the position for 2 seconds, and return to the start position.





Inner Range Quadriceps (cable)

Sets: _____ Reps: _____ Load: _____

- Stand facing the cable, with the involved knee slightly bent, and the cable fastened just above the knee.
- Allow the cable to act as resistance, and gently pull the knee back straight, taking the heel to the ground.
- Hold the position for 2 seconds, and return to the start position.





Standing Calf Raises (single leg)

Sets: _____ Reps: _____

- Stand with your weight through your affected leg, with your toes and the ball of your foot on the step.
- Rise up as high as you can on your toes, keeping your knee extended or only slightly bent.
- Hold this position for 2 seconds, before returning to the start position. Inhale as you return to the start position.





Terminal Leg Extension

Sets: _____ Reps: _____ Load: _____

- Lie on your back on the bed.
- With your knee bent over a pillow/bolster and the toes facing slightly inward, straighten the knee by actively tightening the quadriceps.
- Be sure to keep the bottom of the knee on the pillow.
- Hold the position for 2 seconds, and then return to the start position.





Seated Leg Press

Sets: _____ Reps: _____ Load: _____

- Sit on the leg press machine positioning yourself so your thighs and knees are flexed (60-90°) with your feet resting on the foot plate about shoulder width apart.
- Exhale as you push firmly against the foot plate straightening your legs to 5° off full extension.
- Inhale as you return to the starting position.





Row Ergometer

Time: _____

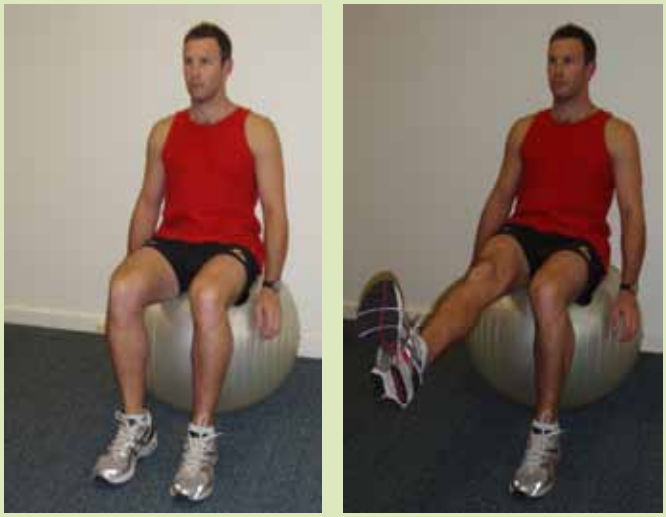
- Sit on the rowing ergometer, with both feet fixed.
- Actively slide the body forward until both knees reach a comfortable range, ensuring the back remains straight and both knees and feet remain in a straight line.
- Pull the handle into your chest, whilst concurrently extending your knees, pushing out against the foot platform. Inhale as you return to the start position.



Balance Exercises (single leg)

Sets: _____ Time: _____

- Stand on the unstable surface, with the affected leg in the centre of the device.
- Focus on maintaining an upright and stable position.. Progress from the; 1) foam/pillow, to 2) the inflatable disc and, finally, 3) the wobble board.
- To increase difficulty, close the eyes or add sport specific drills (ie. throwing and catching a ball).
- Caution: patients should be proficient and comfortable with 2 legs prior to initiating single leg balance activities.



Seated Theraball Balance (with leg extension)

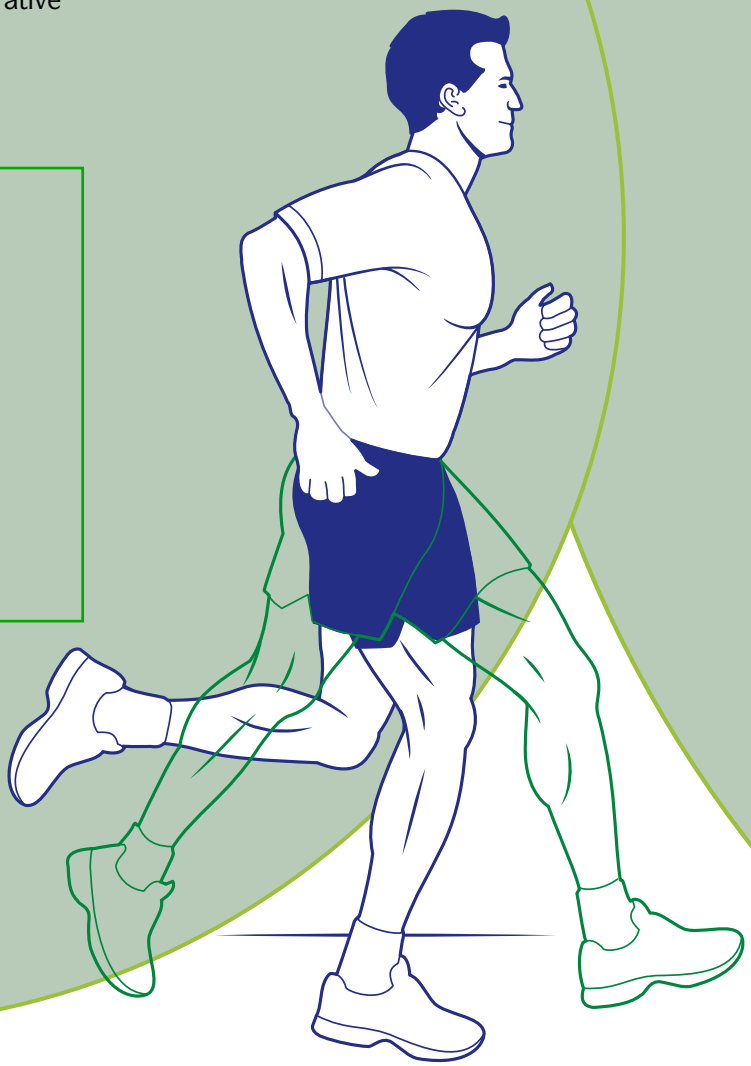
Sets: _____ Time: _____

- Sit on the theraball, so that the knees and hips are flexed to 90°. Whilst maintaining balance, flex the hip of the unaffected thigh so as to bear weight on the affected leg.
- Focus on maintaining balance, with emphasis placed on correct upright posture, with abdominal bracing.
- Close eyes for additional difficulty.

Phase Six/Seven: Months 6-12 months postsurgery

In this phase, gradually increasing the difficulty of the exercises, the patient returns to pre-operative low-impact recreational activities.

Additional Notes:





Forwards Step-up

Sets: _____ Reps: _____

- Stand facing the step (step height = 10-15 cm).
- Proceed to step up straight ahead with the operated leg.
- Emphasis on maintaining balance, with correct upright posture and abdominal bracing.



Forwards Step-down

Sets: _____ Reps: _____

- Begin standing on the step (step height = 10-15 cm).
- Proceed to step down straight ahead with the nonoperated leg, lowering the body in a controlled fashion.
- Emphasis on maintaining balance, with correct upright posture and abdominal bracing.





Lateral Step-up

Sets: _____ Reps: _____

- Stand perpendicular to the step (step height = 10-15 cm) with the operated side closest to the step).
- Proceed to step up side ways.
- Emphasis on maintaining balance, with correct upright posture and abdominal bracing.



Mini Trampoline Jogging

Time: _____

- Standing in the centre of the mini trampoline, proceed to jog 'up and down' on the spot, emphasizing knee lifts.
- Emphasis on maintaining balance, with correct upright posture and abdominal bracing.
- Time and speed can be altered to increase difficulty




Wall (Ball) Assisted Squat

Sets: _____ Reps: _____

- Stand with the back against the ball, and the heels placed about a thighs length from the ball.
- Using the ball as support, slowly lower the trunk until the knees are flexed to 60-90°.
- Hold this position for 2 seconds, and then tighten the thighs as you return to the start position.
- Increase intensity by holding position for 10–20 seconds.




Wall (Ball) Assisted Squat (plie squats)

Sets: _____ Reps: _____

- Stand with the back against the ball, and the heels placed about a thighs length from the ball. Point the toes out to an angle of 45°.
- Using the ball as support, slowly lower the trunk until the knees are flexed to 60-90°.
- Hold this position for 2 seconds, and then tighten the thighs as you return to the start position.





Wall (Ball) Assisted Lunge

Sets: _____ Reps: _____

- Stand with the back against the ball with one foot about a thighs length from the ball, and the other tucked under the ball.
- Using the ball as support, slowly lower the trunk until the front thigh is flexed to 60-90°.
- Tighten the thigh muscles as you return to the starting position.



Half Squat & Lunge Activities

(unstable surfaces)

Sets: _____ Reps: _____

- Standing with feet shoulder width apart and even weight through both legs, squat so that the knees are flexed to 90° at the end of the repetition.
- Ensure the knees remain in line with the feet, and do not progress any further forward than the toes.
- For added difficulty, squat on an unstable surface (pictured), progressing to single leg squats.



Mini Trampoline Balance Exercises

Sets: _____ Time: _____

- Gently bounce on the mini trampoline alternating the left and right side, whilst maintaining an upright and stable position (the toes should remain in contact with the surface).
- Once proficient, the patient may incorporate some sport specific drills (ie. throwing and catching).





Functional Balance Exercises (ie. squat)

Sets:_____ Reps: _____

- Perform a squat on the unstable surface.
- Focus on maintaining a stable position, abdominal bracing and correct technique.
- Progress from the; 1) foam/pillow, to 2) the inflatable disc, to 3) the wobble board and, finally 4) the mini trampoline.
- Caution: patients should be proficient and comfortable in performing modified squats on a stable surface prior to introducing unstable surfaces.







Functional Balance Exercises (ie. lunge and stepping activities)

Sets: _____ Reps: _____

- Perform a lunge on the unstable surface.
- Focus on maintaining a stable position, abdominal bracing and correct technique.
- Progress from the foam/pillow to the inflatable disc.
- Caution: patients should be proficient and comfortable in performing a modified lunge on a stable surface prior to introducing unstable surfaces.

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