Accelerated rehabilitation after Anterior Cruciate Ligament Reconstruction, Menisectomy or Meniscal repair.

Before the operation or "prehabilitation'

Learning the post-operative exercises before the operation, is easier than learning them immediately afterwards, when the knee is painful. In addition, the less painful, swollen and inflamed the knee joint is before surgery, the faster the joint will recover afterwards.
It will be necessary to see a physiotherapist pre-operatively, to settle the joint pain and inflammation, to teach the initial post-operative exercises, and to get the knee into the best possible shape for the operation, so that recovery will be faster.

After the surgery – what to expect

- Walking is permitted immediately, using crutches initially to ease pain, and walking unaided, as soon as pain permits.
- The stay in hospital will be short (usually going home the same day, or the next morning)
- A physiotherapist in the hospital, will teach exercises to bend and straighten the knee, and to maintain muscle strength and flexibility. These exercises will have been part of the prehabilitation routine.
- Early physiotherapy reduces pain, and restores normal movement, making it easier to get off the crutches. Book an appointment to see a physio within 2-3 days of discharge from hospital, as physiotherapy is a vital part of the rehabilitation.
- Over a period of 6 months, there will be a process of progressive rehabilitation aiming at a return to sports.

The success of the surgery depends on compliance and willingness to be an active participant in the rehabilitation process. This will require some dedication if maximum benefit is to be achieved from the surgery. The exercises must be practiced at home, adhering to the rehabilitation protocol the physio is using so that undue stress is not placed on the graft.

Milestones

- Walking unaided - within 2 weeks.
- Jogging - 6 – 12 weeks.
- Sport – 5 – 9 months.

The physiotherapist will guide the rehabilitation, which will be modified for individuals.

Don't

- Go dancing.
- Go hill walking.
- Dive into a swimming pool

Rationale of the rehabilitation programme.

- Moving the knee early after the surgery. Maintains nutrition to the cartilage inside the joint, protects the bone and helps to prevent stiffness of the knee .

- Progressive, controlled loading of the graft stimulates its healing .

- Putting full weight onto the knee when walking, does not damage the graft, so full weight-bearing is permitted as rapidly as pain permits.

- The method of attaching the graft is strong enough to allow aggressive mobilization, but the physiotherapist will guide this, using "closed chain" (with the foot in contact with a surface) exercises to minimize shearing forces on the graft.

- An injury severe enough to rupture the anterior cruciate ligament, also knocks out proprioception (balance receptors inside the knee). The retraining of these balance mechanisms is a vital element in rehabilitation prior to the return to unrestricted sporting activities.

What are "closed-chain" and "open chain" exercises?

- In "open chain" exercises, the end of the limb (the foot) is not resting against a surface, so is unsupported, and able to move freely in space. Following an ACL reconstruction, initially this exerts an unacceptable shearing force on the graft. Examples of open chain exercises, are a straight-leg lift and knee extensions in the gym.

- In "closed chain" exercises, the foot is in contact with a fixed surface and is not hanging freely in space, so no shearing force is exerted on the graft. Examples of closed chain exercises, are : walking; climbing stairs; squats, etc. Closed chain exercises use several muscle groups simultaneously and are more functional than open chain exercise

The Staged rehabilitation programme.

Stage 1 Walking .

Day 1 to Day 14
Goals

- Fully straightening the knee
- Walking normally.
- To establish muscle control.

TREATMENT

- Ice, elevation of the leg when resting, and exercises with the leg resting on the bed, will all help to reduce swelling and pain.
- The exercises consist of "co-contractions" contracting both the muscles at the front (quadriceps) and the back(hamstrings) of the thigh, at the same time. These exercises should have already been taught and been practiced before the operation (prehabilitation phase)
- There is no reason not to put full weight onto the knee when walking, immediately after the surgery. Initially, however, using crutches will be less painful. Progress to walking without the crutches as soon as pain and swelling permit. Aim to achieve a normal heel/toe walking pattern without a limp.
- Retraining walking to encourage straightening of the knee fully at heel strike and follow through to push off with the big toe (heel / toe gait)
- Bending and straightening the knee, with the foot resting on the bed, aiming to be able to straighten the knee completely (both when exercising and walking) by 14 days. Concentrate on getting the knee straight. Don't worry about bending, as it will come back as the joint swelling settles.
- Loosening up the kneecap to keep it mobile.
- Gentle stretching of the hamstring muscles to prevent scar tissue at the donor site, from sticking down to the underlying tissue. This should be started immediately post-operatively.
- Hamstring strengthening, in the form of static weight-bearing "co-contractions" with the quadriceps, immediately post-op, and progressing to active free knee bends (with the foot in contact with the bed) by day 14. **Resisted hamstring strengthening using weights heavier than 1–2 Kg should be avoided for at least 4-6 weeks**.

Upper body strengthening in the gym, such as bench-presses and free weights will not place any strain on the graft, so may be continued throughout the rehabilitation process. Pilates training to strengthen core stability under the supervision of a Pilates trained physiotherapist may also be introduced at this stage.

STAGE 2 Hamstring and quadriceps control

Time period: 2-6 weeks.
Goals

- Full range of motion.
- Muscle control, early proprioception and balance.
- Maintain cardio-vascular fitness.

TREATMENT

- The physiotherapist will help with exercises to bend and straighten the knee, aiming to achieve as much movement as possible, particularly the straightening of the joint.
- Progress the co-contraction exercises to improve muscle control, by increasing the number of repetitions, the length of the contractions, and starting to exercise in weight-bearing. Examples will be two leg quarter squats, lunges, stepping, and straightening the knee whilst in standing, against the resistance of an elastic band.
- Double leg knee bends in prone-lying (the strong leg assisting the operated leg) to strengthen the hamstrings, initially, progressing to unassisted leg curls with no resistance, as pain permits. Unassisted leg curls are both a concentric (as the knee bends) and eccentric (as the knee straightens) exercise.
- The physiotherapist will also assess the strength of the gluteals (buttock) and calf muscles, and check the flexibility of the iliotibial band (a structure running down the outer side of the thigh and knee) .
- Swimming may be started once the wound has healed. Freestyle using a light kicking motion is recommended at this stage, but no diving or tumble-turns are permitted yet.
- Gradually start to exercise using a leg-press, a static bicycle, and a mini-trampoline**.**

It should be emphasized that all knee straightening exercises must still be "closed chain". This remains the case until stage 4 of your rehabilitation has been completed.

NB //Gym activities should be avoided until the swelling of the joint is settling.

- If joint swelling is persistent continue with Ice and isometric quadriceps exercises.
- Hamstring strength will progress automatically with more repetitions. Adding weight resistance to the hamstring exercises must be introduced only very gradually beginning at **3 weeks** post-operatively, to prevent recurrent injury to the area from which the graft was taken. At this stage, **simultaneous (bi-lateral- the strong leg assisting the weak leg)** hamstring curls using 1 – 2 Kg ankle weight may be introduced.

Weeks 3 – 4

Continue with previous exercises

Progress the bi-lateral resisted hamstring curls to low resistance single leg curls, as pain allows.

Weeks 4 – 6

Warning

Care must be taken not to strain the hamstrings, as this will slow down the rehabilitation.

Hamstring curls should aim at low weights with high repetitions and not the other way round. This will increase endurance with reduced risk of injury.

Continue with intensive hamstring stretches, and exercises for weeks 3-4.

Week 6.

Eccentric hamstring strengthening is progressed as pain allows. Hamstring curls in the gym can be started.
Balance (proprioceptive) training, standing on a mini-trampoline, or balancing on a wobble board is now introduced.

NB: At 6 weeks post-op, most people feel a lot of confidence in their knee, but must still be aware that the graft is not mature. Remain conscious of the restrictions on what is permitted functionally, and to avoid failure of the graft, and only attempt what has been included in the rehabilitation thus far.

Stage 3 Proprioception

Time period 6 – 12 weeks

Goals

- Improve strength, coordination and endurance of leg muscles.
- Restore confidence to be more active.

Problems such as joint stiffness, pain under the knee cap, joint pain and swelling, and breaking of the graft, are still possible at this stage, so it is important to follow the guidelines specified by the physiotherapist.

Treatment guidelines:

- Step-lunges and half squats can now be introduced.
- Jogging in straight lines on the flat can be started.
- Swimming (freestyle) / pool walking / deep water running.
- Side-stepping
- Wall squats.
- In the gym, the elliptical stepper may be used.
- Gradually progress the resistance on gym equipment such as leg press and hamstring curls, aiming for progression of both power and speed of contraction.
- Start cycling on a normal bicycle as opposed to a static one.
- Progress balance work on the wobble board, to balancing on one leg, and balancing with eyes closed.

Stage 4 Preparing to return to Sports

12 weeks to 5 months.

Goals

- Sport specific activities
- Introduce agility and reaction time into the balance work.
- Increase strength
- Improve confidence

Treatment guidelines

There is a need to progress general strength, coordination, agility and balance work.

- Progress from jogging to running in a straight line, and figure of eight patterns
- Walking or slow jogging in large circles
- In the gym, using the stepper; leg press; leg curls; step work on progressively higher steps; rowing machine
- Continue cycling, pool running and swimming. At this stage flippers may be worn when swimming
- Jogging up and down stairs
- Box jumps 6 – 12 inches in height
- Hopping both in a straight line and in circles and zig-zags
- Agility work may include shuttle runs, ball skills, sideways running, skipping rope etc
- Sport-specific activities will depend on the sports played. e.g. **Tennis**-lateral step lunges, running forwards and backwards, sideways running; **Skiing**-slide board, stepping and jumping on and off a box sideways, straight-line and zig-zag jumps; **Basketball or Volleyball**- vertical jumps

Stage 5 Return to sport

Time period: 5-9 months

At this stage, it should be safe to return to more active involvement in sports. Exercises must be continued as before, but more sport-specific skills at full speed must be introduced. The speed of return to these skills is guided by the physiotherapist, based on the response of the knee to increasingly more stressful demands on it.

- Jogging in large circles should be progressed to running in small circles.
- Box drop jumps should be progressed in height to 1-2 feet, increasing the height gradually
- Bounding (jumping as far as possible) on two legs, followed by bounding on one leg
- Cutting drills, starting and stopping, changing direction at speed etc
- Kicking a ball for soccer and rugby players
- Jumping and twisting for basketball and volleyball players
- In the gym, open-chain quadriceps exercises can now be safely begun (i.e. leg extensions)

It may be necessary to modify the level of playing sport initially, until strength, endurance and skills are sufficient to return safely to the original level of competition. For soccer and rugby players, it may be better to start back to training, initially wearing running shoes. Football boots may gradually be worn during training until there is enough confidence to begin playing a full game.

For skiing, initially stay on groomed slopes and avoid moguls and off piste . Discuss with the surgeon whether wearing a brace initially for downhill skiing (especially if racing) is advisable. It may also be advisable for racers to lower their DIN settings on the bindings initially.

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