

MICROFRACTURE CARTILAGE REPAIR SURGERY

This information sheet on Microfracture cartilage repair is in three sections:

- Information on the nature and purpose of cartilage repair surgery utilising the microfracture technique
- An outline of the post-operative rehabilitation and reasons why it is important to follow a gradual specific plan
- Example detailed exercise plan.

Purpose and description of the procedure

The operation is performed to stimulate repair of articular surface damage in the knee which has been worn away or damaged by direct injury resulting in a defect in the surface. Normally, the joint consists of a layer of smooth articular cartilage covering the bone ends providing an almost frictionless articulation. Once damaged the joint surface has unfortunately very little intrinsic capability to repair itself but it is possible to stimulate a form of repair using the microfracture technique.

Small “pick” holes are made in the end of the bone, using a sharp awl, approximately two to three millimetres deep and spaced every five to six millimetres. This allows for the marrow part of the bone to effectively grow onto the joint surface. This bone marrow ‘super clot’ contains specialised stem cells which can then form a new joint surface. It is expected that the repair tissue will gradually mature and improve over six to nine months from surgery.

Approximately 60 – 70% of patients note a significant improvement in symptoms of pain and function, depending on the amount of damage and intended activity. Results are best when the area of damage is small and when the area of damage is surrounded by normal articular cartilage.

Rehabilitation

The rehabilitation process is crucial to optimize the healing of the joint surface.

Essentially the program involves a balance between loading the new surface enough to stimulate development of the new surface and avoiding overloading which will damage the growth. Rather like seeding a new lawn it is important to avoid walking on it too soon yet it should be rolled to keep it smooth. To quote the originator Dr Steadman in USA, – *‘when the ideal physical environment is combined with the ideal chemical environment produced by the marrow clot, a repair cartilage can develop that fills the original defect’.*

The procedure is usually performed as a day case and carried out at the same time as an ordinary arthroscopy of the knee. There is no extra incision. On return from theatre there is a padded bandage applied to the leg. This bandage is removed on the day following surgery.

The specific program depends on the site of the repaired defect, its size and whether any other surgery was performed at the same time, such as ligament reconstruction.

Post-operative care: Femur or Tibia surface

Weight Bearing:

- MINIMAL TOUCH WEIGHT BEARING (5-10Kg maximum) is essential using crutches for 6 weeks. Again, like avoiding walking on new grass, any greater load through the joint is likely to damage the healing tissue. Even though the knee may feel comfortable the weight must be kept off it to allow the new surface to mature.
- Knee braces are not usually needed.
- For lesions less than 1cm patients are allowed to take weight sooner.

Movement of the knee joint:

- Early movement and bending (flexion) of the knee is encouraged immediately following surgery and a CPM (Continuous Passive Motion) machine may be used. This helps to smooth the growing articular surface, again rather like rolling new lawn without indenting it.
- If a CPM is used then this should be for 4-6 hours a day with range increased as tolerated until full range of motion is achieved with the machine
- Alternatively a static bike can be used without load: 500 revolutions three times a day.

Exercises during first 6 weeks:

- Physiotherapy exercises commence during the postoperative phase with static quadriceps and hamstring exercises while working on range of movement.
- Static one-third knee bends with 90% wt on the unoperated leg begin the day after surgery
- Static bike, with light resistance only, and pool exercises (in deep water) can start from 1-2 weeks.

From 6 weeks:

- Progression to FULL WEIGHT BEARING is allowed at six weeks followed by a gradual increase in exercise activity including elastic cord resistance exercises, cycling with load, cross trainer and eventually step-machines.
- Jogging can start at 3 months earliest if sufficient quads muscle control.
- Free weights and exercises severely loading the joint surfaces are started at 3 – 4 months when balance control is good, strength has returned and there is no swelling in the knee.
- No cutting, turning or jumping activities are allowed for 4 months and this may be longer for competitive or “heavy” patients.
- Return to impact sports is allowed between 4 – 6 months once knee function is satisfactory as measured on functional tests, and there is no swelling in response to activity.

Post-operative care: Patello-femoral surface

Weight Bearing:

- FULL WEIGHT BEARING is allowed in a hinged knee brace with the hinges set to allow 0 – 20 degrees flexion only for 6 weeks.

Movement of the knee joint:

- Early movement (flexion) of the knee is encouraged immediately following surgery and a CPM (Continuous Passive Motion) machine may be used.
- Alternatively a static bike can be used without load: 500 revolutions three times a day, out of the brace.
- The aim is to obtain full passive pain free range of movement as soon as possible

Exercises during first 6 weeks:

- Physiotherapy exercises commence during the postoperative phase with static quadriceps and hamstring exercises while working on range of movement using static bike, CPM and pool exercises.
- Weight should not be put through the knee cap part of the joint, in other words by taking weight on the bent knee. This is because, rather like avoiding walking on new grass, any greater load through the joint is likely to damage the healing tissue. Even though the knee may feel comfortable the weight must be kept off it to allow the new surface to mature.
- With the brace on, then strength training is allowed but only in the 0 – 20 degree range

From 6 weeks:

- The brace is removed and normal walking should be achieved.
- Weight on the involved leg is allowed as tolerated, but it must be **limited to the angles of flexion that do not compress the treated surfaces**.
- It is important for the physio to know the specific angles that need to be avoided, but often the patient will have been aware of a particular position that the knee cap used to cause pain or catching.
- After six weeks a gradual increase in exercise activity is allowed building up to commencing impact type activities at 4 – 6 months.
- For the patello femoral joint specific closed chain exercises are used to strengthen the muscles controlling the patella without overloading the new surface.
- It is expected that the repair tissue will gradually mature and improve over six to nine months from surgery.

General points to note:

- We use the phrase “as tolerated” to allow a level of activity safe for the repair: symptoms of pain, limp and swelling indicate that too much is being done. Activity levels should then be reduced temporarily.
- Ice should be applied to the knee for 10 - 15 minutes following each exercise session to help reduce swelling.
- The decision to return to sport is based on a joint decision with the surgeon, physiotherapist and trainer as necessary and is based on appropriate testing.
- The timings and exercises are to be given as guidelines – some programs can be faster or slower – this is dependent on various factors, from the demands of the patient to the size of the area repaired, and the availability of rehab facilities.

Specific Rehabilitation program: Femoro-tibial Joint Lesions

0 - 3 Weeks Rehabilitation:

- Touch weight-bearing for 6/52 after surgery
- Range of motion – free flexion as tolerated aiming for full flexion by 6/52
- Patellofemoral mobilisations
- Assisted knee swings 15 mins 3x/day for 6/52
- Stationary bike after 1 -2/52 when comfortable flexion achieved. 500 revolutions 3 times a day. No or minimal load.
- Cold therapy may be used as required
SLR no lag, Static quads, hamstrings & gluteii Open chain quads no resistance
- Hamstring/ Calf Stretch (long sitting)

3 - 6 Weeks Rehabilitation:

- Remain touch weight-bearing for 6/52
- Core stability in sitting
- IRQs Hip Flex/Ext/Abd/Add with knee Ext
- Knee Flex/Ext (Gym ball – heel on ball)

Week 6 Goals:

- Minimal pain and swelling
- FROM

7 - 8 Weeks Rehabilitation:

- Progress PWB-FWB
- Core stability exs with gymball
- Hamstring/calf stretches in standing
- Stationary bike: increase load as tolerated
- Gym ball:
 - Bridging
 - Knee Flex/Ext sitting on ball. Double/ single
 - Sit to stand

Week 8 Goals:

- Mobilise unaided
- Satisfactory static proprioception

9 - 12 Weeks Rehabilitation:

- Continue with Week 6 Exs
- Knee Flex/Ext in standing with theraband to resist (0-30°)
- Proprioceptive work
- Rowing machine
- Leg press – low resistance (10° - 70°)
- Hydrotherapy/swimming

Week 12 Goals:

- FWB Normal gait
- FROM
- Good knee control

3 – 4 Months Rehabilitation:

- Gait re-education

- Step ups on 10cm (40°) to 15cm (60°) step
- Mini stepper
- Static bike with resistance/outdoor cycling
- Treadmill: slow walking forwards/backwards
- Increase proprioception
 - Trampoline single leg stands
 - Single leg mini squat
 - Wobble board
- Lateral step downs on 10cm (40°)step
Forward step downs on 10cm step
- Hip Abd/Add/Flex/Ext in standing + theraband

4 Months Goals:

- Pain free FROM
- Good control of 10cm forward step down
- Increased confidence in knee

4 – 5 Months Rehabilitation:

- Single leg mini squats on trampoline
- Step on & off trampoline with operated leg
- Full stepper/crosstrainer
- Lateral/forward step down 15cm to 20cm (80°)
- If adequate knee control – can begin fast walk on treadmill, gradually progressing to slow jog under supervision

5 Months Goals:

- Satisfactory knee control fast walking
- Perform 20cm step down & neutral pelvis
- Able to complete 1 hour of light exercise

5 - 6 Months Rehabilitation:

- Circuit training
- Gentle jog/shuttle runs
- Gentle change of direction
- Single leg hurdle/step over
- Accelerate/decelerate up to 50% speed
- Plyometrics: skipping, hopping, star jumps

6 Months onwards: Return to full sport phase

- Should have confidence in knee
- Can now run unsupervised if adequate control
- Accelerate/decelerate runs $\frac{3}{4}$ speed
- Figure of 8 runs fwds/bwds
- Slalom fwds/bwds
- Gradually introduce cutting/sudden stop
- Run – sit – run
- ↑ distance: sprints 10m – 20m – 50m
- Can begin sports specific training when agreed with consultant and physiotherapist

Specific Rehabilitation program: Patello-femoral Joint Lesions

0-6 Weeks Rehabilitation:

- Weight bearing as tolerated
- Brace locked at 0-20 for 6/52 when mobilising (After 6/52 brace is gradually opened before discontinued)
- Range of motion (out of brace) – free flexion as tolerated aiming for full flexion by 6/52
- Stationary bike after 1-2 weeks when 100° flexion achieved. 500 revolutions 3 times a day. No or minimal load.
- Gym ball Flex/Ext (Heel on ball)
- Circulation exercises
- Heel slides
- SLR
- Static quads, hamstring & gluteii
- Hamstring/calf stretches in long sitting
- Heel raises in standing
- Patella mobilisations (not into pain or end of range)
- Early proprioceptive exs (Single leg standing)

After 3 weeks add in following:

- Hip Flex/Ext/Abd/Add in standing knee Ext with theraband
- Progress proprioception exs (Trampoline single leg stand)
- Rowing machine (No hands)

Week 6 Goals:

- Full Ext
- 120° Flex
- Minimal pain & swelling
- Good static quads control

7-12 Weeks Rehabilitation:

- Remove brace
- Progress to full ROM
- Gait re-education
- Functional closed chain 10cm step up (40°)
- Progress proprioception:-
 - Trampoline double leg / single leg stand
 - Wobble board
- Treadmill slow walk
- ↑ Static ex bike /ordinary bike
- Knee Ext 0 - 30° in standing with resistance of theraband

3 Month Goals:

- Normal Gait
- Full AROM
- Good knee control
- No load on patellofemoral joint for 3/12
- No swelling & minimal pain

3 – 6 Months Rehabilitation:

- ↑ Functional training
- Treadmill fast walk – supervised only
- Stepper/cross trainer
- ↑ Walking distance
- Patello femoral rehabilitation
- Lateral & forward step down 10cm
- Circuit training
- Progress activity to supervised jogging
- No jogging unsupervised until 6 months

6 Month Goals:

- FROM
- No pain & no swelling
- Strength within 80-90% of contralateral extremity (quads & hams)
- Perform 10cm step down & neutral pelvis

6 Months onwards: Return to full sport phase

- Exercises as per 6/12 femoro-tibial protocol
- Progressing to sport specific training