ACCELERATED REHABILITATION PROTOCOL FOR POST OPERATIVE POSTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Rationale of Accelerated Rehabilitation

Rehabilitation after PCL reconstruction plays a major role in obtaining a functional result. Past protocols which delayed mobilisation and weight bearing have been associated with a variety of problems notably

- Prolonged knee stiffness
- Loss of full extension
- Delay in strength recovery
- Anterior knee pain
- Bone demineralisation

1. Mobilisation

Early mobilisation has many proven advantages notably

- Maintenance of cartilage nutrition
- Reduction in intra-articular adhesions
- Reduction in extra-articular fibrosis
- Improved quality of healing of capsular and extra-articular ligamentous injuries

2. Weight Bearing

Early weight bearing also has many proven advantages notably

- Retention of bone mobilisation
- Reduction in muscular atrophy
- Maintenance of proprioception and coordination

Accelerated Rehabilitation Programme

This programme is provided as a guide to assist the therapist in making clinical decisions regarding the progress of the rehabilitation of patients following PCL reconstruction using hamstring tendon graft.

The protocol described here incorporates

- Early mobilisation with an emphasis on extension
- Early weight bearing
- Reduced bracing
- Closed kinetic chain exercises
- Early proprioceptive exercises

This protocol has been shown to

- Increase patient compliance and cooperation
- Allow earlier return to work and sport
- Decrease patellofemoral joint complications

Phase 1: Early Post Operative Period (Day 1-2)

1. Reduce pain and swelling with local modalities such as ice
2. Begin early ROM exercises with an emphasis on extension
3. Begin quadriceps work with extension exercises. Start with knee bent over a pillow at 30º flexion and perform a quads set.
4. Begin weight bearing as tolerated on two crutches. Teach stair techniques in hospital.

3. Bracing

A post operative brace may be used for the first four weeks or until adequate muscle control is achieved. Patients are likely to significantly stress the graft even in a controlled rehabilitation setting.

4. Open versus closed chain exercises

Closed kinetic chain exercises are performed with the foot placed on a surface (eg floor, step, pedal) and the entire limb bearing a load. This causes the knee to be compressed by the load.

In open kinetic chain exercises ie: leg extensions or kicks, a relatively large shear stress is applied across the knee. The force is resisted by the PCL and is applied to and may endanger the graft

The PCL stresses during closed kinetic chain exercises and varies with the knee flexion angle and increases from 40º to 100º.

In closed chain exercises patellofemoral joint forces are markedly reduced compared to open chain exercises.

In addition closed chain exercises place functional stresses on the extremity which stimulate normal coordinated muscle actions

For these reasons closed kinetic chain exercises are emphasised in this protocol and should be performed from 0 – 60 º of flexion.

Phase 2: Range of Motion (Day 2-14)

Aims

- Reduce post-operative swelling
- Restore ROM with an emphasis on extension
- Increase quadriceps control
- Begin gentle hamstring stretching
- Progress to full weight bearing as tolerated

Possible complications during this phase

- Local haemorrhage down hamstring sheath into the pes anserine area
- Hamstring pain
- Acute graft pullout
- Infection 7-10 days
- Stiffness

Treatment Guidelines

1. Continue modalities to reduce pain and swelling
2. Progress ROM exercises with an emphasis on extension. Aim to achieve 0-60º by 14 days.
3. Quadriceps rehabilitation

    Early active quadriceps strengthening is quads sets, straight leg raises, knee extension 60-0º

    CKC exercises

    Mutli angle isometrics 60º, 40º, 20º

    Wall slides, squats 0-45º

    Patella mobilisation: Calf exercises, hip adduction and abduction

4. Hamstring Rehabilitation

    Early gentle hamstring stretching to prevent painful adhesions and bleeding

    Avoid hamstring resistance exercises early as causes excessive pain and bleeding

Phase 3: Quadriceps and Hamstring Control

This is the period of graft incorporation. During this time the graft should be protected from violent loads

Aims:

- Obtain passive ROM particularly extension 0-90º
- Develop good muscle control and strength

Possible complications

- Fixed flexion deformity, loss of flexion
- Hamstring strain
- Increased laxity of graft

Treatment Guidelines

1. Assess patellofemoral articulation for dysplasia and adjust therapy if necessary. Use McConnell taping if necessary
2. If swelling persists continue use of ice. An effusion often persists until quadriceps tone returns. If significant OA is present a NSAID may be helpful.
3. Introduce the use of gym equipment such as stationary cycle for ROM and endurance, leg press and stair master.
4. Quads Rehab
    - Continue closed chain exercises
    - Progress by increasing number of repetitions, length of contraction and more dynamic position
    - Introduce stationary cycling, leg presses, quarter squats 0-45º, steps, swimming
5. Hamstring Rehabilitation
    - Avoid resisted hamstring work
    - Avoid hamstring strengthening

Phase 4: Proprioception (6-12 weeks)

Graft incorporation is advanced enough to allow free, powerful straight line activity

Aims:

- Restore total leg strength
- Restore endurance capacity of muscles
- Improve coordination and proprioception
- Restore ROM 0-120º

Possible complications:

- Persistent swelling and inflammation (usually related to preoperative OA or meniscal surgery or patellofemoral problem)
- Patellofemoral irritability
- Persisting fixed flexion deformity or flexion loss

Treatment Guidelines

1. Encourage straight line activities such as
    - Cycling
    - Swimming and pool exercises
    - Jogging on flat

2. Quadriceps Rehabilitation
    - Continue with static control with emphasis on endurance eg: wall squats
    - Progress concentration to more dynamic moves eg: step lunges and half squats
    - Progress resistance on gym equipment

3. Hamstring Rehabilitation
    - Begin low resistance hamstring curls. Continue stretching exercises.

4. Proprioception
    - Progress to more dynamic exercises such as
        - lateral stepping
        - slide board
        - agility drills
        - mini-trampoline

Phase 5: Sport Specific (3-6 months)

During this time the graft itself undergoes physiological changes and is unsuitable for competition sport

Aims:

- Incorporate more sport specific activities
- Restore agility and reaction time to normal
- Develop patient confidence

Possible Complications

- Patellofemoral Irritability

Treatment Guidelines

1. Solo, non competitive sports activity is permitted eg: hitting a ball against a wall, football training-non contact
2. Progress all general strength work eg: squats with resistance, leg press, leg curls, rowing machine, step machine and pool work to include fins
3. Proprioception - introduce agility work such as skittle runs, ball skills, sideways running, and skipping rope. Avoid sudden deceleration
4. Sport specific exercises and activities - eg tennis-lateral step lunges, backward running. Skiing-silde board, lateral box jumping, zig zag hoping
5. High speed isokinetics, running programme

Phase 6: Return To Sport (6-9 months)

Aims:

- Return to sport safely and with confidence

Treatment Guidelines

- Can safely do open chain quadriceps work, (ie: leg extensions)
- Continue progression of pylometric and sport specific drills
- Return to training and participating in skill exercises
- Continue to improve power and endurance
- Advice may be needed as to the need for modifications to be able to return to sport