Total Knee Replacement Physical Therapy Protocol

The "Quiet Knee" Approach

Introduction: This is a more conservative approach to knee replacement recovery than traditional clinical protocols. This new technique focuses on controlling inflammation and swelling postoperatively through restricted mobility and passive range of motion (ROM) and aggressive cryotherapy (icing) for the first 10 days immediately following surgery. This contrasts with standard protocols, which often emphasize early and aggressive movement that can cause inflammation in the surgical tissue that is healing. The problem with this "no pain, no gain type of mentality" is that the more patients do in the early period of recovery, the more the knee will swell and become more painful creating a vicious cycle. Under the "Quiet Knee" protocol, patients avoid intensive physical therapy immediately after surgery, allowing the body time to heal before progressing to motion and other strength work. Research results suggests this approach helps set the stage for a smoother long-term recovery and more than 25% reduced opioid exposure. Early on after surgery, "less is more."

Progression Criteria: The protocol outlines specific phases of rehabilitation, with progression based on clinical criteria and the patient's individual progress. This ensures that patients are not pushed too hard too soon, which can hinder recovery. Continuous monitoring of the patient's condition allows for adjustments to the rehabilitation plan as needed, ensuring optimal recovery outcomes.

Guidelines: The rehabilitation program emphasize early, controlled motion to prevent knee stiffness and to avoid disuse atrophy of musculature. The program should balance the aspects of tissue healing and appropriate interventions to maximize flexibility, strength, and pain-free performance of functional activities. This model should not replace clinical judgement.

PRE-OPERATIVE PHASE

Precautions:

- Modify/minimize activities and/or exercises that increase pain
- Maintain activity level to avoid deconditioning and atrophy

Assessment:

- Pain
- Home environment – define barriers and available resources
- Knee active range of motion (ROM) – flexion and extension
- Pre-operative gait quality, distance and use of assistive device

Treatment Recommendations:

- Targeted core and lower extremity strengthening
- Targeted lower extremity stretching
- Functional mobility and transfer training
- Balance training
- Independent with home exercise program (HEP) that addresses primary impairments
- Familiarize with post-operative plan of care, mobility, use of assistive device, and discharge planning

ACUTE CARE PHASE (Week 1)

Precautions:

- Avoid prolonged sitting, standing, and walking
- Avoid severe pain with strengthening and ROM exercises
- Avoid pillow under knee to prevent knee flexion contracture

Assessment:

- Mental status
- Pain
- Wound status
- Swelling
- AROM/PROM of knee
- Post-anesthesia sensory motor screening
- Functional status
- Gait and stair ability
- Assess for compromised cardiovascular status

Treatment Recommendations:

- Therapeutic exercise with focus on active ROM, active quadriceps contraction, and muscle pumping (e.g. quadriceps sets and ankle pumps)
- Promote knee extension activities
- Transfer training: in and out of bed and sit to stand (e.g. chair, toilet)
- Gait training with appropriate device, progressing from rolling walker to cane/crutches when patient demonstrates adequate weight bearing
- Non-reciprocal stair training with assistive device
- Cryotherapy and elevation of lower extremity to prevent swelling
- Initiate and emphasize importance of HEP
- Continuous passive motion machine only if indicated by surgeon

Criteria for Advancement:

- Active knee flexion ROM ~80° in sitting and active extension ROM <10° in supine
- Good pain control
- Transfers unassisted from supine to sit and sit to stand safely
- Ambulates safely with appropriate device on level surfaces and stairs
- Independent with home exercise program
- Discharge home within same day or up to 2 days post-operatively, when goals have been achieved and with surgeon clearance

Emphasize:

- Control swelling
- Independent transfers
- Household ambulation with appropriate assistive device
- Pain-free basic exercises
- AROM (emphasize extension)

POST-OPERATIVE PHASE 1 (Weeks 2-6)

Precautions:

- If ROM plateaus with hard or painful end feel – contact surgeon
- Avoid prolonged sitting or walking
- Avoid severe pain with therapeutic exercise and functional activities
- Avoid reciprocal stair negotiation and ambulation without assistive device until non-antalgic gait is achieved

Assessment:

- Pain
- Active/Passive ROM, including knee flexion and extension
- Manual muscle testing (MMT) including: hip extensors and abductors, knee flexors and extensors, ankle plantar flexors
- Single leg stance (SLS)
- Timed Up and Go (TUG)
- 5x sit to stand
- ADL ability
- Gait stair ability

Treatment Recommendations:

- <u>ROM/Stretching</u>

  Passive extension and flexion exercises, stretching of appropriate muscle groups including quadriceps, hamstrings and gastrocnemius, and knee flexion/extension exercises

- <u>Strengthening</u>

  Straight leg raise in all planes (when terminal knee extension is achieved); prioritize quadriceps, hip, and hamstring strength

- <u>Endurance</u>

  Cycle ergometry: Short crank if knee flexion ROM is <90°, full crank if knee flexion ROM is >110°

- <u>Modalities</u>

  Cryotherapy/elevation/modalities to help control swelling and pain

  Electrical stimulation or biofeedback may be used for quadriceps reeducation

- Patella mobilization when incision is stable
- Forward and lateral step up progression, step down progression (starting with 2-4 inches)
- Gait training with/without assistive device with emphasis on active knee flexion and extension, heel strike, reciprocal pattern, and symmetrical weight training
- ADL training to continue such as sit to stand, in/out of tub/shower, car transfer

Criteria for Advancement:

- Swelling and pain controlled
- Active ROM>110° of knee flexion, 0° of knee extension
- No quadriceps lag
- Ambulate on level surface with/without assistive device with normal gait pattern
- Ascend 6” steps with good control
- Sit to stand without compensatory motion
- Independent with ADL
- Independent with HEP

Emphasize:

- Control swelling
- Increase flexibility
- Active quadriceps contraction through to terminal knee extension
- Functional strength and movements
- Normalizing gait pattern

POST-OPERATIVE PHASE 2 (Weeks 7-12)

Precautions:

- Avoid reciprocal stair negotiation if severe pain or gait deviation present
- Avoid high impact activities such as running, jumping, plyometric activity and vibration platforms

Assessment:

- Pain
- AROM/PROM – Knee flexion and extension
- Strength – MMT including: hip extensors and abductors, knee flexors and extensors, ankle plantar flexors
- Single leg stance
- 5x sit to stand
- ADL ability
- Gait and stair ability

Treatment Recommendations:

- Continuation of phase 1 manual/exercise treatments as needed
- Concentric and eccentric quadriceps strengthening
- Stretching of quadriceps, hamstring and appropriate muscles groups continued
- Leg press progression: bilateral, unilateral, eccentric
- Continue step up/step down progression (6-8”)
- Ball/wall/functional squats
- Retro treadmill, forward treadmill, elliptical, cycle ergometry
- Gait training on flat and uneven surfaces
- Advance proprioception and balance exercise
- Address limitations in the kinetic chain for functional activities such as walking, squatting, stair climbing
- Hydrotherapy once wound is healed if available

Criteria for Discharge/Advancement (If Returning to Sport/High Level ADL)

- Active flexion >120° and knee extension =0° in supine
- Bilateral ankle dorsiflexion >10°
- Functional test measures within age appropriate parameters
- Independent with lower extremity ADL such as tying shoelaces and donning/doffing socks
- Negotiate steps with reciprocal pattern and with minimal pain and deviation
- Lower extremity strength 4+/5, control, and flexibility for high level ADL activities
- Independent with full HEP
- Discharge or progress onto Phase 3 if the goal is to return to sport or advanced functional activities (if cleared by surgeon)

Emphasize:

- Increase flexibility
- Restore strength – symmetrical quad strength and symmetrical squat
- Increase endurance with walking
- Independence with exercise and activity regulation
- Reciprocal stair negotiation

POST-OPERATIVE PHASE 3 (Weeks 13-18); Begin only if returning to sport with surgeon clearance

Precautions:

- Avoid high impacts
- Note: expert opinion varies widely on allowable sports – consult with surgeon

Assessment:

- Flexibility
- Strength
- Star excursion balance test
- Kinetic chain during sport specific movement

Treatment Recommendations:

- Activity specific training
- Eccentric quadriceps control
- Progressive resistance exercises
- Low impact cardiovascular conditioning
- Low impact agility drills
- Dynamic balance activities
- Sports specific warm up and activities

Criteria for Discharge:

- No increase in pain or swelling with activity
- Symmetrical functional capacity on bilateral lower extremities
- Descend 8” step without pain or deviation
- Strength, ROM, flexibility throughout kinetic chain to meet sports specific demands
- Independent with full HEP

Emphasize:

- Return to sport/recreational activity
- Neuromuscular patterning
- Gradual increase of loads to meet sports specific demands

This protocol was developed by the Hospital for Special Surgery (HSS)

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