ALAN H. LEE, M.D.
ORTHOPAEDIC SURGERY AND SPORTS MEDICINE

Keck School of Medicine of USC

Total Knee Arthroplasty

The intent of this protocol is to provide the clinician with a guideline of the post-operative rehabilitation course of a patient that has undergone a Total Knee Replacement. It is by no means intended to be a substitute for one's clinical decision making regarding the progression of a patient's post-operative course based on their physical exam/findings, individual progress, and/or the presence of post-operative complications. If a clinician requires assistance in the progression of a post-operative patient they should consult with the referring Surgeon.

This protocol is developed for primary total knee arthroplasty. Revision total knee arthroplasty should progress Phases I and II cautiously to allow adequate tissue healing.

Phase I-Immediate Post-Surgical Phase (Post-Operative Day 0-3):

Goals:

- Enable patient to perform bed mobility and transfers out of bed to chair/toilet/commode as independently as possible
- Instruct patient on proper use of walker or crutches for ambulation and stair management
- Initiate home exercise program with emphasis on increasing ROM, decreasing edema, and pain
  - Decrease inflammation, swelling, and pain

Precautions:

- Weight bearing as tolerated (WBAT) with device unless otherwise noted by surgical team
- Range of motion as tolerated unless otherwise noted by team
- Avoid torque or twisting forces through operative knee, especially when weightbearing
- No exercise with weights or resistance
- Be vigilant for signs of DVT or peripheral nerve compromise

Positioning:

- Nothing placed behind operative knee when supine
- Towel roll under ankle of involved extremity to promote knee extension
- Towel roll at trochanter of involved extremity to prevent hip external rotation and promote neutral alignment as needed

Initial Assessment:

- Assess patient for any signs of post-operative complications including DVT (calf pain, abnormal swelling, erythema) and peripheral nerve compromise

- Ensure patient is pre-medicated prior to initial assessment as well as subsequent follow up treatments as needed to allow for adequate pain control. Cryotherapy may be recommended for 20 minutes post-therapy session to control pain and swelling
- Assess ROM and strength of involved joint, contralateral knee, and bilateral hip and ankle
- Assess overall strength and ability to perform functional mobility with appropriate assistive device

Initial Perioperative Pain Management:

- Anesthesia for TKA includes:
    - Spinal anesthesia ○ General anesthesia
    - Spinal or general anesthesia with adductor canal block
- Post-operative pain control:
    - Pericapsular Injection
        - Injected directly into operative joint intraoperatively.
        - Combination of Ropivacaine, Epinephrine, Clonidine, and Ketorolac ○ Oral:
        - Centrally acting analgesics -Acetaminophen
        - Anti-inflammatories: Ibuprofen, Naproxen, Celecoxib ○ Steroids
    - Neuropathic pain medications ○ Opioids- short acting (Oxycodone, Dilaudid, Tramadol) ○ Intravenous (IV):
        - Ketorolac (Toradol)
        - Morphine or Dilaudid (for breakthrough pain)

Therapeutic Exercises:

- Active, active-assisted, passive range of motion (A/AA/PROM) of involved joint in supine and sitting
- Ankle pumps (to decrease risk of DVT and help with edema reduction)
- Isometric exercises of quadriceps and gluteal muscles
- Straight Leg Raises (SLR) utilizing best quality quad control
- Closed chain exercises if patient's strength and balance permit e.g. weight shifting and sit to stand transfers

Bed Mobility/Transfers:

- Educate on safe transfers using assistive device with no pivoting on operative knee
- Promote sitting out of bed multiple times/day with assistance/device as needed

Gait Training: WBAT with appropriate assistive device safely for household distances (at least 50ft100ft) with assistance/supervision or independent as indicated

Stair Training: As indicated if discharge home with assistive device/assistance/supervision as needed **Modalities:** Cryotherapy: 3-5X/day for 15-20 minutes at a time with either an ice/cold pack or cryocuff. Do not apply ice pack or cryotherapy wrap directly to skin.

Criteria for Progression to the Next Phase:

- Involved knee flexion ROM >/=80 degrees, knee extension </=-10 degrees
- Demonstrates good quadriceps contraction and independent SLR w/ minimal quad lag
- Independent/safe bed mobility/transfers with least restrictive assistive device
- Ambulating independently at least 100 ft with least restrictive assistive device
- If patient is unable to meet these goals prior to discharge from the hospital, inpatient rehabilitation may be indicated

Phase II – Mobility Phase (day 3- week 6):

Goals:

- Increase A/AA/PROM to >/= 0-110 degrees
- Decrease inflammation/edema
- Manage pain
- Increase strength of operative extremity with focus on knee flexion and extension and proximal hip strength
- Improve gait quality and progress towards unassisted ambulation at household and community distances
- Restore functional activities

Early Phase II (day 3- week 3):

Continue Positioning:

- Nothing placed behind operative knee when supine
- Towel roll under ankle of involved extremity to promote knee extension
- Towel roll at trochanter of involved extremity to prevent hip external rotation and promote neutral alignment as needed

Therapeutic Interventions

- Targeted A/AA/PROM to involved joint
- Utilize stationary bicycle for AAROM
- Soft tissue mobilization
- Joint mobilizations including patellofemoral joint in all directions
- Scar Mobilization if well healed incision
- Gait training to wean from assistive device
- Initiate stair training
- Initiate resistance exercises as tolerated
- Initiate closed chain exercises such as step ups, leg press after good quad control
- Patient should be independent with Home Exercise Program

Modalities:

- Cryotherapy as indicated
- Compression- to control edema
- Neuromuscular Electrical Stimulation (NMES)- wean as quad control improves

Late Phase II (week 4- week 6):

Therapeutic Interventions

- Maximize ROM – both flexion and extension
- Scar Mobilization if well healed incision
- Continue stationary bicycle for AROM
- Soft tissue mobilization if indicated
- Joint mobilizations including patellofemoral joint in all directions as indicated
- Gait training to wean from assistive device- transition to full weight bearing
- Stair training
- Resistance exercises as tolerated
- Closed chain exercises such as step ups, leg press with good quad control
- Neuromuscular and balance training
- Patient should be independent with Home Exercise Program

Modalities:

- Cryotherapy as indicated
- Compression- to control edema
- NMES may be useful for residual quad weakness and poor terminal knee extension quad control

Outcome Measures:

- Timed Up and Go (TUG) Test
- Knee Osteoarthritis Outcome Score (KOOS)
- Lower Extremity Functional Scale (LEFS)

Criteria for Progression to the Next Phase:

- AROM >/= 0-110 degrees
- Minimal pain and edema
- Independent ambulation with/without the least restrictive assistive device for community distances (>/=800 ft)
- Good quadriceps control

Phase III – Intermediate Phase (weeks 7-12):

Goals:

- Improve knee AROM to >/= 0-120 degrees
- Improve overall strength of hip and knee to >/= 4/5
- Ascend and descend stairs with reciprocal pattern
- Return to work as applicable
- Return to light recreational activities

Therapeutic Interventions:

- As quad control normalizes discontinue use of NMES if not already weaned off NMES
- Progress closed chain exercises, adding resistance, weights, or full weight bearing in single-leg stance on operative limb
- Assess and address hip and trunk strength and motor control as indicated
- Step-ups and side step-up
- Higher level closed chain exercises such as squats, lunges, leg press
- Initiate or progress balance and proprioceptive exercise.
- Endurance training, walking/biking/pool

Criteria for Progression to the Next Phase:

- ROM >/=120 degrees
- Strength >/=4/5 throughout LE
- Able to navigate stairs with reciprocal pattern
- Ambulating all surface levels (indoors/outdoors) with minimal to no gait deviations with or without an assistive device

Phase IV – Return to Activity Phase (weeks 12-20):

Goals

- Return to appropriate recreational activities
- Improve strength, balance, ROM, and endurance for all ADLs and recreational activities

Therapeutic Exercises:

- Progress resistance and increase repetitions of previous exercises
- Increased distance/time/intensity of endurance training as tolerated
- Sport or activity specific training

Considerations for Return to Sport

Current recommendations to maximize longevity and success of arthroplasty encourage return to activities considered low impact, such as: swimming, golfing, walking, or stationary biking. Higher impact activities including running, football, soccer, baseball/softball, singles tennis, hockey, and basketball are generally discouraged. Patients should check with their surgeon for advice regarding specific sports. Additionally, several studies have shown that a patient's level of prior experience with a recreational activity is an important consideration when recommending return to physically demanding tasks such as cross-country skiing, hiking, road biking or doubles tennis.

Criteria for Discharge from Skilled Therapy:

- Pain free AROM of operative knee
- MMT strength >/= 4+/5 knee flex/extension
- Return to recreational activities as directed by patient's goals
- Non-antalgic gait without device
- Reciprocal stair management
- Demonstrates good balance
- Independent with home exercise program, including ongoing quadriceps/hip strengthening

Adapted courtesy of Brigham and Women's Hospital, Boston, MA.