
POST TOTAL KNEE ARTHROPLASTY & GAIT TRAINING

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ABOUT ME

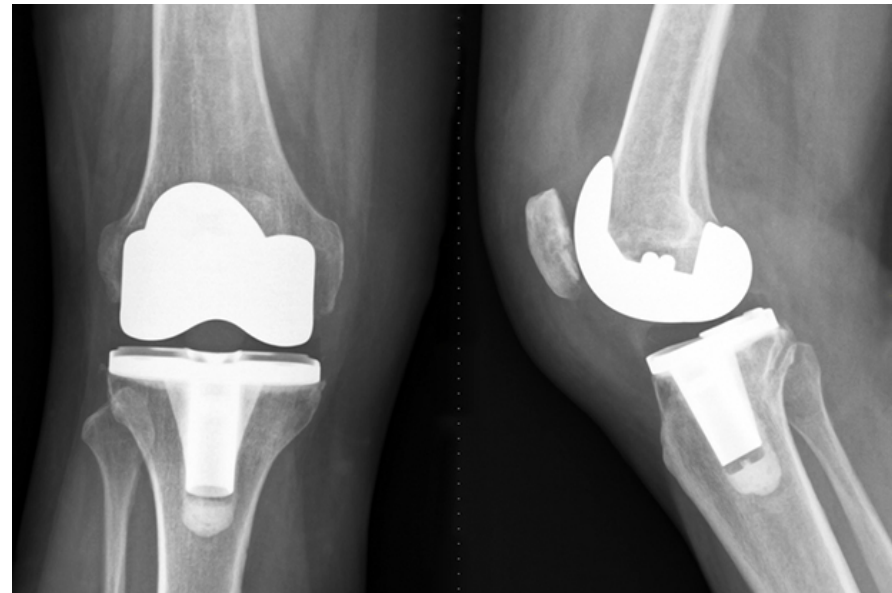
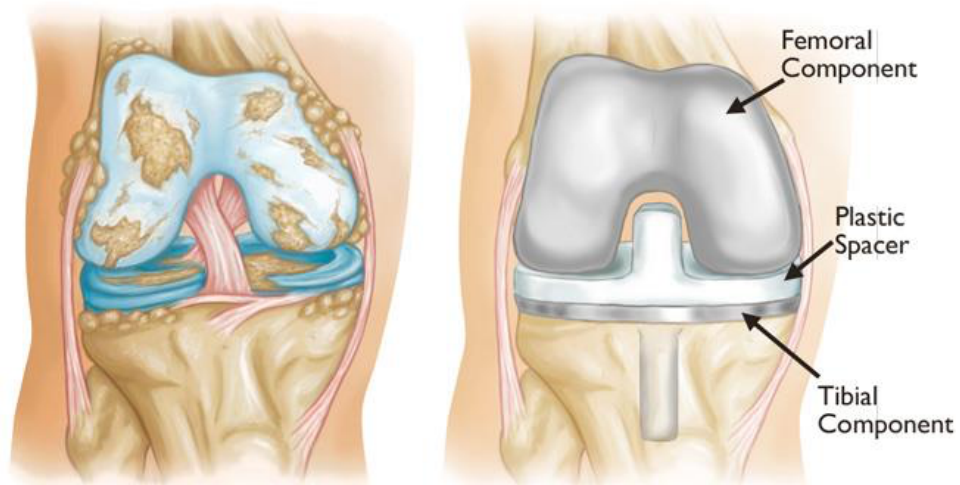
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- Hometown: Charlotte, NC
- Undergrad: UNC (go heels!)
- Interests: ortho, acute trauma floor
- Fun Fact: ask me about APTA Capitol Day!

OBJECTIVES

- Review common gait impairments following total knee arthroplasty
- Discuss intervention strategies to implement post TKA

TOTAL KNEE ARTHROPLASTY,

- Replacement of articular surfaces of femoral condyle and tibial plateau with metal and plastic
 - May also resurface or replace patella



THINGS YOUR PATIENT MAY HAVE_{2,3}

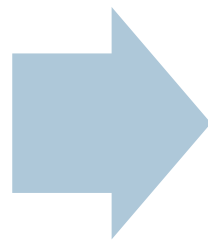
- ON-Q pain relief system
 - Continual local anesthetic to surgical site for ~3 days
 - Bridges the gap between anesthesia and oral pain meds
- Continuous Passive Machine (CPM)
 - Set degrees and speed
- Ice machine: circulation of cold water through pad wrapped around surgical knee
 - Use frozen water bottles (not ice)
 - Thin layer of skin protection – check skin



TYPICAL GAIT DEFICITS₄

Impairments

- Pain
- Decreased knee ROM
- Decreased balance
- Muscle weakness



Gait Deficits

- Decreased gait speed
- Decreased stride length
- Decrease stance time
- Other compensations (vaulting, circumduction)

ADDRESS IMPAIRMENTS

Should address impairments that are leading to deficits with dynamic movement

- Knee ROM
- Manual therapy
- Therapeutic Exercise
- Neuromuscular Re-education
- Balance
- Modalities
- Assistive device

CPG RECOMMENDATION: RANGE OF MOTION₅

It is the consensus of the work group that physical therapists should engage and teach patients to implement passive, active assistive, and active ROM exercises for the involved knee following TKA.

Evidence Quality: Insufficient; Recommendation Strength: Best Practice.

RANGE OF MOTION₅

- Range of motion is considered a standard of care so no studies have explored patient outcomes with ROM vs no ROM
- Likely would not be approved in any trial
- Should complement other interventions
- Protocols often include ROM requirements
 - Typically 0-110° by 6 weeks



LAB PRACTICE: RANGE OF MOTION

Passive ROM

Supine: flexion & extension

Seated: flexion & extension

Active Assisted ROM

Seated: flexion & extension

On step: flexion

Active ROM

Ensure full quad activation!!

Supine: flexion & extension

Standing: flexion & extension

Bike through partial ROM

-Demonstrate it to the patient!

MANUAL INTERVENTIONS: LAB PRACTICE_{6,7}

Pain, function, and patient satisfaction improved in exercise + manual group when compared to just exercise

- Knee effusion massage
- Knee extension mob
- Cross friction
- STM
- Patellofemoral glides
 - Superior/inferior, medial/lateral
- Tibiofemoral glides
 - Anterior and posterior

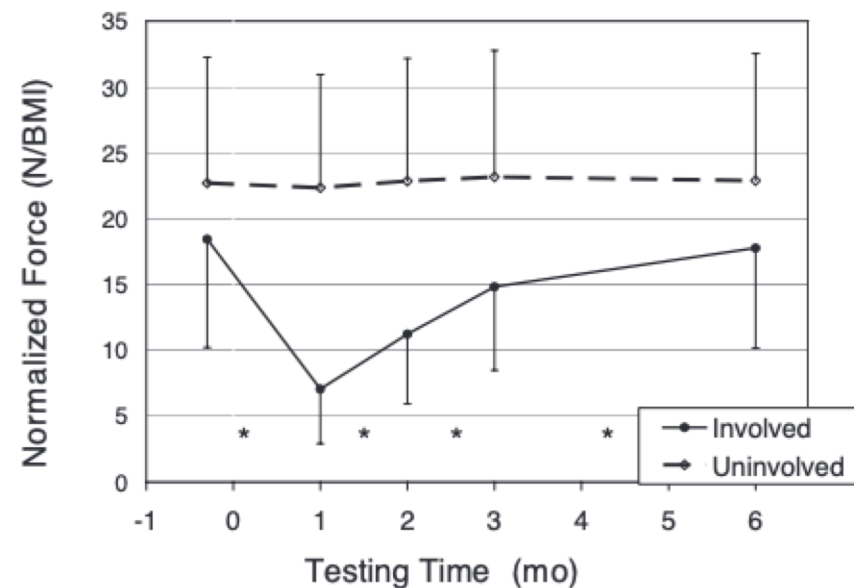
CPG RECOMMENDATION: THERAPEUTIC EXERCISE₅

Physical therapists should design, implement, teach, and progress patients who have undergone TKA in high-intensity strength training and exercise programs during the early postacute period (ie, within 7 days after surgery) to improve function, strength, and ROM.

Evidence Quality: High; Recommendation Strength: Moderate.

THERAPEUTIC EXERCISE_{8,9,10}

- Prolonged quad weakness
 - Immediate post-op: 60% decrease in quad strength
 - 6-12 months post-op: gradual increase in strength comparable to pre-op strength but still significantly weaker than age-matched peers
 - Involved quad strength less than uninvolved strength pre-op and 6 months post-op
- Higher correlation between functional performance and quad strength (compared to knee flexion ROM and bodily pain)
- Consider patient population!



THERAPEUTIC EXERCISE (CONTINUED)

Progressive resistance through modification of reps, sets, load, time under tension, exercise

- SAQ and LAQ
- Standing TKE with band
- Forward and lateral step ups
- Sit to stand → squat
- Stagger stance sit to stand (surgical leg back)
- Partial lunge
- Don't forget hip abductor strength

CPG RECOMMENDATION: NEUROMUSCULAR RE-ED & BALANCE₅

Physical therapists should include motor function training (eg, balance, walking, movement symmetry) for patients who have undergone TKA.

Evidence Quality: High; Recommendation Strength: Strong

NEUROMUSCULAR RE-EDUCATION₁₁

“Rehabilitation should integrate strength and neuromuscular control retraining”

- Greater surgical limb quad and hamstring co-activation pre-op
- Greater bilateral limb quad and hamstring co-activation 1 month post-op
- Quad contraction prolonged during stance phase pre-op and 1 month post-op

BALANCE_{12, 13}

- >40% of patients with knee OA report fall within the year
 - 64% of these patients are female
- SLS duration improved 60% (compared to pre-op) but still 67% less than age-matched controls
- 6 month: dynamic balance improved (compared to pre-op) but still 32% less success rate compared to age-matched controls
 - Tasks included: stepping down, lateral steps, obstacle crossing
- Functional training vs. functional training + balance in pilot study
 - Appeared to show greater improvement of **gait speed, SLS time, and stiffness** at 6 months

BALANCE/NEUROMUSCULAR RE-ED EXERCISES

Static

- Stand on dynamic surface
 - With and without perturbations
 - Surface: towel, mat, wobble board, foam
 - One or both feet on dynamic surface
- Feet together → semi-tandem → tandem → SLS
 - Eyes open and closed

Dynamic

- Wobble board + forward and backward taps, side to side taps
- Walking with changing directions, stopping/starting
- Rotate trunk while sitting/standing
- Side stepping → carioca
- Shuttle walking
- Step over cone/hurdle
- Walking backwards (treadmill, with or without band with handles)

CPG RECOMMENDATION: CRYOTHERAPY₅

CPG: Physical therapists should teach and encourage use of cryotherapy for early postoperative pain management for patients who have undergone TKA.

Evidence Quality: High; Recommendation Strength: Moderate.

MODALITIES – ICE₅

- Large amounts of research support cryotherapy for pain management
- Limited evidence on parameters of use

- Benefits:

- Pain management
- Low cost
- Relatively easy application



- Risk/Cost:

- No difference in adverse events between cryotherapy and control
- Skin irritation, burn, frostbite (only if not properly educated and monitored)

CPG RECOMMENDATION: NMES₅

CPG: Physical therapists should use NMES for patients who have undergone TKA to improve quadriceps strength, gait performance, performance-based outcomes, and patient-reported outcomes.

Evidence Quality: High; Recommendation Strength: Moderate.:

MODALITIES – NMES₅

- Improved outcomes seen with...
 - Earlier NMES (day 2 post op)
 - More frequent NMES (5-7 times per day)
 - Longer cumulative time at max intensity
- Likely best for patients with quad activation deficits
- Use for at least 3 weeks
- No recommendations for parameters



MODALITIES – NMES CONTINUED₅

- Benefits:
 - Improvement in quad and hamstring max voluntary isometric contraction from 2 to 52 weeks
 - Improved gait
 - Improved stair walking performance
 - Patient-reported outcomes
- Risks/Costs:
 - Pain/discomfort for patient
 - Availability to patients
 - Feasibility

ASSISTIVE DEVICE₁₄

- Consider pre-operative assistive device use
- Progression from walker to cane to no AD
 - Usually discontinued between 1-4 weeks
- Encourage continued AD use in the community while decreasing use of AD in household


LAB PRACTICE

- Stepping over a cone/hurdle
- Walking backwards
- Terminal knee extension (TKE) with a band

Can you think of more intervention ideas?

DON'T FORGET...

- Patients are going to be in **a lot of pain**, especially early in POC and when wean from pain medication
 - Educate that working through some pain is normal
 - Work to 5-6/10 of pain during activities like ROM
 - Look and listen for verbal and non-verbal signs of pain (grimacing, wincing, “oof”, etc.)
 - Be gentle with pt’s leg while transitioning during manual (builds trusts)

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- Personalize treatment to the patient's goals
 - Does pt want to run a 5k or be able to play with their grandchildren?
 - Look for signs of complication such as infection!!
 - Infection can significantly lengthen timeline of recovery, requires multiple surgeries, multiple and increased length of PT plan of care, and likely grievance of patient
 - Contact surgeon if you have a concern!!

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