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Improving the quality of rehabilitation of post-operative total knee arthroplasty patients: Clinical audit study

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Abstract
Total knee arthroplasty (TKA) is among the most common elective procedures performed worldwide. Recent efforts have been made to significantly improve patient outcomes, specifically with postoperative rehabilitation. Despite the many rehabilitation modalities available, the optimal rehabilitation strategy has yet to be determined. Therefore, this systematic review focuses on evaluating existing postoperative rehabilitation protocols. Specifically, this review analyses the study designs, rehabilitation methods, and outcome measures of postoperative rehabilitation protocols for TKA recipients during the period of 2 years.

Keywords: Total knee plasty, physiotherapy, arthroplasty, post-operative rehabilitation

Introduction
One of the elective procedures that is performed the most commonly worldwide is total knee arthroplasty (TKA). Postoperative rehabilitation has been the focus of recent attempts in an effort to significantly improve patient outcomes. Although there are many different rehabilitation strategies available, the perfect recovery strategy has not yet been found. Therefore, the primary goal of this systematic study is to evaluate current postoperative rehabilitation techniques. This review primarily looks at the two-year postoperative rehabilitation regimens for TKA recipients' study designs, rehabilitation methods, and outcome indicators.
Most rehabilitation methods focus on enhancing quadriceps power and range of motion (ROM). These regimens also aim to support ADL and more difficult exercise performance (activities of daily living). For the best results, exercises that improve muscle strength, gait, and balance are especially targeted. Numerous postoperative treatments have been studied recently. These techniques include telerehabilitation, continuous passive motion, high-velocity contractions, and rapid rehabilitation.

Material and Methods
This study comprised 30 complete knee transplant patients who visited the OPD in an emergency or for follow-up. Post-operative patient rehabilitation was examined and noted. Based on gait, SLR, daily activities, static quads, and dynamic quads, all patients are classified into 4 phases.
Physical therapy interventions include four main phases, each with a different purpose. The following step is progressed depending on clinical criteria and/or time frames, if necessary. The amount of time it takes to fully recover from this treatment varies a lot. The average estimate is that it will take the patient at least 4-6 months to feel entirely back to their pre-injury level of activity. Some cases could require up to 9 to 12 months for a full recovery.

Phase I-Immediate Post Surgical Phase (Day 0-3)
Physical therapy procedures are designed to increase range of motion, lessen edoema, and maximise patient mobility with the ultimate goal of functional independence in the affected lower extremity.

Finding other sensomotor or systemic issues that may limit a patient's ability to recover is the aim of physical therapy therapies.

Goals

The patient will

1. Quads, both static and dynamic
2. Independently carry out the Straight Leg Raise (SLR) exercise for the operated extremity.
3. Express verbally your knowledge of the post-operative activity guidelines and precautions, such as the need to position the lower extremity correctly, maintain range of motion, and perform strengthening exercises.
4. Patients will also receive instruction on how to massage their knees lightly to reduce postoperative hypersensitivity.

Observation and Assessment

- Keep an eye out for any deep vein thrombosis (DVT) symptoms, such as swelling that has increased, erthymia, or calf pain.
- Talk to the nurse if there is a lot of drainage or blistering or brittle skin around the knee joint or lower extremities to determine whether alerting the surgical team is necessary.
- Use a visual analogue scale to measure patients' pain. Make sure patients are given oral or IV pain medicine 30 to 60 minutes before therapy. Following physical therapy, cryotherapy is advised to lessen knee joint pain, discomfort, and swelling.

Therapeutic exercise and functional mobility

- Exercises that are active, aided, and passive (A/AA/PROM) (seated and supine).
- Massage of soft tissues.
- Isometric exercises for the glutes, hamstrings, and quads.
- Raises with a straight leg (SLR)
- Lower extremity strengthening and range of motion (ROM) as recommended by evaluation findings.
- Exercises using closed chains (if patient demonstrates good pain control, muscle strength and balance). Exercises that include close chains should be carried out while taking the proper WB safety precautions and supporting both upper extremities on either side.
- Practice your gait on stairs and flat terrain.
- Training in transfer.

Precautions

- Weight bearing as tolerated (WBAT) with an assistive device up to full weight bearing (unless the surgeon specifies otherwise).
- Keep an eye on how the wound is healing and consult the referring doctor if there are any indications of heavy bleeding or poor incision integrity.
- Keep an eye out for symptoms of pulmonary embolism (PE), DVT, and/or peripheral nerve damage. Inform the MD right away in these situations.
- No resistance or weight-training exercises.
- Refrain from applying torque or twisting forces to the knee, especially when standing on the affected leg.

Positioning

- To keep the hips rotating in a neutral position and encourage knee extension, a trochanter roll should be applied as needed.
- When patients are supine in bed, a towel roll should be positioned at the ankle to encourage knee extension.
- In order to encourage maximum knee extension and prevent knee flexion contracture, nothing should be put behind the surgical knee.

Criteria for progression to the next phase

- Capability to raise one's leg straight or display quadriceps contraction (SLR)
- Capability to raise one's leg straight or display quadriceps contraction (SLR)
- Minimal pain and inflammation;
- Independent transfers and ambulation of at least 100 feet with the use of the proper assistive equipment.

Phase II: Motion Phase (Day 3 - Week 6)

Goals

- Boost quads, both static and dynamic
- Strengthening of all the muscles in the affected extremity, with a focus on the extensor and flexor muscles of the knee.
- Any weakness in the operating extremity, as well as any generalised weakness in the upper extremities, trunk, or contralateral lower extremity, should also be taken into consideration.
- Proprioceptive training to enhance the operative extremity's body/spatial awareness during functional tasks.
- Training for endurance to improve cardiovascular health.
- Functional training to encourage autonomy in daily life tasks and mobility
- Gait training: When the patient exhibits sufficient lower extremity strength and balance during functional activities, assistive devices are removed (usually 1-4 weeks)
- Reduce swelling and inflammation
- Resuming normal activities

Therapeutic Exercises

Weeks 1-4

- Quads, both static and dynamic
- When using a stationary bicycle for ROM, start with partial rotations and increase the speed as tolerated (no resistance).
- Keep doing isometric workouts for your glutes, hamstrings, and quads.
- SLR in four planes, seated Long Arc Quad, and supine heel slides (flexion, abduction, adduction, extension)
- Quadruple neuromuscular electrical stimulation (NMES) if there is insufficient quadruple contraction. The NMES parameters will be chosen based on the activity/exercise aim. For more information, see the procedural standard of care for neuromuscular electrical stimulation.)
- Gait training to enhance the performance of the concerned limbs during the swing through and stance phase. At the latest by the end of the second week following surgery, patients are advised to wean off their assistive device.

Weeks 4-6

- Continue the previous workouts.
- Keep performing NMES on the quads if there is inadequate muscle function. The use of NMES might advance from isometric quad activity to isotonic and functional activity.

- Step up and down in the front and sides.
- 1/4 lunge in front.
- Use chair and sit-to-stand exercises to improve knee flexion while performing functional duties.
- Keep using the ergometer for ROM.

Modalities
- Cryotherapy 1-3x/day for swelling and pain management.
- Other modalities at the discretion of the therapist based on clinical findings

Precautions
- WBAT with an aid when necessary to reduce compensatory gait
- Keep an eye on how the wound is healing and consult the referring doctor if there are any indications of an infection.
- Keep an eye out for a rise in edema and continue cryotherapy as necessary.

Criteria for progression to the next phase
- AROM 0-110'
- Independent ambulation community distances (>/= 800 feet), without assistive device, deviations or antalgia
- Minimal pain and inflammation

Phase III: Intermediate phase (week 7-12)
Goals
- Increase ROM after surgery (0-115 degrees plus)
- A patella with good femoral mobility.
- The muscles in all lower extremities are strong.
- Start mild recreational activities and resume your most necessary activities (i.e. walking, pool program)

Therapeutic Exercises
- Keep performing the workouts from Phase II while increasing the resistance and repetitions. It is advised to evaluate hip/knee and trunk stability at this time and offer patients open/closed chain exercises that are suitable for their particular needs.
- Continue mobilising the tibial and patellar femoral joints as necessary.
- Start an endurance programme by walking or swimming.
- Begin and advance age-appropriate proprioception and balance exercises.
- Stop using NMES for quads when there is appropriate quad activity.

Criteria for progression to next phase
- AROM that is pain-free or AROM that has plateaued based on preoperative ROM status.
- Based on MMT of all lower extremity musculature, 4+/5 muscular performance.
- Little to no discomfort or swelling.

Phase IV: Advanced strengthening and higher-level function stage (week 12-16)
Goals
- Return to appropriate recreational sports/activities as indicated
- Enhance strength, endurance and proprioception as needed for activities of daily living and recreational activities

Therapeutic Exercises
- Keep performing the preceding exercises while increasing the resistance and repetitions.
- Longer duration of endurance exercises.
- Start a regimen of progressive walking or biking, doubles tennis, golf, or any specified recreational activity.

Criteria for Discharge: (These are general guidelines as patients may progress differently depending on previous level of function and individual goals.)
- Pain-free AROM
- Independent, non-antalgic gait
- Independent step-over-step stair ascending
- All lower extremity muscles must perform at least 4+/5 on the MMT scale.
- Normal, age-appropriate proprioception and balance.
- The patient can exercise independently at home.

Result
During the audit cycle, 30 post-operative Total Knee Arthroplasty performed in JULY 2020 to 2022, were prospectively reviewed against the guidelines for the rehabilitation set by the Brigham and women's hospital, Harvard medical school, Massachusetts; in 4 phases
- **Phase 1 (day 0-3):** Immediate post-surgical
- **Phase 2 (day 3-week 6):** Motion phase
- **Phase 3 (week 7 - 12):** Intermediate phase
- **Phase 4 (week:12-16):** At the advanced strengthening and higher-level function stage, there was good compliance with regard to pre-operative and post-operative active/active assisted/passive exercises, patella femoral and tibial femoral joint mobilisation and soft tissue mobilisation, soft tissue massage, SLR, isometric quadriceps, hamstring and gluteal exercises, closed chain exercise, gait training, and transfer training. Some regulations were created by the Brigham and Women's Hospital at Harvard Medical School in Massachusetts and have since been audited. These topics included infection, superficial wound care, and post-operative cryotherapy techniques. Following the implementation of corrective procedures, it was found that all TKR patients had improved endurance, active range of motion, SLR, and progressive walking up to 20 minutes pain-free. Even without assistance, the physiotherapy patient started moving actively.

Discussion
This physical therapy programme serves as a road map for the patient's post-operative recovery following a total knee replacement (TKA). When deciding how a patient's postoperative course should develop in light of their physical exam and results, personal development, and/or the presence of postoperative difficulties, it is not intended to replace professional judgement. If a physician needs help with a post-operative patient's care strategy, they should consult the referring surgeon.

This physical therapy protocol applies to primary total knee arthroplasty. In a revision total knee arthroplasty, or in cases where there is more connective tissue involvement, Phase I and II should be progressed with more caution to ensure adequate healing.

In 2015, YUKI HIRAGA investigated the impact of post-surgical rehabilitation utilising an activity diary on pain, physical performance, and psychological aspects following TKA. She came to the conclusion that the rehabilitation intervention using an activity diary may be effective for TKA patients in terms of enhancing pain catastrophizing and pain self-efficacy; however, in our study, we are more focused on physical physiotherapy, which helps patients with their range of motion and perform daily activities.

Preoperative physiotherapy had a considerable impact on patients receiving TKR, according to a 2017 study by Rebecca Moyer, however in our investigations, we concentrated more on postoperative physiotherapy.

The study published in Journal of knee surgery in 2019 placed a greater emphasis on telerehabilitation during the post-operative phase in patients with TKR, but our study indicated that professional therapy had more significant results than telerehabilitation.

Conclusion

For example, a pictorial physiotherapy chart was installed in the orthopaedic ward and physiotherapy department with a set timeline for proper rehabilitation and implementation, along with training orientation sessions for postgraduate resident doctors, physiotherapists, and nurses, for the reasons that some components in our audit from June 2020 to June 2022 deviated from the established protocols. 95 percent of post-operative TKR patients recovered, with only a few exceptions due to physiotherapy's unintentional misbehaviour following hospitalisation.

Conflict of Interest

Not available

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References

1. Castrodad IM, Recai TM, Abraham MM, Etcheson JI, Mohamed NS, Edalatpour A, Delanois RE. Rehabilitation protocols following total knee arthroplasty: a review of study designs and outcome measures. Annals of translational medicine; c2019 Oct, 7(Suppl 7).
2. Feng JE, Novikov D, Anoushiravani AA, Schwarzkopf R. Total knee arthroplasty: improving outcomes with a multidisciplinary approach. Journal of Multidisciplinary Healthcare. 2018 Jan 25:63-73.
3. Gleicher Y, Siddiqui N, Mazda Y, Matelski J, Backstein DJ, Wolfstadt JI. Reducing acute hospitalization length of stay after total knee arthroplasty: a quality improvement study. The Journal of Arthroplasty. 2021 Mar 1;36(3):837-44.
4. McGinley A. Factors affecting length of stay following total knee replacement: a clinical practice audit. Journal of Orthopaedic Nursing. 2008 Nov 1;12(3-4):171-8.
5. Tedesco D, Gori D, Desai KR, Asch S, Carroll IR, Curtin C, *et al*. Drug-free interventions to reduce pain or opioid consumption after total knee arthroplasty: a systematic review and meta-analysis. JAMA surgery. 2017 Oct 1;152(10):e172872.

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