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THE ROLE OF KINEMATIC CHAIN EXERCISES IN REHABILITATION AFTER ROBOTIC TOTAL KNEE REPLACEMENT

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Introduction:
Total Knee Replacement (TKR) is widely performed to alleviate pain and restore function in advanced knee osteoarthritis. Robotic-assisted TKR enhances surgical precision, implant alignment, and patient satisfaction. Kinematic chain exercises — Open Kinematic Chain (OKC) and Closed Kinematic Chain (CKC) — have shown promise in improving functional mobility, pain reduction, and joint control. While both are well-studied in conventional TKR, evidence specific to robotic TKR rehabilitation is limited.

Objective:
To review existing literature on the effectiveness of open and closed kinematic chain exercises in the postoperative rehabilitation of patients undergoing robotic TKR.

Methods:
A narrative review was conducted, searching PubMed, ScienceDirect, and Google Scholar (2010–2024) using keywords such as 'robotic TKR', 'kinematic chain exercises', 'open kinetic chain', 'closed kinetic chain', and 'physiotherapy post knee arthroplasty' including studies on kinematic chain exercises in TKR, research including or referencing robotic-assisted TKR, and clinical trials, reviews, and expert opinion articles.

Results:
OKC exercises (e.g., straight leg raises, knee extensions) effectively improve isolated quadriceps strength, especially beneficial in early postoperative stages when weight-bearing is limited. CKC exercises (e.g., mini squats, sit-to-stand, step-ups) enhance joint stability, proprioception, and functional patterns, proving more beneficial in mid-to-late recovery. Robotic TKR-specific evidence suggests precision surgery allows earlier mobilization and tolerance to kinematic chain exercises.
Combined protocols using early-phase OKC followed by progressive CKC yield optimal recovery outcomes.

Conclusion:
Kinematic chain exercises are essential in robotic TKR rehabilitation. Early OKC aids safe quadriceps activation, while CKC in later stages supports functional recovery. Robotic TKR may permit earlier progression, but standardized, evidence-based rehabilitation protocols tailored to robotic cases are needed.

Keywords: Robotic Total Knee Replacement, Kinematic Chain Exercises, Open Kinetic Chain, Closed Kinetic Chain, Physiotherapy.