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TRENDS IN PHYSIOTHERAPY INTERVENTIONS FOR TREATING ANTERIOR CRUCIATE INJURY: A LITERATURE REVIEW

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ABSTRACT

In the event of an ACL ligament injury to the knee, physiotherapy is crucial. Rehabilitating patients as soon as the inflammation has decreased is crucial. This qualitative study investigated how physiotherapists managed ACL injuries from the time of the injury until they were able to resume their leisure or vocational activities. Although the therapy of ACL injuries, both conservative and surgical, was covered, the primary findings of this study were related to referral and postoperative rehabilitation.

Key words: *Ligament injury, Rehabilitation, Post operative management, Physiotherapy.*

INTRODUCTION

Ruptures of the anterior cruciate ligament (ACL) are now rather prevalent and typically result from sports-related trauma. As more individuals participate in sports, there is a trend for this injury to occur more frequently. Physiotherapy has a critical part in three timing stages of this ailment. The first phase begins prior to the injury and includes the tactics we are using to prevent a possible ACL tear [1, 2]. The second phase involves determining whether to treat the patient surgically or conservatively following the injury. Following ACL repair surgery, the rehabilitation program constitutes the third step. The physiotherapist is the patient's primary care provider during each of these phases.[3, 4, 5.]

Anatomy and Biomechanics

The femur and tibia bones are joined by the knee, which is a hinge joint. It is supported by many vital ligaments. The Anterior Cruciate Ligament (ACL) is the most crucial ligament for the stability of the knee. The ACL connects the rear of the femur to the front of the tibia[6, 7]. This ligament's function is to prevent the tibia from rotating on the femur and slipping forward. Because of this, the ACL is most vulnerable to damage when the knee is subjected to twisting or rotating pressures. While this can happen in a contact situation, athletes cutting, braking, or landing from a jump account for over 70% of ACL tears in non-contact events. It is harder to sustain a high level of exercise without the knee bowing or giving way after an ACL tear because the knee is less stable. The repeated cutting and turning that is needed in many sports is very challenging.[8, 9, 10].

Pre-operative Rehabilitation

Improved results from anterior cruciate ligament (ACL) reconstruction surgery require prior rehabilitation. After an ACL injury, your knee has deficiencies in strength, proprioception (the capacity to maintain balance), muscle timing, and gait (walking patterns). Before having ACL reconstructive surgery, physical therapy can help with strength and balance, which can lessen "giving way" episodes and the risk of re-injury in a knee with an ACL deficit. Pre-operative rehabilitation aims to strengthen muscles that are crucial for post-operative rehabilitation, acquire optimal neuromuscular control, restore complete range of motion, and provide an

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understanding of the activities that need to be done following surgery. These variables significantly impact the likelihood of surgery.[11, 12, 23, 14].

Post-operative Rehabilitation

Your surgeon and physiotherapists will lead you through an extensive post-operative rehabilitation program designed to maximize your recuperation and make it easier for you to resume your sport or other hobbies.

Phase 1: Immediate Post-op (0-2 weeks post surgery):-

Goals:	Preserve the graft; • reduce discomfort and swelling; • restore patellar mobility; • restore complete extension; and progressively increase flexion • Reduce the inhibition of Arthrogenic muscles, restore quad control, and achieve complete active extension. • Education of patients o When you sit or lie down, keep your knee straight and raised. When making transfers (i.e., sitting to laying down), support your surgical side and avoid resting with a towel under your knee. Additionally, avoid pivoting on your surgical side.
Weight Bearing	Walking with crutches at first, brace locked; if discomfort does not worsen, walking without crutches can begin. o Until the doctor instructs differently, allograft and hamstring autograft patients maintain partial weight bearing with crutches for six weeks. • May remove brace after 6 weeks per MD and when sufficient quad control is attained; may unlock brace once able to do straight leg lift without lag; Make sure you are leading with the non-surgical side when ascending the stairs.
Intervention	Swelling Management • Ice, compression, elevation (check with MD re: cold therapy) • Retrograde massage • Ankle pumps Range of motion/Mobility • Patellar mobilizations: superior/inferior and medial/lateral

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	Patellar mobilizations are heavily emphasized in the early post-operative phase following patella tendon autograft • Low-intensity, prolonged extension exercises: prone hang, heel prop; • Seated aided knee flexion extension and heel slides with towel • Supine active hamstring stretch and supine passive hamstring stretch • Standing gastronemius and soleus stretches bolstering • Quad sets; • Calf raises; • High intensity NMES (2500 Hz, 75 bursts) supine knee extension for 10 seconds/50 seconds, 10 contractions, twice a week during sessions; use of a clinical stimulator during sessions; take into consideration the distribution of home units right after surgery • Straight leg raise: If you have a knee extension lag, avoid performing straight leg raises. • Abduction of the hip • Multi-angle isometric knee extension at 90 and 60 degrees
Criteria to progress	• Quad contraction with greater patella glide and complete active range of motion extension • Able to perform straight leg raise without lag

Phase 2- Intermediate Post-Op (3-5 weeks after surgery)

Goals.	•Preserve graft integrity; •Preserve complete extension; restore complete flexion (contralateral side); • Normalize gait
Intervention Continue with Phase-1 Interventions.	Flexibility and Mobility The stationary bike All muscle groups should be gently stretched: the prone quad stretch, the standing quad stretch, and the kneeling hip flexor stretch bolstering Step-ups and step-ups with marching; ball squats, wall slides, and mini squats from 0 to 60 degrees; partial squat workout • Bridges and unilateral bridges, side-lying hip external rotation clamshells, bridges on physio balls, bridges on physio balls with

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	roll-ins, alternating bridges on physio balls, and hip hikes are exercises that strengthen the lower back and muscles. Proprioception and balance • Standing on one leg with the knee slightly bent • Lateral step-overs from level to uneven surface and from static to dynamic • Joint retraining for positions
Criteria to progress	The Modified Stroke Test results show that there is no swelling. • Flexion ROM within 10 deg contra lateral side • The opposite side's range of motion for extension

Phase 3- Late Post-Op (6-8 weeks after surgery):

Goals	Maintaining complete ROM, protecting the graft site, and safely advancing strengthening • Encourage appropriate gait patterns Avoid activities that cause discomfort at the location of the graft donor. • Steer clear of post-exercise soreness or edema.
Intervention (Continue with Phase I-II Interventions)	Range of motion/mobility; aerobic; elliptical, stair climber, flutter kick swimming, pool jogging; rotational tibial mobilizations if ROM is limited. bolstering • Exercise equipment includes a leg press machine, a sitting calf machine, a hip abductor and adductor machine, a hip extension machine, a roman chair, and a hamstring curl machine. Resisted hamstring strengthening can commence with hamstring autograft at 12 weeks. * Increase training intensity (strength) and length (endurance). * The following exercises concentrate on appropriate control with emphasis on lateral lunges, Romanian deadlifts, squats to chairs, and strong proximal stability • Single-leg progression exercises include step-ups and step-ups with marching, slide

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	board lunges (retro and lateral), step-downs, single-leg squats, and single-leg wall slides. For further exercises and descriptions, see • Knee Exercises. Proprioception and balance • Advance single-limb balance, incorporating training for perturbations.
Criteria to progress	• Normal gait; • No post-exercise swelling or soreness; • Range of motion equivalent to contralateral side • Symmetric joint position sense (error margin of less than 5 degrees) • Quadriceps index ≥80%; ideally, the HHD mean (if obtainable through isokinetic testing).

Phase 4 - Transitional (9-12 weeks after surgery)

Goals	Maintaining complete range of motion, safely increasing strength, and encouraging appropriate movement patterns Avoid activities that cause discomfort at the location of the graft donor. • Steer clear of post-exercise soreness or edema.
Intervention (Continue with Phase I- III interventions)	• Start sagittal plane submax sport-specific training. • Advance bilateral PWB plyometrics to FWB plyometrics.
Criteria to progress	• Maintain quad strength • Complete 10 repetitions of the single-leg squat with perfect form to at least 60 degrees of knee flexion • No periods of instability Drop vertical leap with good control; >70% on the KOOS-sports questionnaire; >80% on the quadriceps index; optimal HHD mean (if available) for functional assessment. o Hamstring, glut medius, glut max index ≥80%; ideally, the HHD mean (if available, isokinetic testing for HS). o The single leg jump test was 75% more successful than the contralateral side (earliest 12 weeks). • Testing for return to sports

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Phase 5 - Early return to sport (3-5 months after surgery)

Goals	• Progress strengthening safely • Encourage appropriate movement patterns • Safely start a training program tailored to your sport Avoid activities that cause discomfort at the location of the graft donor. • Steer clear of post-exercise soreness or edema.
Intervention (Continue with Phase II- IV interventions)	• Progress strengthening safely • Encourage appropriate movement patterns • Safely start a training program tailored to your sport Avoid activities that cause discomfort at the location of the graft donor. • Steer clear of post-exercise soreness or edema.
Criteria to Progress	• MD clearance and all of the milestone requirements below have been satisfied. • Full jog/run program without experiencing any discomfort or swelling • Functional evaluation o Quad/HS/glut index ≥90%; if available, HHD mean (isokinetic tests recommended) o Hamstring/quad ratio ≥70%; HHD mean recommended (if available, isokinetic testing) o KOOS-sports questionnaire >90%; hop testing ≥90% in comparison to contralateral side • Subjective Knee Evaluation by the International Knee Committee >93 • PRRS, or Psychological Readiness to Return to Sport

Phase 6 - unrestricted return to sport (6+ months after surgery

Goals	Maintain your proprioceptive and strengthening workouts. Perform symmetrically with drills tailored to your sport. Ensure a safe transition to full sport.
Intervention (Continue with Phase II- V interventions)	• Plyometrics program tailored specifically for many aircraft;

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	• Agility program tailored specifically for multiple aircraft; • Incorporate hard cutting and pivoting based on each person's objectives (~7 mo) • Full practice → Non-contact practice → Full play
Criteria to progress	• Last stage, no additional criteria 25,26,27,28.

DISCUSSION

Providing the best possible care for sports injuries is thought to need a biopsychosocial approach to medicine. The participants held the belief that an integrated approach to the treatment of ACL injuries should offer tailored care that takes into account social, psychological, and biomechanical aspects. A few participants were also aware of the patients' concerns about being able to play sports at their prior levels of performance or about going back to hard manual jobs like farming. They seemed at ease addressing psychological issues based on their professional background, employing a range of techniques like counseling, assurance, and appropriate goal-based exercise recommendations.[29, 30, 31, 32] Participants talked about a milestone-based approach to rehabilitation rather than a time-based one, even though they were aware of published standards for ACL care. They felt that allowing for customized therapy and boosting patient motivation was very crucial. By allowing for therapeutic flexibility according to each patient's unique needs, a milestone approach helps to promote motivation[33,34.] Suggestions for further study from physiotherapists: The comments from the participants made it evident that they were able to locate, evaluate, and use evidence. The best way to combine closed and open kinetic chain exercises is a topic of discussion in the literature. Returning to sports is difficult and requires taking social, psychological, and physical aspects into account. [35, 36]. Therefore, it was difficult for the physicians to interpret the study findings in these areas—which frequently had opposing findings—and apply them to clinical practice. Utilizing expert clinical commentary that summarizes, evaluates, and applies the evidence through a case study may be necessary to support evidence-based therapy in this field [37, 38, and 39]. Implications for clinical practice and future research: In order to get the greatest results, physiotherapists treating ACL injuries may choose to keep, enhance, or think about implementing a biopsychosocial and evidence-based strategy. Instead of using timeframe-based targets, a milestone approach to rehabilitation advancement seems to be more widely accepted. ACL injury care may be further improved by improving interprofessional communication to take a more team-based approach and by problem-solving to streamline the present referral procedure. It is very important to recognize and take care of psychological demands if you want to maximize the chances of getting back into sports. For the purpose of helping them comprehend and implement these strategies, physiotherapists might require further training and research. It is important to take into account studies on the psychological treatment of sports injuries and the participation of individuals living in rural areas.

CONCLUSION

We may conclude that the most crucial aspect of the patient's care and management is physiotherapy. Physiotherapy is a key component of pre- and post-ACL reconstruction care, and it has a major influence in preventing ACL injuries. The major goals are to restore muscular

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strength and proprioception as well as the entire range of motion of the knee. To prevent re-injury, these goals must be met by engaging in simple, safe workouts and avoiding knee shear pressures.

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