

Aspetar

Clinical Practice Guideline on Rehabilitation after ACLR



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The purpose of this Clinical Practice Guideline document is to describe the evidence of effectiveness for the components of rehabilitation after anterior cruciate ligament reconstruction (ACLR). This information can be then used to inform ACLR rehabilitation protocols. This guideline is intended to be used by physiotherapists managing patients after ACLR in outpatient clinics. Physicians, orthopaedic surgeons, athletic trainers, nurse practitioners, and other healthcare professionals may also benefit from this guideline. Insurance payers, governmental bodies, and health-policy decision makers may also find this guideline to be useful as an evolving standard of evidence regarding rehabilitation after ACLR. Additional key users of this guideline include researchers, since this document may highlight gaps in the literature and grey areas that require further research.

The guideline targets patients during rehabilitation after ACLR and investigates the effectiveness of the available interventions to the physiotherapist, alone or in combination (e.g., exercise, modalities, objective progression criteria).

Exercise interventions should be considered the mainstay of ACLR rehabilitation. However, there is little evidence on the dose-response relationship between volume and/or intensity of exercise and outcomes. Physical therapy modalities can be helpful as an adjunct in the early phase of rehabilitation when pain, swelling, and limitations in range of motion are present. Adding modalities in the early phase may allow earlier pain-free commencement of exercise rehabilitation. Return to running and return to training/activity are key milestones for rehabilitation after ACLR. However, there is no evidence on which progression or discharge criteria should be used.

References:

link to the original open access article:
<https://bjsm.bmj.com/content/57/9/500>

TIMING AND STRUCTURE OF REHABILITATION

RECOMMENDATIONS ON REHABILITATION AFTER ACLR

The duration of the rehabilitation

The duration of the rehabilitation protocol is individual specific and depends on the patient demonstrating their ability to safely return to their pre-injury activity level (criteria based). Accelerated timelines under the right conditions can be used without adverse events. Specific criteria should be used to progress rehabilitation, mindful of minimum time requirements for graft protection and healing.



Unsupervised exercise execution

Unsupervised exercise execution might be followed by patients after anterior cruciate ligament reconstruction who cannot afford supervised rehabilitation, have reduced access to physiotherapy, or have high motivation and are compliant to perform their rehabilitation independently. Irrespective, patients should have their programmes individually prescribed and be monitored regarding the execution of the rehabilitation protocol, and to ensure the progression without adverse events.



Pre-operative rehabilitation

Pre-operative rehabilitation might improve post-operative quadriceps strength, knee range of motion, and may decrease the time to return to sport. We recommend at least one visit to ensure that there is adequate voluntary muscle activation and no flexion contracture that may require further pre-operative visits and to educate the patient regarding the post-operative rehabilitation course.



Recommended



Not Recommended



No Recommendation

PHYSICAL THERAPY MODALITIES

-
-  **Continuous passive motion**
 -  **Cryotherapy**
 -  **Neuromuscular Electrical Stimulation**
 -  **Electromyographic biofeedback**
 -  **Low load blood flow restriction**
 -  **Whole-body vibration**
 -  **Dry-Needling**





Continuous passive motion

There is no additional benefit for pain, range of motion, or swelling in using continuous passive motion compared with active motion exercises. We recommend against using it in the rehabilitation protocol as it is time-consuming and costly.



Neuromuscular Electrical Stimulation

We recommend the use of neuromuscular electrical stimulation (NMES) in the very early phase after surgery to stimulate muscle activation or minimise the expected disuse atrophy. At the early phase, NMES might be used during functional activities to further facilitate strength gains.



Cryotherapy

Cryotherapy can be applied inexpensively, it is easy to use, has a high level of patient satisfaction, and is rarely associated with adverse events, therefore it is justified in the early phase of post-operative management after anterior cruciate ligament reconstruction. However, patients should be educated on safe ice application to avoid injury. Compressive cryotherapy, if available, might be more effective than cryotherapy alone.



Low load blood flow restriction

Low load blood flow restriction training might be used in addition to standard care in the early phase of rehabilitation to improve quadriceps and hamstring strength, particularly when patients have increased knee pain or cannot tolerate high knee joint loads. However, clinicians should be aware of the contraindications (e.g. cardiovascular disease, extensive swelling, skin irritation, etc).



Whole-body vibration

Whole-body vibration might be used as an additional intervention to improve quadriceps strength and static balance but cannot replace conventional rehabilitation. Given the additional cost, and the reported complications (pain or swelling) when using this intervention, we suggest not including this in the rehabilitation protocol.



Dry-needling

We do not recommend the use of vastus medialis trigger point dry needling in the very early rehabilitation phase due to increased risk of haemorrhage.



Recommended



Not Recommended

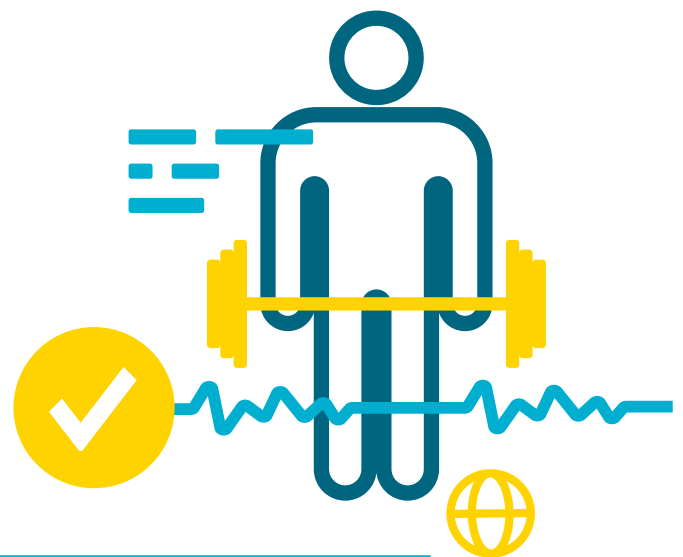


No Recommendation

EXERCISES INITIATION

CONSIDER ANY SURGICAL INSTRUCTIONS

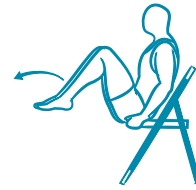
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- ✓ **Active knee motion**
 - ✓ **Early weight-bearing**
 - ✓ **Isometric quadriceps**
 - ✓ **Early eccentric quadriceps**
 - ✓ **Early leg press**
 - ✓ **Open kinetic chain**





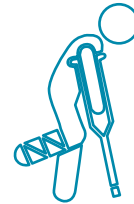
Active knee motion

Active knee motion should begin immediately after surgery, mindful of any surgical instruction. Immobilisation does not decrease pain and can lead to muscle atrophy, which slows the recovery of function.



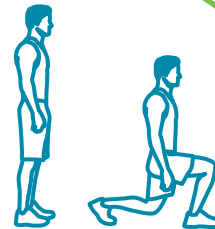
Early weight-bearing

Early weight-bearing (first week) should be done in a progressive, controlled manner, as tolerated by each patient, mindful of any surgical instructions.



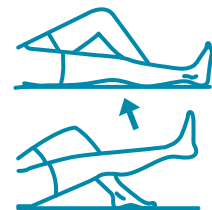
Open Kinetic Chain

Patient may start open kinetic chain exercises in limited range of motion (90° – 45° of knee flexion) from the fourth week after surgery without compromising knee stability. Clinicians and patients should monitor for anterior knee pain and adjust the knee load and the progression of strengthening accordingly.



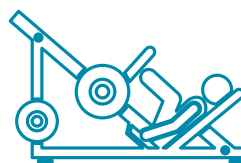
Isometric quadriceps

Isometric quadriceps exercises including static quadriceps contractions and straight leg raises might have a small effect on faster knee flexion recovery, but not on quadriceps strength. They may be prescribed during the first 2 weeks after surgery without compromising the graft integrity.



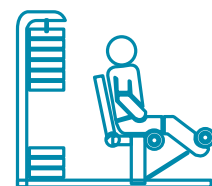
Early leg press

Leg press may be initiated as early as 3 weeks after surgery in patients with hamstring graft, using a functional pattern similar to a half squat (0° – 45°) to improve quadriceps and hamstring strength, functional activities and subjective function. Anterior knee pain should be monitored, with load progressed.



Early eccentric quadriceps

Early quadriceps eccentric strengthening, using eccentric cycle or stepper ergometer, between 20° and 60° of knee flexion, may be initiated at 3 weeks after surgery in patients with patellar tendon or hamstring autograft to improve quadriceps strength and hypertrophy without compromising graft integrity.



STRENGTH AND MOTOR CONTROL TRAINING

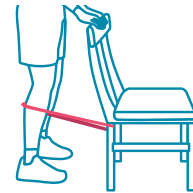
- ✓ **Plyometric and agility training**
- ✓ **Motor control training**
- ✓ **Isotonic and isokinetic training**
- ✓ **Concentric & eccentric training**
- ✓ **Open & closed kinetic chain exercises**
- ✗ **Cross-education**
- ✓ **Core stability**
- ✓ **Aquatic therapy**





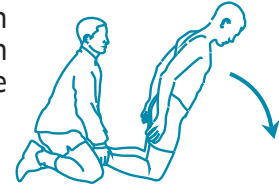
Open & closed kinetic chain exercises

A combination of closed and open kinetic chain exercise may lead to significantly better quadriceps strength and earlier return to sports, without any increase in laxity, compared with closed chain alone. Monitor for anterior knee pain during open kinetic chain exercises and adjust loading accordingly.



Concentric & eccentric training

We suggest using eccentric training in combination with concentric training to elicit improved strength and functional outcomes after anterior cruciate ligament (ACL) surgery.



Isotonic and isokinetic training

The exclusive use of isokinetic training for muscle strengthening after ACL surgery is not suggested. The combination of isotonic and isokinetic training appears to improve muscle strength more than these interventions in isolation.



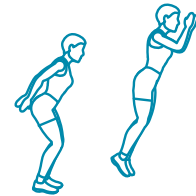
Motor control training

Motor control and strength training are both integral parts of the rehabilitation and should be combined in the rehabilitation protocol to improve outcomes.



Plyometric and agility training

Plyometric and agility training may further improve subjective function and functional activities compared with usual care, without any increase in laxity or pain.



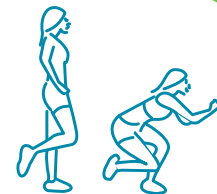
Cross-education

There are conflicting results on the effect of cross-education training programme on quadriceps strength. However, we do not suggest the implementation of an exaggerated cross- education training programme for strength gains in the injured leg. The uninvolved limb's strength should be monitored and restored to baseline/optimal levels as indicated.



Core stability

Core stability exercises might improve functional outcomes and subjective knee function and can be used as an addition to the rehabilitation protocol.



Aquatic therapy

Aquatic therapy may be used in addition to the usual care during the early phase of rehabilitation to improve subjective knee function. We recommend that it is initiated 3-4 weeks postoperative, once the wound has completely healed.



Recommended



Not Recommended



No Recommendation

RETURN TO ACTIVE

-
- ✓ **Return to driving**
 - ✓ **Return to running**
 - ✓ **Return to sport**





Return to driving

We recommend that a patient does not attempt to drive before they can safely activate the brake in a simulated emergency. Typically, this will be at approximately 4–6 weeks after right- sided ACLR and approximately 2–3 weeks after left- sided ACLR.



Return to running

Despite an absence of research findings, we feel it is warranted to suggest criteria for return to running (where running has a volume and intensity to achieve cardiovascular adaptation):



95%

knee flexion range of motion (ROM).

- 95% knee flexion range of motion (ROM).
- Full extension ROM.
- No effusion/trace of effusion.
- Limb symmetry index (LSI)>80% for quadriceps strength.
- LSI>80% eccentric impulse during countermovement jump.
- Pain-free aqua jogging and Alter-G running.
- Pain-free repeated single-leg hopping ('pogos').



Return to sport

Return to sport/completion of rehabilitation

We propose the below minimum criteria required for a professional athlete to be cleared from the clinic/hospital setting and start training with their club, whereupon they should then gradually return to full participation.



- No pain or swelling.
- Full knee ROM.
- Stable knee (pivot shift, Lachman, instrumented laxity evaluation).
- Normalised subjective knee function and psychological readiness using patient-reported outcomes (most commonly the International Knee Documentation Committee subjective knee form (IKDC), the ACL-Return to Sport after Injury scale (ACL- RSI) and Tampa Scale of Kinesiophobia).
- Isokinetic quadriceps and hamstring peak torque at 60°/s should display 100% symmetry for return to high demand pivoting sports. Restore (as a minimum) pre-operative absolute values (if available) and normative values according to the sport and level of activity.
- Counter-movement jump and drop jump >90% symmetry of jump height and concentric and eccentric impulse. Reactive strength index (height/time)>1.3 for double leg and 0.5 for single leg for field sport athletes (higher for track and field).
- Jumping biomechanics - normalise absolute and symmetry values for moments, angles, and work in vertical and horizontal jumps, especially in sagittal and frontal plane at hip, knee, and ankle.
- Running mechanics - restoration of >90% symmetry of vertical ground reaction forces and knee biomechanics during stance during high-speed running and change of direction.
- Complete a sports-specific training programme.



Recommended



Not Recommended



No Recommendation

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