Anterior Cruciate Ligament (ACL) Reconstruction

Introduction

Surgery: Medial para-patella incision in proximal tibia for graft harvest, usually four strand hamstrings or central bone-patella-bone graft (B-PT-B)
Indications for surgery: Unstable knee, return to sport
Expected length of Stay: Day case
Surgeons: Mr J Keating, Mr G Lawson, Mr T. White, Mr. F. Wade

Scope of practice

These guidelines are designed to guide physiotherapists when treating patients following this surgical procedure. These guidelines were produced by a process of systematic review of the current evidence based literature and medical and peer consultation. They were correct at the time of writing. The guidelines should be used in conjunction with the clinical reasoning skills of the physiotherapist and patients should always be treated on a case-by-case basis.

Aim

The aim of these guidelines is to provide physiotherapy staff with a series of recommendations from the current evidence base to assist them in the management of patients who have undergone Anterior Cruciate Ligament Reconstruction (ACLR).

Literature review question

What is a safe and effective rehabilitation programme following ACL reconstruction from day of surgery to return to function and sport in order to maximise outcome?

Search Process

Appraisal process: the databases below were searched between 2008 and August 2013, as previous guidelines were searched up to 2008. Medline and Cochrane databases were searched in the first instance. The titles and abstracts of all identified studies were assessed to determine whether they were pertinent to the research question. The initial searches were then carried out on the other databases and the results combined to ensure articles were not duplicated.

Total number of articles selected: 54
Total number of articles included: 15
CASPs used: 10

Databases:

Database	Dates	Limitations
Medline	2008-August 2013	English
Cochrane	2008-August 2013	English
AMED	2008-August 2013	English
SPORT Discus	2008-August 2013	English
CINAHL	2008-August 2013	English
Pedro	2008-August 2013	English
Pubmed	2008-August 2013	English
EMBASE	2008-August 2013	English

Key Words:

ACL Reconstruction OR Anterior Cruciate Ligament Reconstruction	AND/OR	
	Physiotherapy	Physical Therapy
	Rehabilitation	Post-operative
	Post-surgical	Weight bearing
	Hamstrings	Patellar Tendon
	Ice	Cryotherapy
	Bracing	Immobilisation
	Movement	Strengthening
	Exercise Therapy	Isometric
	Isotonic	Isokinetic
	Closed-chain	Open-chain
	Proprioception	Neuromuscular control
	Plyometrics	Sports-specific
	Training	Functional assessment
	Outcome	Hop testing

Results

No article answered the research question in its entirety.

3 systematic reviews examined the multi-factorial aspects of ACL rehabilitation with regards to bracing, CPM and the type and timing of exercise intervention [53,56,66].

9 articles investigated types of exercise intervention. 6 were RCTs [54,58,57,62,64,65], 1 was a cohort study [52] and 2 were based on expert opinion [59,60].

2 articles looked at functional performance testing. 1 cross sectional study assessed the effect of quadriceps strength on functional performance tests [55]. 1 cohort study looked at the relationship between functional performance tests and self-reported knee function [61].

From the articles reviewed:

- No evidence exists for the use of braces in the early post-operative phase [53,56,66]
- Further evidence exists for the safe utilisation of open kinetic chain quadriceps exercises without compromising the ACL graft [52,56,65]
- 1 article shows the benefit of early isokinetic hamstring training from 3 weeks post-operatively, but only in B-PT-B ACL reconstructions [58]
- Exercise programmes should incorporate both strengthening and neuromuscular exercises [53,54,56,57,59,60,62,63,66]
- There may be some benefit for the use of vibration training for neuromuscular benefits [54,64]
- 1 article demonstrates the relationship between quadriceps strength deficits and reduced functional performance tests/self-reported measures (IKDC & KOOS) [55]

Key Points

- Please note that timescales are approximate and rehabilitation should be guided, at each stage, by minimal swelling, resolution of pain, good muscle recruitment and no changes in ligament laxity on testing;

- The benefits of cryotherapy have been positively reviewed in the early post operative period;

- Early extension to improve range is important and safe with no adverse effects;
- Eccentric quadriceps exercises are of structural benefit to the quadriceps and other lower limb muscle groups;
- One type of exercise programme has not been shown to be more effective but it should incorporate a combination of strength and neuromuscular training;
- There is biomechanical evidence that open chain quadriceps extension exercises can be safely implemented provided that there is no swelling, pain or patellofemoral symptoms;
- The use of two functional outcome measures along with isokinetic testing is the ideal outcome assessment but isokinetic assessment alone does not reflect functional improvement;
- According to the surgeons, there is no difference in the rehabilitation programmes following hamstring graft and bone patellar bone graft procedures. They are happy for B-PT-B grafts to commence early isokinetic hamstring training from 3 weeks post-operatively [58], but not hamstring grafts.

Recommendations

Phase 1

Immediate post-op to outpatient physiotherapy appointment (usually 7 – 10 days)

Precautions: timescales are approximate and rehabilitation progress, at each stage, is guided by minimal swelling, resolution of pain, good muscle recruitment and no changes in ligament laxity on testing.

Goals	Recommendations	
Decrease inflammation	Ice 20 minutes, 2 hourly [1,2]	A1
	Compress when active	C
	Elevate when resting	C
Increase ROM	Commence active ROM exercises [3,4,29,53,59,66]	A3
	Extension/hyperextension exercises [3,30,59,60]	A3
Progress mobility	Gait re-education. Use canvas back splint only until patient re-gains quadriceps control [5,6,7,8,9,53,55,59,66] i.e. able to perform a seated leg extension with no resistance	A1
	Mobilise weight bearing as tolerated	C
Increase muscle strength	Commence static quadriceps exercises [4,59]	A1

Phase 2

10 days to 12 weeks approximately

Precautions: timescales are approximate and rehabilitation progress, at each stage, is guided by minimal swelling, resolution of pain, good muscle recruitment and no changes in ligament laxity on testing.

Goals	Recommendations	
Increase ROM	Increase ROM to achieve full hyper extension and full flexion [3,53,56,59,60]	A3
Progress strength of key lower limb muscle groups both isolated and combined	OKC quads exs may be started if the knee is stable and non-irritable [17,18,19,20, 21,35, 36, 43,44,45,46,47,48,49,50,51,52,56,59,63,65,66,68]	A3
	Hamstring strengthening [13, 14, 15,68]	A1
	Isokinetic Hamstrings strengthening in B-PT-B grafts can be gently started from 3weeks post-op [58].	A3
	Quadriceps (concentric & eccentric), calf, gluteal exs *e.g. mini squats leg press, heel raises, step ups, static bike, theraband® exs* [10,11,13,21,27,28,52,53,56,57,59,60,62,63]	A1
Increase neuromuscular control and stability	Commence stability and balance exs *e.g. trunk and pelvic stability ex, single leg balance ex, wobble board, trampette* [12,13,14,15,16,37,38,39,40,41,42,53,57,59,68]	A3

Phase 3

12 weeks to discharge

Precautions: timescales are approximate and rehabilitation progress, at each stage, is guided by minimal swelling, resolution of pain, good muscle recruitment and no changes in ligament laxity on testing.

Encourage independence with a maintenance programme and strength training of unaffected lower limb.

Goals	Recommendations	
Restore functional strength, endurance, neuromuscular control and confidence	Consolidate strengthening all appropriate muscle groups [55,56,57,60,63,66,68]; e.g. isotonic and isokinetic exercise progression from medium to fast speeds (where available) [27]; vibration training [54,64]	A2

Strength should be > 90% of the unaffected side prior to commencing plyometric and jogging/running drills [12, 22, 32,33,55,67,68] **and** prior to functional hop testing	A3
Progress sports specific rehabilitation and plyometrics e.g. acceleration/deceleration drills, straight line running, figure of eight running, cutting drills	C
Progress to functional rehabilitation relative to activity or sport	C

Criteria for return to functional and sporting activities

Non-irritable, stable knee	C
Objective measures of ROM, knee laxity (Lachmans) and dynamic balance should be recorded	C
Affected lower limb should be > 90% strength of unaffected limb – using isokinetic testing if available (quadriceps and hamstrings)	A3
Two functional hop tests e.g. quadruple cross over hop, single vertical hop, single hop for distance should be > 90% of unaffected limb [22,23,24,25,26,31,32,34,61,67,68]	A3

Return to Activities/Sports – <u>Approximate</u> Timescales

Please note that these timescales should only be used for **GUIDANCE** and all individuals **MUST** fulfil the appropriate criteria in Phase 3 prior to starting these activities.

Driving	When strength, pain and ROM allow, and when insurance company agree
Swimming	As symptoms allow Consider appropriateness of individual strokes
Golf	4/12
Racquet sports	6/12
Contact sports/skiing	9-12/12

<u>Contact details for further information/advice</u>

Royal Infirmary of Edinburgh, Out patient Physiotherapy Department	0131 242 1940
Western General Hospital, Out patient Physiotherapy Department	0131 537 1288
St John's Hospital, Out patient Physiotherapy Department	01506 522063
Spire Murrayfield Hospital, Physiotherapy Department	0131 316 2537

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