

Rehabilitation Guidelines for ACL Reconstruction using Hamstring Graft

Reference: CG2045 v1
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Approved: April 2022
Review Due: April 2025

Purpose

Guidance in the rehabilitation of paediatric patients post anterior cruciate ligament reconstruction, with either STG or LET.

Intended Audience

Physiotherapists and orthopaedic surgeons.

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1. Introduction

A criteria based guideline process to be used in the rehabilitation of patient's post-surgical reconstruction of ACL

2. Guideline Content**Rehabilitation Guidelines for ACL Reconstruction using Hamstring Graft**

The information given below is only a guideline as to the appropriate management for an ACL reconstruction utilising a hamstring graft (semitendinosis and gracilis) potentially the surgeon may carry out an additional LET/Modified Mackintosh/Lemaire procedure..

The essence of the program is to protect the repair during all phases with a graduated exposure to increasing loads

It is your responsibility to evaluate each individual patient's problems and clinical reasoning must be applied to inform decisions on progression, rather than timescale alone. Use professional judgment as patients progress. Even if an exercise or activity is listed at a particular time frame, some patients may not be ready to perform it.

Early return to high level activity runs a definite risk of re-injury.

Patients heal at different rates and rehab needs to be adjusted accordingly.

The key to a successful outcome is a phased rehabilitation with criteria based progression not time dependant progression.

If at any times you have concerns regarding a patient's progression or lack thereof or any symptomatic changes please confer with a senior clinician or contact us at the Sheffield Children's hospital (0114 271 7227)

Inclusion criteria

- Able to attend regular doctor and Physiotherapy appointments
- Patient wishes to return to pre-injury levels of activity
- Compliant patient

Potential for slower recovery and therefore slower progression

- Excessive patellofemoral joint symptoms
- Meniscal repair
- Other ligament injury or surgery
- Major joint surface disruption / bone bruise
- Hyper lax patients

Expected outcome

- Patients report a stable knee within a certain level of function activities.
- Patients may need to be counselled regarding what is a realistic level of function post op.
- Some patients will continue to experience some pain post op (e.g. AKP, joint pain from degenerative menisci etc)
- No reaction swelling with activity

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Possible complications

- Infection
- Immediate post op haemarthrosis
- Graft failure
- Anterior knee pain
- Re-rupture

Possible Problems

Possible problem	Action
Uncontrolled pain (>3/10 VAS)	<input type="checkbox"/> Regular analgesia <input type="checkbox"/> Ice & elevation <input type="checkbox"/> Protected weight bearing <input type="checkbox"/> Modification of activity level
Excessive swelling (>2cm side to side difference sup patella level)	<input type="checkbox"/> Ice & elevation <input type="checkbox"/> Protected weight bearing <input type="checkbox"/> Modification of activity level <input type="checkbox"/> Decrease number of exercises
Unable to regain passive knee extension (should be full by ~ 3 weeks)	<input type="checkbox"/> GAPS / Prone hangs <input type="checkbox"/> Hamstring and gastroc stretches <input type="checkbox"/> Static quads contractions (+/- electrical stim) <input type="checkbox"/> Control knee swelling
Slow to regain passive knee flexion Should be approximately: 110° 3 wks 120° 5wks 130° 7 wks	<input type="checkbox"/> Control pain <input type="checkbox"/> Control knee swelling <input type="checkbox"/> Compliance with exercise <input type="checkbox"/> Rec fem stretches / PFJ mobs
Poor quadriceps contraction / weakness	<input type="checkbox"/> Control knee swelling <input type="checkbox"/> Control pain <input type="checkbox"/> Compliance with exercise <input type="checkbox"/> Static quads contractions (+/- electrical stim)
Hamstring strain / pain	<input type="checkbox"/> Reduce hamstring exercises <input type="checkbox"/> +/- Protected weight bearing <input type="checkbox"/> Hamstring stretches
Anterior Knee Pain	<input type="checkbox"/> Control knee swelling <input type="checkbox"/> Address muscle length (esp rec fem) <input type="checkbox"/> Taping / PFJ mobs <input type="checkbox"/> Alignment assessment
Patient complains of "giving way"	<input type="checkbox"/> Early stages this can be due to quads weakness (hyperextension) <input type="checkbox"/> Refer back to clinic / not resolving

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Phase 1 - Protection - Note if a concomitant meniscal repair has been undertaken – the meniscal protocol takes precedence for the first 4 weeks**Meniscal initial precautions: (See separate guideline for full version)**

- *NWB/PWB crutches (for first 2-4 weeks)*
- *ROM brace limited 0-30° – work to 90° over 4-6 weeks*
- *Good static quads contraction*
- *No flexion beyond 90°*
- *No deep loaded flexion*

Standard ACL:**Goals:**

1. Pain control (VAS <3/10)
2. Swelling controlled (<2cm difference at superopatella level)
3. Good gait pattern FWB/PWB crutches
4. ROM 0 - 90°
5. Good static quads contraction
6. Maintain/regain full knee extension

Restrictions:

1. No open chain quads
2. Weight bearing as tolerated by pain, strength and swelling

Treatment**ROM**

- 0 –90° AROM and AAROM exercises
- Gravity Assisted Passive Stretch (GAPS) to increase extension
- Stretches (gastroc / soleus / hamstring / quadriceps)
- Sleep with brace locked in full extension
- Depending on quads control, ranger brace may limit range whilst walking, commonly increasing this range by 30° every 2/52. (Range can be worked on by the therapist passively out of the brace)

Patella mobilisations**Strength**

- SLR Static quads contractions (in extension)
- Active knee flexion / extension (sliding board)
- Calf raises
- Mini squats

Balance

- Gym ball compressions in lying and sitting
- Weight transference forward / back, side /side in standing

Modalities

- Electrical stimulation of quadriceps if available
- Ice pack

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Phase 1- Protection (approx. 3 - 4 weeks PWB/FWB)**General Observations:**

1. Weight bearing as tolerated with 1 crutch when pain controlled without narcotics, sufficient quads control to maintain knee extension in gait
2. ROM 0 -110°
3. Swelling controlled

Goals:

1. Pain control (VAS <3/10)
2. Swelling controlled (<1cm difference at superopatella level)
3. Good gait pattern WB as tolerated with 1 crutch (reciprocal gait)
4. ROM 0-120°
5. Good static quads contraction

Restrictions:

1. No weighted open chain quads
2. Weight bearing as tolerated by pain, strength and swelling

Treatment**ROM**

- AROM and AAROM exercises
- GAPS
- Stretches (gastroc / soleus / hamstring / quadriceps)
- Patella mobilisations
- Sleep with brace locked in extension if there are concerns re:extension

Strength

- SLR
- Glute exercises
- Bridging (with abduction and adduction)
- Calf raises
- Mini squats
- Multi hip machine if available – or mat exercises
- Active hamstring curls (no resistance)
- Static bike(**evidence remains questionable as to increasing graft extensibility via tendon crimp**),

Balance

- Gym ball compressions in lying, sitting and standing
- Stepping over mini hurdles on floor (improve active knee flexion during gait)
- Gait re-education heel/toe, forwards, backwards etc.

Modalities

- Ice pack

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Phase 2 – Intermediate protection (approx. 5 - 6 weeks)**General Observations:**

1. Independently mobile with-out aid, symmetrical gait
2. ROM 0 -120°
3. Swelling controlled

Goals:

1. Pain control (VAS <1/10)
2. Swelling controlled (<0.5mm)
3. ROM 0 -130°
4. Good muscle control of knee (quads)
5. Minimal patellofemoral symptoms

Restrictions:

1. No weighted open chain quads to terminal extension (90-60° permitted)
2. Avoidance of twisting on knee

Treatment**ROM**

AROM 0-120°

Stretches (gastroc / soleus / hamstring / quadriceps)

+/- Patella mobilisations

Strength

- Mini Lunges (1/2 depth, not full lunge)
- Glut med exercises
- Bridging on gym ball
- Calf raises
- Mini squats
- Leg press 90 - 10° (low resistance only)
- Hamstring curls (introduce resistance)
- Multi hip machine
-

Cardiovascular

- Static bike(**evidence remains questionable as to increasing graft extensibility via tendon crimp**),
- Treadmill walking

Balance

- Gym ball compressions in lying, sitting and standing
- Wobble board 2 feet
- Lateral walking over mini hurdles

Modalities

- Ice Pack

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Phase 2 - Intermediate protection (approx. 7 - 8 weeks)**General Observations:**

1. No swelling, pain free ROM, stable joint
2. ROM 0 -135°
3. Walk for 20 mins without pain FWB

Goals:

1. Manual muscle testing 4/5 (hamstring, quads, abductors, adductors)
2. No Swelling
3. ROM 0 -135°
4. AP draw / Lachmans < 3mm
5. Minimal patellofemoral symptoms

Restrictions:

1. No open chain quads to terminal extension (90-60° permitted)
2. Avoidance of twisting on knee
3. No jogging

Treatment**ROM**

- Stretches (gastroc / soleus / hamstring / quadriceps)

Strength

- Lunges (slowly introduce change of direction)
- Bridging on gym ball (& rolling ball forwards and back)
- Knee extension with resistance 90 - 60° (avoid terminal extension)
- Hamstring curls (increase resistance)
- Bean bag flicks (with caution)

Cardiovascular

- Static bike(**evidence remains questionable as to increasing graft extensibility via tendon crimp**),
- Treadmill walking
- Swimming (straight leg kicking only, no breast stroke)
- Rower
- Cross trainer

Balance

- Wobble board 2 feet / Sit to stand on wobble board
- Trampet
- 2 legged jumps (**EMPHASIS ON LANDING TECHNIQUE**) – quad soaking and maintenance of good knee positioning

Modalities

- Ice Pack

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Phase 3 – Functional Strengthening and Movement Correction (approx. 9 -12 weeks)**General Observations:**

1. No swelling, pain free ROM, stable joint
2. ROM 0 -135°
3. Walk for 20 mins without pain

Goals:

1. Manual muscle testing 4/5 (hamstring, quads, abductors, adductors)
2. No Swelling
3. ROM 0 -135°
4. Minimal patellofemoral symptoms

Restrictions:

1. No open chain quads to terminal extension (90-60° permitted)
2. Avoidance of twisting on knee
3. No jogging

Treatment**ROM**

- Stretches (gastroc / soleus / hamstring / quadriceps)

Strength

- Lunges with change of direction
- Bridging on gym ball (& rolling ball forwards and back)
- Leg press 90 - 10°
- Knee extension with resistance 90 - 60° (avoid terminal extension)
- Multi hip machine
- Hamstring curls
- Bean bag flicks

Cardiovascular

- Static bike
- Treadmill walking
- Swimming (straight leg kicking only, no breast stroke)
- Rower / Stepper / Cross Trainer

Balance

- Wobble board single leg (+/- external challenge, ball etc)
- Trampet
- 1 leg hops (with caution, emphasis on landing technique)
- Sit to stand on wobble board
- Simple change of direction drills (walking pace)

Modalities

- Ice

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Return to running assessment may be started at 12 weeks provided patient has progressed in strength and control to enable the criteria to be assessed.

Return to running criteria

NB for ACL – advise no running before 12 weeks (commonly 6 – 8 week in a brace then 4 weeks strengthening as a bare minimum prior to running)

Commonly used timeframes for return to running require respect of biological healing of the graft (ACL or MPFL) – substantial changes are undergone during the 8-16-week post-operative phase, additionally graft revascularisation remains a controversial topic, and histological changes with respect to ligamentisation continue to occur (it is noted in some studies up to and beyond 2 years post op). Additionally some imaging suggests the dual insult to the knee (injury then surgery) may impact the healing of the chondral surfaces – monitor for any suggestion of OCD +/- Meniscal injury)

- V.A.S. <2 (and no significant increase in pain in session)
- no effusion,
- no quads lag
- full active knee extension and RoM of at least 0°
- sufficient flexion range to run effectively (consider >90%)
- normalised gait pattern to progress from early impairment-based rehabilitation to the second phase
- 2 footed jump land with controlled DVI (L.E.S.S. <5/15)
- Knee dips with minimal D.V.I. (5 controlled reps from a 20cm box)
- 10 x STS from reasonable height seat
- Step up and hold good balance control (no significant DVI on upwards phase)
- Calf raises (Oxford score = 20 unilateral heel raises for 5/5)
- Ability to hop and control DVI – good landing strategy
- Y balance or S.E.B.T.
- If equipment available – quads/hams 85% of non-injured leg
 - Further functional criteria involving the hip may be considered
 - Single leg bridge
 - Side bridge

These will need re-examining immediately post increase in exercise levels and again the following day

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Phase 4 – Advanced Activity (approx. 12 -26 weeks)**General Observations:**

1. No swelling, pain free ROM, stable joint
2. ROM 0 -135°

Goals:

1. No Swelling
2. ROM 0 -135°
3. AP draw / Lachmans < 3mm
4. Minimal patellofemoral symptoms
5. Hop index >75%
6. Dynamometer assessment of quads strength
7. MyJump2 or Optojump assessment
8. Isokinetic assessment

Restrictions:

1. No weighted open chain quads to terminal extension (90-60° permitted)
2. Weighted terminal extension can be introduced at 4 months onwards
3. Slow, controlled introduction of twisting on knee

Treatment**ROM**

- Stretches (gastroc / soleus / hamstring / quadriceps)

Strength

- Bridging on gym ball (& rolling ball forwards and back)
- Knee extension with resistance 90 - 60° (avoid terminal extension)
- Multi hip machine
- Hamstring curls
- Nordic work
- Plyometrics (box jumps, 2 legs, 1 legs)

Cardiovascular

- Static bike
- Jogging (change of direction & agility drills with caution)
- Swimming (straight leg kicking only, no breast stroke)
- Rower / stepper / Cross Trainer

Balance

- Wobble board single leg (+/- external challenge, ball etc)
- Trampet
- 1 leg hops forwards / lateral (+/- theraband)
- Sit to stand on wobble board
- Lunges with TB at waist
- Profitter

Modalities

- Ice pack

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Phase 5 – Return to play Preparation (approx 27 - 52 weeks)**General Observations:**

1. No swelling, pain free ROM, stable joint
2. ROM full

Goals:

1. ROM full
2. AP draw / Lachmans < 3mm
3. No patellofemoral symptoms
4. Hop index >at least 85%
5. Lysholm score >95%, IKDC 85%
6. MATT (Modified Agility T Test)
7. Quads Strength 90% of contralateral leg
8. Return to previous activity

Outcome scores, plus clinician reasoning will inform return to sport.

Restrictions:

- 1. No full contact sport until 12 months**

Treatment

Strength programme as previously

Cardiovascular

- Static bike
- Jogging
- Change of direction running, cone drills
- Swimming (any stroke)
- Rower / Stepper / Cross Trainer

Balance

- Wobble board single leg (+/- external challenge, ball etc)
- Profitter
- Trampet
- 1 leg hops forwards / lateral (+/- theraband)
- Sit to stand on wobble board

Sport specific drills

Return to training for sports (6 months) ensure gradual exposure to sports specific drills

Return to contact sport (12 months)

**NB return to sport CAN take longer than this.
This is a guideline only**

3. References

Summary of evidence for physiotherapy guidelines

A literature search was carried out to identify research relating to rehabilitation following Anterior Cruciate Ligament reconstruction of the knee. After reviewing the articles and information, and discussion with the consultants and therapy team at the SCH, the physiotherapy guidelines were produced on the best available evidence. They are subject to regular change and review as new information becomes available

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