RJAH High Tibial Osteotomy (HTO) or Distal Femoral Osteotomy (DFO) Rehabilitation Guide

Patient Details: **Co-morbidtity (if applicable follow the most conservative guide for the relevant phase):**

Note to Therapist: **This is a guide to progression, not an exhaustive list of rehabilitation and does not replace clinical reasoning.*
**Treat any soft tissue symptoms on their merit.*
**Objective Tests (not exhaustive) can be used as an indication for progression. The choice can be individualised for the patient.*
**Special Instruction(s) includes specific post-operative advice for the individual patient based on their surgeon's recommendation (as applicable). This will be completed on discharge or follow-up clinic appointments.*

PHASE OF REHABILITATION	IDEAL CRITERIA	REHABILITATION GUIDE	GOALS	OBJECTIVE TEST	SPECIAL INSTRUCTION
PHASE 1 **From Day 1**	○ Successful operative outcome. ○ Adequate pain relief. ○ Understands post-op instructions.	• Weight-bear as symptoms allow, elbow crutches for comfort. • ROM as symptoms allow. • Cryocuff/Ice. • Patella mobilisations. • H and calf stretches. • Ankle Exercises (e.g. heel raises). • SQ. • Weight transferring.	1. Reduce inflammation. 2. Promote distal circulation. 3. Gradually regain ROM. 4. Increase confidence. 5. Promote early mobility.		**Check if any specific post-op instructions have been given and amend the guide accordingly.**

PHASE OF REHABILITATION	IDEAL CRITERIA	REHABILITATION GUIDE	GOALS	OBJECTIVE TEST	SPECIAL INSTRUCTION
PHASE 2 **From Week 1**	• Adequate pain relief. • Mobilise independently +/- aids.	• **Contralateral limb strength training 3x per week (continue for 10 weeks) Leg Press, Leg Curl & Leg Ext 3 x 5RM.** • Static Bike or Turbotrainer no/low resistance as tolerated (part revolution → full revolution as symptoms dictate). • Rowing no/ low resistance for ROM (as symptoms dictate). • Anti-gravity treadmill, walk → jog, increase body weight and speed as symptoms dictate. • EOR E mobilisations. • SQ progressing to SLR. • Mini squats/ small knee bends. • Weight transferring exercises → gradually increase weight-bearing. • Independent gait re-education. • Early proprioception exercises, progressing to single leg stance as symptoms dictate. • Step-touch → step-up → step over. • Active CKC and OKC exercises. • Core stability exercises as appropriate. • Flexibility exercises as appropriate. • Other muscle groups not to be neglected. • Upper body active exercise→ resis/reps/sets/speed. • Hydrotherapy (when wounds allow).	1. Promote early function. 2. Gain terminal E. 3. Increase ROM. 4. Encourage FWB. 5. Improve muscular control.	AROM. PROM. SLR. Effusion. Single Leg Stance. Bridging. Clams.	Check X-Ray at 6 weeks post-op.

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PHASE 3 **From Week 6**	○ X-Ray results are satisfactory. ○ Minimal discomfort. ○ Resolving effusion. ○ Independent mobility with no aids. ○ SLR with no lag. ○ AROM = Full E - ≥100º. ○ Single leg stance ≥80% parity. ○ Clams 10 reps with 10 sec hold ideal control [L] & [R]. ○ Bridge10 reps with 10 sec hold ideal control.	• Gait with predictable changes in direction. • Step-ups (for/back/sideways/over) → height/reps/speed. • PWB (parallel bars, deep water or AntiG) landing drills - jumps, hops, leaps → control technique/speed/reps. • Leg Press/Squats → resis/reps/sets/speed. • Proprioception → single leg stance/wobble boards/Trampette/crash mats/etc. • Gymball and Theraband work. • Rowing → dist./speed/resis. • X-Trainer → dist./speed/resis.	1. Progress functional activities. 2. Prevent AKP. 3. Prevent joint stiffness. 4. Restore normal gait pattern. 5. Promote appropriate muscle strength, power and endurance. 6. Improve neuromuscular/ proprioception/ sensorimotor performance. 7. Maintain cardiovascular fitness. 8. Encourage patient compliance.	Planks. Hurdle Step.	

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PHASE 3 **From Week 8**	○ Normal symmetrical gait. ○ Full Active E - ≥120°F. ○ No/minimal effusion. ○ Directional Planks 30 sec hold ideal control. ○ Controlled hurdle step ≥5 reps.	• Add speed exercises, e.g. prone heel flicks, Trampette high knees, Trampette heel flicks. *Sequence Training:* • Train strength and endurance 3 – 4 x per week. • Train strength and endurance on separate days. • Have a minimum of 24 hours between strength days. • **Strength:** *See appendix; Pages 8 – 9* Adjust if necessary based on symptoms. • **Hypertophy:** *See appendix; Pages 8 – 9* Adjust if necessary based on symptoms. • **Endurance:** Gradually progress toward ≥45 min continuous CV exercise (exception of jogging/running). *See appendix; Pages 8 – 9* Adjust if necessary based on symptoms	1. Promote appropriate strength, power and endurance based on individual's needs. 2. Improve neuromuscular performance. 3. Increase confidence.	Inner Range Squat/ Small Knee Bend. Rotatory Stability. Single Leg Bridge.	

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PHASE 4 **From Week 12**	○ Inner Range Squat/ Small Knee Bend = ideal biomechanical control. ○ [L] & [R] Rotational Stability ≥80% parity. ○ Single Leg Bridge10 reps with 10 sec hold ideal control.	• Add FWB landing drills and double footed plyometrics → control technique/speed/reps.	1. Improve neuromuscular performance. 2. Improve biomechanical control. 3. Improve power. 4. Increase confidence.	Single Leg Squat 60°. Vertical Jump.	
PHASE 5 **From Week 16** **Dependent on the patient's activity and functional goals.**	○ Single Leg Squat 60º 5 sec hold with good alignment. ○ Note Vertical Jump Height.	• Progress to single footed landing drills and plyometrics as dictated by control and symptoms. • Introduce jogging → running when eccentric strength and control is adequate. • Add agility drills when sufficient control and confidence is achieved e.g. twist/ turn/ pivot/ cut/ accelerate/ decelerate/direction. • Advance dynamic proprioceptive exercises e.g. volleying football, throwing, catching, racket and ball while balancing on Trampette.	1. Sport specific function.	Vertical Jump. 5 RM. Hop for Distance. Deep Squat. Inline Lunge.	

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Phase 6 **From Week 20** **Dependent on the patient's activity and functional goals.**	○ Vertical Jump Height – shows improvement. ○ Deep Squat – ideal posture +/- heel raise.	• Progress from predictable to unpredictable agility drills. • Perturbation training e.g. therapist randomly nudges patient off balance during a single leg throw-catch drill.	1. As PHASE 5	As PHASE 5	
PHASE 7 **From Week 24** **Dependent on the patient's activity and functional goals.**	○ Vertical Jump Height – shows improvement. ○ 5 RM > 80% parity ○ Hop for distance >80% parity. ○ Inline Squat – ideal movement pattern >80% parity.	• Non-contact sport specific training → terrain/volume/periodisation.	1. Prepare neuromuscular and psychological ability to return to unrestricted function.	As indicated for individuals goals.	
PHASE 8 **From Week 28** **Dependent on the patient's activity and functional goals.**	○ All Tests > 90% parity.	• Contact sport specific training. • Earliest return to contact sport training. • Progress to full restriction free sports and activities [**dependent on Consultant opinion**].	1. Unrestricted confident function 2. Injury prevention	Full sporting Function.	

Terminology Key:

CV	Cardiovascular	PWB	Partial Weight Bear
EOR	End of Range	FWB	Full Weight Bear
E	Extension	ROM	Range of Movement
F	Flexion	AROM	Active Range of Movement
SLR	Straight Leg Raise	PROM	Passive Range of Movement
Q	Quadriceps	OKC	Open Kinetic Chain
H	Hamstrings	resis	Resistance
AKP	Anterior Knee Pain	reps	Repetitions
[L]	Left	RM	Repetition Maximum
[R]	Right		

Summary of Post-Operative Restrictions and Progression (unless stated otherwise):

Activity	Dictated by **sufficient neuromuscular control** and time from surgery.
Weight bearing	Progress as symptoms allow
Jogging/ running.	From 4 months+
Return to full contact sport/ no restrictions	From 7 months+, if meets all specific RTS criteria and MDT approval

Appendix:

Patient Education.

A **repetition maximum** (RM) is the most weight you **can** lift, push, press or curl for a defined number of exercise movements. For example, a 5RM would be the heaviest weight you could lift for 5 consecutive repetitions. What will dictate your RM is muscle fatigue/ weakness, or you are experiencing pain more than 2-3/10 above your normal baseline (10 = worst pain imaginable, 0 = no pain at all), or you are losing technique/ form.

1 – 5 RM will improve Muscle Strength

6 – 10 RM will improve Muscle Hypertrophy

11 – 15+ will improve Muscle Endurance

Sets are is a series of reps of an exercise done in sequence (usually with a rest between). For example, 3 x 5 RM would be an exercise you can perform a maximum of 5 consecutive times (see **repetition maximum**), rest and then repeat twice more. Perform ***a minimum*** **of two sets** for each exercise.

Progress:

As you progress and the loads you are lifting are getting easier, but not easy enough to increase the weight, increase the volume. For example if you are lifting 5RM for 3 Sets, increase the number of sets. When this starts to feel easier reduce the number of sets and try increasing the weight to ensure you remain in the specific training zone for you.

Recommended Rest times between sets:

1 – 5 RM, 2 min. rest between sets.

6 – 10 RM, 1 min. rest between sets.

11 – 15 RM, 40 sec. rest between sets.

Particularly when you have 2 mins between sets, you might choose to save time and increase your workout intensity by performing a **Superset.** This can be a combination of two or three different exercises that work opposing muscle groups, or upper and lower body, or left and right limbs, and the exercises are done back to back with no rest in between. For example you may choose to switch between the leg press and the chest press. Working on the chest press during the 2 min. rest on the leg press and vice versa.

Single Leg and or Arm exercises will give you an indication of the strength differences between your limbs. It also means the weaker limb cannot be assisted by the stronger limb. If you are performing single limb exercises, make sure the RM is specific for each limb. Remember strengthening your non-injured side will limit the deconditioning of your injured side.

Circuits are a collection of exercise sets you repeat without a rest. A rest will be recommended between circuits rounds.

CV Endurance and Strength training don't mix. If you want to progress your CV work to more than a 20 min moderate session, don't do this in the same session that you strength train. The benefits of the two exercises counteract with each other, meaning you will not strengthen as quickly. If you want to progress you CV do so on a separate day.