High tibial osteotomy (HTO) post-operative protocol

High tibial osteotomy (HTO) is a widely performed procedure to treat; knee arthritis; patients with high BMI; ligamentous deficiency and joint instability.

Early Rehabilitation phase (0-2 weeks)

Goals

- Start physio within 7 days
- Patient gait education; full weight bearing immediately in vast majority of cases but mobilising with crutches if required
- Decrease pain and manage swelling with cryotherapy
- ROM: encourage full range of movement by 1- 2 weeks
- Maintain flexibility of hamstrings, calves and quadriceps
- Gluteal and quadriceps activation
- Limit activity to optimise effusion control

Precautions

- **IMPORTANT: Monitor wound**
    - **If you have any concerns about your wound immediately contact us on: OS group: 0203 397 7779**
    - This would include any of the below symptoms or observations;
        - wound leakage – blood or discharge
        - redness around the area
        - excessive or worsening pain
        - raised temperature

- **IMPORTANT: DVT awareness**

    - **If you have any concerns that you may have developed a DVT (deep vein thrombosis) immediately contact us on this number:**
        - **WARD (please insert):**
        - **OS group: 0203 397 7779**

    - This would include any of the below symptoms or observations;
        - sudden calf pain and swelling
        - pain, swelling and tenderness in one of your legs (usually your calf)
        - a heavy ache in the affected area.
        - warm skin in the area of the clot.
        - red skin, particularly at the back of your leg below the knee.
        - shortness of breath and chest pain (very rare)

- **Manage swelling**

    - Cryotherapy is advised
    - **PHYSIOLAB portable S1 device** is the preferred cryo-pneumatic device of OS group. See Appendix B for contact details.

- **Reduce mobility**
    - Rest as much as possible
    - Limited walking to around the house
    - If using crutches please see appendix A for instructions on advice on their use.

Exercises

- Heel slides (slider board) in supine and in seated position (0-90degrees)
- Seated active assisted knee flexion (towel slides with heel on floor)
- Seated calf stretches with towel -knee bent (soleus), knee straight (gastrocnemius)
- Seated hamstring stretches (back straight)
- Quadriceps isometrics
- Glute squeeze supine or standing

- ❖ Ankle pumps
- ❖ Standing hip flexion/extension, abduction/adduction
- ❖ Ice therapy

Criteria to progress to next stage of rehabilitation

- ✔ Full knee extension
- ✔ Full knee flexion
- ✔ Adherence to HEP with clear progression

<u>Early to mid-phase of rehabilitation (non-weight bearing strengthening) 2-6 weeks.</u>

Goals

- ❍ Patient education – Control swelling and manage mobility
- ❍ Maintain full range of movement
- ❍ Non weight-bearing strengthening exercises - hip, hamstrings, quadriceps, calf's
- ❍ Progress from 1 crutch if required to full weight bearing, no crutches after 6 weeks.

Precautions

- Swelling control
- Maintain and protect the wound
- Strengthening must be progressive at the stage

Exercises

- ❖ Sitting passive leg extension with roll under heel
- ❖ Prone leg hangs off end of bed/plinth
- ❖ Continue with hamstring/calf stretches
- ❖ Supine with legs up wall heels slides (knee flexion) with gravity assisted
- ❖ Supine legs up on swiss ball roll heels towards buttocks
- ❖ Static bike: high seat half circles rotations forward/backward full circles lower seat as tolerated (AVOID WITH DFO).
- ❖ Continue to progress quadriceps isometrics
- ❖ SLR on the plinth
- ❖ Clam shells for glute strengthening
- ❖ Glute bridging progress from 2 legs – 1

- ❖ Bridge on swiss ball progress from 2 legs -1
- ❖ Ankle PF with TheraBand for calf strength

Criteria to progress to next stage of rehabilitation

- ✔ Full range of movement
- ✔ Full weight bearing
- ✔ Adherence to HEP
- ✔ Good progression with Lower extremity strengthening

Middle phase of rehabilitation (Progressive weight bearing and strength) 6-12 weeks

Goals

- ❍ Monitor, normalize and re-education gait
- ❍ Full and pain free knee range of motion
- ❍ initiate cardiovascular training
- ❍ Proprioceptive/balance re-education
- ❍ Weight-bearing strengthening of lower extremity muscle groups

Precautions

- Maintain and protect the wound
- Strengthening must continue to be progressive at the stage
- Begin weight bearing with balance re-education from none – toe touch – full
- Before progressing proprioceptive and balance exercises ensure that hip knee and ankle are controlling movements on firm surfaces.

Exercises

- ❖ Continue with static bike exercises (AVOID WITH DFO).
- ❖ Progress from 2 crutches single crutch full weight bearing, always maintaining normal walking pattern
- ❖ Assisted quadriceps stretch in side-lying, prone or in standing as tolerated
- ❖ Standing stretches (partial to full weight-bearing as tolerated) for gastrocnemius (knee straight) and soleus (knee bent) ensure back foot is straight
- ❖ Mini wall squat (30degrees) progress to 60-90 degrees
- ❖ Supine on floor legs on swiss ball: bridging plus knee flexion (heels to buttocks)

- ❖ Chair walking/stool pulls
- ❖ Prone active hamstring curls
- ❖ Sitting hamstring curls with light TheraBand
- ❖ Standing double leg calf raises with/without support progress raises from 2-1 foot
- ❖ Toe walking as tolerated (when full weight bearing)
- ❖ Begin proprioceptive work - Single leg stance 30-60 seconds (only when full WB) progress to unstable surface, with and without vision

Criteria to progress to next stage of rehabilitation

- ✔ Ability to full weight bear
- ✔ Progressed throughout HEP and strengthening
- ✔ Full and pain free ROM at the knee
- ✔ Normalized gait

End stage of Rehabilitation 3-6 months (return to patient required sport/activity)

Goals

- ❍ Continue to progress strengthening: lower chain concentric/eccentric strengthening of gluteal, quadriceps & hamstrings
- ❍ Lower chain strengthening
- ❍ Progress cardiovascular fitness
- ❍ Progress proprioception
- ❍ Sport specific training

Precautions

- Before progressing proprioceptive and balance exercises ensure that hip knee and ankle are controlling movements on firm surfaces
- Begin to progress cardiovascular fitness although within safe environments for the knee

Exercises

- ❖ Sit to stand lower bed height (watch movement) single leg
- ❖ Static Lunge (full range) dynamic lunge / lunge walking
- ❖ Forward and lateral step-ups 4-6-8" (watch for hip hiking or excessive ankle dorsiflexion)

- Eccentric lateral step down on 2-4-6" step with control (watch for hip hiking or excessive ankle dorsiflexion)
- Standing hamstrings curls
- Continue hip strengthening with increased weights/TheraBand resistance (progress on tolerance)
- Calf heel drops eccentric off of step progress from 2-1 leg
- Continue on wobble boards and begin to add basic upper body skills like throwing and catching
- Single leg stance on unstable surface (soft mat or BOSU) with/without support progress to no vision
- Standing eyes open/closed –progress to mini trampoline
- Single leg stance performing higher end upper body skills specific to patient goals
- Static bike - increasing time or resistance progress to outdoor cycling
- Treadmill – walk with incline - quick walk-increased speed (Progressive with tolerance)

➢ End stage functional sport patterning with increased speed and reps as tolerated along with admission to hydrotherapy for further strength and movement control. Return to sport is at the practitioner's discretion although all above criteria must be achieved.

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Suggested outcome measures tests to be used to monitor progression throughout the rehabilitation

Single leg Stance test

Instructions for the Patient (Eyes Open, SLS)

Stand on one leg, place your arms across your chest with your hands touching your shoulders and do not let your legs touch each other. Look straight ahead with your eyes open and focus on an object in front of you. Ideally do this with the shoes off.

Criteria to stop timing the test

The legs touched each other, the feet moved on the floor, their foot touches down, or the arms moved from their start position.

Instructions for the Patient (Eyes Closed, SLS)

Stand on one leg, place your arms across your chest with your hands touching your shoulders and do not let your legs touch each other. Close your eyes once you have gotten in position. Ideally do this with the shoes off.

Criteria to stop timing the test:

The legs touched each other, the feet moved on the floor, their foot touches down, the eyes open during the eyes closed test, or the arms moved from their start position.

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Qualitative Analysis of Single Leg Loading

(Single leg squat)

(Single leg step down)

(Single leg hop for distance)

- See page 14 for test descriptions
- Score a zero if the appropriate strategy is used and one for inappropriate movements. (Best overall score is 0 and worse is 10 points)

Date: Patient: Condition:

Left Right Bilateral

QASLS		Left	Right
Arm strategy	Excessive arm movement to balance		
Trunk alignment	Leaning in any direction		
Pelvic plane	Loss of horizontal plane		
Thigh motion	WB thigh moves into hip adduction		
Knee position	Patella pointing towards 2nd toe (noticeable valgus)		
	Patella pointing past inside of foot (significant valgus)		
Steady stance	Touches down with NWB foot		
	Stance leg wobbles noticeably		
	Total		

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Qualitative Analysis of Single Leg Loading - Test Descriptions

Single leg step down

- Participant stands on a 30cm box
- Instructed to step off the box onto a mark, 30cm from the box and 5cm on the contra-lateral side to the mid line

Single leg hop for distance

- Participant stands on mark at side of standard tape measure
- Hands resting on iliac crests
- Attempts to hop as far as possible staying parallel to the tape.

Cross Over Hop Test

- Subject stands by two parallel lines 20cm apart extending at least 5m
- Undertakes four consecutive hops without pause crossing the grid lines each time.

Star Excursion Balance Test

- Subject stands on leg to be tested in centre of star. Keep heel down.
- Instructed to reach as far as possible down the line without taking undue support from the reaching leg or stepping over onto that leg
- 4 practices then test 5 repetitions

General notes

- All landings for single leg step down and single leg hop for distance must be held for 3 seconds, emphasis during task instruction must be placed on this
- Evaluate all landings using the QASLS scoring system
- For single leg hop for distance also include the distance hopped and the leg length
- Position camera a minimum of 2m from the landing position, zoom in to maximise the size of the subject within the frame
- Allow the subject a minimum of two practice attempts (continuing until they are able to do tasks appropriately) then record a single attempt.

Appendix A - Crutches

- When standing up and sitting down, make sure you take your arms out of the crutches and hold them in one hand. This will help to avoid any shoulder injuries.
- When walking with the crutches, keep the handles pointing forwards and your arms close to your sides.
- Place both crutches forwards together with enough space in between them to step into.
- If you are advised that you are not allowed to put any weight through your injured leg (non-weight bearing), place your crutches forwards together. Now lean through your arms as you hop your uninjured leg up to the same level as the crutches. The foot on your injured leg must stay off the floor at all times when walking.
- If you are advised that you are allowed to weight bear, place the crutches forwards together and then step your injured leg up to the crutches. Now lean through your arms as you step you uninjured leg forwards to the same level.
- When climbing stairs, try to use a banister or rail in one hand and a crutch in the other (you can also carry the extra crutch in this hand):
- GOING UP: Good leg, bad leg, crutch
- GOING DOWN: Crutch, bad leg, good leg.
- Check the rubber stoppers regularly. If they are worn down, bring them back to the Physiotherapist will replace them.

Appendix B - Physiolab

Link for hire	https://physiolab.com/products/to-rent/s1-portable.html
Website	www.physolab.com