Proximal Patellar Tendon Rehabilitation Protocol

Post-PRP Injection | Partial / Grade 3 Proximal Tear | 30 Yr Old Footballer

Treating clinicians: Sports Physician & Physiotherapist

Key Rehabilitation Principles

Tendon healing requires progressive mechanical loading — complete rest is counterproductive. The following principles guide all clinical decision-making throughout this protocol:

- Pain during exercise: acceptable up to 3/10 (NRS). Pain above this threshold warrants load reduction.
- 24-hour rule: post-exercise pain and stiffness must settle within 24 hours. If not, reduce load at next session.
- Avoid high-energy tendon elongation (deep stretching, rapid eccentric loading) in early phases.
- Progress load gradually and systematically — do not skip phases based on subjective comfort alone.
- Consistent tendon loading drives remodelling. Irregular or fear-avoidant loading impairs recovery.
- Avoid NSAIDs for 1–2 weeks post-PRP unless physician-directed. Early pain flare (days 1–10) is expected and does not indicate treatment failure.
- PRP response is gradual: meaningful tendon changes typically occur over 6–12 weeks, not immediately.

Phase 1 — Protection & Pain Reduction (Weeks 0-3)

Goals:

- Protect healing tendon following PRP injection
- Reduce pain and swelling
- Maintain quadriceps activation and hip / core strength
- Prevent tendon elongation or mechanical disruption

Brace & Weight-Bearing

- Brace: locked at 30 degrees flexion as prescribed by treating physician
- Weight-bearing: WBAT with brace – progress per physician guidance
- Brace removal for exercises only if physician-cleared

Avoid

- Deep knee flexion beyond brace range
- Squats, lunges, or resisted knee extension in loaded range
- Running and jumping of any kind
- Heavy open-chain knee extension exercises

Exercise Programme (1–2 × daily)

Isometric Loading — Analgesic Priority

Best evidence-supported early tendon loading. Isometrics reduce pain via cortical inhibition while loading the tendon safely.

Exercise	Sets	Reps / Duration	Notes
Spanish Squat Isometric (preferred)	5	30–45 sec	60–70% effort; brace off if cleared
Wall Sit (alternative, shallow angle 30–45°)	5	30–45 sec	Match brace angle. 2 min rest between sets

Quadriceps Activation

Exercise	Sets	Reps / Duration	Notes
Quadriceps Sets (terminal knee extension)	3	15 reps	Firm contraction; hold 5 sec
Straight-Leg Raise	3	10 reps	Control throughout range; add ankle weight PRN
Adductor Squeeze (ball between knees)	3	15 reps	Facilitates VMO activation

Hip & Core

Exercise	Sets	Reps / Duration	Notes
Glute Bridge (double-leg)	3	12–15 reps	Progress to single-leg when comfortable
Side-Lying Hip Abduction	3	12–15 reps	Control; avoid trunk rotation
Clamshells	3	15 reps	Band resistance when easy
Pallof Press	3	12 reps each	Slow and controlled

Calf Strength

Exercise	Sets	Reps / Duration	Notes
Double-Leg Calf Raise (standing)	3	15 reps	Full ROM; controlled lowering
Seated Calf Raise	3	15 reps	Targets soleus

Conditioning

- Upper body ergometer — preferred early cardiovascular option
- Pool walking — if physician-cleared and wound/injection site allows

Phase 2 — Early Strengthening (Weeks 3-6)

Progression Criteria: Phase 1 → Phase 2 (ALL must be met)

- ✓ PAIN: Spanish squat isometric (5 x 45 sec at 70% effort) completed with pain ≤ 2/10 on NRS on two consecutive sessions
- ✓ PAIN: No pain at rest and morning stiffness < 10 minutes duration
- ✓ SWELLING: Knee circumference within 1cm of contralateral limb at mid-patella level
- ✓ GAIT: Independent walking without antalgic pattern or Trendelenburg sign, no walking aid required.
- ✓ FUNCTION: Straight-leg raise 3 x 10 again gravity without extensor lag
- ✓ FUNCTION: Single-leg stance on injured limb ≥ 10 seconds without trunk compensation

This protocol is a general framework. Modify based on MRI findings, clinical presentation, and individual patient response.

✓ CLEARANCE: Physician clearance post brace removal; confirm on clinical review that brace can be weaned
✓ 24-HOUR RULE: No increase in tendon pain or stiffness following Phase 1 sessions for ≥ 5 consecutive days

Goals:
- Restore full active range of motion
- Initiate tendon remodelling through progressive mechanical loading
- Build quadriceps, calf, and hip strength

Heavy Slow Resistance (HSR) — Introduction

Tempo is critical: 3 sec eccentric / 1 sec pause / controlled concentric (3-1-X).

Exercise	Sets	Reps / Duration	Notes
Box Squat (limited depth, pain-free range)	3	12 reps	3-1-X tempo; adjust depth to 0/10 pain
Leg Press (0–60° range only)	3	12 reps	3-1-X tempo; do not flex beyond 60°
Split Squat (short range)	3	10 reps each	Forward shin slightly; no deep lunge
Step-Up (low step height, 10–15 cm)	3	10 reps each	Control descent

Tendon-Specific Loading

Exercise	Sets	Reps / Duration	Notes
Decline Board Squat (15–25° decline)	3	15 reps	Bodyweight initially; progress load if pain ≤ 3/10

Hamstring Strengthening

Exercise	Sets	Reps / Duration	Notes
Romanian Deadlift (light load)	3	10–12 reps	Hip hinge pattern; neutral spine
Hamstring Bridge / Nordic curl preparation	3	10–12 reps	Progress bridge to single-leg

Conditioning

- Stationary bike — low resistance, upright position preferred
- Elliptical trainer — monitor tendon response
- Pool running with flotation belt

Phase 3 – Heavy Strength Phase (Weeks 6-9)

⚠ This is the most critical phase. Tendon stiffness and force tolerance are established here. Do not rush through or skip.

Progression Criteria: Phase 2 → Phase 3 (ALL must be met)
✓ PAIN: Leg press (3 x 12 at 60 degrees range) and decline squat (3 x 15 bodyweight) completed with pain ≤ 2/10 on NRS
✓ PAIN: VISA-P score ≥ 50 (if used as monitoring tool) or clinical equivalent improvement from baseline

This protocol is a general framework. Modify based on MRI findings, clinical presentation, and individual patient response.

- ✓ PAIN: No pain during or after stationary cycling at moderate resistance
- ✓ SWELLING: No reactive swelling following Phase 2 loading sessions
- ✓ STRENGTH: Box squat and split squat completed through pain-free range with 3-1-X tempo, RPE ≤ 6/10
- ✓ STRENGTH: Single-leg squat (to ~45-degree depth) achievable with acceptable frontal plane control – no Trendelenburg, no valgus collapse
- ✓ ROM: Active knee flexion ≥ 100-degree pain-free; full passive extension
- ✓ FUNCTION: Able to ascend and descend a standard stair step (17-18cm) with pain ≤ 2/10
- ✓ 24-HOUR RULE: Consistently satisfied across all Phase 2 sessions for ≥ 2 consecutive weeks
- ✓ LOAD READINESS: Decline squat progressed to at least 10 kg load (vest or holding plate) for 3 x 15

Goals:

- Restore tendon load capacity and stiffness
- Increase force tolerance through high-load training
- Prepare neuromuscular system for impact loading

Main Strength Work (3 × per week)

Target intensity: 70–85% of maximum effort. Tempo: 3 sec eccentric / 1 sec pause / controlled concentric.

Exercise	Sets	Reps / Duration	Notes
Back Squat or Goblet Squat	4	6–8 reps	70–85% effort; full depth if pain-free
Leg Press	4	6–8 reps	Heavy; controlled 3-1-X tempo
Bulgarian Split Squat	3	8 reps each	Rear foot elevated; controlled descent
Hack Squat or Trap-Bar Deadlift	3–4	6 reps	Preferred if axial load better tolerated

Tendon-Specific Eccentric Work

Decline eccentric squat remains the cornerstone of this phase. Load progresses weekly.

Exercise	Sets	Reps / Duration	Notes
Decline Eccentric Squat (25–30°)	3	15 reps	Slow 5 sec lowering; concentric with both legs

Weekly load progression target: increase resistance by 5–10% or add 0.5–1 kg if prior session pain ≤ 2/10 at 24 hours.

Plyometric Preparation — Low Amplitude Only

Introduce only in the final 1–2 weeks of Phase 3 if tendon response is excellent.

Exercise	Sets	Reps / Duration	Notes
Pogos (bilateral)	2–3	20 sec	Minimal ground contact; stiff ankle position
Line Hops (bilateral)	2–3	20 sec	Forward/back then lateral
Rope Skipping (double-leg)	2–3	20 sec	Low amplitude; monitor response at 24 hours

This protocol is a general framework. Modify based on MRI findings, clinical presentation, and individual patient response.

Phase 4 – Running & Plyometric Phase (Weeks 9-12)

Progression Criteria to Phase 4

- ✓ No reactive swelling following Phase 3 sessions
- ✓ Single-leg decline squat: pain < 2/10 for 15+ reps
- ✓ Good quadriceps symmetry on visual and functional assessment
- ✓ Isokinetic or manual muscle test within 15% of contralateral (where available)

Running Progression

Begin with walk/jog intervals. 48-hour minimum recovery between running sessions.

Exercise	Sets	Reps / Duration	Notes
Walk / Jog Intervals (1:2 ratio)	—	20–30 min	Week 9–10: 1 min jog : 2 min walk
Continuous Jog (low intensity)	—	20–30 min	Week 10–11: build continuous running
Tempo Running (moderate pace)	—	Per session	Week 11: introduce pace variation
Acceleration / Deceleration Runs	—	Per session	Week 11–12: short, controlled bursts
Cutting and Change of Direction (controlled)	—	Per session	Week 12: begin at 50–60% pace; progress

Plyometric Progression

Begin double-leg, progress to single-leg. Low contact volume initially; allow 48-hour recovery between sessions.

Double-Leg

Exercise	Sets	Reps / Duration	Notes
Countermovement Jump	3	6–8 reps	Focus on landing mechanics
Box Jump (low height)	3	5–6 reps	Step down, do not jump down initially
Broad Jump	3	5 reps	Soft landing; absorb force through full lower limb

Single-Leg (introduce in week 11–12)

Exercise	Sets	Reps / Duration	Notes
Single-Leg Hop for Distance	3	5 reps each	Compare distance symmetry
Lateral Single-Leg Hops	3	5 reps each	Side-to-side; controlled landing
Bounding	3	20 m	Alternate leg; progressing stride length

Phase 5 – Return to Football (Weeks 12-16)

Goals:

- Match tendon load capacity to the full demands of football
- Restore athlete confidence, explosive power, and sport-specific movement
- Complete return-to-play criteria prior to unrestricted training / match play

This protocol is a general framework. Modify based on MRI findings, clinical presentation, and individual patient response.

Football-Specific Field Progression

Exercise	Sets	Reps / Duration	Notes
Passing & Ball Control Drills (standing, low demand)	—	Week 12–13	Football re-introduction; low physical load
Controlled Change of Direction at 60–70%	—	Week 13–14	Monitor for pain or reactive swelling
Small-Sided Games (reduced intensity)	—	Week 14–15	Limit contact; manage volume
Full Training Participation	—	Week 15–16	Conditional on RTP criteria met

Sprint Progression

Exercise	Sets	Reps / Duration	Notes
60% Maximum Velocity	—	Week 12–13	Straight-line; monitor mechanics
70% Maximum Velocity	—	Week 13–14	Extend distances gradually
80% Maximum Velocity	—	Week 14–15	Add curved running and deceleration
Maximum Velocity	—	Week 15–16	Only after full RTP criteria satisfied

Return-to-Play Criteria

All criteria below must be satisfied before unrestricted return to football training and match play:

Return-to-Play Checklist

- ✓ Full, pain-free range of motion matching contralateral limb
- ✓ No swelling at rest or following training
- ✓ Quadriceps strength ≥ 90% limb symmetry index (dynamometry preferred)
- ✓ Hop testing battery ≥ 90% limb symmetry (single-leg hop, triple hop, crossover hop)
- ✓ Single-leg decline squat: pain ≤ 1/10 for ≥ 15 reps
- ✓ Spring and cutting at maximum velocity without pain or guarding
- ✓ No tendon flare (pain or stiffness) within 24 hours of football-specific training
- ✓ Athlete psychological readiness – consider ACL-RSI adapted version where appropriate

Weekly Training Structure Template (Phase 3+)

Adjust based on phase and individual tolerance. Recovery days are not passive rest — walking and gentle mobility are encouraged.

Day	Primary Focus	Key Activities
Monday	Heavy Strength	Compound lower limb HSR + isometric tendon loading
Tuesday	Conditioning + Mobility	Bike or elliptical; hip and ankle mobility; upper limb gym
Wednesday	Tendon Loading + Plyometrics	Decline eccentric work; low-amplitude plyometrics (Phase 3+)
Thursday	Active Recovery	Pool walking, upper body, light core, soft tissue
Friday	Heavy Strength	Compound lower limb HSR; vary exercises from Monday
Saturday	Running Progression	Running programme per phase; progress distance or intensity
Sunday	Full Recovery	Rest or gentle walking only; no structured exercise

This protocol is a general framework. Modify based on MRI findings, clinical presentation, and individual patient response.

Common Clinical Pitfalls to Avoid

- Returning to sprinting or reactive drills before adequate strength base (< 90% limb symmetry)
- Aggressive or sustained stretching of the patellar tendon in the first 6–8 weeks
- Progressing plyometrics before heavy strength phase is consolidated
- Ignoring the 24-hour pain response — this is the most reliable clinical loading indicator
- Underloading once pain settles — subthreshold loading impairs tendon remodelling
- Discontinuing isometric loading once pain reduces — continue for analgesic and structural benefit
- Failing to address predisposing factors: training load spikes, quad weakness, biomechanical faults

PRP-Specific Clinical Notes

- Avoid NSAIDs for 1–2 weeks post-injection unless directed by treating physician — NSAIDs attenuate the platelet-mediated healing response.
- A pain flare in the first 7–10 days post-PRP is expected and reflects the inflammatory phase of healing. Reassure the patient; do not escalate intervention.
- PRP response follows a gradual time course. Clinically meaningful improvements in tendon integrity and symptoms typically emerge over 6–12 weeks.
- Serial ultrasound imaging at 6 and 12 weeks may assist in monitoring tendon healing and guiding load progression decisions.
- Second PRP injection may be considered at 3 months if insufficient clinical or imaging response, per physician judgement.

Disclaimer