

PHYSICAL THERAPY PROTOCOL

Patellar Tendon Debridement and Repair

Debridement and Repair for Chronic Patellar Tendinopathy — Tendon in Continuity

FOR THE PHYSICAL THERAPIST

Overview and Goals

This protocol governs rehabilitation after surgical debridement and repair of the patellar tendon for chronic patellar tendinopathy (“jumper’s knee”). Degenerative tendon and any involved bone at the inferior pole are excised, and the tendon is repaired with its continuity preserved. Because the tendon is never rendered discontinuous, progression is meaningfully faster than after a complete patellar-tendon-rupture repair. No single standardized, evidence-based rehabilitation protocol exists for this procedure; this protocol adapts the open-excision rehabilitation of Bahr and colleagues and the well-established eccentric-loading literature to a debridement-with-repair context.^{2,6}

Progression is criterion-based. The time ranges below are typical windows: a patient who meets the criteria may advance, and one who does not should hold in the current phase regardless of elapsed time. The two priorities are protecting the repair early and restoring quadriceps strength and pain-free tendon loading over the full course.

Tendon load is guided by symptoms using a 0–10 numeric pain rating scale (NPRS). Loading exercises should not provoke pain above 3/10 during or in the 24 hours after the session; if they do, reduce load and volume and rebuild more gradually. This applies with particular force to the eccentric decline-squat program introduced in Phase III.

READ BEFORE STARTING — SCOPE & REPAIR PROTECTION

This protocol applies to patellar tendon **debridement and repair with the tendon left in continuity**.

- If a **complete patellar-tendon-rupture repair** or extensive reconstruction was performed, this protocol does **not** apply — that injury requires a slower, extension-protected course. Confirm the procedure with Dr. Roth before starting.

Precautions that apply through the early phases:

- Keep the brace locked in full extension for all walking and sleep through the first 2 weeks; it may be unlocked for seated range-of-motion work.
- Maintain full passive extension from the outset — extension loss is harder to recover than flexion loss.
- Keep tendon-loading pain $\leq 3/10$ during and after exercise; do not begin the eccentric decline-squat program before week 6.
- Avoid loaded deep flexion (deep squatting, lunging past 60–90° under load) until the criteria in Phase II are met.

Rehabilitation Phases

PHASE	WEIGHT BEARING	BRACE	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
PHASE 1 Weeks 0–2 <i>Protection & early mobility</i>	• Weight-bearing as tolerated with crutches.	• Hinged brace locked in full extension	Target: • PROM / AAROM 0–90° as	Quadriceps activation: • Quad sets (isometric), 3 × 10, several times daily • Straight-leg raises, 4-way, 3 × 10	• Minimal effusion • Active quad contraction with no extensor lag

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PHASE	WEIGHT BEARING	BRACE	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
	Wear crutches as gait allows once the brace is unlocked for walking.	- for all walking and sleep. - May unlock for seated range-of-motion exercises.	- tolerated Priority: - Maintain full passive extension (0°) Mobility: - Patellar mobilizations (superior / inferior, medial / lateral) - Heel slides; prone hang for terminal extension	- NMES to quadriceps as needed Controlled motion: - Seated active knee extension, gravity-assisted, 90–40° arc only - Ankle pumps Swelling: - Cryotherapy for effusion control	ROM 0–90° achieved
PHASE 2 Weeks 2–6 <i>Progressive loading & ROM</i>	Full weight-bearing; wean off crutches as gait normalizes (typically weeks 3–4).	Unlock and discontinue the brace once quadriceps control is adequate and gait is non-antalgic — typically once the straight-leg raise is without extensor lag.	- Progress to full ROM by weeks 4–6. - Continue patellar mobilizations as needed	Strengthening: - Isometric quad holds at multiple angles (wall sits 30° / 60° / 90°) - Mini-squats 0–45°, progressing depth as tolerated - Leg press (bilateral → unilateral), limited arc initially - Step-ups (4-inch → 8-inch) Hip / core: - Bridges, clamshells, side-lying hip abduction Conditioning: - Stationary cycling once ROM ≥ 110°, low resistance Neuromuscular: - Single-leg balance on a stable surface	- Full, pain-free ROM - Normal gait without an assistive device - No effusion - Single-leg squat to 60° without pain > 3/10
PHASE 3 Weeks 6–12 <i>Eccentric loading & strengthening</i>	Full.	None.	Full ROM maintained.	- Eccentric decline-squat program begins now — not before week 6.² Eccentric program: - Single-leg eccentric squats on a 25° decline board - Lower on the operative leg to 60–90° (2-second count); return to standing on the other leg 3 × 15, twice daily; add a weighted vest or handheld weights as tolerated - Keep loading pain ≤ 3/10 Strengthening: - Single-leg leg press, Bulgarian split squats, Romanian deadlifts, progressive leg-extension machine - Continue hip and core program Conditioning: - Cycling (progressive resistance), aquatic running, elliptical - Straight-line walking → light jogging at weeks 8–10 if criteria met	- Quadriceps LSI ≥ 70% (isokinetic or single-leg press) - Pain-free eccentric decline squats with added load - Pain-free jogging for 15 minutes - VISA-P improving (target > 60)
PHASE 4 Weeks 12–16+ <i>Return-to-</i>	Full.	None.	Full ROM.	Strengthening: - Continue the eccentric program with progressive overload - Heavy slow resistance (leg press,	See <i>Return-to-Sport Criteria below.</i> Quadriceps LSI ≥ 90%

PHASE	WEIGHT BEARING	BRACE	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
<i>sport progression</i>				squat, leg extension at 6–8 RM) Plyometrics: • Double-leg → single-leg hops; box jumps, drop jumps • Sport-specific jumping and cutting drills Agility / sport: • Ladder and cone drills, lateral shuffles • Sport-specific movement patterns • Graded return to practice → full competition	• Single-leg hop LSI ≥ 90% • VISA-P ≥ 80 • Pain-free sport-specific drills • Clearance by surgeon and physical therapist; psychological readiness

Procedure-Specific Considerations

Tendon Continuity Permits an Accelerated Timeline

The single most important biomechanical fact after this procedure is that the patellar tendon remains in continuity. Debridement removes degenerative tissue and the repair reapproximates it, but the extensor mechanism is never divided end-to-end. That is why weight-bearing as tolerated and early motion are appropriate here, whereas a complete rupture repair requires immobilization in extension, restricted motion for about six weeks, and return to activity closer to nine to twelve months.⁷ In the open-excision literature, patients bore weight as tolerated and began graded tendon loading at two weeks, with eccentric exercises added at six weeks;² a systematic review of post-debridement rehabilitation found formal weight-bearing restrictions were used in only a small minority of protocols.¹

Eccentric Loading Is the Core of Rehabilitation

Eccentric loading is the best-established rehabilitation strategy for patellar tendinopathy, and it remains central after surgery.⁶ The Phase III program mirrors the supervised decline-board protocol used after open excision — single-leg eccentric decline squats, three sets of fifteen, twice daily, run for roughly twelve weeks.² It is deliberately deferred until week 6 so the repair is protected during the earliest healing window, and it is progressed by load, not by pain: symptoms up to 3/10 during and after loading are acceptable, but pain above that threshold means the load or volume was advanced too quickly.

Return to Sport

Surgical management of patellar tendinopathy carries a high return-to-sport rate. A systematic review reported an overall return-to-sport rate near 90%, with about 76% returning to their prior level;³ arthroscopic and open series report a median return to sport of roughly three months.^{4,5} Return is criterion-based rather than calendar-based: full symmetrical strength, a passing hop battery, a VISA-P score of at least 80, and completion of sport-specific drills without symptoms. Patients with a longer preoperative symptom duration may progress more slowly, and maintenance eccentric and heavy-slow-resistance loading should continue for at least six months after return to sport to reduce the risk of recurrence.

RED FLAGS — CONTACT DR. ROTH

- A new extensor lag or inability to perform a straight-leg raise (concern for repair failure).
- Sudden increase in effusion or a palpable defect at the repair.
- Sharp, focal pain at the repair with loading, distinct from the expected tendon-loading soreness.

- Loss of previously achieved range of motion, especially loss of extension.
- Loading pain that consistently exceeds 3/10 and does not settle with reduced load and volume.
- Signs of wound infection.

Return-to-Sport Criteria

Progression is criterion-based. The tiers below are guides; individual patients advance faster or slower depending on the extent of debridement, quadriceps recovery, and preoperative symptom duration.

Activity Tier	Criteria & Timing
Activities of daily living (ADLs)	Full pain-free ROM, quadriceps control without extensor lag, gait normalized off crutches and brace. Typically weeks 4–6.
Stationary bike / elliptical / aquatic running	ROM $\geq 110^\circ$ for the bike (elevated seat, low resistance), no effusion. Bike typically around weeks 4–5; elliptical and aquatic running in Phase III.
Jogging / running	Quadriceps LSI $\geq 70\%$, pain-free eccentric decline squats with load, no effusion. Straight-line jogging typically weeks 8–10, progressing to interval running.
Agility, plyometrics, sport-specific drills	Full pain-free strength progression, VISA-P improving, single-leg hop building toward symmetry, no pain or effusion with advanced loading. Typically Phase IV (weeks 12–16+).
Full return to sport (incl. cutting, pivoting)	Quadriceps strength LSI $\geq 90\%$; single-leg hop LSI $\geq 90\%$; VISA-P ≥ 80 ; sport-specific drills completed without pain, effusion, or apprehension; clearance by surgeon and physical therapist; psychological readiness. Typically ~3–4 months.

REALISTIC EXPECTATIONS

Patients should understand that surgery addresses the degenerative tendon but that **tendon rehabilitation is a loading program, not a rest program**. Around 90% of patients return to sport and about three-quarters return to their prior level, with a median return near three months^{3,4,5} but strength and pain-free loading are rebuilt gradually and some tendon-loading soreness during rehabilitation is expected and acceptable up to 3/10. A longer duration of symptoms before surgery can mean a slower recovery. To protect the result, maintenance eccentric and heavy-slow-resistance loading should continue for at least six months after return to sport. Persistent loading pain above 3/10 that does not settle, loss of extension, or a new extensor lag should prompt re-evaluation by Dr. Roth.

References

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Glossary

AAROM — Active-assisted range of motion; the patient initiates motion with assistance from gravity, a strap, or the therapist.

ADL — Activities of daily living.

AROM — Active range of motion; the patient moves the joint independently against gravity.

CKC — Closed kinetic chain; exercises performed with the foot fixed (e.g., squats, leg press).

Decline board — An inclined platform (typically 25°) that increases load on the patellar tendon during single-leg squats, the basis of the eccentric program.

Eccentric loading — Loading a muscle-tendon unit as it lengthens (the lowering phase of a squat); the best-established stimulus for tendon remodeling in patellar tendinopathy.

Extensor lag — Inability to actively achieve the last degrees of knee extension that are available passively.

Extensor mechanism — The quadriceps–patella–patellar tendon unit that straightens the knee.

HSR — Heavy slow resistance; slow, heavily loaded strength training used as an alternative or complement to eccentric loading for tendinopathy.

In continuity — The tendon remains intact end-to-end; it was debrided and repaired but not divided, permitting an accelerated rehabilitation.

LSI — Limb Symmetry Index; the operative limb's value as a percentage of the contralateral limb (operative ÷ contralateral × 100).

NMES — Neuromuscular electrical stimulation; used to augment quadriceps activation.

NPRS — Numeric pain rating scale; a 0–10 self-report scale used to keep tendon-loading pain ≤ 3/10.

OKC — Open kinetic chain; exercises performed with the foot free (e.g., seated knee extension).

PROM — Passive range of motion; the therapist or a strap moves the joint while the patient stays relaxed.

ROM — Range of motion.

SLR — Straight-leg raise.

VISA-P — Victorian Institute of Sport Assessment–Patella; a validated 0–100 questionnaire of patellar-tendon symptoms and function — higher is better.



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Dr. Roth completed his orthopaedic surgery residency at Harvard Medical School and his sports medicine fellowship at the Kerlan-Jobe Orthopaedic Clinic in Los Angeles. In practice since 2013, he specializes in advanced arthroscopic techniques and sports medicine procedures, and sees patients at Palo Alto Medical Foundation's Palo Alto and Dublin offices. He welcomes calls from physical therapists about his patients or this protocol.

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