Pediatric Rehabilitation Protocol for Osgood-Schlatter Disease

This protocol is intended to guide clinicians through the post-operative course for Osgood-Schlatter Disease. This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary based on providers preference, additional procedures performed, and/or complications. If a clinician requires assistance in the progression, they should consult with the referring provider.

The interventions included within this protocol are not intended to be an inclusive list of exercises. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

Considerations for the Pediatric Population

The exact cause of Osgood-Schlatter Disease (OSD) is unknown, though there are many factors that contribute to its progression in the pediatrics and adolescent populations. One of the primary predictors of OSD development is single-sport athlete vs multi-sport athletic participation and overuse. OSD is also commonly associated with repetitive microtrauma of the tibial tuberosity or due to tight quadriceps. This leads to an asynchronous development of bone and soft tissue during the maturation phase of development. In severe cases, a partial avulsion of the tibial tubercle apophysis is possible as well.

The likelihood of developing OSD is increased with higher levels of activity especially after periods of rapid growth seen in adolescence. Literature does not currently support surgery as the most effective treatment for OSD, thus conservative management should be considered as the primary means of treatment given the importance of focusing on preventative strategies to reduce overuse injuries. In line with conservative management, a period of sport avoidance is required to allow for appropriate healing which can sometimes take several months. This alone can occasionally resolve symptoms without any further treatment, however when symptoms persist, following a criterion-based protocol should be implemented for appropriate and safe progression of activity. Furthermore, due to the long symptom duration at baseline (nearly 2 years), it may be prudent to consider this a long-standing condition, which will benefit ongoing management.

Diagnosis Considerations	• Pain: typically directly on tibial tuberosity or patellar tendon attachment • Common Aggravating Factors: prolonged sitting, squatting, climbing/descending stairs, running, and jumping. • Higher-level activities which include landing with excessive hip internal rotation and/or knee valgus may contribute to abnormal PF joint loading. • Strength deficits (including balance and eccentric control) may be noticeable throughout the lower extremity and lumbopelvic region.	
Differential Diagnosis	• Articular cartilage injury • Bone tumor • Chondromalacia patella • Referred pain from low back or hip • Hoffa's Disease • Inflammatory joint disease • Neuromas	• Osteochondritis dissecans • Patellar stress fracture • Tibial tuberosity avulsion fracture • Prepatellar Bursitis • Quadriceps/Patellar tendinopathy • Sinding-Larsen-Johansson Syndrome • Symptomatic Bipartite Patella • Synovial plica

PHASE I: IMMEDIATE/ACUTE (0-2WEEKS)

Rehabilitation Goals	• Patient education on activity and sport avoidance
	  ○ Minimize aggravating factors as much as possible, such as descending stairs, prolonged sitting, running, jumping
	  ○ Initial self-symptom management and joint protection
	  ○ Risk of OSD
	• Reduce any swelling, minimize pain especially along anterior knee following exercise
	• Restore lower extremity mobility (including hip and ankle)
	• Minimize arthrogenic muscle inhibition and promote appropriate quadriceps function and hip control

Interventions	During this early phase, numerous manual interventions may be utilized to reduce the patient's pain, restriction to movement, and joint loading: • Soft Tissue Mobilization/Instrument-Assisted Soft Tissue Mobilization • Patellar Taping (McConnell, Kinesio taping for relief) • Ischemic compression/Blood flow Restricting Training • Joint mobilization/manipulation *Mobility* • Stationary biking for tolerable mobility (no to minimal resistance) • Stretching/Foam rolling ○ Hip flexors, Hamstrings, Quadriceps, Iliotibial band, Adductors, Hip extensors/rotators, Gastroc-soleus complex *Strengthening* • Static (isometric) squats within pain free ranges • Standing 4-way hip strengthening • Quadriceps isometrics at 0, 45, 90 degrees of flexion • Straight leg raise • Bridge/unilateral bridging • Sidelying clamshells, Standing and Sidelying hip abduction • Core/lumbopelvic stabilization (transverse abdominus, multifidus lifts, front/side planks)
Criteria to Progress	• Pain <2/10 with activity • Independent with initial home exercise program

PHASE II: IMMEDIATE/SUB-ACUTE (2-5 WEEKS)

Rehabilitation Goals	• Progress to closed-chain/weightbearing activities without loading of knee flexion • Maintain full ROM • Independent with progressed home exercise program, all daily activities
Additional Interventions **Continue with Phase I interventions*	*Strengthening* • Sumo walks, Monster walks, lateral band walks • 4-way hip drills • Standing Anti-rotation/pallof pressing • Heel raises *Balance/proprioception* • Single-leg stance • BOSU balance training • Clock taps • Ball toss *Cardiovascular/Endurance* • Training Stationary bike (low resistance) • Elliptical (low resistance) • Swimming

Criteria to Progress	• Tolerance to weightbearing activities • Maintenance of full ROM • Normalize muscle length or achieve muscle length goals

PHASE III: INITIAL LOADING PHASE (5-8 WEEKS)

Rehabilitation Goals	• Promote proper movement patterns • Avoid post exercise pain and swelling • Progressive tolerance to flexion based activity • Achieve daily functional goals including stair climbing
Precautions	• Weight-bearing, closed chain exercise to be performed every other day

Additional Interventions **Continue with Phase I-II Interventions*	*Strengthening*
	• Partial squat, squat to chair, wall slide
	• Isometric wall squats
	  ○ Progress with external resistance at knees for added gluteal recruitment
	• Lunge, reverse lunge, slider lunge
	• Step ups: medial and lateral progressing height per knee tolerance/pain
	• Lateral step downs
	• Agility Ladder
	  ○ Avoid hopping and high knees
	
	Cardiovascular/Endurance Training
	• Light walking
	• Cycling with resistance

Criteria to Progress	• Independent self-management of symptoms • Pain free weight bearing activity with current exercise program

PHASE IV: PROGRESSIVE LOADING PHASE (9-12 WEEKS)

Rehabilitation Goals	• Achieve all muscle strength goals
	  ○ Quadriceps index >75%; HHD or isokinetic testing 60 d/s
	  ○ Hamstrings ≥75%; HHD or isokinetic testing 60 d/s
	  ○ Glut med, glut max index ≥75% HHD
	• Progressive tolerance to flexion and eccentric closed chain activity
	• Begin running and plyometrics

Additional Interventions **Continue with Phase I-III interventions*	*Weightbearing Strengthen Progression: Flexion-based Loading* • Runners climb • Single leg squat • Double leg squat jumps • Double leg box jumps up/down • Single leg hop downs, Single leg forward hops, Lateral hopping/speed skaters • Deceleration training ○ Depth drop: double leg to single leg *Cardiovascular/Endurance Training* • Return to Run Program

Criteria to Progress	• Pain <2/10 max with any running, turning or jumping
	• Functional Assessment
	  ○ Quadriceps index >85%; HHD or isokinetic testing 60 d/s
	  ○ Hamstrings ≥85%; HHD or isokinetic testing 60 d/s
	  ○ Glut med, glut max index ≥85% HHD

PHASE V: RETURN TO SPORT (12-16 WEEKS)

Rehabilitation Goals	• Maintain full ROM • Increase strength and endurance • Agility and sport specific training

	• Education to patient and guardian regarding training loads, pain and over-activity
	  ○ No pain or swelling during or after exercise along tibial tuberosity
	  ○ Ability to progress return to run program without pain or swelling along tibial tuberosity

Additional Interventions **Continue with Phase II-IV interventions*	*Progress to plyometric and agility programs* • Speed and Agility Program • Jump and Plyometric Program *Sport Specific Training* • Non-contact practice → full practice • Avoid over-activity by limiting practice to 4-5x/week maximum

Criteria to Progress	• Participate in the sport specific training without knee pain for 2 consecutive weeks
	• Single leg horizontal jump ≥90% compared to contralateral side, demonstrating good landing mechanics
	• Symmetric SL Vertical jump compared to contralateral side, demonstrating good landing mechanics
	• KOOS-sports questionnaire >80%
	• Functional Assessment
	  ○ Quad/HS/glut index ≥90%; HHD mean or isokinetic testing @ 60d/s
	  ○ Hamstring/Quad ratio ≥66%

PHASE VI: UNRESTRICTED RETURN TO SPORT (4+ MONTHS)

Rehabilitation Goals	• Continue strengthening and proprioceptive exercises • Symmetrical performance with sport specific drills • Safely progress to full sport
Additional Interventions **Continue with Phase II-V interventions*	*Sport Specific Training* • Multi-plane sport specific plyometrics and agility program ○ Include hard cutting and pivoting depending on the individuals' goals *Return to full play* • Full practice 5-6x/week → Full play
Criteria for Discharge	• Independent self-management of symptoms • Patient and Guardian to demonstrate appropriate understanding of condition, overload principles and symptoms, and maintenance to prevent risk of recurrence

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Contact	Please email MGHSportsPhysicalTherapy@partners.org with questions specific to this protocol

References:

1. Bezuglov, E. N., et al. "Conservative Treatment of Osgood-Schlatter Disease among Young Professional Soccer Players." *International Orthopaedics*. 2020. 44 (9): 1737–1743, https://doi.org/10.1007/s00264-020-04572-3.

2. Ciatawi, Kartini, and I. Wayan Suryanto Dusak. "Osgood-Schlatter Disease." *Current Orthopaedic Practice*. vol. Publish Ahead of Print, 2022, https://doi.org/10.1097/bco.0000000000001110.

3. Circi, E., et al. "Treatment of Osgood–Schlatter Disease: Review of the Literature." *MUSCULOSKELETAL SURGERY*. 2017. 101 (3): 195–200, link.springer.com/article/10.1007/s12306-017-0479-7, https://doi.org/10.1007/s12306-017-0479-7.

4. Gaweł, Eliza, and Anna Zwierzchowska. "Therapeutic Interventions in Osgood-Schlatter Disease." *Medicine*. 2021. 100(50): 28257, https://doi.org/10.1097/md.0000000000028257.

5. Lintner, Laura J, et al. "Childhood and Adolescent Sports-Related Overuse Injuries." *PubMed*. 2023. 108 (6): 544–553.

6. Neuhaus, Cornelia, et al. "A Systematic Review on Conservative Treatment Options for OSGOOD-Schlatter Disease." *Physical Therapy in Sport*. 2021. 49: 178–187, www.sciencedirect.com/science/article/pii/S1466853X2100047X, https://doi.org/10.1016/j.ptsp.2021.03.002.

7. Rathleff, Michael S., et al. "Activity Modification and Knee Strengthening for Osgood-Schlatter Disease: A Prospective Cohort Study." *Orthopedic Journal of Sports Medicine*. 2020. 8(4): 232596712091110, journals.sagepub.com/doi/full/10.1177/2325967120911106,

https://doi.org/10.1177/2325967120911106.

8. Rathleff, Michael S., et al. "Activity Modification and Load Management of Adolescents with Patellofemoral Pain: A Prospective Intervention Study Including 151 Adolescents." *The American Journal of Sports Medicine*. 2019. 47 (7): 1629–1637, pubmed.ncbi.nlm.nih.gov/31095417/, https://doi.org/10.1177/0363546519843915.

9. Vaishya, Raju, et al. "Apophysitis of the Tibial Tuberosity (Osgood-Schlatter Disease): A Review." *Cureus*. 2016. 8 (9): www.ncbi.nlm.nih.gov/pmc/articles/PMC5063719/, https://doi.org/10.7759/cureus.780.