

High Tibial Osteotomy Rehabilitation Protocol

- I. 0-2 Weeks
 - a. Toe Touch/Flat Foot Weight Bearing (x 4 weeks)
 - b. ROM Goals: 0-110 degrees by end of Week 2
 - c. Patella Mobilization exercises
 - d. EMS/E-Stim
 - e. Cryotherapy
 - f. Stretches: Hamstring/Gastro-soleus, iliotibial band, quadriceps
 - g. Strengthening:
 - i. Isometrics: Quads,
 - ii. Closed-Chain: gait retraining, toe raises, wall sits, mini-squats
- II. 2-4 Weeks
 - a. Add:
 - b. ROM: 0-130 degrees
- III. 4-6 Weeks
 - a. Full ROM 0-135 degrees
 - b. Conditioning: stationary bike; aquatic program as available
 - c. Strengthening:
 - i. Close Chain: gait retraining, toe raises, wall sits, mini-quats
 - ii. Leg Press (70-10 deg)
- IV. 6-12 Weeks
 - a. Advance to Regular Weight Bearing off of crutches
 - b. Continue with brace unlocked fully
 - c. Continue Stationary Bike, Aquatic Program if available
 - d. Strengthening:
 - i. Knee Flexion hamstring curls (90 deg)
 - ii. Knee Extension quads (90 to 30 deg)
 - iii. Hip abd-add, multi-hip
 - iv. Continue with Leg Press
 - e. Proprioceptive training (weight shifting, mini-tramp, plyometrics)
 - f. Walking; Stair climbing machine
- V. 12-16 Weeks
 - a. Out of Brace
 - b. Progress Strengthening Activities as Tolerated
- VI. 4 Months
 - a. Return to Recreational Sports Activities as tolerated

	Postoperative Weeks					Postop Months		
	1-2	3-4	5-6	7-8	9-12	4	5	6
Brace: Long-leg postoperative Unloading	X	X	X	X	X	(X)	(X)	(X)
Range of motion minimum goals: 0°-110° 0°-130° 0°-135°	X	X	X					
Weight bearing: None to toe touch ¼ to ½ body weight Full (fracture site healed)	X	X	X	X	(X)			
Patella mobilization	X	X	X	X				
Modalities: Electrical muscle stimulation (EMS) Pain/edema management (cryotherapy)	X X	X X	X X	X X	X	X	X	X
Stretching: Hamstring, gastroc-soleus, iliotibial band, quadriceps	X	X	X	X	X	X	X	X
Strengthening: Quad isometrics, straight leg raises, active knee extension Closed-chain: gait retraining, toe raises, wall sits, mini-squats Knee flexion hamstring curls (90°) Knee extension quads (90°-30°) Hip abduction-adduction, multi-hip Leg press (70°-10°)	X	X (X)	X X	X X X X X	X X X X X	X X X X X	X X X X	X X X X
Balance/proprioceptive training: Weight-shifting, mini-trampoline, BAPS, BBS, plyometrics				X	X	X	X	X
Conditioning: UBC Bike (stationary) Aquatic program Swimming (kicking) Walking Stair climbing machine Ski machine		X	X X X	X X X	X X X X X	X X X X X	X X X X X	X X X X X
Recreational activities								X

BAPS = Biomechanical Ankle Platform System (Camp, Jackson, MI), BBS = Biodex Balance System (Biodex Medical Systems, Inc, Shirley, NY), UBC = upper body cycle (Biodex Medical Systems, Inc, Shirley, NY).

(X): See text - based on patient symptoms, function, resumption weight bearing, fracture site healing.

SOURCE: Noyes FR, Heckmann TP, Barber-Westin SD: Chapter 33: Rehabilitation after tibial and femoral osteotomy. *Noyes' Knee Disorders: Surgery, Rehabilitation, Clinical Outcomes*, Saunders, Philadelphia, 2009, pp. 905-914.

Range of Motion, Flexibility, and Modality Usage Following Osteotomy

Time Postoperative, Frequency	Extension- Flexion Limits	Patellar Mobilization	Flexibility 5 reps x 20 secs	Electrical Muscle Stimulation 20 minutes	Cryotherapy 20 minutes
1-2 weeks 3-4 x/day, 10 minute sessions	0° - 90°	Medial- lateral Superior- inferior	Hamstring, gastroc-soleus	Yes	Yes
3-4 weeks 3-4 x/day, 10 minute sessions	0° - 110°	Medial- lateral Superior- inferior	Hamstring, gastroc-soleus	Yes	Yes
5-6 weeks 3 x/day, 10 minute sessions	0° - 130°	Medial- lateral Superior- inferior	Hamstring, gastroc-soleus	Yes	Yes
7-8 weeks 2 x/day, 10 minute sessions	0° - 135°	(if required)	Hamstring, gastroc-soleus	Yes	Yes
9-52 weeks 2 x/day, 10 minute sessions	(should be full)		Hamstring, gastroc-soleus, quadriceps, iliotibial band		Yes

Muscle Strengthening Exercises Following Osteotomy

Time P.O., Frequency	Quadriceps Isometrics (Active)	Straight Leg Raises	Knee Extension (Active- assisted) 90° - 30°	Toe Raises	Wall Sits (to fatigue)	Mini- Squats	Lateral Step- ups (5-10 cm block)	Hamstring Curls 0° - 90°	Multi- hip (Flex, Ext, Abd, Add)	Leg Press 70° - 10°
1-2 weeks 3 x/day 15 minutes	1 set x 10 reps (every hour)	Flex 3 sets x 10 reps	3 sets x 10 reps							
3-4 weeks 2-3 x/day 20 minutes	Multi- angle 0°, 60° 1 set x 10 reps each	Flex, ext, 3 sets x 10 reps	3 sets x 10 reps	3 sets x 10 reps						
5-6 weeks 2 x/day 20 minutes	Multi- angle 30°, 60°, 90° 2 sets x 10 reps	Add Ankle wt ≤ 10% of bodyweight 3 sets x 10 reps	Active 3 sets x 10 reps	3 sets x 10 reps	3 sets to fatigue	3 sets to fatigue				3 sets x 10 reps
7-8 weeks 2 x/day 20 minutes		Add abduction, adduction 3 sets x 10 reps Add rubber tubing, 3 sets x 30 reps	Active 3 sets x 10 reps	3 sets x 10 reps	3 sets to fatigue	3 sets to fatigue Add rubber tubing, 0° - 30°	3 sets x 10 reps		3 sets x 10 reps	3 sets x 10 reps
9-12 weeks 2 x/day 20 minutes		3 sets x 10 reps Rubber tubing, 3 sets x 30 reps	With resistance 3 sets x 10 reps	3 sets x 10 reps	3 sets to fatigue	Add rubber tubing, 0°-40°, 3 sets x 20 reps	3 sets x 10 reps	Active, 3 sets x 10 reps	3 sets x 10 reps	3 sets x 10 reps
13-26 weeks. 2 x/day 20 minutes		Rubber tubing, high speed, 3 sets x 30 reps	With resistance 3 sets x 10 reps			3 sets x 20 reps		Active, 3 sets x 10 reps	3 sets x 10 reps	3 sets x 10 reps

P.O., postoperative; flex, flexion; ext, extension; abd, abduction; add, adduction; reps, repetitions

Aerobic Conditioning Exercises Following Osteotomy

Time Postoperative, Frequency	Upper Body Cycle	Bicycle (stationary)	Water Walking	Swimming	Walking	Stair Climbing Machine (low resistance, low stroke)	Ski Machine (short stride, level, low resistance)
3-4 weeks 1-2 x/day	10 minutes						
5-6 weeks 2 x/day	10 minutes	10 minutes	10 minutes				
7-8 weeks 1-2 x/day	15 minutes	15 minutes	15 minutes				
9-12 weeks 1 x/day (select one activity per session)		15-20 minutes	15-20 minutes	15-20 minutes	15-20 minutes	15-20 minutes	15-20 minutes
13-26 weeks 3 x/week (select one activity per session)		20 minutes	20 minutes	20 minutes	20 minutes	20 minutes	20 minutes