Additional file 1: Physiotherapy-led exercise and brace intervention divided into phases

Physiotherapy-led exercise intervention divided into phases

Time	Exercises
Weeks 1-2	Effusion control – ankle pumps and elevation. Range of motion (ROM). Quadriceps activation exercises in open and closed kinetic chains. Proprioceptive exercises with hand support. Strengthening exercises; leg extension (ROM 90-0°), heel raise and hip abduction. Cross trainer and stationary cycling allowed 2 weeks after treatment initiation.
Weeks 3-4	ROM. Proprioceptive exercises with no hand support on uneven surface Strengthening exercises; leg extension (ROM 90-0°), heel raise, squat (ROM 0-90°), hip abduction. Patients were allowed to go to a fitness center 4 weeks after treatment initiation.
Weeks 5-8	ROM. Proprioceptive exercises on uneven surface. Strengthening exercises; leg extension (ROM 90-0°), heel raise, squat (ROM 0-90°), leg press (ROM 0-90°) and hip abduction.
Weeks 9-13	ROM. Proprioceptive exercises landing and jumping on uneven surface. Strengthening exercises; leg extension (ROM 90-0°), heel raise, squat (ROM 0-90°), leg press (ROM 90-0°), hip abduction, Physio lunges and Rumanian dead lift. Running on treadmill allowed 12 weeks after treatment initiation.

Weeks 13-16	ROM (if required). Proprioceptive exercises landing and jumping on uneven surface. Strengthening exercises; leg extension (ROM 90-0°), squat - two or single leg (ROM 0-90°), leg press (ROM 90-0°), hip abduction, hip bridge - two or single leg, Physio lunges and Rumanian dead lift. Hamstring exercises in open kinetic chain, plyometric and sport-specific exercises were allowed 16 weeks after treatment initiation.

Strength training descriptors of the progressive strength exercises

	Week 1-4	**Week 5-16**
Load	Bodyweight	12 RM*+2
Repetitions	12	12
Set per session	1 set	3 sets
Rest between sets	-	60 s**
Sessions per day/week	3 per day	3 per week
Contraction modes	2 s concentric, 1 s isometric, 2 s eccentric	2 s concentric, 1 s isometric, 2 s eccentric
Rest between repetitions	0 s	0 s
Time under tension	60 s/exercise/session	180 s/exercise/session
Contraction failure in each set	No	Yes
Range of motion	Maximum possible in the brace (0-90°)	Maximum possible in the brace (0-90°)
Rest between training sessions	4 hours	≥48 hours
Anatomical definition of the exercises	Yes	Yes

The physiotherapy-led exercise intervention including goal and progression of exercises

Time	**Goal of exercise**	**Description**	**Title of exercise and Illustration**
Weeks 1-8	Effusion control Prevention of deep venous thrombosis	Ankle pumping exercises with the leg elevated.	Elevated ankle pumps

Weeks 1-2	Restore quadriceps activation including isometric quadriceps setting.	Activation of knee extensors - 5 seconds hold.	Isometric quadriceps contractions	
Weeks 1-2	Restore quadriceps activation including isotonic quadriceps setting.	Activation of knee extensors by lifting the heel off the floor and into full knee extension – 5 seconds hold.	Short-arch quadriceps contractions	
Weeks 1-2	Restore quadriceps activation including isometric quadriceps setting.	Activation of knee extensors by pressing the heel into the floor- 5 seconds hold.	Isometric quadriceps contractions – slightly bent knee	
Weeks 1-16	Restore ROM passive knee flexion.	Knee flexion performed passively. The patient is helping with hands and heel slides along the floor, or the patient is standing with the foot placed on a step.	ROM 0-90° knee flexion seated	ROM 0-90° knee flexion standing
Weeks 1-16	Restore ROM passive knee extension.	Knee extension performed passively. The patient increases extension by	ROM knee extension 0°	

		applying pressure on the thigh.		
Weeks 1-2	Restore balance and coordination including proprioceptive exercises with hand support.	Shift of weight performed while stepping forwards and backwards with non-injured leg. Progress to single-leg standing for 30 seconds adding movement of non-injured leg and turning head.	Forwards and backwards stepping – hand support 	Single leg standing – hand support
Weeks 3-4	Restore balance and coordination including proprioceptive exercises with no hand support.	Single-leg standing for 30 seconds adding small knee bends, moving arms and non-injured leg in different positions and turning head. Progress to eyes closed and unstable surface.	Single-leg stand 	Single-leg stand unstable surface
Weeks 5-16	Restore dynamic balance and coordination including proprioceptive exercises with no hand support.	Forward stepping landing on injured leg. Push backwards through the heel and land on the non-injured leg. Progress to unstable surface, increased stride length, speed and change of	Forward stepping to single-leg stand 	Forward stepping unstable surface

		direction	
Weeks 13-16	Restore balance and coordination including proprioceptive exercises with no hand support.	Static lunge position rotate upper body from side to side. Progress to unstable surface and/or holding a bar or a weight.	Static lunge position - upper body rotation
Weeks 1-8	Restore strength including progressive strength training.	Heel raises Exercise with or without hand support. Progress to holding a weight in each hand for increased load.	Heel raises
Weeks 1-16	Restore strength including progressive resistance exercises	Hip abduction Progress to resistance band placed above the knee. In case of collateral ligament injury, the band is not allowed under knee level in the first six weeks	Hip abduction - standing Hip abduction – side lying

Weeks 1-16	Restore strength including progressive resistance exercises	Leg extension 90-0° Progress to resistance band placed around the ankle and fixed to the forefoot	Leg extension 90-0°
Weeks 3-16	Restore strength including progressive resistance exercises.	Squat 0-90° Progress to holding a weight in each hand for increased load or do single-leg squatting.	Squatting 0-90°
Weeks 9-16	Restore strength including progressive resistance exercises.	Physio Lunges Progress to holding a weight in each hand for increased load.	Physio Lunges
Weeks 9-16	Restore strength including progressive resistance exercises.	Rumanian deadlift Progress to gradual increase of ROM.	Rumanian deadlift
Weeks 5-16	Restore strength including progressive resistance exercises.	Simulated leg press 0-90° with resistance band.	Simulated leg press

Weeks 13-16	Restore strength including progressive resistance exercises.	Hip bridge. Progress to single-leg hip bridge.	Hip bridge
Week 16	Restore explosive strength including plyometric exercises.	Series of jumps on two legs. Progress to increased height and speed, jumps including turns and single-leg jumps.	Jumping - from floor to step (two feet) - from step onto floor (two feet) - jumping two feet - jumping on one leg

Support brace intervention divided into phases

Time	PTS* brace
Weeks 1-4	PTS-brace 0-90° 24 hours/day.
Weeks 5-8	PTS-brace 0-90° 24 hours/day. Careful removal of PTS-brace was allowed for showering (sitting with 45° flexion or standing without weight bearing)
Weeks 9-12	PTS-brace 0-90° was worn only during performance of the exercise programme and knee-strenuous activities, however ROM exercises were performed without the brace.

Week 12	PTS-brace discontinued.

*Posterior Tibial Support