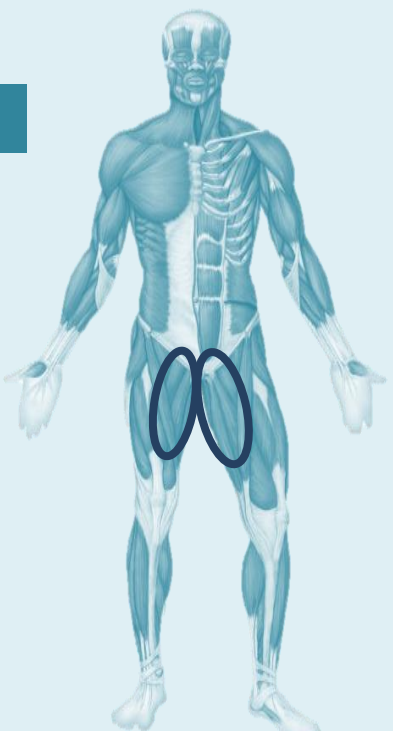
ASPETAR سبيتار

ACUTE ADDUCTOR INJURIES

Treatment Protocol



ASPETAR سبيتار

Aspetar Orthopaedic & Sports Medicine Hospital

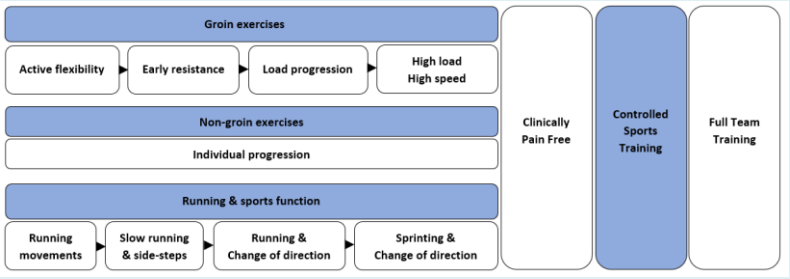
www.aspetar.com

Intro

- This protocol is a description of the standardized criteria-based treatment protocol included in our research study on acute adductor injuries.
- The sessions were supervised by a sports physiotherapist.
- The protocol was developed to minimize equipment needed. Only resistance elastics, agility cones, and a ball (if relevant) are needed.
- The protocol has two key parts. A groin exercise progression and a progressive running and sports protocol.
- For athletes with high compliance (>3 sessions/week), additional non-groin exercises were included on alternate days when the protocol exercises were not performed. These were not standardized, but generally focused on the posterior chain muscle groups. These exercises all had to be completed without adductor pain.
- During the treatment period, therapeutic ultrasound, laser, and dry needling were prohibited.
- Soft-tissue treatment/massage was prohibited on the injured area, but allowed elsewhere, if high muscular tone was considered to limit exercise performance.
- Athletes were not allowed to progress through the rehabilitation phases if they were taking any form of pain medication.

Rehabilitation phases

Both the groin exercise protocol and the running & sports movement protocol are divided into 4 phases. Set criteria (described later) need to be met prior to passing each stage. The two parts can be progressed independently, meaning that it is for example possible to be in phase 2 in the groin exercise protocol and in phase 4 in the running protocol or vice versa. Criteria for both protocols must be completed before initiation of on-field/on-court sports-specific training.



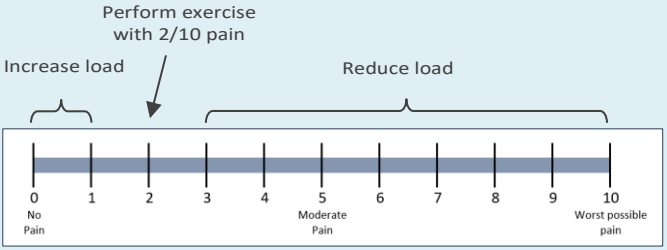
Intensity of exercises

Pain-Controlled Repetition Maximum

Standardization of intensity in resistance training generally relies on an estimate of a percentage of maximal load at a given number of repetitions performed to failure. This is known as repetition maximum (RM). An example could be 75% of 1RM, which corresponds to 10RM, representing the maximal load that can be completed in 10 consecutive repetitions.

In patients with acute muscle injuries, low actual RM can rarely be performed, as pain will usually set the limit of load when targeting the injured muscle. Therefore, setting a predefined number of repetitions will generally result in sets being performed at a lower load and/or with fewer repetitions than their current ability. Thus, athletes were instead instructed to perform the included exercises to repetition failure within a pain limit of 2 on numerical rating scale from 0-10.

If pain was ≤ 1/10, athletes were encouraged to increase the load. If pain was ≥ 3/10 the load was reduced, i.e. the athletes were continuously encouraged to perform exercises with minor pain corresponding to 2/10 and for as many repetitions as possible.
We call this pain-controlled repetition maximum.



Numerical pain rating scale

Groin exercise protocol

Phase

1 Active flexibility

Exercises - 4 sets of 20 reps
1. Leg swings side to side
2. Leg swings front to back
3. Hip circles

Progression Criteria
Minimal pain (≤2/10) during:
- Rest
- Walking
- Standing maximal abduction activation without resistance

2 Early resistance

Exercises - 2 sets of 20+ reps (PRM) – velocity: 3s con/3s ecc
Continue exercises 1-3
4. Hip adduction with elastics
5. Hip flexion with elastics
6. Abdominal twist with elastics

Progression Criteria
No resting pain (DOMS accepted).
Hip adduction exercise: min. 1 set of 20PRM (pain ≤ 2/10)

3 Load progression

Exercises - 3 sets of 15+ reps (PRM) – velocity: 3s con/3s ecc
Continue exercises 1-6
7. One leg coordination exercise.

Progression Criteria
Hip adduction exercise: Min 1 set of 15PRM (pain ≤ 2/10)
Full range of motion high velocity active dynamic stretching/ballistic stretch (pain ≤ 2/10)

4 High load High speed

Exercises - 3 sets of 15+ reps (PRM) – velocity: <1s con/3s ecc
Continue exercises 1-7.
8. Kicking exercise/Tension Arc
9. Copenhagen Adduction exercise.

Clinically Pain Free (CPF) criteria
Pain free palpation
Pain free maximal isometric adduction in outer-range
Pain free maximal passive adductor stretch
Pain free hip adduction exercise with elastics at 10RM
Pain free Copenhagen Adduction exercise 10 reps.
Pain free T-Test at 100% self-reported intensity

Running & sports function protocol

Phase			
1	**Running movements**	**Exercise** Small steps on the spot progressed into slow running	**Progression Criteria** Running movements performed pain free at 30% intensity
2	**Slow running & side-steps**	**Exercises** Linear running (jogging) with increasing speed and time Narrow side-steps increasing step width and speed Forward and backwards running Zig-zag shuffles	**Progression Criteria** Running pain free for 15 min. up to 60% intensity Side-steps and zig-zag runs pain free at 60% intensity
3	**Progressive running & COD**	**Exercises** 30m linear running intervals with increasing speed Side-steps and ladder drills increasing step width and speed Hard acceleration and decelerations Zig-zag shuffles and turns with and without ball.	**Progression Criteria** 10 straight 30m. sprints pain free at 80% intensity T-Test pain free at 80% intensity
4	**High speed running & COD**	**Exercises** 30m linear running intervals progressed to max sprints Side-steps progressed to max width and max speed Acceleration and decelerations progressed to max speed Zig-zag shuffles and turns with and without ball progressed to max speed COD/cutting exercises at different angles (45, 90, 135 & 180 deg.)	**Clinically pain free criteria:** 10x straight 30m sprints pain free at 100% intensity T-Test pain free at 100% intensity **Controlled sports training criteria:** Illinois Agility test pain free at 100% intensity Spider test pain free at 100% with and without ball, if ball sport Individual sports-specific drills

Active flexibility

Leg swings

Extension/Flexion

Stand on one leg while holding on to a stable support on the same side as the moving leg. Swing the leg backward and forward in a kicking motion with progressing range and speed. Keep the chest forward and try not to bend the hip of the standing leg during the movement.

Leg swings

Abduction/Adduction

Stand on one leg while holding on to a stable support at the front. Swing the leg from side to side in front of the body with progressing range and speed. Keep the chest forward and try not to bend the hip of the standing leg during the movement. Keep the toes pointing forward during the entire movement.

Hip circles

Stand with the legs app. 1½ hip-width apart and the hands placed on the side. Move your pelvis and hips in a circular motion. Continuously create bigger circles and increase speed of movement.

Early resistance & progression

As soon as you can move your leg maximally out to the side with only minor pain (max 2/10), and you have no or minimal pain during rest and walking, you can start to place resistance load on your adductors.

In this study we used elastic tubes, but you can also use a cable pulley doing the same exercises.

The elastic tubes we used had 4 different levels of resistance: 1 to 4 elastic tubes. These were 3m long to reduce the difference in load from the beginning to the end of the movement (which is higher with shorter bands). Further adjustments of resistance is made by changing the distance from the fixation point to the starting position of the exercise. This is used to adjust and record progression.

Hip adduction with an elastic band

Stand on one leg with the other leg positioned as far out to the side as possible and the strap from the elastic band around the ankle. There should be tension in the elastic band from the beginning of the movement.

The upper body is kept straight while holding on to a stable support. The leg is moved in towards the standing leg until they touch, while being about half a foot length behind the foot of the standing leg with toes pointing forward throughout the movement.

Every set is performed with as many repetitions as possible. To increase the load, increase the distance from the fixation point to the starting point of the exercise or increase the number of elastic tubes.

The hip adduction exercise is used in the progression criteria. Initially 2 sets are performed. If you are able to have a load where you get tired after 20 repetitions, this is a criterion to move to phase 3, where 3 sets are performed. Being unable to do more than 15 repetitions is a criterion to move to phase 4, where 4 sets of the exercise is performed. Performing 10RM pain free is one the criteria for completion of the protocol. Below table provides an overview of mechano-biological resistance exercise descriptors.

	Phase 1	Phase 2	Phase 3	Phase 4
Load magnitude	-	Maximum load until 2/10 pain	Maximum load until 2/10 pain	Maximum load until 2/10 pain OR 10RM
Number of repetitions	-	>20	16-20	10-15
Number of sets	-	2	3	4
Rest between sets	-	Individualised	Individualised	Individualised
Session per week	-	3	3	3
Duration of experimental period	-	Until protocol completion	Until protocol completion	Until protocol completion
Distribution of contraction modes per rep.	-	Concentric: 3s Isometric: 0s Eccentric: 3s	Concentric: 3s Isometric: 0s Eccentric: 3s	Concentric: ≤1s Isometric: 0s Eccentric: 3s
Rest between repetitions	-	0s	0s	0s
Total time under tension	-	252+s	288s-360s	160s-240s
Volitional failure	-	Yes	Yes	Yes
Range of motion	-	Hip neutral to maximal hip abduction	Hip neutral to maximal hip abduction	Hip neutral to maximal hip abduction
Recovery time between sessions	-	48h	48h	48h
Anatomical definition of exercise	-	Yes	Yes	Yes

Hip flexion with an elastic band

Stand on one leg while holding on to a stable support. The elastic band is attached just above the knee, which is as far back, in hip extension, as possible. There should be tension on the elastic band from the beginning of the movement.

The leg is moved forward and upwards in a hip flexion movement to about 45 deg. hip flexion with the lower leg bent and relaxed during the movement. Keep the chest forward and maintain abdominal muscle contraction so the pelvis does not move, and the movement is only in the hip.

Every set is performed with as many repetitions as possible. To increase the load, increase the distance from the fixation point to the starting point of the exercise or increase the number of elastic tubes.

Abdominal twist with an elastic band

Stand with one leg in the front and one in the back perpendicular to elastic band fixation point, which should be attached above shoulder height. The leg closest to the fixation point should be in the front.

Pull the elastic band by rotating the upper body away from the fixation point. Arms are kept slightly flexed throughout the movement. Keep a strong contraction of the abdominals and focus on keeping pelvis in the same position throughout the movement. The upper body should be rotating so one shoulder is moving straight in front and then the other (if your shoulder strength is the limiting factor, keep your hands close to the body in the same position throughout the movement).

Every set is performed with as many repetitions as possible. To increase the load, increase the distance from the fixation point to the starting point of the exercise or increase the number of elastic tubes.

Kicking exercise / Tension Arc

Use two elastic bands for this exercise. One is placed high and one is placed low. Stand on one leg with the low placed elastic band around the ankle of the moving leg. Grip the other elastic band with the hand of the other side.

The leg and arm are rapidly moved forward in a kicking and throwing motion at the same time (<1s) and then slowly returned to the starting position (3s). Do not touch the ground with the moving foot between repetitions.

Every set is performed with as many repetitions as possible. To increase the load, increase the distance from the fixation point to the starting point of the exercise or increase the number of elastic tubes. Be sure not to compromise your technique in the exercise due to too much resistance.

One-leg coordination exercise/ cross country skiing on one leg

Stand on one leg with the other leg slightly bent in the knee. When keeping the balance is easy start the movement. Bend and straighten the knee that you are standing on, while swinging the other leg and the arms in the same rhythm. When the knee of the moving leg is in the front the arm of the opposite should be in the front too. These should follow each other throughout the exercise.

The exercise can be progressed by adding dumbbells in each hand.

Copenhagen Adduction exercise

This is a partner exercise where you are lying on the side with one forearm as support on the floor and the other arm placed along the side of your body. The top leg is held around the height of the partner's hip, who is holding your leg with one hand supporting the ankle and the other hand supporting the knee.

Raise the body from the floor and move the bottom leg up so that the feet touch each other, and the body is in a straight line. Slowly lower your body(pelvis) towards the ground while the foot of the bottom leg is also lowered, so that it just touches the floor without using it for support. It is important to note that the training focus is mainly on the upper leg.

If you don't have a partner available, you can perform the exercise by placing your top leg on a table or exam bed, which should be at about the height of your hip when you're standing.

Do as many repetitions as possible.

- Athletes were recommended to continue with this exercise twice per week after they returned to sport

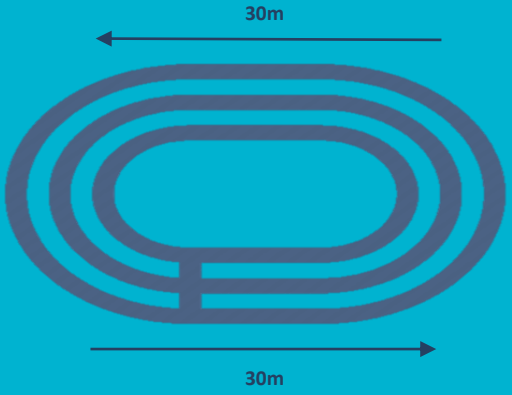
Slow straight running movements

Initially start by performing small steps on the spot. Once you a comfortable doing this, and the pain is max 2/10, progress into actual slow running. We use a 5m "agility ladder" marked on the ground, where two feet has to be within the squares when you're moving forward. When you can do this pain free at 30% of you maximal speed, you can move to the next running phase where other ladder drills and zig-zag movements are included.

Slow straight running

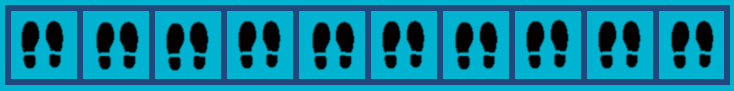
When the short slow running is performed pain free, you can progress to more natural running (jogging). Initially, take short strides and progress when you feel ready. Similar to the basic exercises, try to push yourself so you feel a bit of minor pain equivalent to 2/10. If the pain increases during the run or when attempting to increase speed, reduce the pace, but try to keep running. When accelerating it can be beneficial to lean forward with the entire upper body rather than upright with the chest forward, and to take shorter strides.

Once you can run pain free at about 60% of your intensity for 15 min, you are ready to progress to higher speeds.



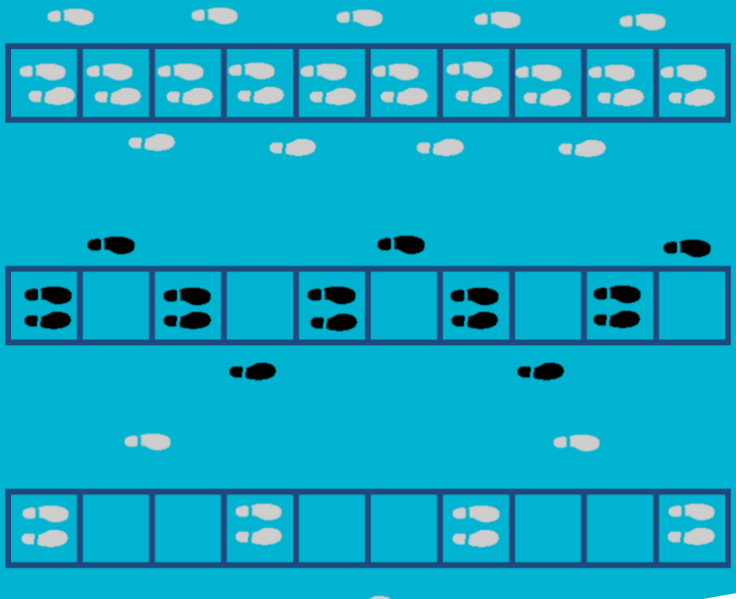
Ladder drills: lateral shuffles

Start with ladder to your side. Move one foot laterally into the first box, followed by the second foot. Continue to shuffle laterally with two feet in each box. Progress in speed and by skipping one and 2 boxes as you move laterally.



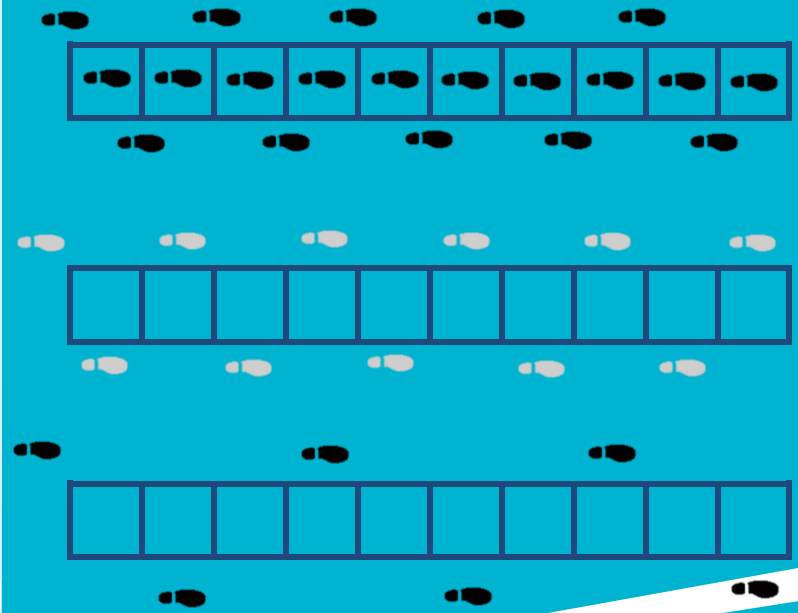
Ladder drills: side-to-side steps

Start on the side of the ladder then step into the first box with one foot after the other. As the second foot enters the box the first foot should move out of the box to the opposite side. The second foot is then moved one box forward end the first foot enters the same box. The second foot then goes out of the box and the first foot moves a box forward. This exercise is also known as the "Ickey shuffle" drill. The progression of this exercise is the relative speed as well as the number of boxes forward (one, two or three).



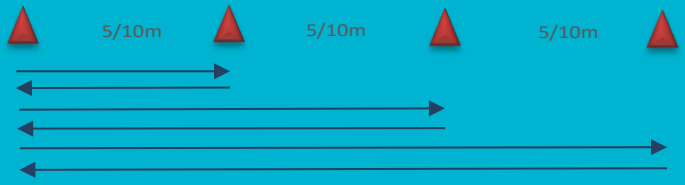
Ladder drills: Diagonal unilateral jumps

Stand on one leg on the side of the ladder. Jump into the first box and then as fast as possible to the opposite side slightly forward, followed by a jump into the next box. Jump on the same leg throughout the length of the agility ladder. Progress by jumping over the box and then further forward.



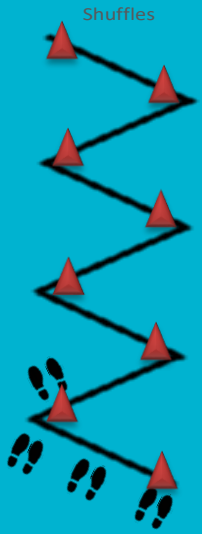
Accelerations and decelerations

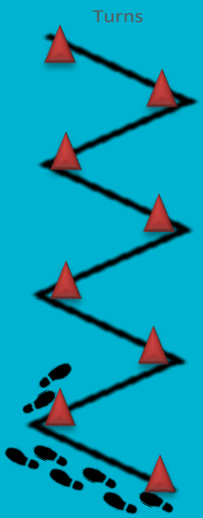
Linear forward and backwards runs with increasing intensity. Accelerate forward towards the first cone then backwards back to the starting cone, and again forward towards the second cone and all the way back to the starting cone. Similar toward the third cone. This drill can also include full turns and reactive actions.



Zig-Zag runs

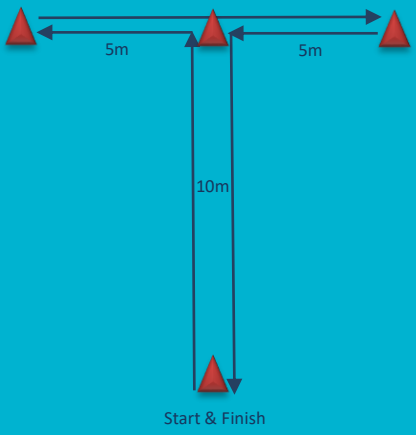
Zig-zag runs with varying distance between cones and total length. These are performed with shuffle movements and forward running with sharp turns, and can be performed with and without ball, with increasing speed.





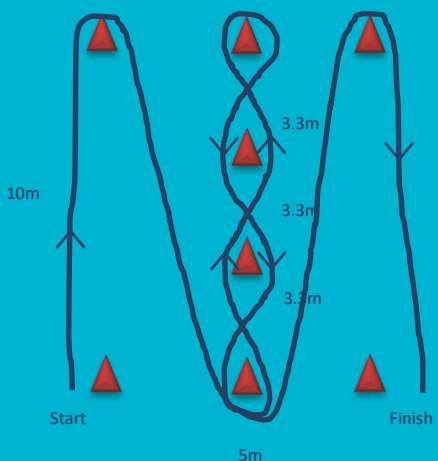
T-test

Run in a T-shaped pattern. From the bottom of the "T" run straight toward the middle cone. Shuffle to the side and touch the cone with one hand, then shuffle towards the opposite side and touch the cone furthest away. Shuffle back to the middle cone, touch, and run backwards towards the starting cone.



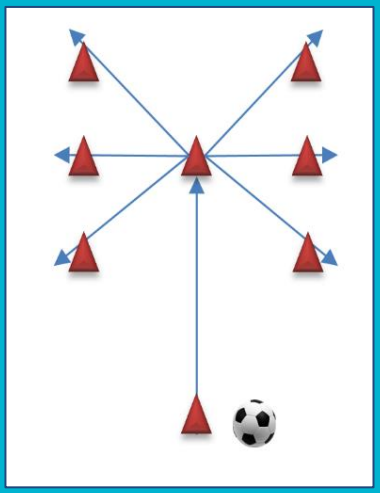
Illinois Agility drill

Run straight towards the first cone and back. Then swerve around the four cones in the middle front and back and sprint towards the lateral cone and to the finish line, as depicted below.



Star drill

Run straight forward from the first cone to the cone in the middle (10m). Then cut and accelerate to one of the other cones changing direction in 45°, 90°, 135°, & 180° angles to both sides. Jog back to the first cone after each run. The exercise can be performed both with and without a ball.



Additional exercises

General non-groin exercises

In addition to the standardized protocol, we generally recommend performing additional exercises on the days that the protocol is not performed.

There may be many different exercises which can be relevant for you. Discuss with your physiotherapist how to prioritize these. It is important that none of these exercises are focusing on the adductors, as it is part of the protocol that the adductor muscles get a relative recovery day between the groin exercise sessions. In this regard, ensure all additional non-groin exercises are performed pain free.

Clinically Pain Free Criteria

In order to be progressed to the controlled sports training, you have to be clinically pain free in specific clinical examination tests, as well as in a number of groin exercises, and running and change of direction drills as described below.

Clinically Pain Free Criteria
Pain free adductor palpation
Pain free maximal isometric adduction in outer-range abduction
Pain free maximal passive adductor stretch
Pain free hip adduction exercise with elastics at 10RM
Pain free Copenhagen Adduction exercise 10 reps.
Pain free linear sprinting at 100% self-reported intensity (10x30m)
Pain free T-Test at 100% self-reported intensity

Controlled Sports Training

When you have completed the clinically pain free criteria, you have to perform on-court or on-field exercises at an intensity corresponding to what you would expect to perform during a normal training session. This will usually take at least 2 or 3 days, respectively. The exercises will depend on your sport and your position. When you have completed these exercises pain free and you feel ready, you are allowed to return to your sport, preferably with a progressive increase in normal training sessions initially. Below is an example from football with drills you need to complete pain free before you return to sport.

Criteria for completion of controlled football training

Pain free Illinois Agility Test at 100% intensity
Pain free Spider test at 100% intensity
Pain free football drills:

- Pre-planned & reactive change of directions with and without ball
- Jumps (bilateral/unilateral, horizontal/vertical)
- Straight passes, progressing distance
- Crosses (standing & running)
- Corner kicks/goal kicks
- Shooting scenarios
- One vs. one

Orthopaedic & Sports Medicine Hospital

www.aspetar.com

twitter.com/Aspetar

facebook.com/Aspetar

instagram.com/aspetar

youtube.com/aspetar