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# Groin Injuries in Football Players

# Overview



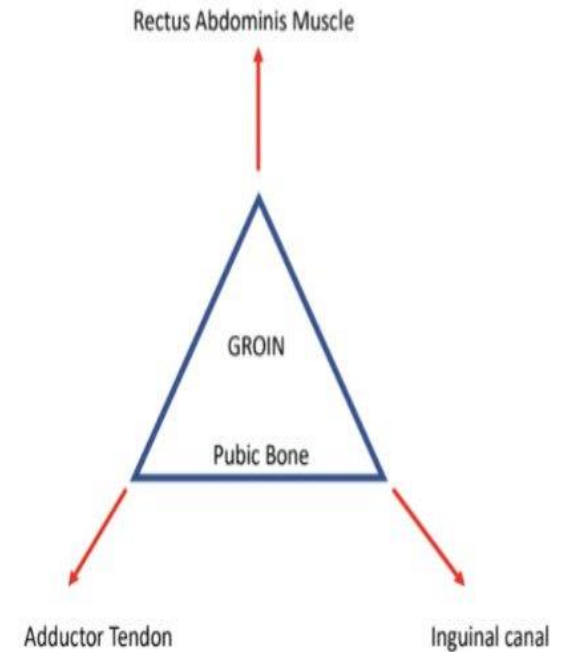
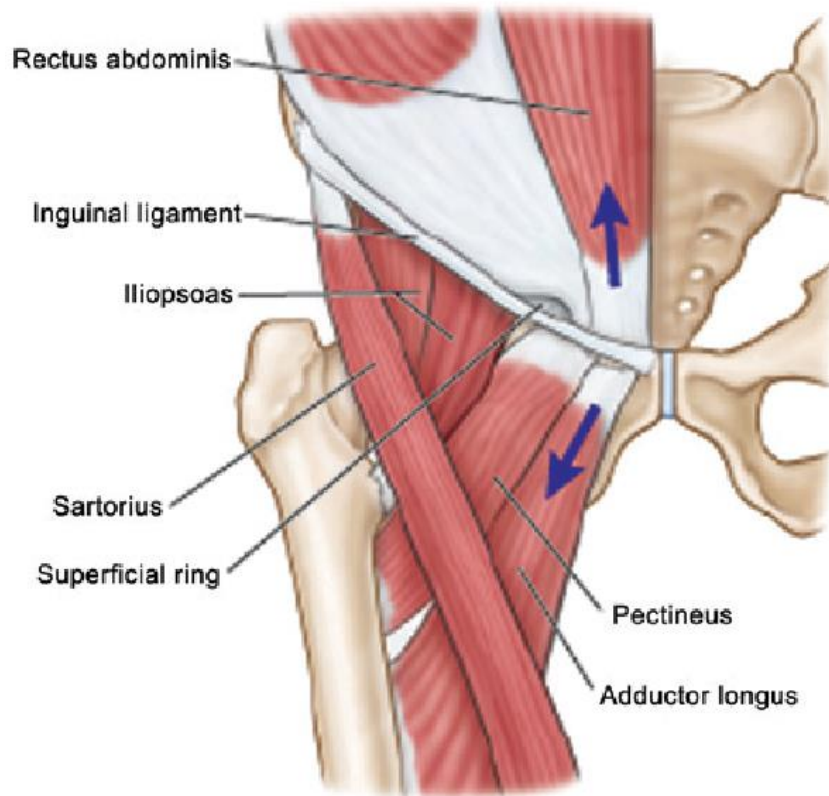
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- Groin anatomy
- Main groin issues experienced by football players
- Clinical and imaging assessments
- Treatment and Rehabilitation Options

# Groin Anatomy



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**Figure 1:** Relationship between inguinal canal and muscle group/tendons which can all lead to groin pain

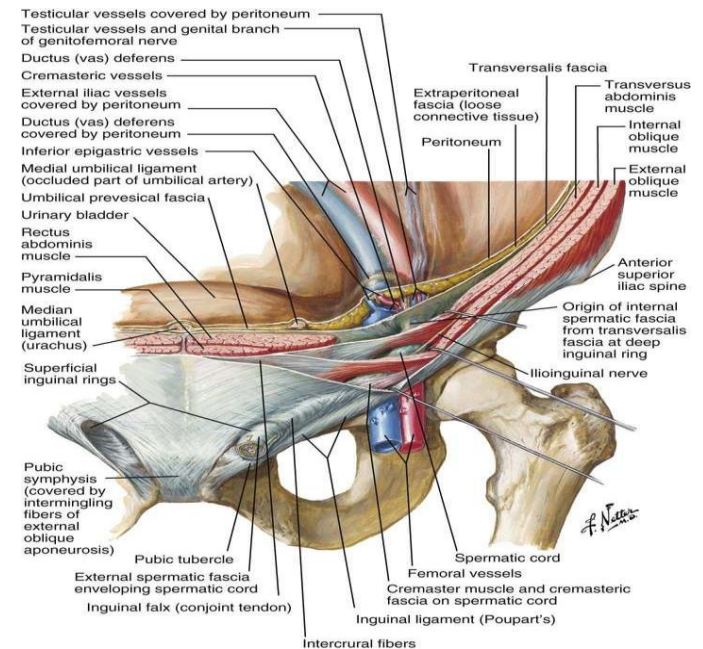
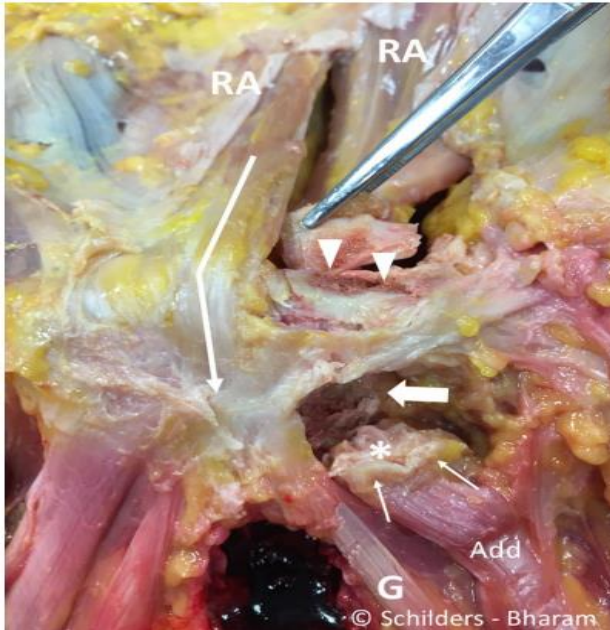
# A Complex Area



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## Is chronic groin pain a Bermuda triangle of sports medicine?

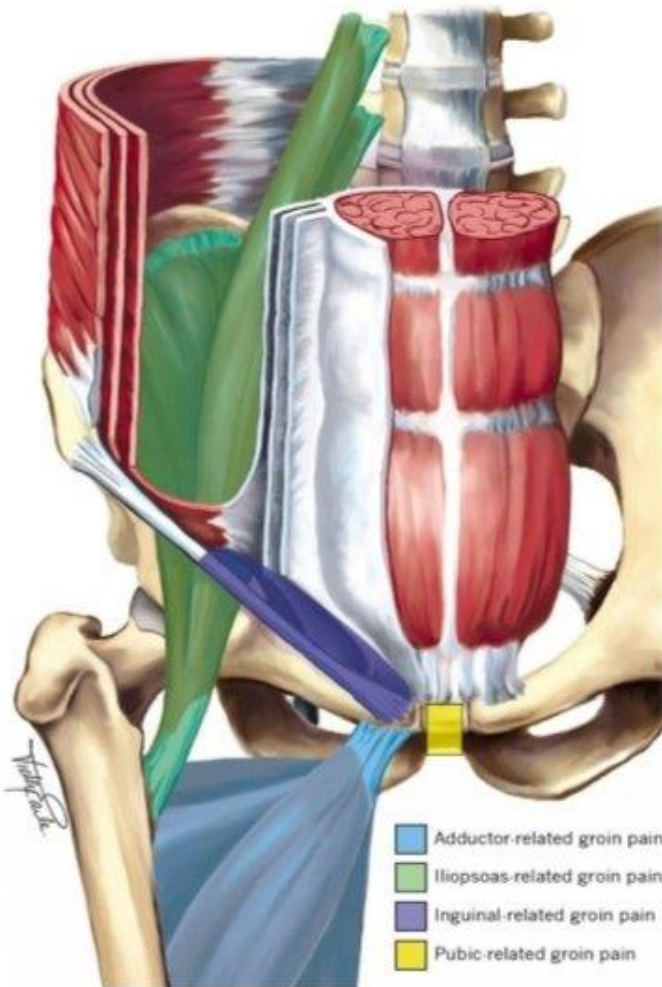
Božidar Šebečić, Mladen Japjec, Saša Janković, Vencel Čuljak, Bojan Dojčinović, Mario Starešinić



# DOHA Consensus



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## Clinical entity

## Symptoms and examination findings

*Adductor-related groin pain*

Adductor tenderness and pain on resisted adduction testing.

*Iliopsoas-related groin pain*

Iliopsoas tenderness. More likely if there is pain on resisted hip flexion and/or pain on hip flexor stretching.

*Inguinal-related groin pain*

Pain in inguinal canal region and tenderness of the inguinal canal. No palpable inguinal hernia is present. More likely if aggravated by abdominal resistance or Valsalva/cough/sneeze.

*Pubic-related groin pain*

Local tenderness of the pubic symphysis and the immediately adjacent bone. No particular resistance tests suggested to provoke symptoms related to pubic-related groin pain.

*Hip-related groin pain*

Clinical suspicion that the hip joint is the source of groin pain, either through history (e.g. mechanical symptoms of locking or catching) and/or clinical examination (e.g. painful and limited range of motion of the hip).

*Other causes for groin pain*

Clinical suspicion of symptoms or a diagnosis that cannot be classified into one of the previous mentioned entities.

# Acute Groin Injuries



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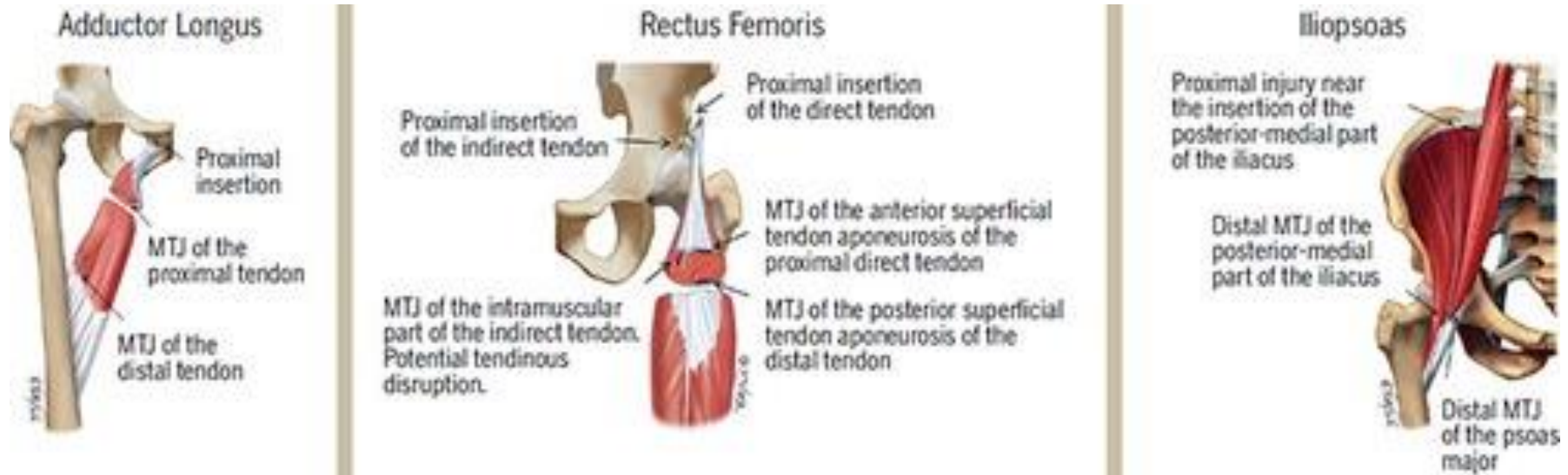


FIGURE 2. Typical anatomical locations of acute groin injuries in athletes. Images reproduced with permission from Serner et al.<sup>87,88</sup> Abbreviation: MTJ, myotendinous junction.

# Chronic Groin Pain



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Usually due to three causes that are often combined;

- Pubic overload / osteitis pubis.
- ‘Inguinal disruption’ / Sportsmans hernia arising from a secondary weakness of the posterior wall of the deep inguinal ring
- Musculotendinous / Enthesopathic lesions of the adductors or rectus abdominus

# Pubic bone stress / Osteitis Pubis



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## Athletic osteitis pubis

Corey J Hiti <sup>1</sup>, Kathryn J Stevens, Moira K Jamati, Daniel Garza, Gordon O Matheson

Osteitis pubis is an overuse injury caused by biomechanical overloading of the pubic symphysis and adjacent parasymphyseal bone with subsequent bony stress reaction.

The pain is usually aggravated by running, cutting, hip adduction and flexion against resistance, and loading of the rectus abdominis. The pain can progress such that athletes are unable to sustain athletic activity at high levels.

Management of chronic recurrent *osteitis pubis*/pubic bone stress in a Premier League footballer: Evaluating the evidence base and application of a nine-point management strategy

Stephen S. McAleer <sup>a,c,\*</sup>, Justus Gille <sup>b</sup>, Stefan Bark <sup>b</sup>, Helge Riepenhof <sup>a,b</sup>

Pubic bone Stress stages	Clinical presentation
I	Groin pain on the kicking side Unilateral inguinal and adductor pain Pain subsides during warm-up but reappear post-training
II	Bilateral inguinal and adductor pain Increased pain after training
III	Bilateral inguinal, adductor and abdominal pain Pain kicking a ball, sprinting, changing direction, moving from sit to standing and prolonged walking Unable to train or play
IV	Adductor and abdominal pain with referral to the lumbopelvic region during defecation, coughing and sneezing and walking on uneven surfaces Inability to perform activities of daily living (ADLs) symptom free



# Pubic Apophysitis



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Original article



OPEN ACCESS

## Pubic apophysitis: a previously undescribed clinical entity of groin pain in athletes

Matthieu Saily,<sup>1</sup> Rod Whiteley,<sup>2,3</sup> John W Read,<sup>4</sup> Bruno Giuffre,<sup>3,5</sup> Amanda Johnson,<sup>2,6</sup> Per Hölmich<sup>7,8,9</sup>

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<sup>5</sup>Radiology Department, Royal North Shore Hospital, Sydney, New South Wales, Australia  
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### ABSTRACT

**Background** Sport-related pubalgia is often a diagnostic challenge in elite athletes. While scientific attention has focused on adults, there is little data on adolescents. Cadaveric and imaging studies identify a secondary ossification centre located along the anteromedial corner of pubis beneath the insertions of symphyseal joint capsule and adductor longus tendon. Little is known about this apophysis and its response to chronic stress.

**Aim** We report pubic apophysitis as a clinically relevant entity in adolescent athletes.

**Methods** The clinical and imaging findings in 26 highly trained adolescent football players (15.6 years  $\pm$  1.3) who complained of adductor-related groin pain were reviewed. The imaging features (X-ray 26/26, US 9/26, MRI 11/26, CT 7/26) of the pubic apophyses in this symptomatic group were compared against those of a comparison group of 31 male patients (age range 9–30 years) with no known history of groin pain or pelvic trauma, who underwent pelvic CT scans for unrelated medical reasons.

**Results** All symptomatic subjects presented with similar history and physical findings. The CT scans of these patients demonstrated open pubic apophyses with stress-related physical changes (widening, asymmetry and small rounded cyst-like expansions) that were not observed in the comparison group. No comparison subject demonstrated apophysal maturity before 21 years of age, and immaturity was seen up to the age of 26 years.

**Conclusions** This retrospective case series identifies pubic apophysal stress (or ‘apophysitis’) as an important differential consideration in the adolescent athlete who presents with groin pain.

### INTRODUCTION

Sport-related pubalgia in adult athletes remains a diagnostic and management challenge for the sports physician. Anatomically, we consider four potential sources of pain as most commonly incriminated: adductor longus, ilio-psoas, inguinal canal (associated or not with neural irritation and/or hernias), and pubic symphysis. Nevertheless, other causes for sport-related groin pain have also been cited (eg, hip pathology, rectus abdominis strain, pelvic stress fracture).

Unlike adults, the adolescent population is vulnerable to maturation-related injuries, such as osteochondral lesions, growth plate fractures, osteochondroses and apophysitis.<sup>1–4</sup> Pubic symphysis maturation is a long and complex process.<sup>5</sup> Developmentally, the pubic symphysis is the last part of the human skeleton to mature.

Developmental activity at the symphyseal joint face has been recorded as occurring until 35–40 years of age.<sup>6</sup> Accordingly, this site is used to determine age at death of skeletal remains.<sup>6</sup> Cadaveric studies<sup>6</sup> describe the anatomy as including an apophysis (secondary ossification centre) as ‘... extended from the antero-medial pubis to lateral limit of the capsular tissues closely applied to fibrocartilaginous disk, capsular tissues and deeper sub-chondral bone’. During growth, the apophysal cartilage undergoes endochondral ossification with irregular islands developing in ridges along the pubic sub-chondral surface. MRI<sup>7,8</sup> shows that the pubic symphysis’ appearance is age-dependant with all participants under 21 years demonstrating a pubic apophysitis. Robinson *et al*<sup>7</sup> concluded that ‘this junction of the pubis, apophysis and soft tissue might be expected to represent an area of biomechanical weakness that endures considerable forces during athletic single stance manoeuvres.’

In young football players, injury to the pelvic or groin region represent between 4.9% and 11% of the injuries seen.<sup>9–12</sup> Groin-related injuries tend to increase with maturation during adolescence.<sup>10</sup> Le Gall *et al*,<sup>9</sup> in an elite youth football academy population, documented 20.4% prevalence of osteochondral disorders affecting the pelvis in the symptomatic subjects, specifically, they reported sites of injury as: the ischium, anterior inferior iliac spine, anterior superior iliac spine, iliac crest and lesser trochanter. The pubic symphysis was not cited. Oddly, pubic apophysitis is rarely mentioned as a differential diagnosis,<sup>13–15</sup> and to the best of our knowledge this particular clinical entity has not been described previously.

Practically, the maturation process of the pubic apophysis bridges adolescence and adulthood, and therefore, most young football players signing a first professional contract should be considered as skeletally immature in this respect.

We aimed to report pubic apophysitis as a potential clinical entity in skeletally immature athletes and to propose a clinical and radiological workup.

### METHODS

#### Setting

The Aspire Sports Academy’s medical centre (Doha, Qatar) responsible for the care of approximately 180 boys aged 12–18 years.

#### Inclusion criteria

**Symptomatic group**  
 During a 2-year period from September 2009 to September 2011, all athletes presenting with sport-related groin pain were examined by one

Original article

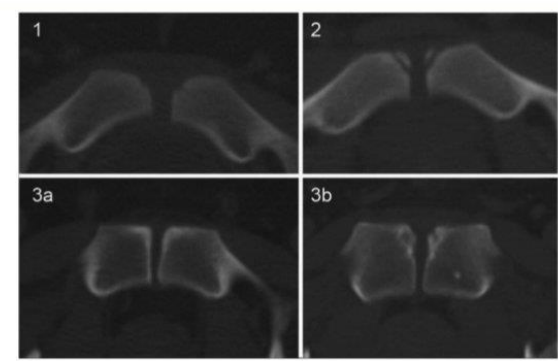


Figure 1 Axial CT scan depicting the clinical staging of maturation (stages 1, 2, 3a and 3b) from the comparison group. A secondary centre of ossification (stage 2) was deemed to be present only if a growth plate was definitely either partially or completely visible between the ossification centre and the metaphysis.

Table 1 Investigations performed and ages for each athlete in the clinical (painful) group

Athlete	X-ray	Ultrasound	MRI	CT	Age at X-ray
1	Yes	No	Yes	No	14.9
2	Yes	Yes	No	No	15.5
3	Yes	No	Yes	No	16.7
4	Yes	Yes	No	No	15.4
5	Yes	Yes	No	No	16.1
6	Yes	Yes	No	No	16.9
7	Yes	No	No	No	16.5
8	Yes	Yes	Yes	Yes	18.0
9	Yes	No	No	No	16.2
10	Yes	Yes	Yes	Yes	16.9
11	Yes	No	No	No	16.3
12	Yes	Yes	No	No	16.8
13	Yes	Yes	No	No	16.1
14	Yes	Yes	No	No	14.5
15	Yes	No	Yes	No	14.4
16	Yes	No	No	No	16.8
17	Yes	No	Yes	No	13.8
18	Yes	No	Yes	No	13.9
19	Yes	No	Yes	No	13.3
20	Yes	No	No	Yes	13.6
21	Yes	No	Yes	No	15.3
22	Yes	No	Yes	No	14.6
23	Yes	No	Yes	Yes	17.0
24	Yes	No	No	Yes	14.0
25	Yes	No	No	Yes	17.5
26	Yes	No	No	Yes	15.0
Totals	26	9	11	7	
			Average	15.61	
			S.D.	1.32	
			Minimum	13.3	
			Maximum	18.0	



Figure 2 Anteroposterior pelvic X-ray showing pubic symphysis stress-related signs.

# Inguinal-related groin pain

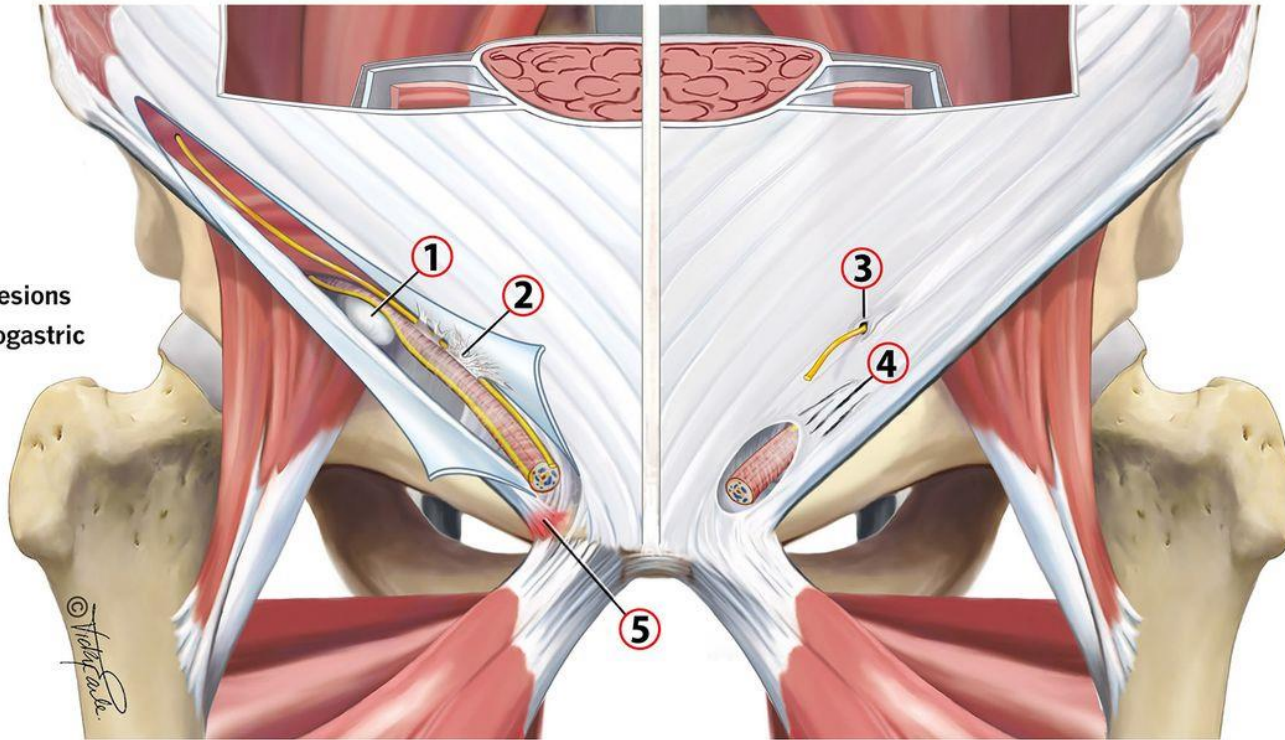


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## Inguinal-related groin pain in athletes: a pathological potpourri

[Zarko Vuckovic](#),<sup>✉1</sup> [Andreas Serner](#),<sup>1</sup> [Willem M P Heijboer](#),<sup>1,2,3</sup> and [Adam Weir](#)<sup>1,4</sup>

1. Posterior wall bulge
2. Ilioinguinal nerve adhesions
3. Ilioinguinal or iliohypogastric nerve entrapment
4. Tears in external oblique aponeurosis
5. Enthesopathy at inguinal ligament insertion



# Sports Hernia



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## 'Treatment of the Sportsman's groin': British Hernia Society's 2014 position statement based on the Manchester Consensus Conference

Aali J Sheen,<sup>1</sup> B M Stephenson,<sup>2</sup> D M Lloyd,<sup>3</sup> P Robinson,<sup>4</sup> D Fevre,<sup>5</sup> H Paajanen,<sup>6</sup>  
A de Beaux,<sup>7</sup> A Kingsnorth,<sup>8</sup> O J Gilmore,<sup>9</sup> D Bennett,<sup>10</sup> I MacLennan,<sup>1</sup> P O'Dwyer,<sup>11</sup>  
D Sanders,<sup>8</sup> M Kurzer<sup>12</sup>

### **What pathology if any is present?**

Abnormal tension exists in the inguinal canal due to varying degrees of inguinal disruption and this is recognised as posterior wall weakness, external ring dilation, conjoint tendon damage and tears in the inguinal ligament. Not all of the features are present in any one individual and other pathologies involving the muscles, ligaments and joints may also be affected.

### **What appropriate nomenclature would be acceptable for this condition?**

The agreed term to be used for this condition is **inguinal disruption** as this was thought to accurately describe the condition which tends to present with an increase in tension in the groin area due to the high level of 'twisting, turning, sprinting and kicking' the athletes undertake in their sporting activity.

Infographic

## Athletic Pubalgia (Sports Hernia): Presentation and Treatment

Justin Drager M.D., Jonathan Rasio B.S., Alexander Newhouse B.S.

**Athletic Pubalgia (Sports Hernia)**

Arthroscopy  
The Journal of Arthroscopic and Related Surgery

Abdominal and groin pain caused by weakening or tearing of abdominal wall without hernia

**PRESENTATION**

Pain upon palpation over

- Deep inguinal ring
- Insertion of inguinal ligament
- Pubic tubercle
- Adductor tendon origin

Acute pain radiating towards perineum and proximal adductors

Pain upon performing resisted sit-ups, sneezing, or coughing

**DIAGNOSIS AND CONSERVATIVE MANAGEMENT**

- Rule out femoroacetabular impingement
- MRI may reveal tear or strain
- Lidocaine injection helps identify source of pain
- Initial treatment includes rest, anti-inflammatories, and physical therapy

**SURGICAL MANAGEMENT**

- Reattachment of Rectus abdominis
- Reconstruction of inguinal canal
- Pelvic floor repair
- Adductor tenotomy

**OUTCOME**

High rates of return to athletic activity

Justin Drager, MD, Jonathan Rasio, BS  
& Alexander Newhouse, BS  
<https://www.arthroscopyjournal.org/>

RUSH UNIVERSITY  
MEDICAL CENTER

# Signs of Sports Hernia



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## Contemporary management of 'Inguinal disruption' in the sportsman's groin

Aali J Sheen<sup>1\*</sup> and Zafar Iqbal<sup>2</sup>

To help determine the diagnosis clinically, it has been suggested that if at least three out of the five signs below exist then a diagnosis of ID can be made [6]:

- 1) Pin-point tenderness over the pubic tubercle at the point of insertion of the conjoint tendon.
- 2) Palpable tenderness over the deep inguinal ring.
- 3) Pain and/or dilatation of the external ring with no obvious hernia evident.
- 4) Pain at the origin of the adductor longus tendon.
- 5) Dull, diffuse pain in the groin, often radiating to the perineum and inner thigh or across the mid-line.

The following tests have also been used in addition, with the initial screening of athletes to determine the diagnosis of ID as which, can also be used after any treatment for any improvement or worsening of their symptoms:

- 1) Weakness on resisted sit ups.
- 2) Reduced power on adductor squeeze strength.

## ATHLETIC PUBALGIA AND ASSOCIATED REHABILITATION

Abigail A. Ellsworth, PT, DPT, CSCS, CPS<sup>1</sup>  
Mark P. Zoland, MD<sup>2</sup>  
Timothy F. Tyler, MSPT, ATC<sup>3</sup>

Five signs that are indicative of athletic pubalgia

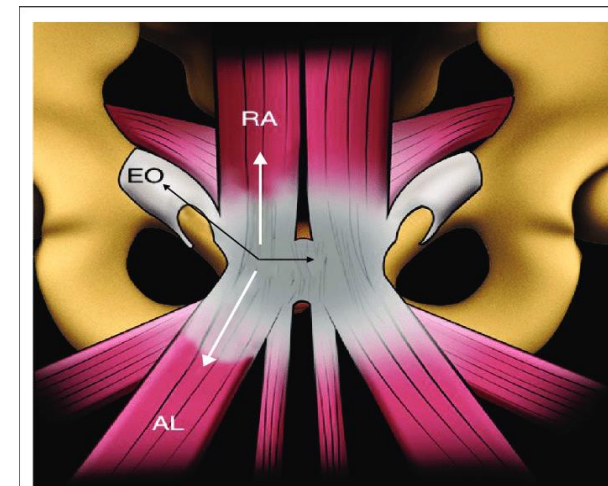
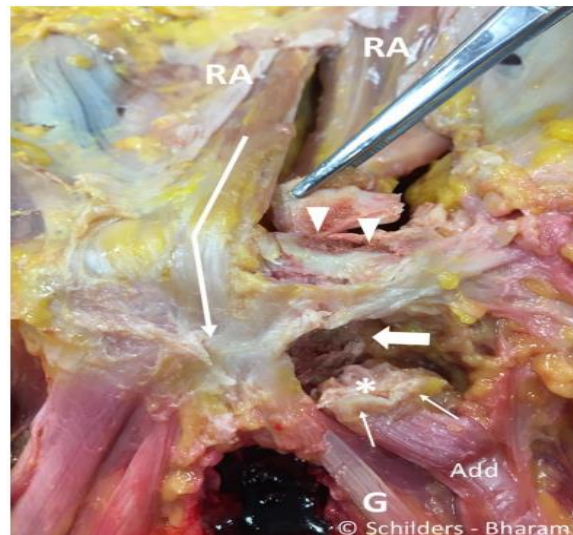
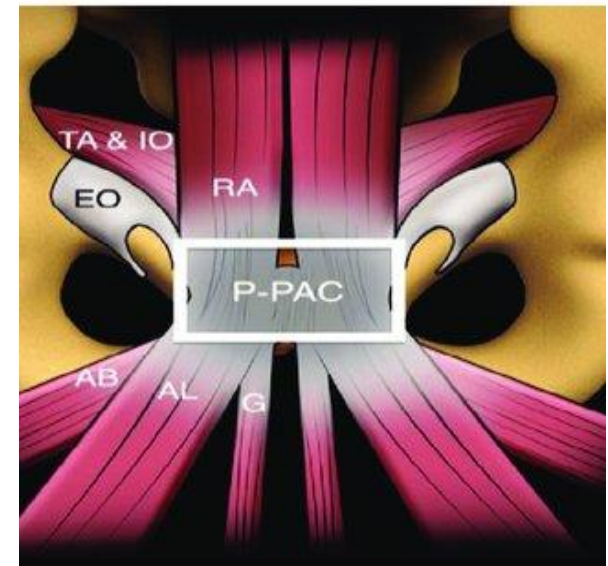
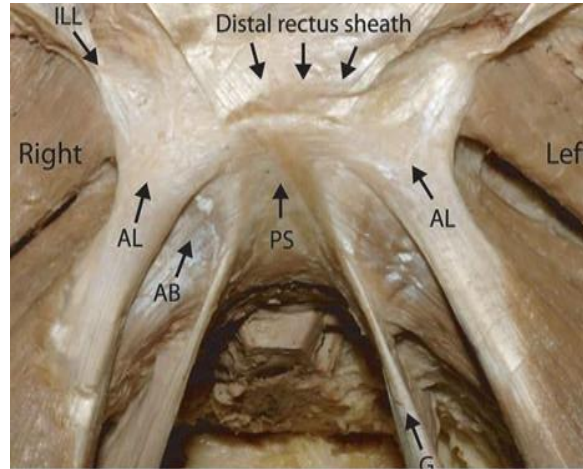
- 1-A subjective complaint of deep groin/lower abdominal pain
- 2-The pain is exacerbated with increased exertion such as sprinting, cutting, sit-up and is relieved with rest
- 3-Palpable tenderness over the pubic ramus at the insertion of the rectus abdominus and/or conjoined tendon
- 4-Pain with resisted hip adduction at 0,45, and/or 90 degrees of hip flexion
- 5-Pain with resisted abdominal curl up.

# Prepubic Aponeurotic Complex (P-PAC)



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The PPAC is formed by interconnection between the tendons of the adductor longus, adductor brevis, gracilis and pectineus muscles, the aponeurosis of rectus abdominis, pyramidalis and external oblique muscles, the articular disc, the anterior pubic periostium and by the superior, inferior and anterior pubic ligament;





# Adductor Tendinopathy



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## Imaging of adductor-related groin pain

L. Pesquer<sup>a</sup>  , G. Reboul<sup>b</sup>, A. Silvestre<sup>a</sup>, N. Poussange<sup>a</sup>, P. Meyer<sup>a</sup>, B. Dallaudière<sup>a c</sup>

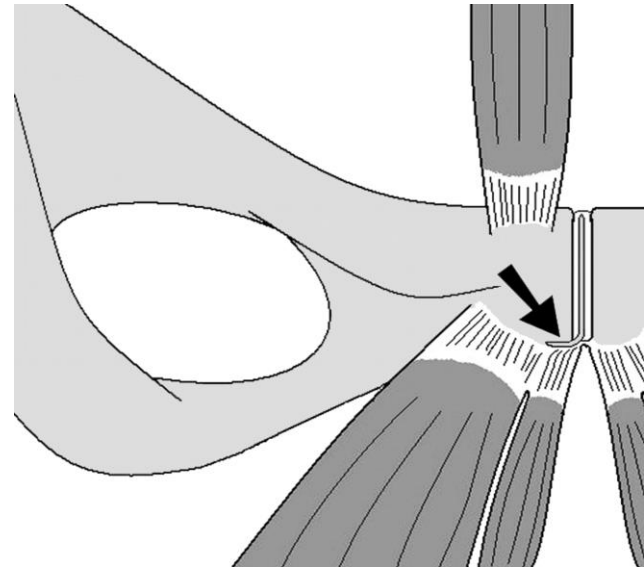
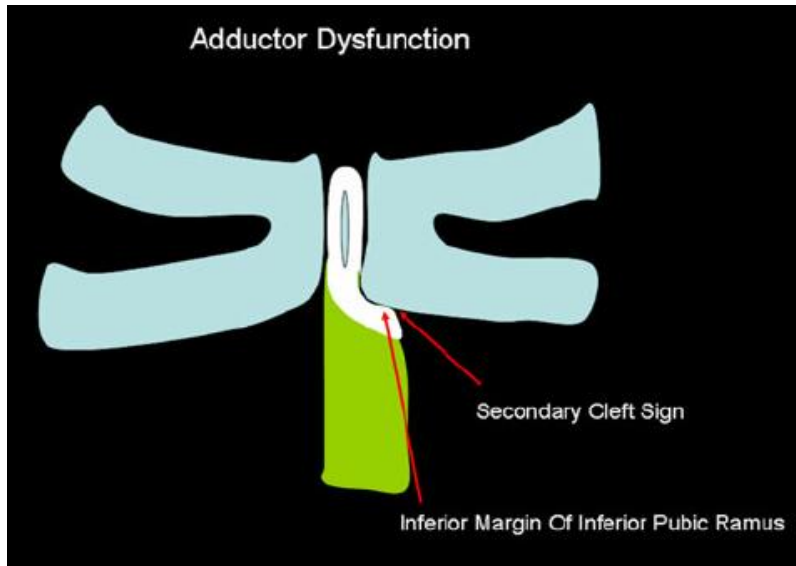
Groin pain of musculotendinous origin generally arises from the proximal insertic of the adductor longus. However, the clinician must distinguish between proximal tendon involvement at the enthesis where the tendon inserts into the periosteum and a more distal lesion at the musculotendinous junction. This is important because proximal tendon involvement may require surgical management whereas a distal lesion of the musculotendinous junction should be treated solely by physiotherapy [12].

Adductor longus tendinopathy is a mechanical enthesopathy generally due to repetitive strain injuries. Classically, it presents as pain of the inner side of the top of the thigh, which radiates downwards, is negative for cough impulse, and increases when stretched against resistance, during sports movements and kicking. In some cases, only the tendon is involved but generally posterior wall deficiency (weakness of the posterior wall of the deep inguinal ring, inguinal hernia) or osteitis pubis is also detected. Imaging is therefore needed when medical treatment is unsatisfactory. The condition is typically bilateral due to the decussation of tendon fibers.

# Secondary Cleft



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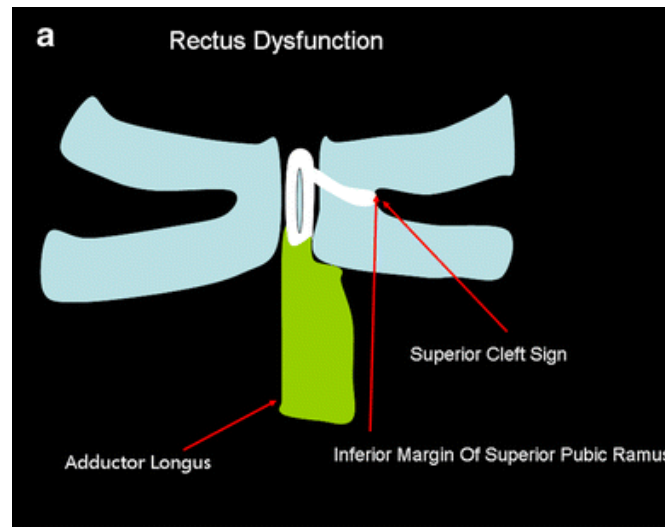
The secondary cleft sign is a marker of short adductor (gracilis, adductor brevis, and pectineus muscles) attachment injury.

Diagram shows development of secondary cleft (*arrow*) due to tear at conjoined tendon attachment to inferior margin of fibrocartilage and at conjoined tendon enthesis.

# Superior Cleft



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Rectus abdominis–  
adductor longus  
attachment  
microtearing



# Pyramidalis-anterior pubic ligament-adductor longus complex (PLAC)



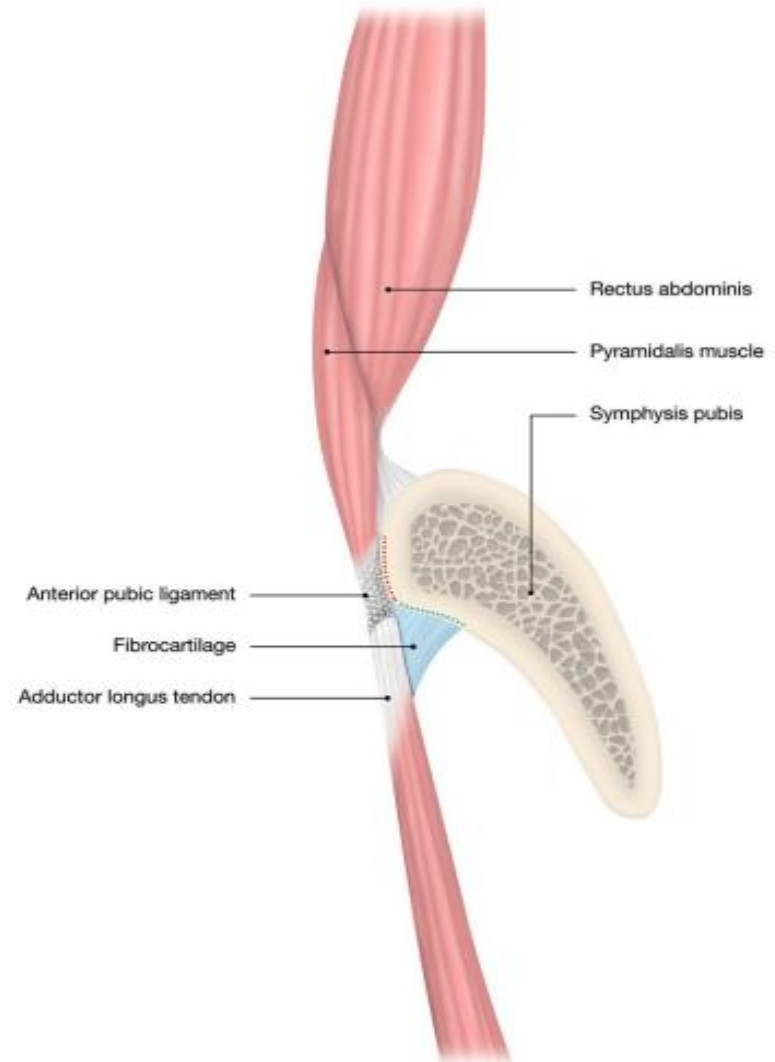
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Studies by Prof Ernest Schilders demonstrates a strong direct connection between the pyramidalis muscle and adductor longus tendon via the anterior pubic ligament.

This introduces the new anatomical concept of the pyramidalis-anterior pubic ligament-adductor longus complex (PLAC).

A classification system of 6 types of PLAC injuries has been developed.

MRI imaging should be employed for all proximal adductor longus avulsions to assess the integrity of the PLAC.



# Combined Injuries



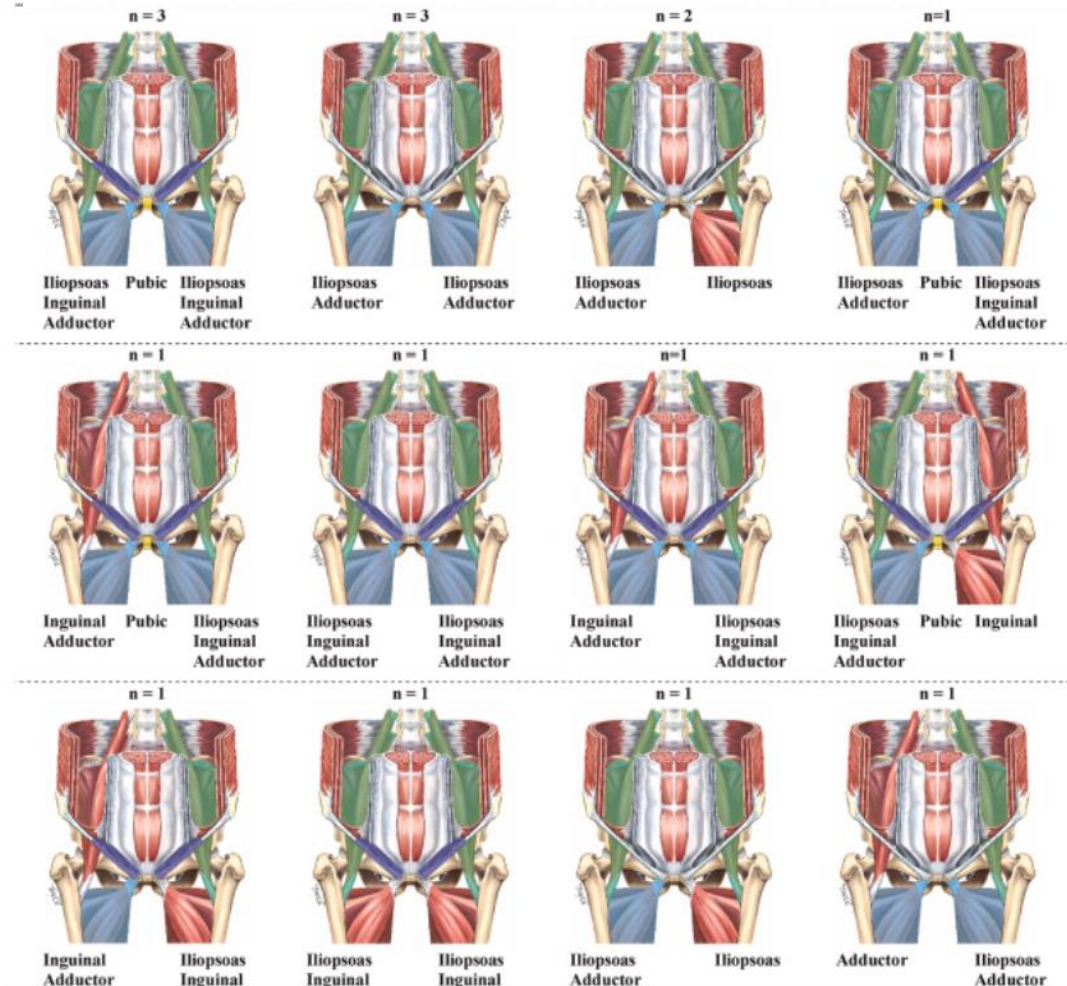
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- DOHA consensus is a useful framework, but groin injuries in football players are often combined as shown in this study
- Pain provocation tests are often positive and multiple clinical entities is often present in male football players with longstanding groin pain.
- Both the number of positive pain provocation tests and the number of clinical entities correlate with pain intensity and disability in male football players with longstanding groin pain.

Original article

Pain provocation tests and clinical entities in male football players with longstanding groin pain are associated with pain intensity and disability

Mathias F. Nielsen<sup>a,\*</sup>, Lasse Ishøj<sup>a</sup>, Carsten Juhl<sup>b,c</sup>, Per Hölmich<sup>a</sup>, Kristian Thorborg<sup>a</sup>





## Screening for Serious Pathology Causing Groin Pain

Evidence supporting diagnostically accurate red flag signs and symptoms in the groin region is limited<sup>21</sup> and inconsistent across current practice guidelines.<sup>48</sup> Still, clinicians must be aware of abdominal and pelvic organ disorders mimicking musculoskeletal-related groin pain.<sup>15</sup> A history of cancer, such as prostate cancer in men, breast cancer in women, or cancer in any reproductive organs, is a potential red flag, as it is associated with metastases in the hip and groin region.<sup>32</sup> Other red flags of concern are history of trauma, fever, unexplained weight loss, painful urination, night pain, and prolonged corticosteroid use.<sup>29,51,100</sup>

Serious pathology causing groin pain includes avascular necrosis, femoral neck fracture, or femoral shaft stress fracture. Information on screening for avascular necrosis is limited, but it has been suggested that having normal hip range of motion (ROM) is helpful in ruling out this condition.<sup>42</sup> The patella-pubic percussion test (sensitivity, 95%; negative likelihood ratio = 0.07) and fulcrum test (sensitivity, 88%; negative likelihood ratio = 0.92) provide good to limited clinical utility to help rule out femoral neck fractures and femoral shaft stress fractures, respectively.<sup>68</sup>

If there is suspicion of serious underlying pathology, specific imaging should always be performed. Plain radiographs are a good primary examination to detect neoplasms in the skeleton. Even in seemingly healthy athletes, this should be considered for unexplained or long-standing groin pain not improving with treatment. If a stress fracture is considered, radiographs are frequently negative, especially in the early stages, and therefore cannot be used to rule out these injuries.<sup>17,47</sup> Alternatively, magnetic resonance imaging (MRI), which visualizes bone stress reactions at an earlier stage, especially in high-risk sites, is therefore recommended.<sup>17,47</sup> In the skeletally immature adolescent athlete, plain radiographs are used to detect osseous avulsions in musculotendinous distraction injuries, avascular necrosis, and epiphysiolytic of the femoral neck.<sup>6,30</sup>



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# Assessment

# Per Holmich Groin Assessment



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[How to Examine the Groin by Per Holmich - YouTube](#)



@PerHolmich

# James Noake

## Groin Assessment



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Groin injury	Mechanism & history	Pain pattern
Hip joint	Twist / pivot under load; repetitive flexion +/- internal rotation (impingement pattern); hyper-extension (anterior capsule / labral traction). Catching / clicking. Large ROM (eg dysplasia).	Deep groin pain radiating into thigh - lateral hip (C-sign) - occasionally gluteal. Can even radiated down leg to ankle! Can be aching, throbbing, shooting - don't be misled re pseudo-sciatic behaviour
Inguinal disruption	Sudden / acute or repetitive trunk twist, sprint, off line work / cutting, change of direction, aggressive abdominal core work. May recall acute pop / tear but can be chronic onset Sitting up in bed, rolling over. Coughing / sneezing.	Tearing, elastic band like. Lower abdominal, over pubic tubercle & external ring (so generally moe medial groin), occ radiates to genitals (esp if IIN / GFN concurrent irritation in inguinal canal)
Pubic stress / overload (old 'Osteitis pubis')	Repetitive multi-directional / shear movements & overload - sports eg rugby, football, ice hockey, sprint, hurdles. Stress risk factors - female, previous BSI, RED-S	Midline lower abdominal / deep pelvic. Can flit from side to side. Radiates into genitals and perineum - esp if stress extends into inferior ramus. Often masquerades as non MSK pain eg prostatitis
Adductor / PLAC / pre-pubic	acute onset sudden explosive cutting / change of direction manoeuvre, or forceful ball strike eg side foot. May have felt pop / give	Focal pain medial groin at pubis. Can radiate superiorly into lower abdo. Doesn't typically move into genitals/ perineum.
Peripheral nerve (ilioinguinal / genitofemoral)	May be related to defined inguinal disruption event (neuroma?) but can occur independently with repeat canal stress / traction. Post hernia repair well recognised complication	Dysaesthetic / hyperaesthetic pain diffusely medial groin, thigh, genitals. Variation from person to person due to variation in typical anatomy.
Iliopsoas	Acute traumatic tear - rapid change of direction (hip flexion with adduction moment - or sports with explosive hip flexion - dance, gymnastics. Overruse injuries to IPT eg running massively over-diagnosed - consider alternative DD eg prox femur stress fracture, hip joint	Pain deep in groin crease and femoral triangle below inguinal ligament. Occ radiates into proximal thigh .



@DrJN\_SportsMed

# Clinical Tests for Groin Pain



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## Original Research

### Clinical examination tests for adductor- and pubic-related groin pain in athletes with longstanding groin pain: Inter-examiner reliability and prevalence of positive tests

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## ARTICLE INFO

Handling Editor: Dr I. Herrington

## Keywords

Groin pain  
Pubic bone  
Adductor  
Tendinopathy

## ABSTRACT

**Objectives:** Evaluate the inter-examiner reliability of pain provocation tests for hip adductors (palpation, stretch and resistance) and for pubic symphysis (palpation) in athletes with longstanding groin pain, and to determine the prevalence of positive tests.

**Design:** Inter-examiner reliability.

**Setting:** Orthopaedic and sports medicine hospital.

**Participants:** Male athletes with longstanding groin pain.

**Main outcome measures:** Inter-examiner reliability, absolute/positive/negative agreement, and the mean prevalence of positive tests for athletes classified with adductor- and pubic-related groin pain were calculated.

**Results:** We included 44 male athletes with longstanding groin pain (61 symptomatic sides). The mean age was 29 years ( $\pm 6$ ) and 70% were soccer players. Inter-examiner reliability was slight to moderate for adductor palpation (Cohen's Kappa statistic( $\kappa$ ) = 0.02–0.54) and pubic palpation ( $\kappa$  = 0.37–0.45); moderate for the adductor stretch test ( $\kappa$  = 0.50), and fair to substantial for adductor resistance tests ( $\kappa$  = 0.22–0.74). Palpation pain was most prevalent at the adductor longus origin (94%) in athletes classified with adductor-related groin pain.

**Conclusion:** The inter-examiner reliability of palpation tests varied from slight to moderate. The adductor stretch test had a moderate reliability, and adductor resistance tests a fair to substantial reliability. Adductor longus origin is the main site for palpation pain. Adductor resistance tests not related to the adductor longus have limited inter-examiner reliability. The adductor stretch test did not assist in classifying adductor-related groin pain.

## 1. Introduction

Longstanding groin pain is common in sports involving multidirectional sprinting and kicking, such as football (Langhout et al., 2019; Walden et al., 2015). Various diagnoses – and even more diagnostic terms – are used in daily practice due to the often unknown aetiology and heterogeneous taxonomy (Heijboer et al., 2021; Serner et al., 2015).

The 2015 Doha agreement meeting classification system addressed this taxonomy problem by proposing a classification system including four clinical entities of groin pain (adductor-, inguinal-, iliopsoas- and pubic-related groin pain.)

Adductor-related groin pain is the most prevalent clinical entity (Hölmich et al., 2013; Taylor et al., 2017). This term can be used when there is recognizable injury pain in the adductors on resisted hip

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W.M.P. Heijboer et al.

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Fig. 1. Summary of adductor palpation, stretch, and resistance tests performed as part of the standardized clinical examination protocol. RF = rectus femoris, S = sartorius, IL = iliopsoas, P = pectineus, AL = adductor longus, mod. = modified.

Some athletes do not meet all criteria specified in Doha agreement classification system (Hölmich et al., 2013). For example, an athlete may report pain in the adductor area while playing football and during adductor palpation, but may be pain free on adductor resistance testing. In these instances, examiners were allowed to classify “likely”

adductor-related groin pain to obtain a full overview of potentially positive/negative examination tests. This subjective clinical decision also took the other findings from the complete examination (Appendix A) into account. Likely pubic-related groin pain could be classified when the athlete reported pain in the pubic symphysis area during sports, but




## Top-Ten Tips for Imaging Groin Injury in Athletes

Hardi Madani , Philip Robinson 







Imaging and clinical tests for the diagnosis of long-standing groin pain in athletes. A systematic review

[Michael K. Drew](#)<sup>a b</sup>   , [Peter G. Osmotherly](#)<sup>a</sup>  , [Pauline E. Chiarelli](#)<sup>a</sup> 

Imaging of adductor-related groin pain

[L. Pesquer](#)<sup>a</sup>   , [G. Reboul](#)<sup>b</sup> , [A. Silvestre](#)<sup>a</sup> , [N. Poussange](#)<sup>a</sup> , [P. Meyer](#)<sup>a</sup> , [B. Dallaudière](#)<sup>a c</sup>

Imaging of inguinal-related groin pain in athletes

Myriame Bou Antoun  , Gilles Reboul  , Maxime Ronot  , Amandine Crombe  ,  
Nicolas Poussange  and Lionel Pesquer 

Radiologic Imaging of Pelvis, Groin, Hip, and Thigh Injuries

[Jan Verlyser](#)  & [Jan L. M. A. Gielen](#)

MRI and dynamic ultrasound identified as the primary methods for identifying the majority of issues.

Selective nerve blocks can be used to rule out and identify specific causes of pain.

X-ray, CT and small field of view DEXA useful in some cases.





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# Treatment Options



## The conservative treatment of longstanding adductor-related groin pain syndrome: a critical and systematic review

**AUTHORS:** Gian Nicola Bisciotti<sup>1</sup>, Karim Chamari<sup>1</sup>, Emanuele Cena<sup>1</sup>, Gonzalo Rodríguez García<sup>1</sup>, Zarko Vuckovic<sup>1</sup>, Alessandro Bisciotti<sup>2</sup>, Andrea Bisciotti<sup>2</sup>, Raul Zini<sup>3</sup>, Alessandro Corsini<sup>4</sup>, Piero Volpi<sup>4,5</sup>

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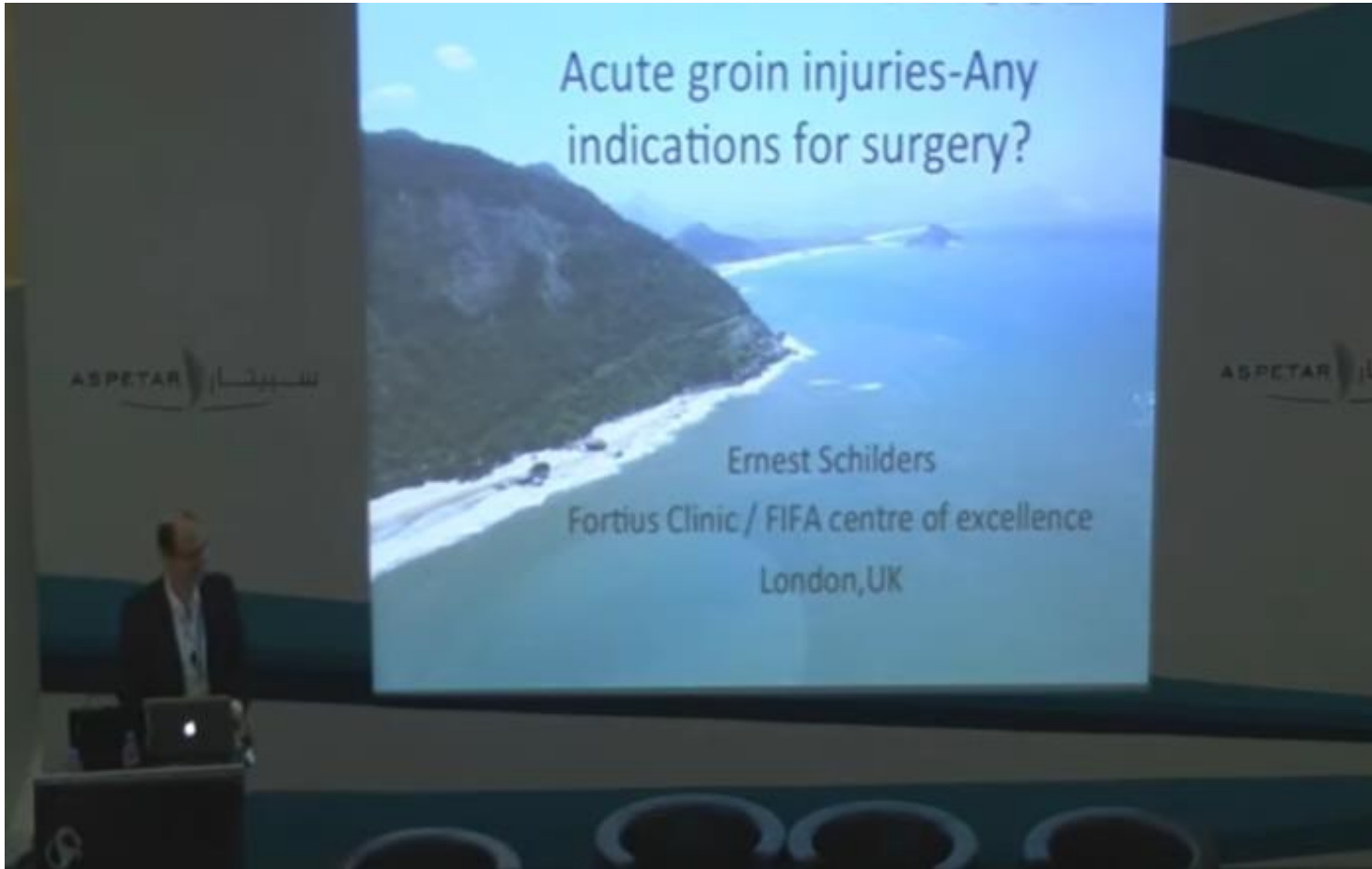
**TABLE 5.** Level of strength of evidence and grade of recommendation of the studies reviewed.

Type of intervention	Level of strength of evidence	Grade of recommendation
Compression clothing therapy	Moderate	C
Manual therapy and strengthening exercise	Moderate	C
Prolotherapy	Moderate	C
Corticoid injection therapy	Conflicting	D
PRPt	Conflicting	D
EPI	Conflicting	D
PDR	Conflicting	D

# Prof Schilders - Acute groin injuries – any indications for surgery?



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[Acute groin injuries – any indications for surgery? Ernest Schilders - UK \(youtube.com\)](https://www.youtube.com/watch?v=...)



@e\_schilders

# Prof Sheen – Sports Hernias & Chronic Groin Pain



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[28. HerniaTalk LIVE Q&A: Sports Hernias & Chronic Groin Pain \(youtube.com\)](https://www.youtube.com/watch?v=28. HerniaTalk LIVE Q&A: Sports Hernias & Chronic Groin Pain (youtube.com))



@aalisheen

# Is surgery required?



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ORIGINAL ARTICLE



## The Sheen Paajanen grOin Recommended Treatment 'SPoRT' score for groin pain

S. Biswas<sup>1</sup> · J. J. Pilkington<sup>1</sup> · P. Stathakis<sup>1</sup> · S. Jamdar<sup>1</sup> · R. Harwood<sup>2</sup> · H. Paajanen<sup>3</sup> · A. J. Sheen<sup>1,4</sup>

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### Abstract

**Introduction** Evaluating groin pain still evades many clinicians at times as they have difficulty determining the cause of pain when no true hernia exists. This study's aim was to evaluate a simple and novel scoring system which is reproducible, to help determine whether conservative measures or surgery is recommended for the management of groin pain attributable to inguinal disruption.

**Material & methods** A retrospective analysis of all patients from 2018 to 2020 that underwent surgery or conservative management for inguinal disruption with at least a 1-year follow-up were evaluated. The scoring system is based on MRI and ultrasound imaging as well as clinical findings, with scores given from -2 to +2 based on the defined findings listed. A maximum total of four points scored for each assessment was used. Sensitivity and specificity analysis was conducted for each potential score cut off point.

**Results** A total of 172 patients were evaluated with 33 patients (19%) undergoing conservative management and 139 patients (81%) undergoing surgery. The median SPoRT score for the surgery group was 2.0 (1.0, 3.0), and -1.0 (-3.0, 0.0) in the physiotherapy group which was a significant difference ( $p < 0.001$ ). An optimal cut off of  $\leq 0$  for physio and  $\geq 1$  for surgery was established, yielding a sensitivity of 90.9% (95% CI 75.7%–98.1%), a specificity of 89.2% (95% CI 82.8%–93.8%) and an area under the curve (AUC) of 0.936 (95% CI 0.874–0.997).

**Discussion** SPoRT score of  $\leq 0$  can recommend a patient should undergo conservative measures or physiotherapy as a mainstay of treatment with a score of  $\geq 1$  recommending surgery. Further validation of the score is necessary.

**Keywords** Groin pain · Inguinal disruption · Scoring system · Sportsman's groin · Surgical management

### Introduction

Inguinal disruption is a recognised entity which results with groin pain mainly focusing on the inguinal canal but also recognises that it is part of a syndrome which may involve a tear of a strain of the origin of the rectus abdominis muscle

and/or the adductor tendons [1]. The nomenclature has been debated and changed over the years and was originally recognised as the sportsman's groin or hernia. Two recent publications both challenged this as an exact entity and the terms inguinal disruption as well as inguinal-related pain have both been popularised after the Manchester and Doha consensus statements respectively [2, 3]

The diagnosis is made predominantly by exclusion as other musculoskeletal injuries around the adductor and rectus muscle origins can cause groin pain [4]. In addition, we cannot exclude the hip joint as a possible aetiological factor, especially with femoral acetabular impingement (FAI), a condition which is known to present as groin pain [5].

The Copenhagen Hip and Groin Outcome Score (HAGOS) is a Patient-Reported Outcome (PRO) questionnaire for young to middle-aged, physically active individuals with hip and groin pain [5]. This score consists of six separate subscales assessing Pain, Symptoms, Physical function

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## SPoRT Score Calculator

Input the model parameters below to calculate the SPoRT score:

Sheen Paajanen groin Recommended Treatment 'SPoRT' score for groin pain

This score was developed to help determine whether conservative measures or surgery is required for the management of groin pain attributable to inguinal disruption.

The SPoRT score has demonstrated excellent performance with an accuracy of 89.54%, sensitivity of 90.9%, specificity of 89.2% and an AUROC of 0.936.

How the SPoRT score is calculated :-

#### MRI Findings:

- Adductor Tendinopathy/Injury = -2
- Rectus Origin Injury = -2
- Rectus Abductor Aponeurotic Tear = -2
- PLAC Abnormality = -2
- Labral Tear = -2
- Oostitis Pubis = -1
- Bone Oedema = -1
- FAI = -1
- No Findings = 0

#### USS Findings:

- Hernia = 2
- Femoral Hernia = 2
- Lipoma of Cord = 2
- Posterior Wall Weakness = 2
- Pain on Pubic Bone = 1
- No Findings = 0

#### Clinical Findings:

- Groin Defect of External Ring = 2
- Groin Hernia = 1
- Pain on Twisting or Turning = 1
- Pain on Running = 1
- Pain on Coughing or Sneezing = 1
- Pain on Sit Ups = 1
- Pubic Bone Pain = -1
- No Findings = 0

#### MRI Feature 1

-1

#### MRI Feature 2

-1

#### MRI Feature 3

0

#### MRI Feature 4

0

#### USS Feature 1

2

#### USS Feature 2

0

#### USS Feature 3

0

#### USS Feature 4

0

#### Clinical Feature 1

1

#### Clinical Feature 2

0

#### Clinical Feature 3

0

#### Clinical Feature 4

0

Total SPoRT score: 1

P (Surgery): 0.97638

Prediction: Surgery

# Dr Muschaweck – Sports Hernia & Minimal Repair Technique



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[113. HerniaTalk LIVE Q&A: Sports Hernia & Minimal Repair Technique \(youtube.com\)](https://www.youtube.com/watch?v=113. HerniaTalk LIVE Q&A: Sports Hernia & Minimal Repair Technique)



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# Rehab

# Rehabilitation of Groin Injuries



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...mich protocol"  
...ductor and abdominal  
...symptom free: adductor, abductor, abdominal, low back, coordination  
Hollmann et al. 2006, Jensen et al. 2006, Wisk et al. 2011, Paganoni et al. 2012

Andreas Serner  
Post Graduate Researcher - Aspetar

Rehabilitation of Groin Injuries

ASPETAR

 **YouTube** [Rehabilitation of Groin Injuries \(youtube.com\)](https://www.youtube.com/watch?v=...)



@aserner



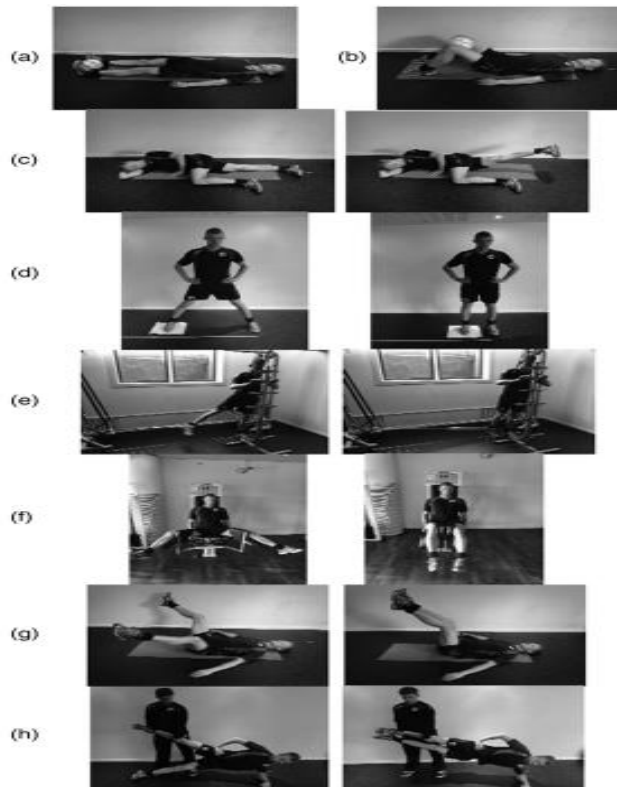
# Groin Rehab Exercises



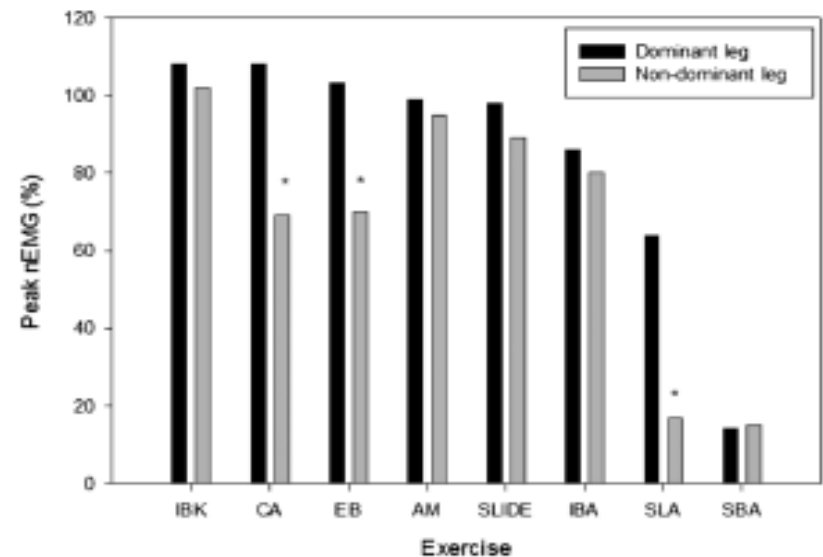
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## EMG evaluation of hip adduction exercises for soccer players: implications for exercise selection in prevention and treatment of groin injuries

Andreas Serner,<sup>1,2</sup> Markus Due Jakobsen,<sup>3</sup> Lars Louis Andersen,<sup>3</sup> Per Hölmich,<sup>1,2</sup> Emil Sundstrup,<sup>3</sup> Kristian Thorborg<sup>1</sup>



**Figure 1** The eight included hip adduction exercises: (a) isometric adduction with a ball between the ankles; (b) isometric adduction with a ball between the knees; (c) side-lying adduction; (d) sliding hip abduction/adduction exercise; (e) hip adduction with an elastic band; (f) hip adductor machine; (g) supine bilateral hip adduction; (h) Copenhagen adduction.



**Figure 2** Mean peak nEMG for the dominant and the non-dominant adductor longus. nEMG=Normalised electromyography; Dominant leg=The preferred kicking leg. \* Denotes a significant difference between the dominant and the non-dominant leg. IBK, isometric adduction with a ball between the knees; CA, Copenhagen adduction; EB, hip adduction with an elastic band; AM, hip adductor machine, SLIDE, sliding hip abduction/adduction exercise; IBA, isometric adduction with a ball between the ankles; SLA, side-lying adduction; SBA, supine bilateral hip adduction.

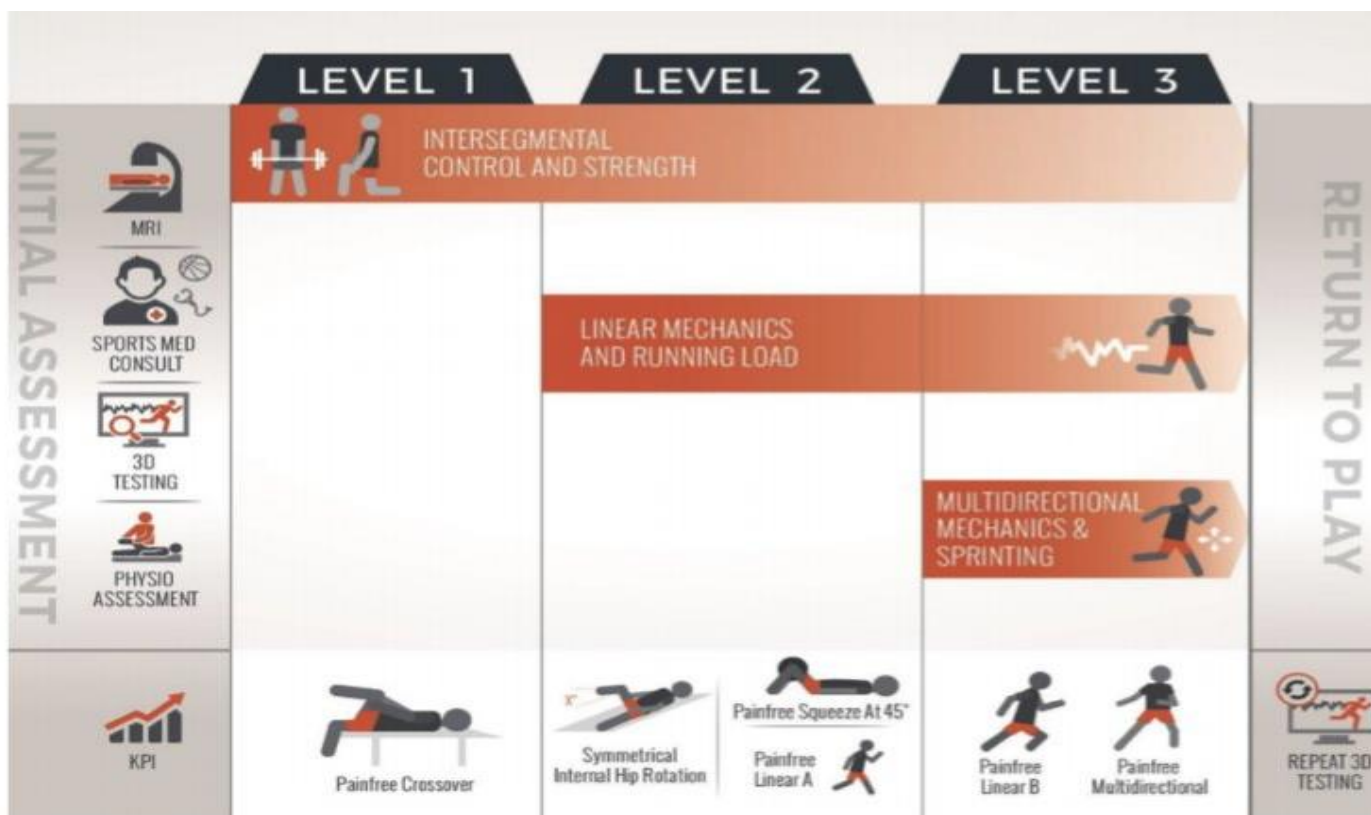
# Groin Rehab Continuum



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Clinical and biomechanical outcomes of rehabilitation targeting intersegmental control in athletic groin pain: prospective cohort of 205 patients

Enda King,<sup>1,2</sup> Andrew Franklyn-Miller,<sup>1,3</sup> Chris Richter,<sup>1</sup> Eamon O'Reilly,<sup>1</sup> Mark Doolan,<sup>1</sup> Kieran Moran,<sup>4,5</sup> Siobhan Strike,<sup>2</sup> Éanna Falvey<sup>1,6</sup>



@enda\_king



## Current Clinical Concepts: Exercise and Load Management of Adductor Strains, Adductor Ruptures, and Long-Standing Adductor-Related Groin Pain

Kristian Thorborg, PhD, MSportsphysio, PT

### Key Points

- Injuries to the hip-adductor muscles and tendon complexes are the most common problems in athletes presenting with acute and long-standing groin pain.
- These injuries can present either in isolation or with associated groin injuries, and the differential diagnosis is important to understand the prognosis and management.
- Measuring symptoms, strength, and performance can assist with early detection and monitoring, exercise progression, and return-to-sport decisions in athletes with adductor problems.
- Addressing hip-adductor, gluteal, and trunk strength, as well as balance, coordination, and plyometrics, using specific exercises and loading strategies is mandatory in primary, secondary, and tertiary prevention of adductor-related injury and groin pain.
- Progressive strength training and sport-specific loading is the treatment with the highest level of evidence for both acute and long-standing adductor-related problems.



# Strength Testing



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## HIP & GROIN

## STRENGTH TEST

# EXPLAINED



[Measure Hip & Groin Strength | VALD Performance ForceFrame - YouTube](#)



@JoClubbSportSci



## Effect of Holmich protocol exercise therapy on long-standing adductor-related groin pain in athletes: an objective evaluation

Abbas Yousefzadeh,<sup>1</sup> Azadeh Shadmehr,<sup>1</sup> Gholam Reza Olyaei,<sup>1</sup> Nasrin Naseri,<sup>1</sup> Zahra Khazaeipour<sup>2</sup>

To cite: Yousefzadeh A, Shadmehr A, Olyaei GR, et al. Effect of Holmich protocol exercise therapy on long-standing adductor-related groin pain in athletes: an objective evaluation. *BMJ Open Sport & Exercise Medicine* 2018;4:e000343. doi:10.1136/bmjsem-2018-000343

Accepted 23 May 2018

### ABSTRACT

**Aim** To objectively evaluate the effect of Holmich protocol-based exercise therapy on long-standing adductor-related groin pain (LSAGP).

**Methods** We reproduced the Holmich protocol of exercise therapy and objectively evaluated its effect on 17 male athletes (mean age, 25.07±4.96 years) suffering from LSAGP, of whom 14 participants completed the 10 weeks treatment period. The study was designed as a single-blinded, before-and-after clinical trial. Main outcome measures included pain, functional ability, hip range of motion (ROM), hip abductor and adductor muscle strength, and successful return to sports activity. **Results** Eleven athletes (78.57%) returned to their sports activities in a mean time of 14.2 weeks (range, 10–20 weeks). Visual analogue scale pain score, hip abductor and adductor muscles strength, and function scores improved significantly. Although hip abduction ROM did not show any significant changes ( $p = 0.609$ ), the extent of progress in the hip internal rotation ROM was significant ( $p = 0.001$ ). The ratio of hip adduction to abduction strength did not change significantly ( $p = 0.309$  for the isometric and  $p = 0.957$  for the eccentric ratio).

**Conclusions** Exercise therapy according to the Holmich programme may be an effective treatment for LSAGP. However, more emphasis should be paid to the hip adductor muscles' eccentric strength.

**Trial registration number** IRCT2016080829269N1.

### INTRODUCTION

Groin pain arising from sports injuries is widespread, especially among those who participate in sports that involve repetitive rotational movements such as kicking and turning as in soccer.<sup>1</sup> This type of injury is the fourth most common sports injury, with soccer players suffering from long-term symptoms and frequent relapses.<sup>2–4</sup> The injury rate is 1.015–1.133 per 1000 hours of play, which is equivalent to 11%–16% of all football injuries.<sup>5,6</sup> The prognosis for exercise-related groin pain is not clear. Injured athletes may be forced to wait a long time before returning to sports activity free of restriction.<sup>5,7</sup>

### Summary

- ▶ Exercise therapy based on the Holmich protocol may be an effective treatment for long-standing adductor-related groin pain.
- ▶ We need more emphasis on eccentric strength of hip adductors in our treatment protocol.
- ▶ Future studies should also include assessment of hip muscles' strength.

It is known that adductor-related groin injuries are the most common cause of groin injury, accounting for 69% of groin injuries in football and 58% across all forms of sport.<sup>4,8</sup> Adductor-related groin pain is often treated without surgery. Among different conservative approaches, it appears that exercise therapy (ET) is more effective than other conservative treatment methods such as electrotherapy, manual therapy or steroid injections.<sup>7,9</sup> Unfortunately, however, many important factors including frequency, duration and the exact amount of resistance or perceived exertion to be used in the ET protocols have not been carefully recorded in clinical trials.<sup>9</sup> To our best knowledge, the randomised clinical trial carried out by Holmich *et al.*<sup>10</sup> in 1999 still offers the best evidence for the effectiveness of exercise as a prescription for the treatment of adductor-related groin pain.<sup>6,19</sup> Holmich *et al.*<sup>10</sup> collated the results of ET (based on isometric and isotonic strengthening of the hip abductor/adductor and the abdominal muscles) with results from physiotherapy including passive modalities (transverse friction massage, laser therapy, transcutaneous electrical nerve stimulation and stretching). They evaluated successful treatment (based on pain measures), patients' subjective global assessments and their return to sport without groin pain at the same level as before the injury.<sup>6,7</sup> 'Successful treatment' as described in their study is an unfeasible



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Table 2 Holmich protocol: module 2—from third week

Exercise	Amount (all performed twice)	Rest period
1 Leg abduction and adduction exercise carried out in side lying	5 series of 10 repetitions of each exercise	1 min rest after one set of 10 repetitions of each exercise
2 Low-back extension exercise prone on the end of bench	5 series of 10 repetitions	1 min rest after 10 consecutive repetitions
3 One-leg weight pulling abduction/adduction standing*	5 series of 10 repetitions for each leg	1 min rest after one set of 10 repetitions of each exercise
4 Abdominal sit-ups both in straight and in oblique direction	5 series of 10 repetitions	1 min rest after 10 consecutive repetitions
5 One-leg coordination exercise with flexing and extending knee and swinging arms in same rhythm (cross-country skiing on one leg)	5 series of 10 repetitions for each leg	1 min rest after one set for each leg
6 Training in sideways motion on a 'Fitter'	5 min	
7 Balance exercise on wobble board	5 min	
8 Ikatng motions on sliding board	5 sets of 1 min rest after each set continuous work	1 min rest after each set

\*For one-leg weight-pulling abduction/adduction, the perceived resistance was determined by the physiotherapist at the baseline, which was the maximum weight that could be handled by the subject without pain for 10 repetitions. This weight was increased by the physiotherapist every week of treatment.

week, the athletes were asked to perform exercises from module 1 every other day, between the treatment sessions. Although adductor muscle stretching was forbidden, participants were allowed to stretch other muscles when needed, but after the treatment session.

During the treatment course and before the final evaluation, no athletic activity was permitted. The participants were allowed to ride a bicycle, on the condition that it was pain free. From the sixth week of treatment, participants were allowed to run slowly on a soccer pitch, only so long as it did not produce groin pain.

As the duration of treatment in the Holmich study was between 8 and 12 weeks, we selected an average 10 weeks as the minimum treatment duration for our study.

However, participants were allowed to continue their treatment for up to 12 weeks, if needed. At the end of the treatment period, a written programme was also given to the participants regarding their sports rehabilitation. After the 10th week, we placed a weekly telephone follow-up call to each participant enquiring whether they had returned to sports activity. In addition, there was a final follow-up appointment 20 weeks after the baseline for all participants during which they completed a fresh questionnaire regarding their symptoms.

### Outcome measurements

The subjects were evaluated by a trained single-blinded physiotherapist before treatment and 10 weeks after the treatment commenced.

### Hip muscle strength (abductor/adductor)

Our muscle strength test set-up consisted of a hand-held dynamometer (Powertrack II Commander JTECH Medical, Salt Lake City, Utah, USA) and an examination table. Application of the hand-held dynamometer has been shown to be a valid procedure for muscle strength measurement.<sup>15</sup> The main outcomes for muscle strength were maximal isometric hip adduction (IHAD), maximal isometric hip abduction (IHAB), maximal eccentric hip adduction (EHAD), maximal eccentric hip abduction (EHAB) and maximal IHAD/IHAB and EHAD/EHAB ratios.

The strength measurement methods we used have been described in detail in earlier studies.<sup>10,14,15</sup> According to Thorborg *et al.*<sup>14</sup> IHAD and IHAB were measured with subjects in the supine position (applying a make test), while EHAD and EHAB were measured with subjects lying on their sides (applying a break test).<sup>14</sup> We carried out measurements for the affected lower limb. Using leg



Figure 1 Training in sideways motion on a 'Fitter'.

# Modified Holmich Protocol



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## *Clinical Study*

### **The Effect of Therapeutic Exercise on Long-Standing Adductor-Related Groin Pain in Athletes: Modified Hölmiş Protocol**

Abbas Yousefzadeh,<sup>1</sup> Azadeh Shadmehr ,<sup>1</sup> Gholam Reza Olyaei,<sup>1</sup>  
Nasrin Naseri,<sup>1</sup> and Zahra Khazaeipour<sup>2</sup>



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)



(i)



(j)

# Osteitis Pubis Rehab



## Case studies

### Management of chronic recurrent *osteitis pubis*/pubic bone stress in a Premier League footballer: Evaluating the evidence base and application of a nine-point management strategy



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#### ABSTRACT

**Background/Aim:** The aim of this paper was to use a clinical example to describe a treatment strategy for the management of recurrent chronic groin pain and evaluate the evidence of the interventions.  
**Methods:** A professional footballer presented with chronic recurrent OP/PBS. The injury was managed successfully with a nine-point programme –  
 1. Acute pharmacological management.  
 2. Tone reduction of over-active structures.  
 3. Improved ROM at hips, pelvis and thorax.  
 4. Adductor strength.  
 5. Functional movement assessment.  
 6. Core stability.  
 7. Lumbo-pelvic control.  
 8. Gym-based strengthening.  
 9. Field-based conditioning/rehabilitation.  
**The evidence for these interventions is reviewed.**  
**Results:** The player returned to full training and match play within 41 and 50 days, respectively, and experienced no recurrence of his symptoms in follow up at 13 months.  
**Conclusion:** This case report displays a nine-point conservative management strategy for OP/PBS, with non-time dependent clinical objective markers as the progression criteria in a Premier League football player.

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#### 1. Introduction

Groin injuries have a prevalence ranging from 0.5% to 6.2% of all sport-related injuries (Johnson, 2003). This incidence is more prevalent in sports where sprinting, kicking, twisting and cutting are dominant movements such as soccer (Hagglund, Walden, & Ekstrand, 2008; Hawkins & Fuller, 1999), rugby (Brooks, Fuller, Kemp, & Reddin, 2005a, 2005b), Australian Rules football (Orchard & Seward, 2002), ice hockey (Agee, Dompier, Dick, Putukian, & Marshall, 2007) and Gaelic Games (Wilson, Caffrey, King, & Gissane, 2007).

Osteitis pubis (OP) or pubic bone stress (PBS) is associated with inflammation of the pubic bones, symphysis and adjacent structures (Fricker, Taunton, & Ammann, 1991; Williams, Thomas, & Downes, 2000). It has been reported to include some presence of periosteal trauma and erosion at the pubic symphysis joint (PSJ) (Fricker et al., 1991; Lynch & Renstrom, 1999). Originally OP was used as a radiographic finding for inflammatory markers and changes seen at the symphysis pubis. Much discussion has arisen regarding the terms used in reference to the hip and groin, with some authors disputing the use of OP as a general term for long-standing adductor related groin pain (LSARGP), and instead proposing the more specific term of pubic bone stress (Bradshaw & Holmich, 2009; Verrall, Hamilton, et al., 2005). The amount of structures within this complex region and the possible multiple simultaneous pathologies that may emanate from the region have

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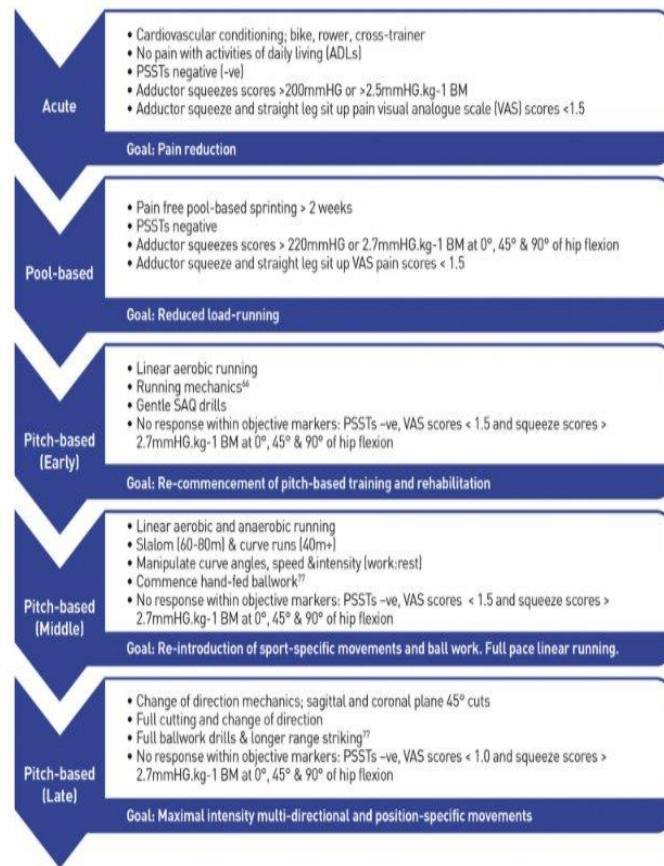


Fig. 9. Osteitis pubis rehabilitation protocol for return to play in professional soccer players. PSSTs, pubic symphysis stress tests; BM, body mass; SAQ, speed agility and quickness drills.



# Iliopsoas Rehab



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## Iliopsoas Grade 2 Myotendinous Junction Injury in an Elite Football Player: Return to Play Process

Lesão Grau 2 da Junção Miotendinosa do Iliopsoas num Jogador Profissional de Futebol

Alexandre Fernandes <sup>1\*</sup>, Pedro Cunha <sup>2</sup>, Júlio Silva <sup>2</sup>, Carlos Duarte <sup>2</sup>, Alexandre Estaca <sup>2</sup>



Figure 3. Return to play process infographic.

LLLT - low level laser therapy; TENS - transcutaneous electrical nerve stimulation; ROM - range of motion; LP-PRP - leucocyte poor platelet rich plasma; LSI - Limb Symmetry Index.



# Sports Hernia Rehab



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## Return to Play After Sports Hernia Surgery



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### KEYWORDS

• Sports hernia • Inguinal disruption • Surgical treatment • Return to sports

### KEY POINTS

- Despite common presentation in the sports clinic, the definition, clinical characteristics, and treatment of sports hernia (SH) have not been fully understood.
- The clinical spectrum and treatment outcome of SH are reviewed.
- Details of nonoperative and postoperative rehabilitation processes are addressed in this article.

### INTRODUCTION

SH is considered an overuse syndrome presenting with chronic lower abdomen and groin pain. Since Gilmore popularized the syndrome of groin disruption as Gilmore's groin in the early 1990s,<sup>1</sup> this condition has been named various terms, such as SH,<sup>2-6</sup> athletic pubalgia,<sup>7</sup> athletic hernia,<sup>8</sup> Gilmore's groin,<sup>9,10</sup> osteitis pubis, sportsman's hernia,<sup>11,12</sup> sportsmen's groin,<sup>13</sup> hockey groin syndrome,<sup>14</sup> symphysis syndrome,<sup>15</sup> and inguinal disruption.<sup>16</sup> In a recent consensus conference by the British Hernia Society in Manchester, United Kingdom, "inguinal disruption" was proposed as nomenclature for this condition.<sup>17</sup> Despite common presentation in the sports clinic, however, the definition, clinical characteristics, and treatment of SH have not been fully understood. The clinical spectrum of SH, with its treatment outcome and recovery process, is addressed in this article.

### ANATOMY AND PATHOGENESIS

Fibers from the rectus abdominis, conjoint tendon (a fusion of the internal oblique and transversus abdominis), and external oblique merge to form the pubic aponeurosis. This pubic aponeurosis is confluent with the adductor and gracilis origin. SH is considered an injury to muscular and/or fascial attachments of these structures to the anterior pubis. There still is argument, however, regarding the exact anatomic area of disruption because even operative findings of SH repair is obscure.

#### Box 4

#### Rehabilitation protocol after surgical repair of sports hernia (phase III)

Weeks 5 to 8: return-to-sports/plyometric exercises

#### Goals

- Prescribe sport-specific movements and speeds to prepare and strengthen the involved tissue for the forced couples created during sport-specific movements
- Progress to running on uneven surfaces progressing to an intensity required for specific sport
- Return to full play without pain

*Rehabilitation: exercise in all 3 planes of motion. Implement return-to-running and sport-specific activities in both open and closed kinetic chain. Monitor patient pain levels and progress as tolerated.*

- Core strengthening/core stability exercises
  - 3-Way planks
  - Prone physioball walkouts
  - Dynamic planks
  - Resisted core exercise using medicine balls, sports cords, weights
  - Advanced cross-band resisted core exercises
- Triplane weight-bearing exercises
  - Forward and lateral lunges
  - TRX/Rip 60 double-leg and single-leg squats
  - Resisted band ambulation forward, backward and lateral
  - Speed skaters progressing to resisted speed skaters
  - Slide board drills
- Proprioceptive training
  - Sport cord arcs
  - Sport forward and backward shuffles
  - Single-leg ladder drills
  - Single-leg BOSU drills
- Cardiovascular training
  - Return to running on even, flat ground
  - Line jumps/box jumps
  - Progress to running on uneven surfaces progressing to an intensity required for specific sport
  - Sport-specific sprinting, endurance running, changes in direction
  - Ladder drills
  - High knees, butt kicks, bounding, high skipping, bear crawls
- Plyometric exercises
  - BOSU drills
  - Box jumps
  - Medicine ball tosses/lunges
  - Weighted rope drills
  - Cone drills
- Agility drills
  - Straight running at a steady pace, 20 to 30 minutes
  - High knee drills
  - Lateral running in crouched position
  - Backward running
  - Vertical jumping
  - Stair climbing
  - Carioca drills
  - Line touch drills
  - Figure-8 running
  - Run and cut

# Return To Play Criteria



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## Return to Play in Long-Standing Adductor-Related Groin Pain: A Delphi Study Among Experts

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### RTP CRITERIA IN LARGP - Physical assessment -

