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Doha agreement meeting on terminology and definitions in groin pain in athletes

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ABSTRACT

Background Heterogeneous taxonomy of groin injuries in athletes adds confusion to this complicated area.

Aim The 'Doha agreement meeting on terminology and definitions in groin pain in athletes' was convened to attempt to resolve this problem. Our aim was to agree on a standard terminology, along with accompanying definitions.

Methods A one-day agreement meeting was held on 4 November 2014. Twenty-four international experts from 14 different countries participated. Systematic reviews were performed to give an up-to-date synthesis of the current evidence on major topics concerning groin pain in athletes. All members participated in a Delphi questionnaire prior to the meeting.

Results Unanimous agreement was reached on the following terminology. The classification system has three major subheadings of groin pain in athletes:

1. Defined clinical entities for groin pain: Adductor-related, iliopsoas-related, inguinal-related and pubic-related groin pain.
2. Hip-related groin pain.
3. Other causes of groin pain in athletes.

The definitions are included in this paper.

Conclusions The Doha agreement meeting on terminology and definitions in groin pain in athletes reached a consensus on a clinically based taxonomy using three major categories. These definitions and terminology are based on history and physical examination to categorise athletes, making it simple and suitable for both clinical practice and research.

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INTRODUCTION

Groin pain in athletes is a common problem and renowned for being a complex issue. The wide variety of possible injuries in numerous anatomical structures and high prevalence of 'abnormal findings' in asymptomatic athletes contribute to the complexity. Heterogeneous taxonomy of groin injuries in athletes adds further to the confusion.

Clinical practice is challenging with clinicians using differing groin pain terminology, where even the same term can have multiple interpretations.

A recent systematic review on the treatment of groin pain in athletes included 72 studies, in which 33 different diagnostic terms were used.[1] The need for clear terminology and definitions has been highlighted numerous times.[1–3]

The 'Doha agreement meeting on terminology and definitions in groin pain in athletes' was convened to attempt to resolve this problem. Our aim was to agree on a standard terminology, along with accompanying definitions.

BACKGROUND TO THE MEETING

The First World Conference on Groin Pain in Athletes was held in Doha, Qatar in November 2014. In the lead-up to this conference, 24 experts from a variety of backgrounds were invited to participate in the conference and agreement meeting, and are the authors of this report.

We used a Delphi process to form agreement. Prior to the meeting, several authors were invited to perform systematic reviews to give an up-to-date synthesis of the current evidence on major topics concerning groin pain in athletes. These reviews were presented at the conference as invited lectures and accompany this statement in this issue. Along with the reviews, all members participated in a Delphi questionnaire prior to the meeting. This article presents

- A brief summary of the findings of recent systematic reviews;
- The background and process of the agreement meeting;
- The results of the Delphi questionnaire;
- The results of the agreement meeting;
- Suggestions for future research.

SYSTEMATIC REVIEWS PROCESS

A literature search for recent reviews identified areas where either an update of a previous review or a new review was needed. The nine reviews all underwent a full peer review prior to publication.

Current overview of groin pain in athletes—summary of reviews presented at the First World Conference on Groin Pain in Athletes

Epidemiology of groin injuries in football

This epidemiological review identified 34 articles on the epidemiology of groin injuries in senior football.[4] In general, the sources of risk of bias, identified using a 5-point checklist, were related to participant selection (18 studies), exposure (17 studies) and precision of the estimates given (18 studies).

Groin injuries in male club football accounted for 4–19% of all injuries, and 2–14% in women. An aggregated data analysis of 29 studies found a higher proportion of groin injuries in men (12.8%) than women (6.9%, absolute difference 5.9%, 95% CI 4.6% to 7.1%). Groin injury rates in males were 0.2–2.1/1000 h and 0.1–0.6/1000 h in women (rate ratio 2.4, 95% CI 2.0 to 2.9). Future studies should instead: include clear definitions of injury classifications; consider using definitions other than only time loss to identify ongoing chronic issues; be performed in regions outside Scandinavia and address the sources of bias mentioned above.

Epidemiology of groin injuries in non-soccer elite sports

This review focused on elite non-soccer team sports and summarised 31 papers identified where more than 10 team seasons of groin or groin region injury incidence was reported.[5] These studies used varying injury definitions and also considered varying injury categories from general to specific (all groin/hip region injuries, groin injuries, adductor muscle strains, intra-articular hip injuries). This heterogeneity makes it hard to compare results between studies.

When playing the same sport, males had greater injury incidence of groin injury than females (RR 2.45, 95% CI 2.06 to 2.92). The sports with a high rate of groin injury were ice hockey and the football codes where field kicking is common (Australian football, Gaelic football). Within the football codes, player positions involving more kicking had a higher incidence. Uniform injury classification and definitions would improve comparison of results across studies.

Risk factors for groin injuries in athletes

An update of a previous review was performed.[6] There were 29 studies identified and methodological heterogeneity precluded meta-analysis, so a 'levels of evidence' approach was used. The majority of studies were cohort studies and the median quality score (Downs and Black) was 11/33 (range 6–20).

There is level 1 and 2 evidence that previous groin injury, higher level of play, reduced hip adduction (absolute and relative to abduction) strength and lower levels of sport-specific training are associated with an increased risk of groin injury in athletes. To date, there has been virtually no investigation of the relationship between exposure/athletic load and risk. Future studies should be large enough to ensure around 50 cases to examine for moderate to strong associations and include clear injury definitions. Prevention studies on the role of interventions for established risk factors should be performed.

Factors associated with hip and groin pain in athletes

While risk factor studies should ideally be prospective in design, cross-sectional and case–control studies allow multiple factors to be examined in smaller populations. While no cause–effect relationship can be determined, these factors can be considered in future studies on risk factors, investigations and treatment. A new systematic review[7] with a meta-analysis examining factors differentiating athletes with and without groin pain was carried out.

There were 17 studies included of which 10 were high quality. In total, 62 different measures were investigated. Eight studies were suitable for meta-analysis. Meta-analysis showed that athletes with hip and groin pain had: pain and lower strength on adductor squeeze test, reduced hip internal rotation and bent knee fallout, but that hip external rotation was the same as controls.

When data could not be pooled, a 'levels of evidence' synthesis was performed. There was strong evidence that athletes with hip and groin pain have: lower patient-reported outcome (PRO) scores and altered trunk muscle function compared to controls. Moderate evidence was found that bone marrow oedema and secondary cleft signs are associated with hip and groin pain in athletes compared to asymptomatic controls.

Diagnostic accuracy of clinical tests for hip-related groin pain

Clinical examination of the hip joint presents a challenge in clinical practice. A systematic review in 2013 identified 25 studies related to the diagnostic accuracy of clinical tests for the hip joint.[8] Ten studies were of high quality. The meta-analysis of 14 papers showed that most tests possess weak diagnostic properties. The patella-pubic percussion test was shown to have excellent sensitivity and good specificity for femoral neck fractures.

There has been increasing interest in hip labral pathology and femoroacetabular impingement in athletes. A new systematic review with meta-analysis on the diagnostic accuracy of clinical tests for the diagnosis of hip femoroacetabular impingement/labral tears was performed.[9] It identified 21 studies, of which only one was of high quality. Few hip tests have been investigated sufficiently in high-quality studies to establish their role in clinical decision-making. Nine studies were suitable for meta-analysis. Meta-analysis showed that flexion-adduction-internal rotation test (FADIR test) and flexion-internal rotation possessed only screening accuracy.

Imaging in long-standing groin pain in athletes

A recent review identified 17 articles on imaging in athletes with long-standing adductor-related or symphyseal pain.[2] Twelve articles were on MRI, four on radiography and one on ultrasound. Common methodological weaknesses of the studies included: lack of or inadequate control group, small sample sizes, lack of or incomplete clinical information on participants and unknown reliability of the assessment of the imaging findings reported. Confusing terminology and undefined diagnostic labels were often used, making study interpretation difficult.

Four findings were commonly reported in athletes with long-standing adductor-related or symphyseal groin pain: degenerative changes of the symphyseal joint, adductor muscle insertion pathology, pubic bone marrow oedema and secondary cleft signs. Their exact clinical relevance for treatment or prognosis remains unclear.

Patient-reported outcome measures for athletes with hip and groin pain

Very few studies have been performed in which validated outcome measures have been used.[1] A number of measures have been developed to allow reliable and valid assessment of athletes with hip and groin pain. A new systematic review identified 20 studies in which 9 different PRO questionnaires were examined.[10] The quality was determined using the COnsensus-based Standards for the selection of health Measurement INstruments list (COSMIN) and an evaluation of the measurement properties. The Hip And Groin Outcome Score (HAGOS), Hip Outcome Score (HOS), International Hip Outcome Tool-12 (IHOT-12) and IHOT-33 were recommended for the assessment of hip-related groin pain in young and middle-aged athletes. HAGOS was the only PRO aimed at young-aged and middle-aged athletes with groin pain.

Treatment of groin injuries in athletes

A new systematic review on the treatment of groin pain in athletes identified 72 studies, which were assessed for their methodological quality.[1] The majority of studies (90%) were case

series, of which 80% were retrospective. Twenty-five per cent reported on conservative treatment and 75% on surgical treatment for groin pain. Only four studies were of high quality. Blinding of the participants was not performed in any study and only two studies blinded the outcome assessor or concealed treatment allocation. Thirty-three different diagnostic terms were used, often with different interpretations for the same term between studies.

A significant association was found with methodologically weaker studies reporting higher treatment success percentages. There has been no significant improvement in the quality of studies published over the past 30 years. A level of evidence approach was used to synthesize the results.

There is moderate evidence that for long-standing adductor-related groin pain:

1. Supervised active physical training results in a higher success and percentage of athletes returning to play than passive physical therapy modalities.
2. Multimodal treatment including manual adductor manipulation can result in a faster return to play, but not a higher treatment success, than a partially supervised active physical training programme.
3. Partial release of the adductor longus tendon is effective for return to sport over time.

Additionally, there is moderate evidence that, for athletes with inguinal-related groin pain, laparoscopic hernia repair results in lower pain and a higher percentage returning to play than conservative treatment.

Prevention of groin injuries in athletes

A new systematic review with a meta-analysis of randomised controlled trials on the prevention of groin injuries in sports was performed.[11] Seven trials, with six on football and one on handball, were identified. Two studies used an adductor strengthening programme, two studied the FIFA '11' preventive programme and two looked at balance training. The final study used a presentation to educate players.

In total, there were 4191 participants included in the prevention studies and they sustained 157 injuries. After data pooling, no significant groin injury prevention effect was found (relative risk 0.81; 95% CI 0.60 to 1.09). A potentially clinically relevant, but not statistically significant, reduction of 19% was found on meta-analysis. Future studies should focus on high-risk sports such as football or ice hockey and be adequately powered.

Return to sports after hip surgery for femoroacetabular impingement in athletes

A new systematic review identified 18 moderate to high-quality case series reporting on return to sports after surgery for femoroacetabular impingement.[12] In total, 977 athletes were included with 738 (76%) undergoing arthroscopy, 180 (18%) open surgery and 59 (6%) using a mini-direct anterior approach. There is limited evidence that, on average, 87% of the athletes returned to sport after hip surgery with 82% attaining the pre-injury level of sport. However, these relatively high rates of return to sport are not always maintained with longer term follow-up. As all available studies are case series (Level of Evidence IV), and many have a retrospective design, the outcomes should be interpreted with caution. There is a clear need for high-quality studies, and a recent Cochrane review identified four ongoing trials on surgery and conservative treatment for femoroacetabular impingement.[13]

Background and process of the agreement meeting

Selection of members

Members were invited to ensure representation of different countries, specialties and opinions. Where possible, members were chosen who had previously published on groin pain in athletes. The names and affiliations can be found in the authors' list. They did not represent specific organisations but were selected for their expertise.

Expert group demographics

The group comprised 24 international experts from 14 different countries. There were 7 sports medicine physicians, 6 physiotherapists, 5 general surgeons, 4 orthopaedic surgeons, 1 radiologist and 1 combined orthopaedic and general surgeon. The members had been practising for an average of 22.8 (SD ±8.9) years since qualifying. Twenty-one members had clinical practice roles and three had full-time research and education posts. The clinicians estimated that they saw a median of 150 (IQR 30–400) patients with groin pain in a year, of which 90 (IQR 30–150) were athletes. One expert (RJdV) was brought in for his expertise on research and reviews, and to present a summary of current terminology.

Delphi procedure

Prior to the meeting, one member of the expert group (AW) prepared two clinical cases in which the history, physical examination and selected imaging findings were sent to the members of the groin expert group (n=23).[14] They all completed a standardised questionnaire and provided their preferred terms to describe the diagnoses. The results were returned to the coordinator (AW) with the members being blinded to each other's answers. Once all members had completed the questionnaire, and in advance of the meeting itself, a summary of the results was circulated to the members. The full process and results are published by Weir, *et al*.[15]

A short summary of the history and clinical findings of both cases is included in online supplementary appendix 1.

Case 1—First diagnostic term

For case 1, the frequency of the 9 different terms used to describe the first possible diagnosis was:

Six adductor-related groin pain, 6 adductor tendinopathy, 4 adductor enthesiopathy, 2 femoro-acetabular impingement (FAI), 1 adductor tendinitis, 1 adductor strain, 1 pubic bone stress injury, 1 pubic bone fibrocartilage separation and 1 chronic low grade capsular/enthesis stress.

Case 1—Second diagnostic term

Thirteen experts gave a second term to describe the diagnosis for case 1:

Two osteitis pubis, 2 adductor tendinopathy, 1 FAI, 1 CAM lesion, 1 adductor strain, 1 osteoarthritis of pubic symphysis, 1 adductor tear, 1 pubic bone marrow oedema, 1 pubic ring failure, 1 adductor longus teno-osseous defect and 1 combination of multiple (>2) diagnostic terms.

Case 1—Third diagnostic term

Three experts gave a third term to describe the diagnosis for case 1:

1 adductor tendinopathy, 1 FAI and 1 pubic plate tear.

Case 2—First diagnostic term

For case 2, the frequency of the 11 different terms used to describe the first possible diagnosis was:

Nine inguinal-related groin pain, 3 sports hernia, 2 incipient hernia, 2 inguinal disruption, 1 Gilmore's groin, 1 pubic bone fibrocartilage separation, 1 inguinal canal aponeurosis strain, 1 ilioinguinal disruption, 1 enthesopathy inguinal ligament,

1 posterior wall weakness, 1 core muscle injury and 1 hip chondral surface damage.

Case 2—Second diagnostic term

Ten experts gave a second term to describe the diagnosis in case 2:

Two hip labral tear, 1 posterior wall weakness, 1 superficial inguinal ring insufficiency, 1 enthesopathy of the conjoined tendon, 1 rectus abdominus strain, 1 pubic symphysis pathology, 1 adductor tendinopathy, 1 FAI and 1 combination of multiple (>2) diagnostic terms.

Case 3—Third diagnostic term

Four experts gave a third term to describe the diagnosis in case 2:

One pubic cleft arthritis, 1 transversus abdominis strain, 1 tear of the posterior inguinal wall and 1 combination of multiple (>2) diagnoses.

In total, 18 different terms were used to describe the diagnosis for the first case, while 22 different terms were used for the second case.

The results of the Delphi procedure confirmed the disparity in current terminology and demonstrated the need for the meeting. The results were presented briefly at the meeting, along with an overview of the terminology and definitions used in the treatment studies identified in the review.[1] Prior to the meeting, all members were given the opportunity to present the use of certain preferred terms or classification systems. Five members offered to present at the meeting. The meeting itself is described in the following section.

Agreement meeting process

Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar hosted the Agreement Meeting on 4 November 2014. During the meeting, the panel chairperson (PB) did not adopt an advocacy position for any specific terminology. The chairperson was responsible for directing the agreement meeting itself. Two members (AW, KMK) noted the terms suggested and summarised these for the members. Five members (WM, GV, PH, HP and PR) gave short presentations to the group. Two members (RJdV, AS) also presented data of the currently used terminology in intervention studies for long-standing groin pain and acute groin injuries, respectively. A discussion then followed during which a single set of terms and definitions were agreed on. During the day when there was disagreement on some points, a voting system was used. For example, on the issue of inguinal-related groin pain, there was discussion that the use of 'inguinal' as a term may give the impression of the presence of an occult inguinal hernia, while there was unanimous agreement that there is no occult inguinal hernia present. Unanimous agreement was reached on the following terms and definitions.

There were some important considerations that are presented here as a preamble to the terms.

Groin pain in athletes

Groin pain in athletes was the group's preferred umbrella term ahead of others such as athletic pubalgia, athletic groin pain, sports groin pain, athletes' groin, etc because it is clearly descriptive. It cannot be misunderstood to be a diagnostic term. The group did not specifically define the term athlete.

Clinical examination based classification system preferable

To ensure that the system proposed would be both generalisable and straightforward for use in everyday practice, a clinically based classification system was preferred by the group. This means that a thorough history and physical examination are essential. The fact that the role of imaging is yet to be fully clarified was also felt to be a reason to opt for a system based solely on history and physical examination findings. The group recognised that there is no currently accepted gold standard for history, examination or imaging, with regard to diagnosis. In addition, the high prevalence of findings in asymptomatic athletes makes the use of imaging to diagnose groin pain in athletes difficult.

The group also emphasised that palpation is important to identify the painful structures. Palpation must be precise as numerous structures in the groin are in close proximity, and can refer pain to overlapping areas. The term tenderness is defined in this system as discomfort or pain when the area is palpated, and the athlete recognises this to be their specific injury pain.

Long-standing groin pain

The main focus of the day was on the entities in long-standing groin pain and the majority of the published literature also concerns long-standing groin pain. The group did not specify the exact duration they considered to be long-standing. Long-standing groin pain can start either gradually or suddenly and does not refer to the mechanism of onset, but refers only to the duration of symptoms.

Acute groin injuries

The group briefly considered acute groin injuries. Acute injuries refer to the manner in which the athlete first felt the pain, that is, sudden onset. This is a descriptive term and does not refer to the underlying risk factors or aetiology of these injuries. The group considered acute groin injuries to be those with a specific inciting event. It was noted that there is a lack of evidence pertaining to acute groin injuries. The group felt that in general the system proposed below could potentially be used to classify the majority of acute groin injuries into entities.

Consequently, a careful history along with clinical examination and assesment comprising palpation, stretching and resistance testing is critical. In cases with severe pain, it may be hard to perform a thorough physical examination.

More studies are needed to examine the roles of examination and further investigations in acute groin injuries. The group recognised that some acute groin injuries such as proximal rectus femoris injuries would not readily fit into the classification system currently proposed. Further work will be needed to refine this system to fully encompass the entire spectrum of acute groin injuries.

The classification system has three major subheadings of groin pain in athletes.

Classification system

1. Defined clinical entities for groin pain: Adductor-related, iliopsoas-related, inguinal-related and pubic-related groin pain
2. Hip–related groin pain
3. Other causes of groin pain in athletes

The majority of the day was spent discussing and defining these four entities. The term entity was chosen to reflect the recognisable pattern of symptoms and signs exhibited by the athlete.

In the history, in all cases the athlete should report pain in the affected region that worsens on exercise.

Palpation, resistance testing and stretching of affected muscle groups are used to categorise athletes into these entities. The pain reported by the athlete on resistance testing should also be

felt in the affected structure. For example, in adductor-related groin pain, the pain on resisted adduction testing should reproduce the athlete's recognisable pain in the adductors. Pain felt in a different location—for example, the inguinal region on resisted adduction testing—would not signify adductor-related groin pain.

The exact technique of physical examination was not discussed during the meeting. Such detail went beyond the scope of the one-day meeting to achieve this level of detail. The intraobserver and interobserver reliability of several elements of the physical examination has been explored previously and found to be acceptable for use in practice.[16] An athlete can have more than one entity, in which case multiple entities can be diagnosed.

1. Defined clinical entities for groin pain

Adductor-related groin pain
Adductor tenderness AND pain on resisted adduction testing.

Iliopsoas-related groin pain
Iliopsoas tenderness
The group agreed that iliopsoas-related groin pain is more likely if there is pain on resisted hip flexion AND/OR pain on stretching the hip flexors.

Inguinal-related groin pain
Pain location in the inguinal canal region AND tenderness of the inguinal canal. No palpable inguinal hernia is present.

The group agreed that inguinal-related groin pain is more likely if the pain is aggravated with resistance testing of the abdominal muscles OR on Valsalva/cough/sneeze.

Pubic-related groin pain
Local tenderness of the pubic symphysis and the immediately adjacent bone.

The group felt that there was no particular resistance test that specifically provoked symptoms related to pubic-related groin pain that could be used in conjunction with palpation.

The location of the four entities above is shown in figure 1.

2. Hip–related groin pain
There was agreement that pain from the hip joint should always be considered as a possible cause of groin pain.

History should focus on the onset, nature and location of the pain and mechanical symptoms such as catching, locking, clicking or giving way. It was acknowledged that hip-related groin pain can be hard to distinguish from other causes and that it may coexist with other types of groin pain. The group recommended that physical examination including a passive range of motion and hip special tests (Flexion-abduction-external rotation (FABER) and Flexion-adduction-internal rotation (FADIR) test) should be performed in all cases when athletes present with groin pain.

The expert group found it hard to recommend single discriminatory clinical tests to identify the hip as a cause of groin pain in athletes. Previous studies demonstrated that while hip surgeons often do perform certain special tests, there are a large number used in clinical practice.[17] Most clinical tests for the hip joint have good sensitivity but poor specificity.[6 7] This means that clinical tests can be useful in practice for excluding hip-related groin.

Hip joint pathologies are difficult to rule in using clinical tests alone, as when there is a high clinical suspicion, a positive test does not greatly increase the post-test likelihood of hip joint pathology being present. The general value of hip examination in the athlete is unknown as most studies investigating the value of hip joint special tests included a highly selected, pre-screened and referred population seen in specialised orthopaedic practice settings.

A detailed classification of the possible causes of hip-related groin pain in athletes, such as femoroacetabular impingement or labral tears, was outside the scope of this agreement process. Where there is a clinical suspicion, either through history or clinical examination, of hip-related pain, this should be investigated and treated appropriately.

3. Other conditions causing groin pain in athletes
The group emphasised that there are many other possible causes for groin pain in athletes. A high index of clinical suspicion is needed to identify these and clinicians need to be alert to the possibilities, especially when the symptoms cannot be easily classified into one of the commonly defined clinical entities.

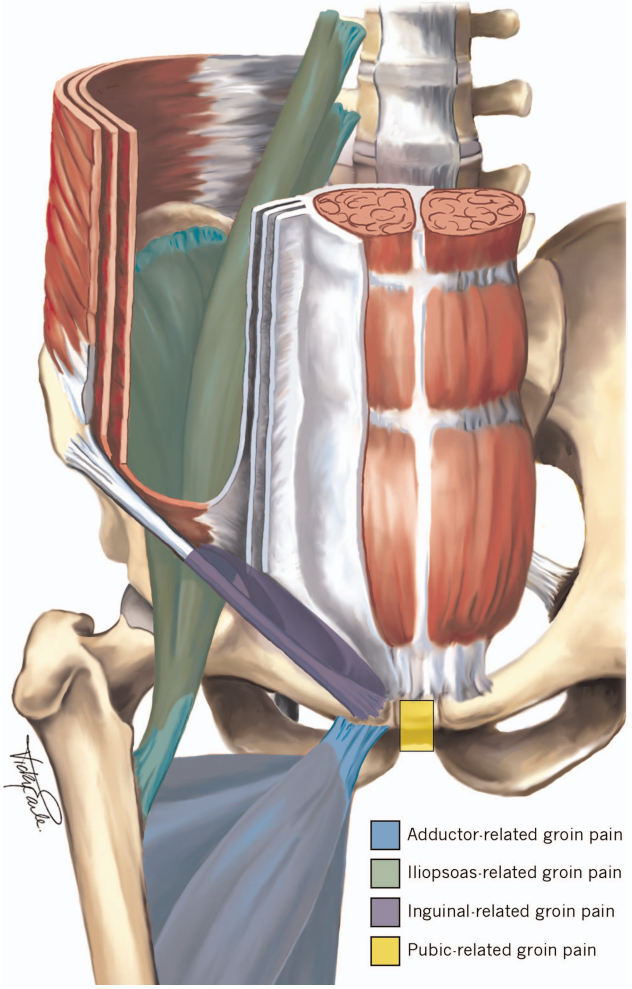

Figure 1 Defined clinical entities for groin pain. *Adductor-related groin pain*: Adductor tenderness AND pain on resisted adduction testing. *Iliopsoas-related groin pain*: Iliopsoas tenderness+more likely if pain on resisted hip flexion AND/OR pain on hip flexor stretching. *Inguinal-related groin pain*: Pain in inguinal canal region AND tenderness of the inguinal canal. No palpable inguinal hernia is present. More likely if aggravated with 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 to test specifically for pubic-related groin pain.

There are numerous possible causes and a number are listed in table 1. The main categories are orthopaedic, neurological, rheumatological, urological, gastrointestinal, dermatological, oncological and surgical, but this list is not exhaustive as many rare conditions could possibly cause pain in the groin region.

A careful history and physical examination covering more than only the musculoskeletal system and appropriate additional investigations or referral are critical for identifying other possible causes.

Taxonomy and nomenclature: recommendation of terms to avoid using in groin pain in athletes

The group discussed and chose not to recommend a number of popular terms, including terms previously used by several members of the group. It was felt that it was not appropriate to incorporate such terms into the new classification system. There were differing reasons including a lack of specificity, uncertainty about the suggested underlying pathology, inappropriate or incorrect term or large degree of variation in how they have been used historically.

The terms that the group chose not to recommend were: adductor and iliopsoas tendinitis or tendinopathy, athletic groin pain, athletic pubalgia, biomechanical groin overload, Gilmore's groin, groin disruption, Hockey-goalie syndrome, Hockey groin, osteitis pubis, sports groin, sportsman's groin, sports hernia, sportsman's hernia.

Medicolegal considerations

The content of this agreement meeting statement reflects the opinions of the members of the group and all authors approved the final manuscript prior to publication. The content will need to be updated in the future and the group aims to update it again prior to 1 December 2018. The statement endeavours to present a way of classifying groin pain in athletes based on history and physical examination. It is not intended to be a standard of care and should not be interpreted as such. Healthcare providers must continue to base individual treatments on the specific facts and circumstances of individual cases.

Future directions

The systematic reviews included in this statement, along with the members of the group identified a number of areas that need further investigation.

The expert group recommends the following priorities for further research.

Epidemiology

Future epidemiology studies should aim to specifically categorise groin pain in athletes. Studies should clearly state how the terms used are defined. The system provided here could be used to clinically differentiate groin pain to allow for a better understanding of the epidemiology. Future studies should: consider using definitions other than only time loss to identify ongoing chronic issues; be performed in regions outside Scandinavia; and address the sources of bias such as participant selection, exposure and precision of the estimates given. Studies can further explore the relationships between hip and groin pain.

Risk factors

Future studies investigating risk factors for groin pain in athletes should include clear definitions of the injuries recorded. Until now, the majority of studies have focused on intrinsic risk factors. Studies on extrinsic risk factors, such as training and match load, the relationships between hip and groin pain, and age of sports specification are needed. The relationship between groin pain in athletes and sports specific movements should be investigated further.

Clinical examination and classification

The reliability of a number of tests that could be used to classify athletes according to the new classification system has already been established. There is little known about the reliability of examination, for pain and bulging, of the inguinal region in athletes with groin pain. Now that agreement has been reached on

Table 1 An overview of some of the possible causes of groin pain in athletes

Entities defined during the meeting	Other musculoskeletal causes	Not to be missed
Adductor-related groin pain	Inguinal or femoral hernia	Stress fracture
Iliopsoas-related groin pain	Postherniorrhaphy pain	▶ Neck of femur
Inguinal-related groin pain	Nerve entrapment	▶ Pubic ramus
Pubic-related groin pain	▶ Obturator	▶ Acetabulum
Hip-related groin pain	▶ Ilioinguinal	Hip joint
	▶ Genitofemoral	▶ Slipped capital femoral epiphysis (adolescents)
	▶ Iliohypogastric	▶ Perthes' disease (children and adolescents)
	Referred pain	▶ Avascular necrosis/transient osteoporosis of the head of the femur
	▶ Lumbar spine	▶ Arthritis of the hip joint (reactive or infectious)
	▶ Sacroiliac joint	Inguinal lymphadenopathy
	Apophysitis or avulsion fracture	Intra-abdominal abnormality
	▶ Anterior superior iliac spine	▶ Prostatitis
	▶ Anterior inferior iliac spine	▶ Urinary tract infections
	▶ Pubic bone	▶ Kidney stone
		▶ Appendicitis
		▶ Diverticulitis
		Gynaecological conditions
		Spondyloarthropathies
		▶ Ankylosing spondylitis
		Tumours
		▶ Testicular tumours
		▶ Bone tumours
		▶ Prostate cancer
		▶ Urinary tract cancer
		▶ Digestive tract cancer
		▶ Soft tissue tumours

the new terminology, the performance of this system in clinical practice needs to be examined. Athletes with groin pain should be examined independently by multiple clinicians to see if they can be reliably classified in practice.

Imaging

The high prevalence of radiological changes in athletes has been well documented. The reliability of various imaging modalities should be investigated. There is little known on the predictive value of these changes in asymptomatic populations with regard to the onset of groin pain. The role of imaging in the prediction of treatment response or prognosis in those with groin pain should be explored. This information will enable a better understanding of the clinical relevance of findings observed when imaging is performed for athletes with groin pain. Imaging studies should use suitable and larger control groups, clear descriptions of the clinical findings, reliable and reproducible imaging protocols and clear terminology. Standard imaging protocols should be developed for the investigation of hip-related groin pain.

Outcome measures

The use of validated outcome measures should be encouraged. HAGOS appears to be the only PRO aimed at young to middle-aged adults, including athletes, that addresses pain and dysfunction in the groin area. It (HAGOS)[18] can therefore be recommended for assessment in this population. HAGOS,[18] HOS,[19] IHOT-12[20]and IHOT-33[21] can be recommended in the assessment of young to middle-aged adults with hip-related groin pain. There is insufficient evidence to recommend other PRO instruments at present.

Larger studies, including item response theory (IRT) models, would improve the understanding of these measures and their clinimetric properties, for their use on the individual level, and across different groin conditions, sports, age groups, genders, nationalities and cultures.

Treatment

More high-quality randomised controlled trials comparing different treatments are needed. Establishing minimal reporting criteria was recommended, and these recommendations accompany are published in the paper by Delahunt, *et al*.[22] These standards are a resource for all who plan to undertake treatment studies. Improved reporting quality and homogeneity will ensure quality and assist in interpreting and understanding studies in clinical practice. The combination of a uniform terminology and minimal reporting standards should help to ensure better quality studies.

Prevention

The recent meta-analysis of randomised trials did not show significant reductions in the number of groin injuries. Future studies should focus on high-risk sports such as football or ice hockey and be adequately powered. Until now, studies have focused on strengthening, balance training and education; other interventions could also be studied. For hip-related groin pain, the role of screening and prevention should be investigated, with special attention given to the adolescent period.

Acute groin injuries

Very few studies on acute groin injuries have been performed. Epidemiological studies including a description of the mechanism of onset and location are needed. Injury mechanisms, treatment and prognosis have never been evaluated in detail and should also be investigated.

CONCLUSION

The Doha Agreement Meeting on terminology and definitions in groin pain in athletes reached a consensus on a clinically based taxonomy. Groin pain in athletes was divided into three major categories:

1. Defined clinical entities for groin pain: adductor-related, iliopsoas-related, inguinal-related and pubic-related groin pain.
2. Hip-related groin pain.
3. Other causes of groin pain in athletes.

These definitions and terminology are based on history and physical examination to categorise athletes, making it simple and suitable for both clinical practice and research.

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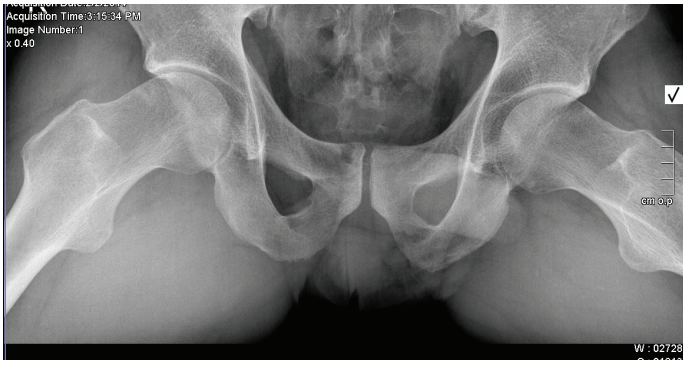
CASE 1

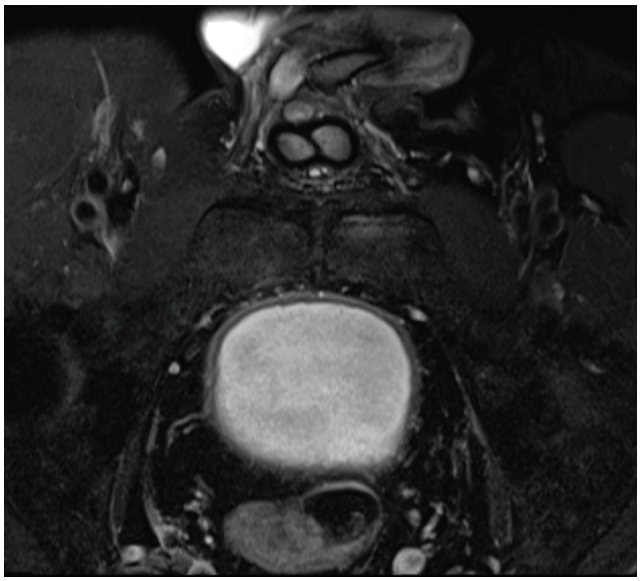
HISTORY

27 y.o. male amateur runner (3 x week) and soccer (3 x week) player.
No previous history of groin injuries.
Gradual onset 1st episode left sided groin pain – over the past 8 weeks.
Pain located around proximal adductors and on insertion on the pubic bone.
The pain is worse on sprinting, kicking and changing directions in football and mild pain at the end of 5km runs.
Initially able to train and play without performance being affected.
Now unable to sprint fully or kick with any power.
Past medical history: none.
Previous injury: 2 years ago lateral ankle ligament injury right side, good recovery. Contusions.
Medically fit, no health issues. Medication: none. No allergies.

EXAMINATION

General – healthy athletic male. Mild varus alignment both legs.
Lumbar spine – normal pain free range of motion.
Horizontal pelvis.
Hip: Normal pain free flexion. 20 degrees internal and 50 degrees external rotation bilaterally. No pain on Faber or FADIR test.
Groin region: no swelling, bruising, scars.
Palpation: Pain on palpation of proximal adductor tendon and attachment at the pubic bone. No pain on palpation of iliopsoas, rectus abdominus, inguinal canal/ring, inguinal ligament, conjoined tendon, other structures in the groin region.
Resistance testing: Hip adduction 0°, 45°, 90° - pain felt at adductor insertion, moderate strength. Hip flexion 0° and 90° - no pain, good strength. Hip abduction 0° and 45° - no pain, good strength. Abdominal – sit up 45° hip flexion – no pain, good strength. Oblique sit ups 45° hip flexion – no pain, good strength.
Stretch tests: symmetrical length of adductors with mild pain on stretching of left adductors felt in proximal adductors. Symmetrical length on testing hip flexors and no pain on stretching.





X-ray report:
There is a moderate reduction of the articular surface of the lateral articular surface of the right hip. There is a reduced head –neck offset junction on the Dunn view.

MRI pelvis:
There is bone marrow oedema of the left pubic ramus. There is no visible cleft or tear of the left adductor tendon but there is adductor longus enthesiopathy. Cystic changes at right adductor tendon origin due to previous injury. No rectus femoris abnormality. No signs of advanced pubic symphysis osteoarthritis. Normal fascia transversalis.
Conclusion: left adductor longus tendinopathy without associated cleft or tear.

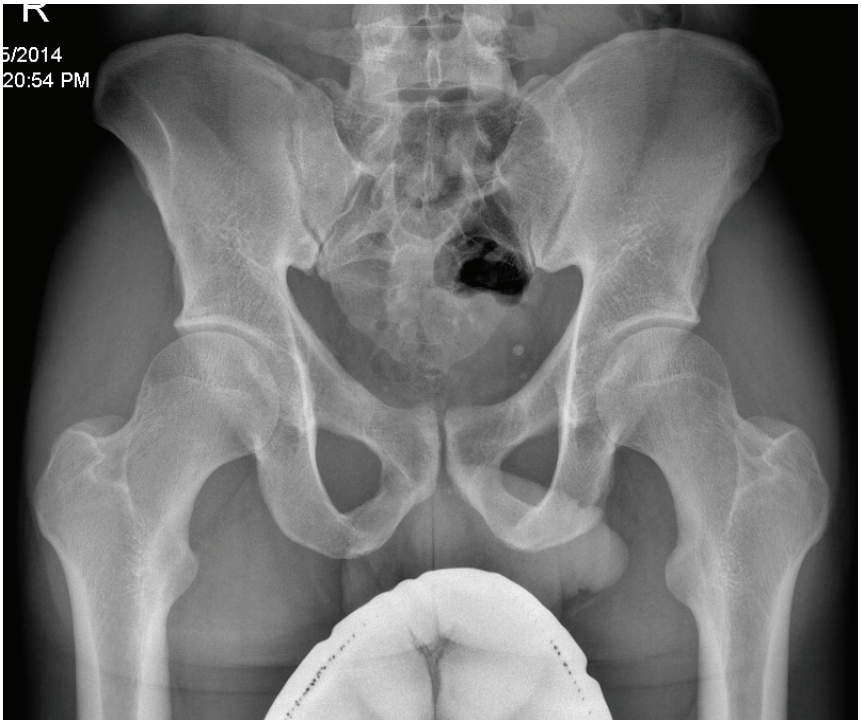
CASE 2

HISTORY

31 y.o. male professional soccer player.
Normally trains on a daily basis.
Several episodes on pain in both adductors and in inguinal region over the years.
Normally treated with short duration of rest, modified training and some oral anti-inflammatories.
In the past the pain settled with 2 -3 weeks. Now: Gradual onset left sided groin pain – over the past 6 weeks.
Pain located around inguinal region on the left side. The pain is worse on sprinting and changing directions.
Initially able to train and play without performance being affected. Since 4 weeks pain after warming up.
Now unable to sprint fully or change direction at speed.
Past medical history: right sided partial medial meniscectomy.
Previous injury: 5 years ago right sided partial medial meniscectomy, good recovery. Contusions. Previous hamstrings strain left side 3 years ago with good recovery.
Medically fit, no health issues. Medication: none. No allergies.

EXAMINATION

General – healthy athletic male. Mild varus alignment both legs.
Lumbar spine – normal pain free range of motion. Horizontal pelvis.
Hip: Normal pain free flexion. 10 degrees internal and 40 degrees external rotation bilaterally. No pain on Faber or FADIR test. Groin region: no swelling, bruising, scars.
Palpation: Pain on palpation of the left external inguinal ring, conjoined tendon and inguinal ligament. There is no palpable inguinal hernia. No pain on palpation of proximal adductor tendon or attachment at the pubic bone. No pain on palpation of iliopsoas, rectus abdominus or other structures in the groin region.
Resistance testing: Hip adduction 0°, 45°, 90° - no pain, good strength. Hip flexion 0° and 90° - no pain, good strength. Hip abduction 0° and 45° - no pain, good strength. Abdominal – sit up in 45° hip flexion –pain in left inguinal region, good strength. Oblique sit ups 45° hip flexion – pain in left inguinal region, good strength.
Stretch tests: symmetrical length of adductors with no pain on stretching. Symmetrical length on testing hip flexors and no pain on stretching.



X-ray report:
AP pelvis: Hip and sacroiliac joints normal. No soft tissue abnormality. Moderate sclerosis of pubic symphysis.

USS report:
Ultrasound groin: there is no musculotendinous strain. No avulsion of the adductor longus tendon. Rectus abdominous muscles normal. The psoas muscles are normal. There is moderate bilateral bulging of the posterior wall of the inguinal canal, more on the left.
No inguinal hernia.