

ATHLETIC GROIN PAIN

STATE OF PLAY MORE THAN A DECADE AFTER DOHA CONSENSUS

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INTRODUCTION – MORE THAN A DECADE AFTER DOHA

More than a decade after the Doha Agreement, athletic groin pain remains a challenging and evolving area of practice. The Doha Consensus established a shared terminology and clearer clinical framework, but important uncertainties remain regarding anatomy, diagnostic testing, imaging interpretation and management. Written by past and present Aspetar clinicians and researchers, this article reviews what has changed, where meaningful progress has been made, where uncertainty persists and which priorities should now guide clinical practice and research. It is not a personal viewpoint, an updated consensus statement, a systematic review, or an attempt to force agreement where uncertainty remains, but a “state of play” for those interested in groin pain to review and reflect their practice against.

WHY WAS THE DOHA CONSENSUS IMPORTANT?

The Sports Groin Pain Center at Aspetar was established in 2012, at a time when groin pain in athletes remained one of the most debated and inconsistently defined areas of sports medicine. The initiative reflected Aspetar’s broader vision of

combining high-level clinical care, research and international collaboration to advance athlete health and performance. Within this environment, it became increasingly apparent that clinicians were often using different diagnostic terms to describe similar presentations, influenced by their professional background, specialty or country of training. This problem extended well beyond Aspetar.

The Groin Pain in Athletes meetings held in Doha in 2012 and 2013 culminated in the first World Conference on Groin Pain in Athletes, hosted at Aspetar in November 2014. A central objective of the conference was to establish international agreement on terminology and classification¹. In preparation for the consensus process, clinical cases, accompanied by imaging, were circulated to international experts from sports medicine, physiotherapy, orthopaedic surgery, general surgery and radiology¹. The striking variation in the diagnostic terms applied to the same cases highlighted the urgent need for a common language.

A formal consensus process, including these international multidisciplinary experts, led to the Doha Agreement on terminology and definitions in groin pain in athletes, which was published in the British

Journal of Sports Medicine². The agreement proposed a clinically driven framework that classified groin pain into defined clinical entities, hip-related groin pain and other causes of groin pain². Its most important contribution was not the creation of a definitive diagnostic system, but the provision of something that had been missing for decades: shared terminology.

The impact of the Doha Agreement extended beyond classification. Its terminology was rapidly adopted internationally, widely cited in the scientific literature and incorporated into clinical practice across many countries. Clinicians, researchers, surgeons, physiotherapists and sporting organisations were able to discuss athletic groin pain using a more consistent language. Its success established the terminology through which much of the subsequent decade of clinical practice and research was conducted, while also exposing important questions that terminology alone could not resolve.

WHAT HAS EVOLVED OVER THE PAST DECADE?

Since the Doha Agreement, progress has reflected refinement rather than reinvention. The four defined clinical entities—adductor-, iliopsoas-, inguinal-

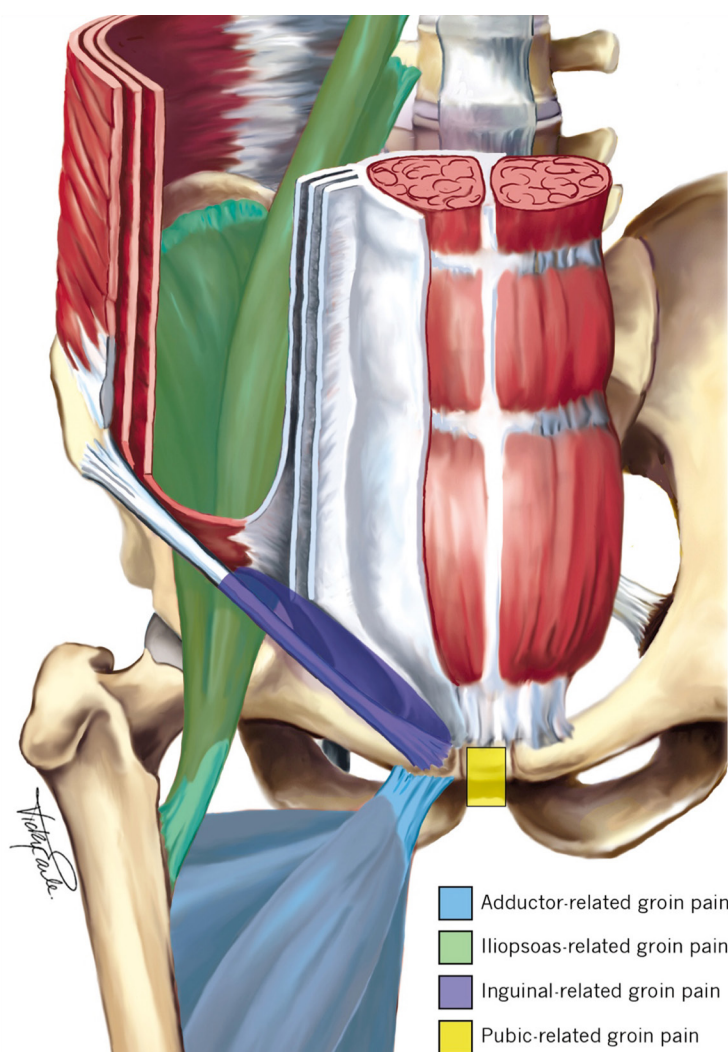


Figure 1: The artists summary of the Doha agreement by Vicky Earle: <https://vearlemedicalart.com/>

and pubic-related groin pain—alongside hip-related and other causes, remain widely used. Research has expanded understanding of the presentations within and alongside these categories, which are increasingly recognised to coexist, particularly in athletes with long-standing groin pain²⁻⁵.

Evolution of the Entities and Clinical Presentations

Adductor-related groin pain

Adductor-related groin pain remains the most commonly assigned clinical entity in athletes with long-standing groin pain^{3,6}. Clinical findings also demonstrate greater inter-examiner reliability than pubic-related findings⁶.

Pubic-related groin pain

Evidence has developed for distinct developmental, bony and ligamentous

presentations within pubic-related groin pain.

Pubic apophysitis is now recognised as an important differential diagnosis in adolescents and young adults because maturation of the pubic apophysis may continue into the early twenties⁷. Although findings may resemble adult adductor- or pubic-related groin pain, the developmental nature may require different loading and management decisions⁸⁻¹⁰.

MRI evidence has also identified inferior pubic ligament injury in approximately one-third of athletes with pubic-related groin pain, but in none of the athletes in an adductor-related groin pain comparison group. This may represent a distinct traumatic pubic presentation (65% of traumatic cases, 17.5% of atraumatic cases), although its clinical relevance requires further investigation¹¹⁻¹³.

Iliopsoas-related groin pain

There has been comparatively little advancement in iliopsoas-related groin pain. Although the Doha definition has been applied in epidemiological studies and MRI abnormalities have been described, limited evidence connects examination findings, imaging, specific pathology and treatment response^{3,5,14,15}.

Inguinal-Related Groin Pain

Inguinal-related groin pain remains one of the most puzzling entities regarding examination, pathology and the source of pain. Proposed causes can broadly be divided into nerve entrapment and musculoskeletal injury¹⁶. Neither explains the full range of presentations.

In our clinical experience, some athletes present following increased training load with pain reproduced from lower-abdominal musculofascial structures and appear to respond to load modification and rehabilitation. This pattern requires prospective evaluation.

Pain mapping demonstrates that symptoms may cover a broad lower-abdominal and proximal-thigh region⁴. This is compatible with neural involvement but is not specific enough to confirm nerve entrapment and may also reflect referred pain, overlapping nociceptive input or altered pain processing. Posterior-wall weakness also remains disputed because similar ultrasound findings occur in asymptomatic athletes.

Intraoperative and radiological findings of nerves surrounded by fascia or adhesions may support neural involvement in selected cases, but their significance remains uncertain¹⁷. This contributes to debate over open non-mesh, open mesh and laparoscopic mesh procedures^{18,19}. Current evidence does not identify a superior approach or reliably determine which athletes will benefit from these surgical procedures or from non-surgical treatment. Future studies should define meaningful subgroups and compare long-term rehabilitation and surgical outcomes.

Hip

Hip-related groin pain has arguably accumulated the strongest evidence base within the past decade. The 2016 Warwick Agreement, supported by the 2021 Oxford Consensus, defined femoroacetabular impingement (FAI) syndrome as a triad of

symptoms, clinical signs and consistent cam/pincer morphology, reframing isolated morphology as a risk factor rather than a diagnosis in itself^{20,21}. This distinction is important given the high prevalence of cam and pincer morphology in asymptomatic athletic populations^{14,22}. There is however increasing and consistent evidence linking bony morphology and cartilage injury, with a dose-response relationship (larger cam associated with larger acetabular cartilage damage), establishing cam morphology as a causal risk factor for hip osteoarthritis in athletes^{23,24}.

Presentations and populations underrepresented in the initial consensus

Traditional groin-pain frameworks were informed predominantly by male football populations. Greater attention has since been directed towards female athletes, adolescents, and other underrepresented groups. For example, pelvic-floor symptoms and dysfunction are increasingly recognised as potentially relevant, particularly in female athletes^{25,26}.

These estimates require caution because of methodological differences and the use of self-reported rather than clinically confirmed symptoms. Nevertheless, pelvic-

floor symptoms may be under-recognised (see related article in this edition).

Evolution in Diagnosis

The Doha Agreement prioritised clinical history and examination, with imaging used to support assessment and exclude pathology that examination alone could not reliably identify. This reduced the risk of imaging-led diagnosis in a region where abnormalities are frequently found in asymptomatic athletes²⁷.

Imaging quality and anatomical precision have since improved, helping identify developmental, ligamentous and bony presentations not differentiated within the original framework, including pubic apophysitis and inferior pubic ligament injury. Imaging may provide greater anatomical detail and identify coexisting or alternative pathology, although the clinical significance of many findings remains uncertain.

Targeted symphyseal and iliopsoas injections have also been explored as methods of testing tissue-specific hypotheses. For suspected nerve-related groin pain, MR neurography may assist in selecting patients for image-guided ilioinguinal, iliohypogastric and

genitofemoral nerve blocks, rather than in guiding needle placement itself. However, much of the supporting evidence is derived from middle-aged, non-athletic populations with chronic or post-surgical inguinal pain, with reported mean ages of 42 and 51 years, limiting its potential applicability to younger athletes^{28,29}. Observational evidence suggests that imaging phenotype and injection response may help identify subgroups, but the 2022 ESSR Delphi consensus rated the supporting evidence as low^{30,31}. (See related article in this edition).

Pain Processing in Longstanding Groin Pain

A further evolution is the role of altered pain processing in longstanding groin pain. The Doha entities are assigned through pain reproduction during palpation, resisted testing and functional provocation. In athletes with persistent symptoms and increased pain sensitivity, the meaning of a positive test may be more complex.

Emerging evidence suggests that a higher number of positive tests and assigned entities has been associated with greater pain intensity and disability³². Multiple findings may reflect several local tissue pathologies, increased regional pain sensitivity or both.





Rehabilitation has increasingly shifted from time-based and entity-driven programmes towards individualised, criteria-based progression. Management now places greater emphasis on symptom response, irritability, impairments, tissue capacity, loading tolerance and the milestones required for return to performance³³.



The unresolved question is how to distinguish predominantly tissue-driven presentations from those in which altered pain processing is an important contributor. These controversies highlight a central tension: greater anatomical precision does not necessarily provide greater certainty regarding pain source, prognosis, or optimal management.

Evolution in Management

The Doha Agreement provided shared terminology but was not intended to prescribe entity-specific treatment pathways. Rehabilitation has increasingly shifted from time-based and entity-driven programmes towards individualised, criteria-based progression. Management now places greater emphasis on symptom response, irritability, impairments, tissue capacity, loading tolerance and the milestones required for return to performance³³. Successful programmes have targeted individual impairments and loading limitations rather than applying separate protocols to each entity. Diagnosis and tissue presentation may still influence prognosis and initial management, particularly in acute muscle or tendon injuries and pubic apophysitis. Overall, management has become increasingly individualised and load-informed.

ONGOING LIMITATIONS OF THE DOHA CONSENSUS

While the Doha Agreement achieved its primary aim of improving the consistency of terminology used in athletic groin pain,

the clinical entities were not designed to provide tissue-specific diagnoses, determine prognosis or prescribe management. Developments over the subsequent decade have highlighted three areas in which the framework requires further evolution: the breadth and dynamic nature of clinical presentations, the specificity of the diagnostic criteria and the extent to which classification informs management or outcomes.

First, the entities do not fully capture the breadth of clinically relevant presentations. PLAC-related and rectus abdominis pathology have been increasingly recognised as potential sources of symptoms in both acute and long-standing presentations³⁴. The original framework also emerged largely from male football populations, with limited evidence representing female athletes, adolescents and other sporting populations^{2,26,35}. Pelvic-floor symptoms and developmentally distinct presentations such as pubic apophysitis further illustrate the range of clinical considerations not specifically addressed within the original definitions.

The classification is also relatively static (initial entity classification being used throughout the process), despite athletic groin pain frequently being dynamic and multifactorial (symptom sources can change or evolve). Athletes may meet the criteria for multiple entities simultaneously, particularly in long-standing presentations, and the relative clinical importance of different symptom regions or contributing factors may change over time³. The entities

therefore provide a useful description of the regions in which symptoms are reproduced but may not fully capture the complexity or evolution of the individual athlete's presentation.

A second limitation relates to the diagnostic criteria used to assign an entity. The Doha Consensus intentionally prioritised clinical assessment over imaging, helping to avoid imaging-led overdiagnosis in a region where asymptomatic abnormalities are common². However, subsequent work has highlighted the difficulty of assigning a specific entity on clinical grounds alone. Symptoms and pain distributions overlap, and the recommended provocation tests are often more sensitive than specific. A squeeze test may reproduce symptoms in the adductor, pubic or lower-abdominal region, while palpation around the pubic-adductor-lower-abdominal interface may not reliably distinguish between the adductor insertion, enthesis, apophysis, pubic bone or adjacent structures^{2,4,6,36}.

Inter-examiner reliability of the Doha classification is only fair to moderate overall, while palpation reliability for adductor- and pubic-related findings ranges from slight to moderate, even among experienced examiners^{5,6}. Imaging may improve diagnostic confidence and help distinguish presentations such as pubic apophysitis, adductor tendon pathology and pubic bone or ligamentous injury. However, imaging findings and responses to targeted injections cannot be assumed to identify the definitive source of symptoms in isolation. Future diagnostic models may

therefore need to integrate clinical history, pain provocation, selected imaging findings and the athlete's response to loading, rather than relying on any single component as has been done at the hip²⁰.

A third limitation is that the entity-based framework was not designed to determine management or prognosis. Although the Doha entities improved descriptive consistency, they remain broad umbrella terms that do not necessarily identify the underlying pathology, forecast recovery or indicate the most appropriate treatment pathway^{4,37}. This is particularly evident in inguinal-related groin pain, where the same entity may encompass competing neural, musculoskeletal, fascial or posterior-wall hypotheses that lead clinicians towards markedly different rehabilitation or surgical approaches^{4,37}. Pubic apophysitis similarly demonstrates how comparable clinical findings may conceal a developmentally distinct presentation requiring different loading decisions⁷.

Current rehabilitation literature increasingly emphasises criteria-based, impairment-driven and load-informed progression rather than separate entity-specific protocols^{33,38}. The absence of clearly differentiated rehabilitation pathways across the entities suggests that the Doha classification currently has greater descriptive than prescriptive utility. Classification may describe where pain is reproduced, but does not independently determine what is driving the presentation, what the athlete's prognosis will be or which management strategy is most likely to succeed.

The Doha Agreement therefore remains highly valuable as a shared clinical language and starting point for assessment. Future development should retain that common language while determining whether the addition of anatomical, imaging, developmental, loading and functional information improves prognostic accuracy, treatment selection and athlete outcomes. Future frameworks should ultimately be judged not only by their diagnostic detail or reliability, but by their clinical utility.

OTHER CONTROVERSIES

Radiology

Since the Doha Consensus, imaging quality, anatomical precision and inter-centre consistency have improved, but whether greater precision identifies the symptomatic

structure, provides accurate prognosis or guides management remains uncertain.

One major advance has been the MRI classification of pyramidalis–anterior pubic ligament–adductor longus complex (PLAC) lesions. This provides structured anatomical description, although evidence linking PLAC grades to treatment decisions or outcomes remains limited. Similarly, imaging criteria for posterior-wall weakness in inguinal-related groin pain lack consistent definition and prognostic validation³⁹.

Hip pathology may coexist with the defined entities, and imaging may be required where suspicion persists because FADIR provides predominantly screening-level accuracy. The Lisbon Agreement subsequently standardised terminology, imaging techniques and reporting for femoroacetabular impingement syndrome⁴⁰.

The Aspetar pubic symphysis radiographic scoring protocol has also provided a reproducible framework for

TABLE 1

Priority research question	Clinical value
<i>Do the Doha entities predict prognosis?</i>	<i>Determine whether entity classification meaningfully predicts recovery time, recurrence or restoration of performance.</i>
<i>Can clinically meaningful subgroups be identified?</i>	<i>Identify subgroups with different prognosis or treatment response that warrant different management pathways.</i>
<i>Can diagnostic accuracy and clinical utility be improved by integrating clinical assessment, imaging and functional response?</i>	<i>Determine whether an integrated diagnostic model improves classification and treatment selection beyond clinical examination alone.</i>
<i>How do clinical presentations and entity classifications evolve over time?</i>	<i>Establish whether changes in symptoms or entity classification during rehabilitation should alter prognosis or management.</i>
<i>Who responds to rehabilitation or surgery for inguinal-related groin pain?</i>	<i>Define which clinical features identify athletes more likely to benefit from rehabilitation or surgical intervention.</i>
<i>Does PLAC classification influence prognosis or management?</i>	<i>Determine whether PLAC grade or associated features should influence prognosis or the choice between operative and non-operative care.</i>
<i>Which imaging findings are clinically meaningful?</i>	<i>Identify which imaging findings predict symptoms, prognosis or treatment response rather than representing incidental abnormalities.</i>
<i>What is the role of altered pain processing?</i>	<i>Identify when pain sensitivity materially influences presentation, prognosis or response to rehabilitation.</i>
<i>How do sex, age, maturation and sporting demands influence presentation?</i>	<i>Determine whether diagnostic criteria, prognosis or management need to differ across populations.</i>
<i>Which rehabilitation components influence outcomes?</i>	<i>Identify the rehabilitation components, dosage and progression strategies most strongly associated with successful outcomes.</i>
<i>Which outcomes should be consistently reported?</i>	<i>Establish a core outcome set that captures recovery, recurrence and restoration of sporting performance.</i>

Table 1: Priority Questions and Required Datasets



Figure 3: The front cover of the BJSM special edition.

describing pubic changes⁴¹. However, multiple terms continue to describe similar findings, and posterior-wall insufficiency, secondary cleft signs and pubic bone marrow oedema may occur in asymptomatic athletes^{27,42,43}. Imaging should therefore be interpreted alongside clinical history and examination. Its prognostic value remains largely unanswered.

PLAC Management

The PLAC classification for acute adductor avulsions represents an anatomical advance, although its management

implications remain less established. The classification provides a structured description, and has reported good agreement between MRI grading and intraoperative findings in athletes undergoing surgical repair⁴⁴.

Evidence supporting surgery rests largely on single-centre case series without direct comparison against criteria-based rehabilitation. Small non-operative series have reported high return-to-sport rates, preserved strength and favourable longer-term function. A 2022 systematic review similarly suggested shorter return-to-sport

times with non-surgical treatment and comparable return to previous activity, although the evidence remained limited and heterogeneous⁴⁵⁻⁴⁷. Structured exercise-based rehabilitation is therefore reasonable in many presentations, but treatment selection remains poorly defined. The unresolved question is whether PLAC grade, displacement, associated injury, or recurrence identifies athletes who benefit from surgery, or whether the classification provides anatomical description without meaningful prognostic or treatment-selection value.

FUTURE DIRECTIONS: HOW CAN WE MOVE FORWARD?

Research Priorities

Despite progress, the evidence continues to be dominated by single-centre studies, small samples and profession-specific perspectives, creating a risk of confirmation bias and overstatement of proposed classifications. The priority should not simply be to create more detailed anatomical labels, but to establish whether clinical entities and proposed subgroups improve diagnostic reliability, prognosis, treatment selection or athlete outcomes.

In the absence of a robust diagnostic gold standard, this will require greater standardisation of imaging terminology and prospective evaluation of clinical, imaging, loading, functional and pain-related variables. Research must also better represent female athletes, adolescents, and different sports.

Priority Questions and Required Datasets (Table 1)

Large, prospective, multicentre cohorts and longitudinal registries using standardised clinical, imaging, treatment and outcome datasets are required to identify prognostic factors and clinically meaningful treatment-response subgroups before appropriately targeted comparative studies and randomised trials are undertaken. Acute, longstanding, recurrent and adolescent presentations should be analysed separately where relevant, as their prognosis and predictors may differ substantially⁴⁸. A minimum common dataset should include demographic and sport characteristics, symptom history, clinical entities, examination and imaging findings, recent training load, functional capacity, treatment exposure and adherence. Outcomes should

RECOMMENDATIONS BASED ON THE CURRENT STATE OF PLAY

1. *Use the Doha entities as a starting framework rather than a final diagnosis.*
2. *Screen for red flags and non-musculoskeletal causes in atypical presentations.*
3. *Move beyond identifying the painful structure; determine the mechanism driving symptoms, overload and performance limitation.*
4. *Recognise the limited specificity and reliability of clinical and palpation tests.*
5. *Use imaging to support, rather than replace, clinical reasoning.*
6. *When entities coexist, prioritise the most clinically relevant and modifiable contributors.*
7. *Individualise rehabilitation according to irritability, loading tolerance, function and recovery trajectory.*
8. *Consider hip morphology only alongside specific symptoms, imaging and clinical signs.*
9. *Assess inguinal-related pain beyond the absence of a hernia, including musculoskeletal and neural mechanisms.*
10. *Use injections to test defined hypotheses rather than for diagnosis in isolation.*
11. *Consider surgery only where a clear indication exists and appropriate non-surgical care has not resolved symptoms or is unsuitable.*
12. *Judge success by restoration of function, performance and durable sporting participation.*

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extend beyond return-to-sport time to include recurrence, persistent symptoms, restoration of performance and durable sporting participation. Rehabilitation reporting should also consistently describe exercise dosage, progression criteria, load prescription and return-to-sport decision-making to improve reproducibility and interpretation of treatment effectiveness⁴⁹. External validation and consistent outcome reporting will be essential to determine whether proposed classifications, imaging findings and management strategies have reproducible clinical value.

SUMMARY

More than a decade after Doha, the agreement remains the shared language through which athletic groin pain is described and studied. Subsequent work has refined anatomical understanding, imaging classification and rehabilitation, but the clinical entities remain broad descriptors rather than tissue-specific diagnoses, prognostic categories or treatment

pathways. Clinical findings, imaging and injection responses must therefore be interpreted within the wider context of symptom behaviour, loading, function and pain processing. Future progress will depend less on creating additional labels and more on determining which clinical subgroups meaningfully predict prognosis, guide treatment and improve athlete outcomes through large, standardised multicentre datasets.

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References

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