GROIN PAIN: A VIEW FROM BELOW

THE IMPACT OF LOWER EXTREMITY FUNCTION AND PODIATRIC INTERVENTIONS

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INTRODUCTION

The evaluation and treatment of groin pain in athletes is challenging, often because the anatomy is complex, multiple pathologies coexist that can cause similar symptoms and the causation of injury is multi-factorial. Athletic groin injuries are more prevalent in sports that involve kicking and twisting movements while running. Sports such as ice hockey, fencing, handball, cross-country skiing, hurdling, high jumping and football (soccer and Australian Rules) commonly have a high incidence of groin injury. Groin pain accounts for approximately 5 to 18% of all athletic injuries, with kicking sports generally producing most of these injuries. For example, the literature indicates that nearly 1/3 of soccer players will develop groin pain during the course of their careers. Yet, despite the high prevalence of groin pain in sport, there is a lack of evidence-based medicine regarding diagnosis and conservative management of groin pain. This is surprising as the morbidity of groin pain ranks only behind knee, anterior cruciate ligament injury and bone fracture in terms of time loss from sport[1]. Much of the scientific literature relies upon an association between qualitative history taking, clinical appraisal and diagnostic imaging. Hence, links between groin pain and lower extremity biomechanics are poorly represented within the scientific literature. Despite the lack of an evidence base, clinically the link between foot-ankle biomechanics, leg length inequality and pelvic instability is clear. Within the clinical realm of sports injury, biomechanical optimisation principals are frequently utilised to prevent, rehabilitate and manage groin pain.

The objective of this paper is to:

1. Review causes of groin pain in the athlete.
2. Examine potential biomechanical risk factors for groin pain.
3. Explore the role of podiatry in the management of the athletic groin pain.

> *Asymmetry of the legs is considered a risk factor for injury*

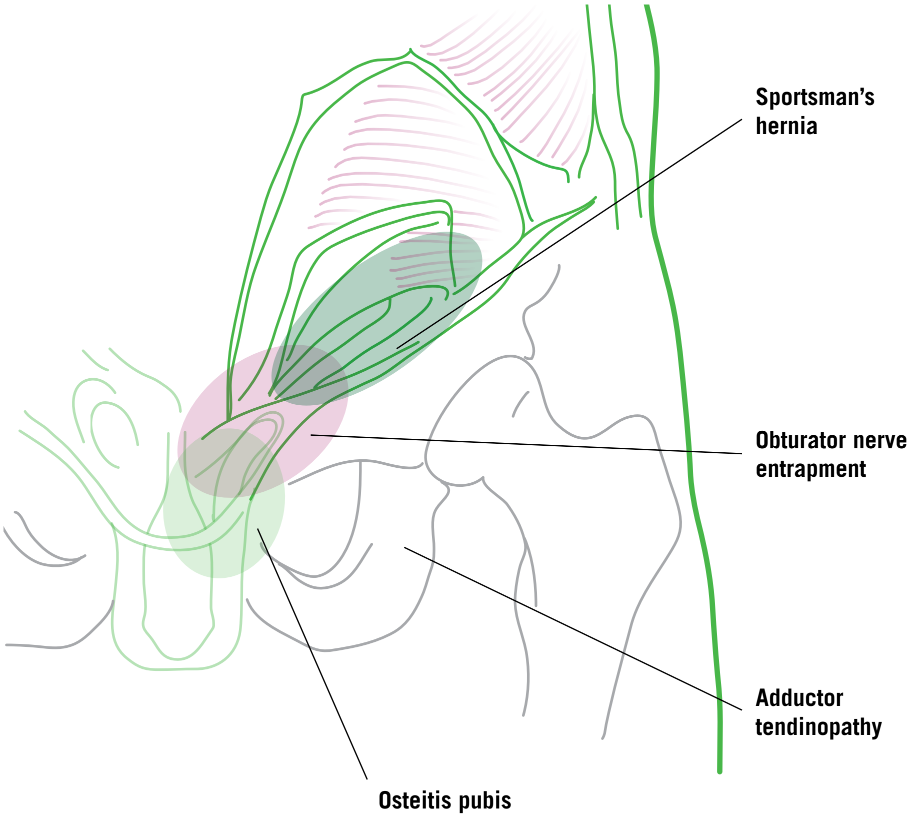


Figure 1: Anatomy of athletic pubalgia or 'groin disruption injury'.

CAUSES OF GROIN PAIN IN THE ATHLETE

Groin pain reviewed

The definition of groin pain is broad and vague. The literature provides no consensus on pathology/pathophysiology or management. Groin pain involves a number of conditions involving the lower abdomen, inguinal regions, proximal adductors and perineum, upper anterior thigh and hip. The most commonly seen groin pathology is related to the adductor muscles, pubic symphysis, inguinal region and nerve supply to the groin.

Diagnosis is complicated by multiple groin pathologies presenting at one time. This is referred to as 'athletic pubalgia', a generalised term that refers to a spectrum of musculoskeletal injuries that occur in and around the pubic symphysis and that share similar mechanisms of injury and common clinical manifestations[2]. Another clinically relevant label is 'groin disruption injury' (Figure 1) consisting of sportsman hernia, osteitis pubis, conjoint tendinopathy, adductor tendinopathy and obturator nerve entrapment[3].

Osteitis pubis

Osteitis pubis is a condition that involves the pubic bone symphysis, surrounding muscle insertions and structures. Small avulsion fractures can also occur at the attachment of the adductor tendons to the pubic bone, as well as repetitive micro-trauma or shearing forces to the pubic symphysis. This micro-trauma exceeds the dynamic tissue capacity for hypertrophic remodelling, resulting in tissue degeneration. The condition is overuse in nature, caused by repetitive contraction of the muscles that attach to the pubic bone and the pubic symphysis. Actions such as running, jumping, kicking and rapid changes of direction cause the abdominal and groin muscles to produce a pulling or traction force on the pubic bone. This adds to the suboptimal biomechanics of the pelvis and lower extremity, and results in excessive stress and injury. Despite the clarity of the mechanism of injury, the condition is still not well-understood as it can involve multiple factors including:

- stress reaction of the pubic symphysis due to high shear forces common with cutting and side-stepping actions,
- conjoint tendon or in combination with the adductors that spreads to the subchondral bone,
- an imbalance or loss of synergy between the abdominals and adductor muscles.

Clinical signs of osteitis pubis include groin pain while climbing stairs, running, kicking, changing directions and tenderness of the pubic symphysis exacerbated by provocative examination techniques.

Sports hernia

Sports hernia is a medially-located bulge in the posterior wall of the inguinal canal due to weakening of the abdominal wall[3]. This has been attributed to an injury of the conjoint tendon (common insertion of internal oblique and transverse abdominus muscles joining the distal lateral edge of rectus abdominus). The conjoint tendon with the lower edge of internal oblique and transverse abdominus muscles protects the posterior wall of the inguinal canal (fascia transversalis), a weak point in the abdominal wall. The pathology is explained as interplay of opposing forces between the abdominal and adductor muscles. Conjoint tendon is the inferomedial portion of internal oblique (trunk rotation and lateral flexion) and transversal abdominus (core stability) muscles. The role of adductors is adduction, flexion and internal rotation of the hip. The condition presents often, and has complex clinical findings and historically varying terminology. It is interchangeably referred to as a sportsman's hernia, pre-hernia complex, conjoint tendon tear, Gilmore's groin, external oblique tear and inguinal wall deficiency[4,5]. Athletes who participate in sports that require repetitive twisting and turning at speed (Australian Rules football, soccer, hockey) are at most risk of developing a 'sports hernia'.

The mechanism is usually of insidious onset and often unilateral on the dominant kicking leg in football. However, it is important to note that 1/3 of patients describe a sudden tearing sensation. The pain is typically localised to the conjoint tendon but may involve the inguinal canal laterally or the lower abdomen. The pain increases with sudden movements, acceleration, twisting, turning and kicking and may be provoked by coughing and sneezing. Symptoms may range from mild tenderness without palpable protrusion of the inguinal wall, to severe tenderness but not a palpable protusion (hernia).

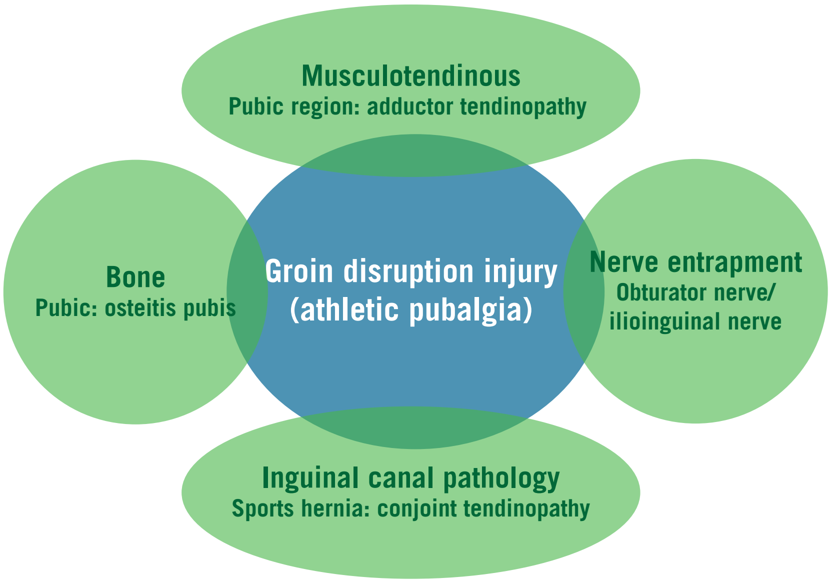


Figure 2: The inter-relationship of groin pain or 'groin disruption injury'.

Adductor tendinopathy and strain

The most common musculoskeletal cause of groin pain is a muscle strain of which the adductor longus muscle is the most frequently injured. With repetitive loading this results in micro-inflammatory change in the para-symphseal bone which is a precursor to osteitis pubis[2]. The adductors act as primary stabilisers of the hip joint. Adductor-related groin pain can be acute, primarily as a strain of the myotendinous junction associated with a powerful contraction (kicking actions) or can be chronic with tenderness over the adductor insertion at the pubic bone. Tendinopathy in the groin is not acute, but a silent pathology. It presents with gradual pain and stiffness in the groin region with start-up activity, dysfunction is exacerbated by sprinting, cutting, kicking and sliding tackle actions. Clinical signs include tenderness on palpation at the origin of the adductors and pain with resisted hip abduction.

Pelvic nerve entrapment

Obturator neuralgia has been described as a cause of exercise-related groin pain, particularly in athletes with a high repetition of twisting and turning, and kicking. The condition involves a fascial entrapment of the obturator nerve where it enters the thigh. Symptoms include medial thigh pain that begins insidiously. The obturator nerve is entrapped proximally where it enters the thigh, but its cutaneous dermatome is at the middle/lower medial thigh. The pain at the adductor origin points to adductor enthesopathy that could consequently cause nerve entrapment. Obturator entrapment pain can present as a deep ache in the proximal adductor region that is referred to the medial thigh and worsens with exercise. Pain or numbness radiates down the inner thigh, with associated weakness. The obturator nerve arises from the ventral rami of L2 - L4 and descends through the psoas muscle. The nerve continues to descend through the obturator tunnel where it divides into an anterior and a posterior branch. Pain typically has an insidious onset and is localised to the adductor origin at the pubic bone. Imaging does not play a significant role in confirming the diagnosis, but may be important in excluding other diagnoses. Diagnostic measures include:

- reproduction of pain by stretching the adductor muscles after exercise,
- electromyography and
- a local anaesthetic block of the obturator nerve.

Examination findings are painful passive abduction, painful/weak resisted adduction and tenderness at the pubic tubercle. After exercise there is weak resisted adduction and sometimes numbness in the lower/inner thigh. The condition represents a subset of groin pain in athletes that is treatable by surgical means (fascial release). Surgery allows most patients to resume previous levels of activity.

BIOMECHANICAL RISK FACTORS FOR GROIN PAIN IN THE ATHLETE

Biomechanics is the science of motion and how the musculoskeletal system adapts to variations in human movement. Human movement patterns affect the way the body functions and are implicated in sporting injury. The goal of sports medicine is to maintain a state of equilibrium or homeostasis of the joints, muscles and sporting techniques (e.g. walking, running, jumping and kicking) in an effort to prevent injury. Groin pain is a multifactorial dilemma for the sports medicine practitioner.

In the literature

While an association exists between groin pain and sports involving kicking and twisting activities when running, there is a lack of literature that investigates the effect of musculoskeletal biomechanics in groin pain. This is most likely due to the anatomical and biomechanical causes which are complex and controversial. To highlight the lack of established scientific research in the groin-lower extremity biomechanics paradigm, the online data bases CINAHL, PsycINFO®, Medline®, SPORTDiscus, Cochrane and Scopus were searched to retrieve all available publications related to "groin and lower extremity biomechanics in sport" for the period January 1990 to December 2012. All databases were systematically searched using the same keywords and text words. Where relevant, 'smart word' searching was used when the data bases did not recognise the search words. Peer-reviewed journal publications with themes exploring any facet of links between groin pain and the lower extremity including leg length differences and pelvic imbalances were examined.

A total of 676 from CINAHL (n=86), PsycINFO (n=13), Medline (n=320), SPORT Discus (n=169), and Scopus (n=88) articles were identified with themes applicable to the search. The Cochrane database did not result in any meta-analyses previously examining the focus of the current review. Further investigation harnessed a total of 12 articles with broad reference to groin-lower extremity biomechanics and leg length inequality studies associated with the lower extremity in sport. However, no results were obtained for specific research on the effects of anatomical biomechanics of the lower extremity and groin pain. There were case studies with reference to the topic.

As the literature provides limited consensus, much of the research into links between the biomechanics of anatomical pathology and groin pain is gained from clinical appraisal, case studies, surgical reports and observations from the sports medicine community. Consensus has been achieved that muscle imbalance or structural asymmetry is a key component to sub-optimal biomechanical homeostasis, which within the confines of clinical sports medicine are rated the most important intrinsic risk factors for injury. The most common of these factors are:

- foot misalignment,
- knee position,
- tibial angle,
- femoral anteversion,
- leg length discrepancy (which can encompass pelvic instability) and
- a past history of injury.

Figure 3 identifies the main biomechanical risk factors of the lower extremity which have an association with groin pain. For the sports medicine practitioner an understanding of biomechanics will assist athletes when preparing for the goal of injury-free sport and when injury does occur, enabling sound rehabilitation principles.

THE ROLE OF THE UNSTABLE PELVIS IN GROIN PAIN

A well-balanced pelvis is paramount to optimal sports biomechanics as the majority of sports played depend on a well-balanced pelvis that requires the complex orchestration of different muscle groups, ligaments and joints. The sacroiliac joints at the back of the pelvis and the pubic symphysis at the front form a unit to hold the pelvis absolutely steady during any activity in any position which involves movement of the legs. If the pelvic girdle is not balanced and firmly tied by all of the ligamentous structures it cannot effectively allow movement of the legs without excess strain at the pubic symphysis joint. The pubic symphysis joint may shear or separate causing pain. Instability of the pelvis and resultant groin pain has many contributing factors, the common biomechanical entities being:

- faulty foot and body mechanics,
- gait disturbances,
- poor running or walking mechanics,
- tight, poor hip range of motion due to muscle stiffness in the hips, groin and buttocks,
- muscular imbalances and
- leg length differences.

Thus a goal of athlete screening is to identify the unstable pelvis and nullify the causative factors that result in leg length inequality, reduced hip range of movement and adductor-abductor muscle imbalance (refer to malicious malalignment syndrome). These entities contribute to functional and structural pelvic instability, compromising rotational stabilisation of the pelvis which is a critical factor in injury prevention and reoccurrence[3].

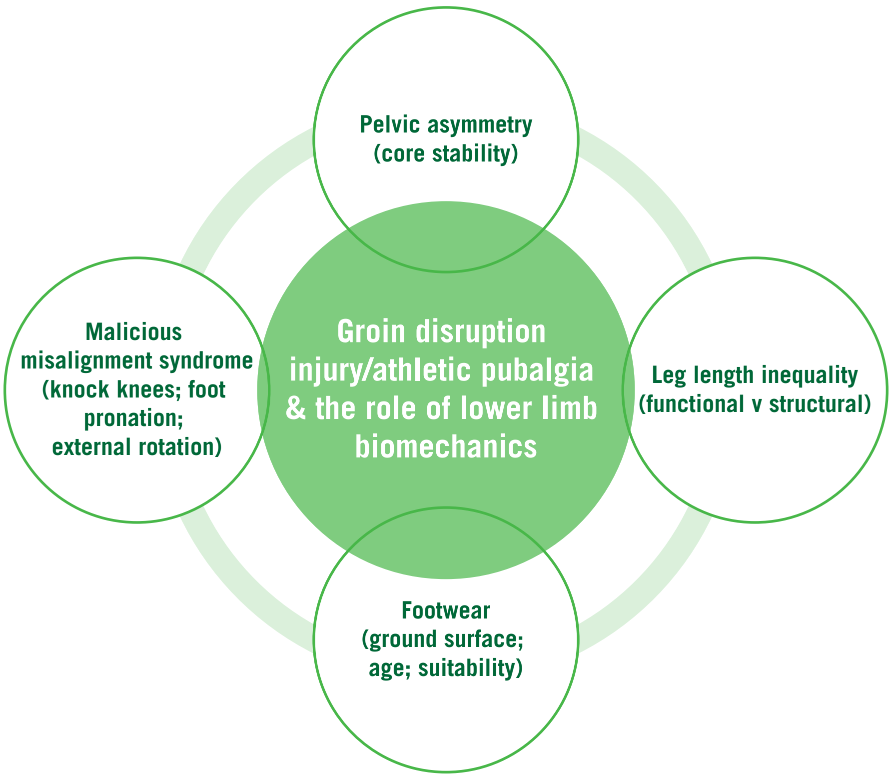


Figure 3: Relationship between 'groin disruption injury' and lower extremity biomechanics.

LEG LENGTH INEQUALITY

An imbalance between the lengths of legs is frequently overlooked in the evaluation of groin, low back and hip problems. Asymmetry of the legs is considered, in clinical sports medicine, to be a risk factor for postural compensations and injury. It generally can be classified into three categories:

1. **Anatomical difference:** a natural developmental asymmetry which is fixed following closure of the femoral and tibial growth plates. Other causes of a structural or anatomical difference include fracture, disease and complications of hip replacement surgery.
2. **Apparent (functional) discrepancy:** this is due to an instability of the hip-pelvis-low back, that allows the proximal femur to migrate proximally, or due to an adduction or abduction contracture

of the hip that causes pelvic obliquity, so that one hip is higher than the other. When the patient stands, it gives the impression of leg length discrepancy, while the problem is actually due to musculoskeletal dysfunction.

3. **Combination** of the first and second type of leg length imbalances.

Consensus on what leg difference is considered clinically significant varies in the literature. A review of the American Academy of Orthopaedic Surgeons literature shows that, in a study of 600 military personnel, 30% had a limb length imbalance ranging from 5 to 15 mm. This was considered a normal variation[6]. Other reports indicate that anatomic leg-length inequality is not clinically significant until the magnitude reaches 20 mm. Other studies suggest as little as 5 mm difference is considered significant[7]. The effect of leg length inequality on pelvic alignment is the altered biomechanics of the sacroiliac joint and pelvic girdle as a whole. An incorrect pelvic tilt increases the risk of groin injury as the pelvis is tilted too far forward causing musculoskeletal pelvic imbalance. The effect of pelvic overload during sport cannot be underestimated in groin injury. Running and other exercise-related activities are associated with high ground reaction forces (Figure 4). Such load forces with an unstable pelvis, secondary to leg length imbalance, at high speed running, kicking and twisting manoeuvres will compromise groin integrity.

FOOTWEAR AND GROUND SURFACES

A common mechanism for lower extremity injury is the relationship between ground surface and footwear. Ground hardness refers to the effect the ground has on absorbing impact loads. The contribution of hard grounds to groin injury is associated with high ground reaction forces at one end of the ground spectrum and an unstable-soft surface at the other. Ground reaction forces during running and jumping are commonly measured to range from 2 to 10 times body weight (Figure 4). Hard ground provides greater peak reaction forces and are associated with injury risk especially in those sports that involve running, jumping, side-stepping and other load-bearing exercises. However, just as hard surfaces are a risk factor, a ground surface which is uneven or too soft will also overload the unstable pelvis.

Important footwear characteristics for injury prevention include:

- traction,
- cushioning,
- fit and
- suitability relative to task as well as lower-limb morphology.

A common mechanism, but a poorly understood one, is the interaction between foot-fixation and playing surface interface. Data from various professional sporting organisations including the NFL (American Football) indicates that per-team injury rates are 27% higher for games played on artificial turf surfaces vs games played on natural grass. Injury is also associated with climatic conditions with an increase in injury associated with warmer climates (e.g. pre-season training and early rounds of competition) and grass species. Grass types with high root density, generally the warmer climate grasses, creates greater shoe-surface traction. Conversely ryegrass, a cool climate winter grass, is likely to create lower surface traction due to its fine root density. Therefore a combination of unstable pelvis and poor footwear selection relative to ground surface is a risk factor for groin injury. However, this association has never been made scientifically.

Injury prevention

When it comes to athletes, footwear is the only form of player apparel that acts as a filter between the ground surface and the body. It is this interaction that will directly influence movement patterns of an athlete on a variety of surfaces (soft, hard, wet, dry and undulating). For active populations such as military personnel, basketball players, runners and footballers, footwear has a direct correlation to injury. While a plethora

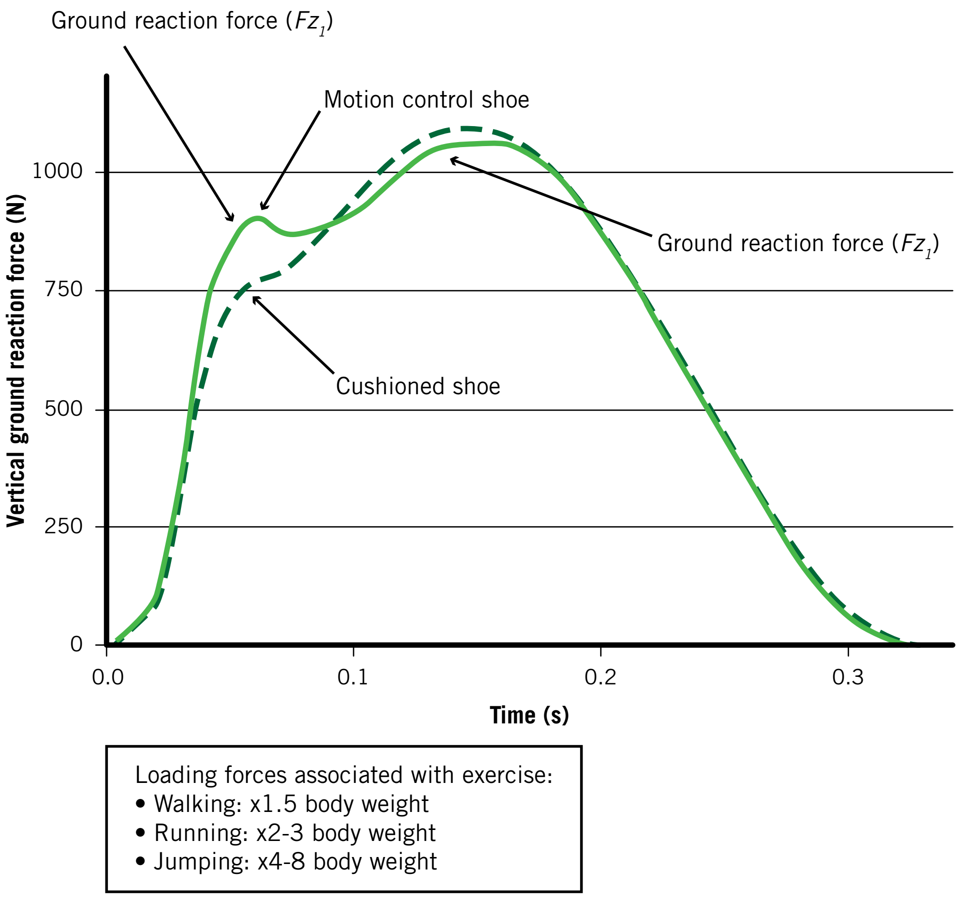


Figure 5: Differences in load attenuation when running in firm shoes on hard surfaces vs cushioned footwear on hard surfaces. Figure adapted from Ferris DP, Liang K, Farley CT. Runners adjust leg stiffness for their first step on a new running surface. J Biomech 1999; 32:787-794.

Figure 5: Malicious misalignment syndrome: internal femoral torsion, internally rotated knees, tibial bowing and hyper-pronated feet.

of data highlights the benefits of footwear to injury prevention, often footwear is an area of sporting preparation which is not factored into the injury prevention paradigm. Not only does the type of surface used on various surfaces potentially pose injury risk, but the relationship between foot types (pesplanus, pescavus, hyper-pronated, supinated) and footwear is an important criterion for injury prevention. The individualism of foot shape and foot biomechanics adopting generic footwear prescription policies, where one footwear style applies to all in a team or where the athlete selects footwear based on personal bias, is poor sports medicine. An important principle of maintaining homeostasis of foot function is the need for a close association between foot and shoe motion. Over the past 20 years, research has substantiated the neurophysiological responses of footwear to an individual whereby individuals are likely to adapt running styles due to different shoes, foot-leg biomechanical imbalances and lower extremity muscular tuning. Furthermore, without tailored footwear prescriptions, a close association between the fit of a foot and an athletic shoe does not exist. These features will have implications for movement efficiency, injury prevention and performance enhancement ideals of athletic footwear. Thus footwear will contribute to a number of sporting outcomes such as performance, traction, comfort and injury. It is therefore imperative that any injury prevention and management programme take into account individual tailored footwear prescription and that the type of footwear used be specific to ground conditions.

Malicious misalignment syndrome

The relationship between groin pain and malicious misalignment syndrome is one of compensation. 'Malicious misalignment syndrome' is characterised by excessive internal rotation of the hips and femur, knock knees, tibial bowing and hyper-pronated feet.

The condition is commonly associated with patellofemoral dysfunction and anterior knee pain. However, the implications of the biomechanics of this syndrome to groin pain should not be underestimated. Accepted dogma indicates the importance of pelvic stability to prevent injury and guard against reoccurrence[3]. Logically, misalignment of lower extremity biomechanics will contribute to an unstable pelvis. A probable mechanism is an internally rotated lower limb with hyperfoot pronation. The foot-ankle motion will cause the legs to rotate and the pelvis to tilt forward straining the sacroiliac joint. Where asymmetrical leg rotations or asymmetrical foot pronation exists, there will be asymmetrical loading of the right and left hemi-pelvis that contributes to pelvic instability.

The pathomechanics of 'malicious misalignment syndrome' for the athlete is the alteration to running stride. Over time the demands of an unbalanced running stride causes the adductor muscles to tighten, limiting external hip rotation, shortening and tightening of iliopsoas and an anterior pelvic tilt. The result is increased spinal curvature and continuous tension on the muscles in the lower back, causing elements of the musculoskeletal system to function at unnatural angles to each other. In turn the sacroiliac joint and pubis symphysis are prone to repetitive weakening and micro instability of the osteochrondral junctions of the pelvis, pelvic instability and eventual injury.

Unilateral weight-bearing is a necessary requirement of closed-chain sporting

"Footwear is the only player apparel that acts as a filter between the ground and body"

activity for walking, running and kicking actions. Logically, this normal sequence of intermittent single leg loading and unloading results in increased loading at the hemi-pelvis. If the pelvis is stable, these demands can be catered for. However, when the pelvis is unstable the potential for athletic chronic groin injury is enhanced where restricted hip joint motion exists and imbalances between the adductors and abductors occur.

Hip range of motion

Over the past 30 years there has been an ever-increasing body of knowledge associating restricted hip range of motion and groin injury. In an early study of 180 footballers, decreased hip abduction range of motion was linked with subsequent groin strains, compared with uninjured players[8]. A more in-depth investigation of 306 professional footballers also concluded that decreased range of hip abduction was a significant risk for groin injury[9]. Similar results were obtained in a study of Australian Rules footballers conducted over two seasons. Players without previous history of groin injury who displayed reduced total hip joint range of motion progressed to chronic groin injury[10]. The pathomechanics of poor hip range of motion is not only the effect of shortening the adductor muscle group, which loads the insertion and predisposes, especially adductor longus, which is most commonly injured during sporting activity, but the reduction on hip range of motion increases the load forces of the pelvis, especially at the pubis symphysis.

Muscle imbalance

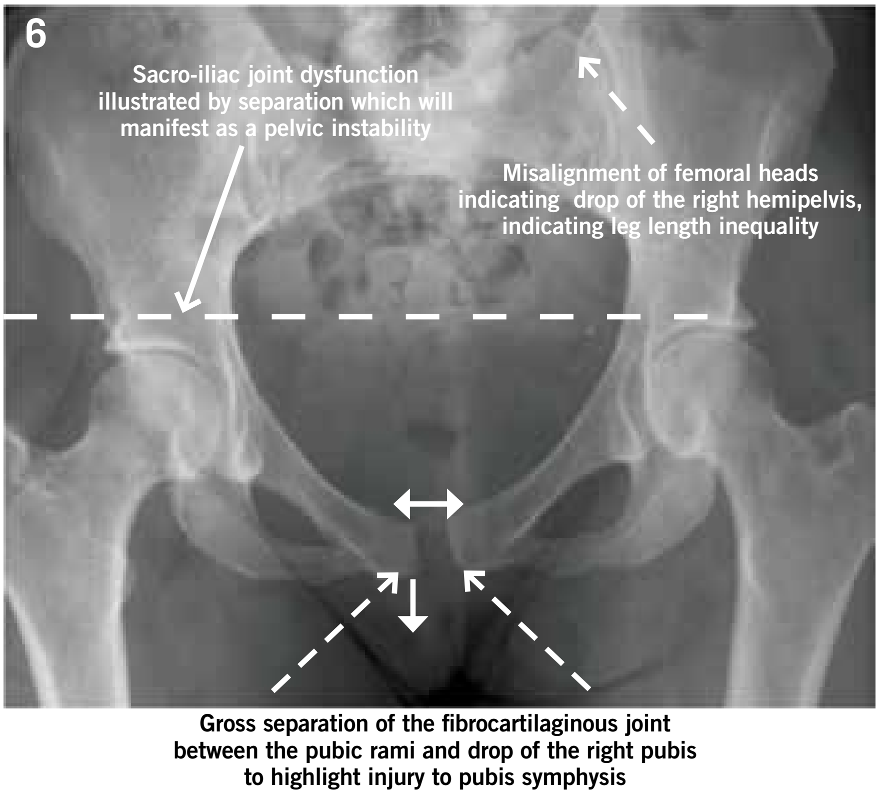
As a consequence of restricted hip joint range of motion, imbalances of the adductors and abductor muscle groups occur. Differences in muscular strength between the adductor and abductor muscle groups results in a lack of mechanical advantage for the groin as a whole. The primary function of the adductor muscle group is adduction of the thigh (open chain motions) and stabilisation of the lower extremity and pelvis in closed chain motion. Reviews of hip muscular weakness in athletes suggest that adductor muscle strength is linked to the incidence of groin strains. A study conducted in ice hockey players found a relationship between low hip adduction strength and groin strains[11]. In the players who sustained a groin strain, pre-season adduction/abduction strength ratio was lower on the side that subsequently sustained a groin strain (compared with the uninjured side). Furthermore, hip adduction/abduction strength ratios were significantly different between a non-injured and injured group of professional athletes in the National Hockey League. These results were reproduced in a 2012 study of 86 elite underage Australian footballers which indicated that athletes with groin injury exhibited hip adductor muscle strength deficiency both before and during the onset of groin injury. The mean hip adductor muscle strength of these players was decreased significantly from baseline[12].

THE ROLE OF PODIATRY IN THE MANAGEMENT OF THE ATHLETIC GROIN PAIN

The role of podiatry in the management and prevention of groin injury necessitates a comprehensive understanding of the role of lower extremity biomechanics in groin pathology. For enhanced patient outcomes, co-operation between the physician, surgeon, physiotherapist and podiatrist provides a comprehensive management plan for the athlete. Stabilisation of the pelvis requires integrity of the adductor muscle group and the pubis symphysis. The effect of alignment of the feet, legs and pelvis is significant to ensuring pelvic stability. Injury to the pelvic and lower limb muscles, tendons and joints will disrupt normal hip mechanics and lead to an increased risk of adjacent injury. Podiatric screening of the pelvis by assessing lower extremity biomechanics and foot posture will contribute to injury prevention and assist in rehabilitation of groin injuries. The assessment of the lower extremity includes:

1. Clinical observation, gait analysis and review of plain film radiology.

A comprehensive patient evaluation provides the clinician with an understanding of the biomechanics which contribute to groin pain. Examination requires both weight-bearing postural



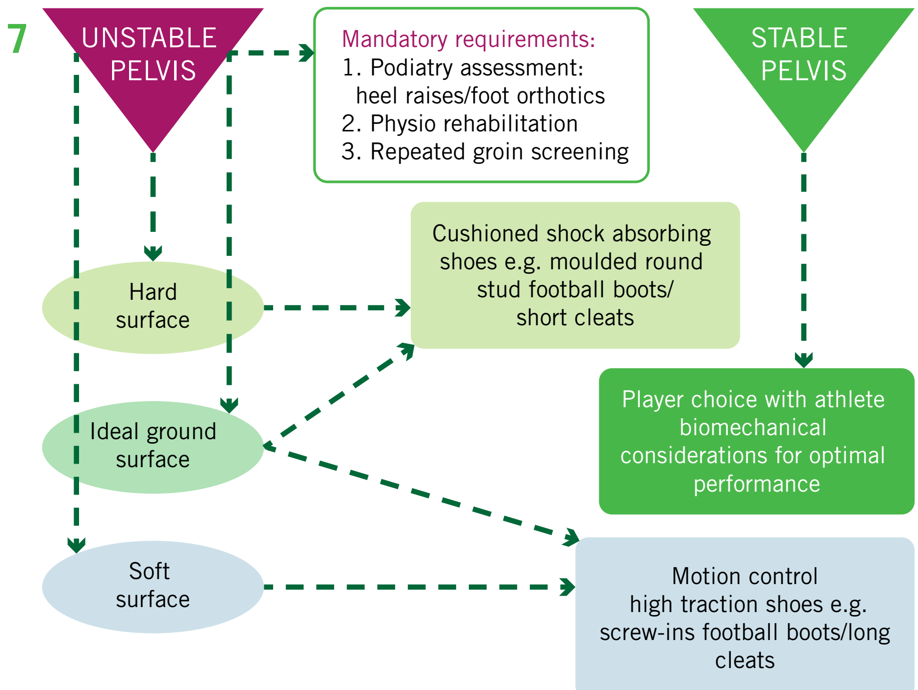


Figure 6: Anteroposterior X-ray of pelvis with left leg raised ('flamingo' view) indicating macro-instability (widening) of the symphysis pubis and slight superior migration of left pubic bone when compared with right.

Figure 7: Relationship between pelvic alignment/ground surfaces and footwear selection.

and non-weight-bearing examination. Static stance evaluation will enable an overall evaluation of posture, identify foot imbalances and assess pelvic asymmetry. Gait observations, both shod and barefoot, enable the clinician to better appreciate the effect of groin injury on locomotion and whether the lower extremity biomechanics can be addressed by footwear and orthotic interventions.

Measurements of leg-length discrepancy are obtained prone or lying down in non-weight-bearing positions. While providing a generic overview of possible leg length inequality, it is an unreliable measure as muscle imbalance will affect the results. During weight-bearing standing evaluation, if there is a pelvic tilt due to a possible leg length difference then weight-bearing X-ray is the investigation of choice. It is important to distinguish true leg length discrepancy from apparent leg length discrepancy. In such a situation, CT leg length scans will provide an accurate diagnosis between anatomical and functional leg length difference. For assessment of the pelvis, sacroiliac dysfunction and bone pathology weight-bearing anteroposterior X-rays of the pelvis and 'flamingo' stress radiographs are used. Flamingo views are valuable as they quantify pubic instability, specifically the amount of symphyseal displacement. Measures greater than 2 mm are termed macro-instability (Figure 6).

2. Heel lifts and foot orthotics

Heel raises, foot lifts and shoe modifications balance a biomechanically inferior pelvis or level a tilted hemipelvis due to an anatomical or functional short leg, reduce the shortening associated with a leg length difference and improve gait efficiency. Heel lift utilisation, however, will only address one aspect of lower limb instability. Foot orthotics are often required to optimise foot-ankle biomechanics (hyper-pronation, pesplanus, ankle equinus), assist with compensatory motions of tibial bowing and genu valgum (knock knees) and neutralise the effects of malicious misalignment syndrome. For the clinician managing groin injury generally, a combination of heel raise and foot orthotics is used in combination.

3. Footwear

The use of prescription footwear is also an important component of the podiatric management of groin pain. Tailored footwear programmes significantly lower injury rates in sport. Evidence from intervention studies in codes of football indicate a direct correlation between improved individual comfort, reduced injury and improved performance. Figure 7 offers clinical guidelines to footwear and ground surface management for the stable and unstable pelvis.

Figure 8: Example of cleated football boots for soft/unstable surfaces.

When an unstable pelvis is diagnosed in the athlete, the type of footwear selected will differ depending on the ground surface. When the surface is soft and unstable, such as those encountered with natural turf in winter climates, the aim is to provide a stable lower extremity to ensure musculoskeletal homeostasis. This is achieved by increasing the coefficient of friction and thus traction between the athlete and the ground surface. Thus for football, suitable footwear styles include football boots with screw-in studs and long cleats.

When ground surfaces are firm, the aim of managing and rehabilitating pelvic instability is to attenuate load to the lower extremity and thus dampen the forces of running and multi-directional movements. Suitable footwear therefore includes cushioned running shoes and, in football, moulded, turf-style shoes.

CONCLUSION

Chronic groin pain is a common problem in athletes. The multifactorial nature and the various anatomical structures that contribute to groin pain have made the condition difficult to prevent and manage. Early detection and intervention are the keys to optimal management and prevention of chronic injury. The current lack of reliable clinical indicators (i.e. clinical and functional screening tests) to assess the likelihood of developing chronic groin pain makes it difficult to establish effective prophylactic guidelines, but an astute clinician awareness of the potential risk factors will improve athlete management. This review provides the clinician with an understanding of the entity, focuses on the biomechanical risks associated with groin pain from a lower extremity perspective and introduces the role of podiatry as an effective adjunct to the multi-disciplinary groin management team.

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