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Assessment and Management of Long-standing Groin Pain in Athletes.

A Review of the Literature

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Introduction

Groin pain can be a very debilitating and long-standing condition for the athlete (Fricker 2002 and Lynch and Renstrom 1999). In soccer, football and ice hockey, groin pain has been reported to be a common complaint (Anderson et al 2001 and Smodlaka 1980). Even though the condition tends to vary in intensity it seems to be painful and disruptive during crucial sporting movement patterns involving running, twisting, side-to-side movement and kicking (Bradshaw et al 1997; Polglase et al 1991 and Renstrom 1992).

To date most epidemiological data on groin pain in different sporting populations has only described the incidence of groin injuries (Ekstrand and Gillquist 1983; Ekstrand and Hilding 1999; Gibbs 1993; Lorentzon et al 1988; Molsa et al 1997; Nielsen and Yde 1989 and Schmidt-Olsen et al 1991). However these studies have not provided any information on the morbidity of groin injuries, which is an important aspect since the significance of groin injuries lies in their high morbidity. Moreover the terms “groin injury” and “groin strain” used in these studies, does not differentiate between acute or more long-standing conditions but merely reflects the anatomical location of the injuries.

Statistical reports from the Australian Football League (AFL) 2002-season indicate that while groin-injuries may not show a particular high incidence, the prevalence which has been defined as “missed games per club per season” has shown to be one of the highest in this sport only to be exceeded by anterior cruciate ligament-injuries (Orchard and Seward 2003). Another significant feature of this injury, in the AFL, has been the high risk of recurrence (Orchard and Seward 2003 and Seward et al 1993). These findings support the historical reports that groin injuries can be a long-standing and debilitating complication to the athlete, causing frustration among athletes, as well as clinicians (Fricker 1997; Gilmore 1998 and Renstrom 1992). The nature of this condition also means that it becomes costly to treat.

A major difficulty in reviewing the literature on assessment and management of long-standing groin pain is that many different terms have been used to categorize this condition. However athletic pubalgia, chronic, unclear, unexplained, over-use, and long-standing groin pain are all terms essentially aiming to describe the same condition. Most likely due to a lack of consensus in the literature no definition of this condition have been identified. The term “long-standing groin pain” is chosen for this review, simply because it implies the long-standing nature of this condition without favoring any specific diagnosis.

For the purpose of this article long-standing groin pain in athletes refers to: Groin pain in athletes, non-specific in origin, with a duration of at

least one month. Non-specific in origin refers to the absence of objective diagnostic findings of pathologies, such as fractures, hip-pathology, lumbar pathology, systemic diseases and tumors. This is consistent with the time frame and criteria presented in the majority of the literature (Akermark and Johansson 1992; Ekberg et al 1996; Fricker et al 1991; Hackney et al; Holmich et al 1999; Kalebo et al 1992; Lovell et al 1995 and Polglase et al 1991).

As with most areas within sports medicine, the understanding of long-standing groin pain is based more on empirical observations than hard scientific evidence (Fricker 2002; Thompson 1996). The aim of this review is to highlight the best available evidence on assessment and management of long-standing groin pain in athletes, in order to guide clinicians in their clinical reasoning and determine directions for further research. The review will (a) include a critically evaluation of some of the most commonly identified theories on the diagnosis and pathology (b) summarize the literature on clinical presentation and evaluate current examination procedures, including clinical tests and diagnostic imaging and (c) critically evaluate current management including surgery, rehabilitation and pharmacological intervention.

Methods

A database search was performed up to August 2003, using Cochrane Library, Medline, CINAHL and Current Contents. The search was limited to the English language and the terms used and combined were “groin pain”, “groin injury”, “osteitis pubis”, “conjoined tendon”, “hernia”, “athletes”, “exercise”, “soccer”, “football”, “epidemiology”, “imaging”, “treatment” and “management”. Bibliographies of relevant papers were searched and all papers relevant to the area were included. Only one Randomized Controlled Trial was found, so this was not found to be a meaningful inclusion criterion. This is likely to explain why no systematic reviews or meta-analysis on the assessment and management of long-standing groin pain in athletes were identified in the literature.

Diagnosis and pathology

The patho-physiology of long-standing groin pain in athletes has historically been a very controversial issue in Sports Medicine. This section will critically evaluate some of the more commonly identified theories on the diagnosis and pathology, including osteitis pubis, pubic instability, sports hernia, tendinopathy, nerve entrapment and multiple pathologies.

Osteitis Pubis

Osteitis pubis has been described in the literature as a self-limiting disease of the symphysis pubis, ranging from many months to years (Fricker et al 1991 and Lynch and Renstrom 1999). It involves either the unilateral or the bilateral joint margin of the symphysis pubis, which are marked by erosions, eventually followed by a process of healing. The diagnosis is usually confirmed by a bone scan that illustrates increased uptake in the region of the symphysis or by radiographic changes such as widening of the symphysis cleft and erosive changes (Anderson et al 2001; Batt et al 1995; Fricker et al 2002; Johnson 2003 and Lynch and Renstrom 1999).

Whether these findings are the primary source of long-standing groin pain in athletes is unknown. Very few studies have actually investigated the association between clinical evaluation, physical findings, diagnostic imaging and symptoms of long-standing groin pain in athletes. Fricker et al (1991) reported poor correlation of radiographic findings/bone scan uptake in athletes with clinical symptoms. Some symptomatic athletes showed no changes on x-rays or bone scan. Neither were the radiographic changes or uptake on bone scan correlated to the duration and intensity of symptoms in these athletes.

Besjakov et al (2003) found that male athletes with long-standing groin pain had radiographic findings of abnormal bone changes in the symphysis pubis significantly more frequently and more severely than their age matched references. However the level of physical activity level in the reference groups could not be estimated, which might be an important factor, since plain x-ray changes around the symphysis pubis have been suggested to be correlated to the amount of physical activity undertaken by the athlete (Harris and Murray 1974). Besjakov et al (2003) found that in asymptomatic individuals bone changes increased in frequency with age in both sexes, suggesting that changes/abnor-

malities are more an indication of wear and tear than actual symptomatic long-standing groin pain.

A case study by Ekberg et al (1996) found changes in the signal intensity on MRI, in the superior ramus of the pubic bone in athletes with long-standing groin pain. The changes in signal intensity were found to be located more laterally in the superior ramus, suggesting a different location of this injury than indicated by radiographic findings and bone scan uptakes.

A prospective study by Verrall et al (2001) confirmed these findings and found that athletes (predominately male Australian Rules footballers) with groin pain and tenderness of the symphysis and/or superior pubic ramus showed a significantly high association of increased signal intensity ($p<0.01$) on MRI due to Pubic Bone Marrow Oedema (PBMO). Verral et al (2001) hypothesized that the findings of PBMO in this study may represent an acute stress response to the bone. The athletes in this study were considered symptomatic when they had groin pain occurring within a recent six-week period of intensive pre-season training. However the study did not state the duration of groin symptoms in these athletes.

Whether the finding of PBMO is significant in athletes with longer duration of symptoms remains uncertain. The majority of literature on long-standing groin pain describes athletes with a duration of symptoms of at least 1 month, and a mean duration of symptoms ranging between 3-12 months (Ekberg et al 1988; Hackney 1993; Holmich et al 1999; Lovell 1995; Malycha and Lovell 1992; Polglase et al 1991 and Smedberg et al 1985). Whether these athletes with "recent" groin pain can be considered representative of athletes with long-standing groin pain is questionable.

Interestingly, in the study by Verral et al (2001), 72 % of the subjects showed evidence of PBMO. Even though an association between athletes with groin pain and tenderness of the symphysis and/or superior pubic ramus and increased signal intensity on MRI existed, you could argue that the high incidence of PBMO in these athletes might not be indicative of symptomatic groin pain, but merely reflects a bone reaction due to the increase in their loading demands (6-weeks intensive pre-season training). Another interesting finding in this study was an association of more degenerative features on MRI ($p<0.01$), such as the presence of a bone cyst, pubic symphyseal fluid, pubic beaking and pubic symphysis joint irregularity, in athletes with a past history of groin pain (Verral et al 2001).

Further controlled imaging-studies comparing symptomatic and asymptomatic athletes with longstanding groin pain are needed to substantiate whether pubic bone marrow oedema and/or degenerative changes are significant and associated findings in athletes with long-standing groin pain.

Pubic Instability

Instability of the symphysis pubis has been suggested to be a feature of osteitis pubis (Anderson 2001; Fricker 1997; Johnson 2003 and Lynch and Renstrom 1999). Walheim et al (1984) reported that symphyseal translations less than 2 mm should be considered normal. However, no research has demonstrated that translation of more than 2 mm correlates with long-standing groin pain. Fricker (1997) stated that symphysis translations of more than 2 mm "..is not inevitable a sequel of osteitis pubis and may be asymptomatic" (p. 97).

Sports Hernia

Sports hernia, inguinal hernia, inguinal posterior wall deficiency, lower abdominal abnormalities, abdominal wall muscle tears and conjoined tendon tears are all diagnoses mentioned in the literature, essentially describing very similar conditions (Gilmore 1998; Hackney et al 1993; Kemp and Batt 1998; Le Blanc and Le Blanc 2003; Meyers et al 2000; Simonet et al 1995; Smedberg et al 1985 and Taylor et al 1991). These conditions are thought to be the cause of long-standing groin pain due to weakness/tear of the posterior inguinal wall.

The theoretical rationale behind the exact structures and pathology causing the pain are however still open for debate. One theory suggests an abnormality/tear of the abdominal wall or the conjoined tendon is the painful structure (Gilmore 1998; Meyers et al 2000; Simonet et al

1995 and Taylor et al 1991), while another suggests an actual hernia as the possible source of pain (Hackney 1993; Kemp and Batt 1998 and Smedberg et al 1985).

Most of the presenting "evidence" for these pathologies is based on case-series with a reported positive surgical outcome as the justification for the involvement of a specific structure (Gilmore 1998; Hackney et al 1993; Le Blanc and Le Blanc 2003; Meyers et al 2000; Simonet et al 1995; Smedberg et al 1985 and Taylor et al 1991). The identified literature on surgery on long-standing groin pain reports, in general, a very high rate of success and positive surgical outcome, in athletes with long-standing groin pain (Akermark et al 1992; Azurin et al 1997; Brannigan et al 2000; Hackney 1993; Malycha and Lovell 1992; Martens et al 1987; Meyers et al 2000; Polglase et al 1991; Simonet 1995; Srinivasan and Schruricht 2002; Taylor et al 1991 and Urquhart et al 1996). The reported surgical success rate seems to be unaffected by the type of surgical procedure and the structure which has been operated upon, which almost suggest any procedure will be beneficial.

These reports must be considered very low level of evidence. The positive results of surgery could be due to expectations, actual complete rest or a general pain inhibiting response due to the invasive nature of surgery. In order to improve our understanding of the pathology behind long-standing groin pain, in athletes, randomized prospective designs, blinded procedures and control groups must be introduced instead. The limitations of these studies and their designs will be discussed further in the section under "management".

Few studies investigating the herniographic findings in athletes have suggested that hernia might be the cause of long-standing groin pain (Kesek et al 2002 and Smedberg et al 1985). In the study by Smedberg et al (1985), hernias were at herniography found in 84.2 % of the symptomatic groin sides and in 49.1 % of the asymptomatic groin sides.

Kesek et al (2002) showed that herniographic findings were present in 25 % of athletes with unclear groin pain. However, the absence of a control group makes it impossible to determine whether hernias were specifically related or associated to symptomatic athletes.

Whether hernia is a cause of long-standing groin pain remains unclear. Even though these studies indicate that hernia is a common clinical feature in athletes with long-standing groin pain there is no strong evidence of the actual hernia being the source of symptoms in athletes with long standing groin pain. Fredberg and Kissmeyer-Nielsen (1996) concluded in a literature review on the results of 308 operations for unexplained long-standing groin pain, that the present literature did not provide strong evidence that "sportsmans hernia" constitutes a possible explanation for long-standing groin pain.

In a retrospective study by Orchard et al (1998) a significant correlation between bilateral inguinal canal posterior wall deficiency and recent groin pain was found in Australian Rules footballers using ultrasound imaging. Orchard et al (1998) defined recent groin pain (symptomatic) as "…pain (in either lower or upper thigh region) over the previous 8 months which had caused him to miss matches or had affected his match or training performance for a duration of longer than one month"(p.134-135). Whether these findings can be extrapolated to athletes with long-standing groin pain remains uncertain, since the subjects were not necessarily symptomatic at the time of the examination. This study also reported a high number of asymptomatic groins showing inguinal canal deficiency, again suggesting that even though it seems to be a common clinical feature it may not always predict groin pain.

Tendinopathy

Renstrom and Peterson (1980) and Renstrom (1992) stated that the most common injuries to the groin area in sports were tendon injuries to the adductor longus, rectus femoris, rectus abdominis and iliopsoas. However this was a general statement on groin-injuries, on the basis of their findings, and they did not specify whether this injury was an equally dominating feature in both acute and long-standing groin pain in athletes. Holmich (1997) also made a general statement that the most common site for groin pain is the adductor muscles and particularly in the in-

sertion area of the pubic bone. However no evidence has been identified to support this. These authors seem to agree that adductor muscle pain can cause long-standing problems in athletes.

Kalebo et al (1992) used ultrasonography in localizing and differentiating between muscle lesions in 36 athletes with long-standing groin pain. 33 patients had unilateral pain. In 28 patients, abnormalities such as focal sonolucent areas and discontinuity of tendon fibers, indicative of non-healed partial ruptures were found. These abnormalities were located in the tendomuscular junction, within the tendon or at the attachment of rectus abdominis, rectus femoris, hamstring gluteals and the adductor group. The authors reported that these findings differed clearly from the asymptomatic side without giving any correlation coefficients on the association between symptoms and ultrasonographic findings.

These findings should be considered carefully due to the lack of correlation coefficients and the small sample size. Furthermore, it seems the examiners were not blinded to the clinical examination of the subjects or their symptoms. This has certainly not been clarified in an appropriate manner and introduces a large bias when the examiner has to decide whether an ultrasonographic finding is significant.

This study did not find any cases of swollen tendons, suggesting a tendinitis, instead a focal, localized lesion indicating a failed healing response was present. These findings seem to point in the same direction as more recent studies suggesting that the pathologic state of painful tendons are more a degenerative condition and a failed healing response, than an inflammatory tendinitis (Astrom and Rausing 1995; Khan et al 1999 and Mafulli et al 1998).

Whether tendinopathy is an appropriate diagnosis in athletes with long-standing groin pain remains unclear and further studies are needed to clarify this.

Nerve entrapment

Nerve-entrapment as a cause of long-standing groin pain has been suggested in some of the literature (Akita et al 1999 and Bradshaw et al 1997).

Bradshaw et al (1997) reported 32 cases of athletes with obturator neuropathy. The condition is, thought to be, caused by a fascial entrapment of the obturator nerve where it enters the thigh. The most significant finding in these patients was that denervation of the obturator nerve, detected by needle EMG, was present in all the patients in this study. The justification for this feature being a possible source of groin pain is based on the positive surgical outcome of a fascial release in these patients and their EMG recordings returning to normal.

The lack of matched controls makes it impossible to come to any general conclusions.

Multiple pathologies

Several studies have suggested that groin pain in athletes presents with complex and multiple pathologies (Albers et al 2001; Ekberg et al 1988 and Lovell 1995).

Ekberg et al (1988) claimed that the diagnosis and treatment in patients with a groin injury often reflects the specialty of the doctor, and therefore other causes of long-standing groin pain may be overlooked. Ekberg et al (1988) prospectively evaluated 21 athletes with long-standing groin pain, using a multidisciplinary protocol, in order to try and give an unbiased illustration of the clinical presentation in these athletes. Only two patients fulfilled the diagnostic criteria of one diagnosis, all the other patients had two or more positive clinical findings. This led the authors to conclude that long-standing groin pain is a complex condition with several positive findings to explain the symptoms.

While this study certainly indicates the presence of a complex pathology, in athletes with long-standing groin, it also highlights the difficulties of diagnosing these patients without any reliable or validated diagnostic tools present in the literature. Even though the study seems less prone to be biased towards one specific diagnose, it does not provide any confidence that each discipline is not still biased towards a clinical feature within their own specialty, especially considering the fact that all of the examiners did their clinical examination without being “blinded” to the history of the patients.

Whether the actual pathology of long-standing groin pain is as complex as this study seems to suggest remains unclear. It is certainly open to suggest that a multidisciplinary approach can provide more subjective opinions, possibly creating more confusion than consensus.

In a study by Lovell (1995) 189 cases of athletes with long-standing groin pain were reviewed retrospectively. The patients were initially seen by the author, and the review was based on the case-notes. The author found incipient inguinal hernia in 50 % of cases to be the predominant primary diagnosis. Adductor lesions were the primary diagnosis in 19 % of cases, osteitis pubis 14%, pubic instability 8 %, iliopsoas injury 5 %, ilioinguinal neuralgia 5 % and the rest were other differential diagnosis.

Again the authors did not provide any reports on reliability or validity of the differential diagnostic test used, which makes it difficult to fully accept these results. Comparison with other studies is also problematic since there is very little consensus on the diagnostic criteria used. Reviewing patients in retrospect creates a large bias, due to possible changes/mistakes in examination procedures as a result of a lack of standardized and prospective procedures.

Implications

As mentioned earlier the patho-physiology of long-standing groin pain has been a controversial issue in Sports Medicine because of the many different theories on the pathology/pathologies behind longstanding groin pain. The current literature seems to provide very little clarification. Many theories have been developed and it seems that different countries, regions and clinicians all have their own theoretical approach to the problem.

However the literature does seem to provide us with an insight to an area that has been totally dominated by surgical case-series and retrospective studies. The general lack of reliable and validated diagnostic criteria, blinded procedures, control groups and large numbers makes it difficult to conclude whether all these clinical findings and diagnoses are the results of a primary pathology causing pain, or just present a normal variation within athletes who are exposed to a greater load due to their activities.

Another problem is the large variety in the athletes' duration of symptoms in these studies. Athletes with similar presentations of unclear groin pain might present at a different pathological state at the initial onset of their symptoms compared to those with long-standing symptoms. A possible reason for the very complex clinical picture might be that some studies are looking at athletes in different stages of their healing process.

So far the understanding of the pathology causing long-standing groin pain remains unclear, with only theories to suggest the source of symptoms. Further studies are needed to develop a better understanding of the pathology behind the possible causes of longstanding groin pain. Comparison of pathologic findings in symptomatic and asymptomatic athletes with a similar activity level should be investigated. At this point in time the most interesting finding has been the presence of pubic bone marrow oedema in symptomatic athletes with recent groin pain. It would be interesting to see to what extent this feature is present in athletes with long-standing groin pain.

Another important aspect of trying to understand the pathology behind long-standing groin pain might be to describe this condition in different subgroups, divided on the basis of what activity the injury has occurred in. One could suggest that some of the debate about the pathology could be that the existing literature have looked at athletes with similar overuse symptoms from the groin, but with different structural injuries, due to a different sport and mechanism of injury. Even though ice hockey and soccer/football are suggested to have the highest incidence of groin injuries (Andersson 2001; Smodlaka 1980 and Nicholas and Tyler 2003), the movement pattern in these sports certainly vary to a degree that a difference in mechanism of injury and structural damage should be considered as a possibility.

Clinical presentation

Presenting history

Most of the presenting history that has been considered characteristic for athletes with long-standing groin pain is based on empirical reports.

The athletes usually complain of unilateral, and sometimes bilateral, adductor pain, with tenderness at the adductor insertion and the symphysis pubis (Fricker 1991; Holmich 1997; Lynch and Renstrom 1999 and Renstrom and Peterson 1980).

The symptoms seem to have an insidious onset and can often be very diffuse and difficult to locate. Coughing and sneezing quite often seem to aggravate the pain (Albers et al 2001; Hackney 1993; Holmich 1997 and Lynch and Renstrom 1999).

Some authors have reported that athletes with long-standing groin pain can recall an acute incident or onset like a sudden strain (Hackney 1993; Meyers et al 2002; Meyers et al 2000; Simonet et al 1995 and Urquhart et al 1996), however most authors report that the athletes usually present with a history of a more insidious and gradual onset (Akermark and Johansen 1992; Brannigan et al 2000; Fricker 1997; Holmich 1997; Lynch and Renstrom 1999; Martens et al 1987; Malycha and Lovell 1992; Polglase et al 1991 and Renstrom and Petersson 1980).

The different reports on insidious versus more sudden onset in athletes with long-standing groin pain is interesting, because it suggests different mechanisms of injury, where the gradual insidious onset might represent an overuse behavior, and the sudden onset seems more acute and specific in nature. The reports might reflect different injuries both resulting in a long-standing condition, however this needs further investigation.

Pain and stiffness in the groin is reported to be frequently experienced in the morning and at the beginning of athletic activity. However this often gets better with warm up and activity, only then to reappear after activity. Running in a straight line is not always a problem but an increase in speed, change of direction or kicking is usually painful and problematic (Fricker 2002; Holmich 1997; LeBlanc and Leblanc 2003 and Renstrom and Peterson 1980).

Clinical Examination

Palpation

Palpation of the anatomical structures suspected to be causing long-standing groin pain in athletes has been used as a diagnostic tool and criteria in several studies (Ekberg 1988; Kalebo et al 1992; Lovell 1995 and Renstrom and Petersson 1980). However, the evidence to support the reliability or validity of this procedure is lacking.

Verral et al (2001) found an association between symptomatic athletes with tenderness on the pubic symphysis and MRI findings of PBMO in athletes with recent groin pain (within 6 weeks). Whether stress injury and pubic bone marrow oedema is present in athletes with long-standing groin pain and can be detected by palpation remains unclear and is yet to be investigated.

Squeeze test

The squeeze test, an isometric contraction of the adductors, has been used as a diagnostic test and is frequently mentioned in the literature (Ekberg 1988;Lovell 1995 and Renstrom and Petersson 1980). However, no reports on reliability and validity of this test have been identified in the literature.

Pubic symphysis stress test (Modified Thomas test)

It is proposed that the position of the lower limbs during the Modified Thomas test produces biomechanical stress that exceeds the pain threshold of the injured tissue causing groin pain (Hogan 1998). This test was renamed the Pubic symphysis stress test because it emphasizes the pain provocation component (Hogan 1998).

The reliability of this test has been reported to be very high and the test has been reported to be a significant indicator when people with groin pain were able to run pain-free again (Hogan and Lovell 2002). However, the results from these reports have only been published as abstracts and in formats that do not provide enough information to evaluate the potential of this test. Published research is needed to enable us to critically evaluate this test.

Diagnostic entities

Holmich et al (1998) developed an examination procedure for athletes with long-standing groin pain based on diagnostic entities, avoiding the term diagnosis since evidence based data needed to define the precise diagnose was not

available (Holmich 2000 and Holmich et al 1999). The procedure involved tests for pain, strength and flexibility of the adductor muscles, iliopsoas, rectus abdominis and pain at palpation of the symphysis joint.

Holmich et al (1998) reported that all the described tests were reproducible and only subject to limited intra and inter-observer variation. Unfortunately these results have only been published in an abstract, and therefore there is not sufficient information for the results to be evaluated.

Diagnostic imaging

Diagnostic imaging has played a major role in the diagnosis of long-standing groin pain in athletes during the years. X-rays, bone scan, MRI, ultrasonography and herniography have all been used and recommended in the literature (Fricker et al 2002; Ekberg et al 1997; Karlsson et al 1997 and Lynch and Renstrom 1999). In athletes with long-standing groin pain the use of any of these diagnostic tools cannot be considered valid in the diagnosis of long-standing groin pain, since no evidence for the actual pathology have been established yet. The role for diagnostic imaging at this stage should more be considered as an important tool in the differential diagnose ruling out other more specific conditions such as fractures, hip-pathology, lumbar pathology and tumors, which can have a similar presentation to long-standing groin pain (Lynch and Renstrom 1999).

Clinical implications

In sports medicine today no clinical test exists, that has shown to be reliable or valid in detecting long-standing groin pain in athletes. There might be several reasons for this but, first of all, our actual lack of knowledge of the exact pathology behind this injury explains the problems of creating a test, which can reproduce the symptoms or determine the involved structures. Another problem of trying to implement one specific test might be the complex nature and multiple pathologies presenting with this injury (Albers et al 2001; Ekberg et al 1988 and Lovell 1995).

Instead of concentrating excessively on trying to provide a specific clinical test, it might be better to examine the commonalities of this condition. Long-standing groin pain in athletes seems to be characterized by over-use, insidious onset and its tendency to interfere and decrease athletic function, however often does not prevent athletic performance (Fricker 2002; Holmich 1997; LeBlanc and Leblanc 2003 and Renstrom and Peterson 1980). It therefore seems logical that we as clinicians should try and address this level of impairment and the effect it has on the athlete's functional capacity.

Other studies have been successful in rating the severity of symptoms in other longstanding "overuse" conditions such as patellar and achilles-tendinopathy (Visentini et al 1998 and Robinson et al 2001). The outcome measures developed from these studies, named the VISA-score (Visentini et al 1998) and the VISA-A questionnaire (Robinson et al (2001), are questionnaires that request the patient to rate specific and relevant functional items on pain, function and activity on VAS-scales and categorical rating scales. This creates a total score, indicative of the severity of the condition. The VISA-score and the VISA-A questionnaire have shown good inter and intra-reliability and have displayed content validity (Visentini et al 1998 and Robinson et al 2001).

These tests are not designed to be diagnostic, however, a similar approach should be considered in trying to create a reliable and valid assessment tool capable of rating the severity of long-standing groin. This sort of assessment tool would be extremely valuable in further research as well as in clinical practice. So far this approach has not been identified in the literature with regards to athletes with long-standing groin pain.

Management of long-standing groin pain in athletes

Surgical treatment

Surgery has been recommended in the treatment of long-standing groin pain in athletes (Akermark and Johansson 1992; Joesting; 2002 Meyers et al 2002 and Fon and Spence 2000).

However no randomized controlled studies on surgical procedures in long-standing groin pain have been identified in the literature. Most studies on surgical treatment seem to be case series

and retrospective in nature (Urquhart et al 1996 and Taylor et al 1991) but this has not been made clear (Akermark and Johansson 1992; Azurin et al 1997; Brannigan et al 2000; Hackney 1993; Malycha and Lovell 1992; Martens et al 1987; Polglase et al 1991; Simonet 1995 and Srinivasan and Schruricht 2002).

All studies on surgical treatment identified in the literature claimed a high success rate of their intervention ranging from 60 –100 % of subjects returning to athletic activity. It has to be mentioned that these results have been reported despite great variability of the surgical procedures performed in these studies (Akermark and Johansson 1992; Azurin et al 1997; Brannigan et al 2000; Hackney 1993; Malycha and Lovell 1992; Martens et al 1987; Meyers et al 2000; Polglase et al 1991; Simonet 1995; Srinivasan and Schruricht 2002; Taylor et al 1991 and Urquhart et al 1996). The main limitations in these studies are the lack of a randomized controlled design and the retrospective nature of the analysis. Due to the lack of control groups none of the results can be confidently related to the intervention. Furthermore no reports on reliable and validated outcome-measures have been identified in the surgical literature.

Still, authors have suggested the justification for surgical intervention, based on the remarkable success of surgery in these athletes (Fon and Spence 2000 and Joesting 2002). Nonetheless you could certainly question the validity of this reported success rate purely on the basis that "return to sports activity", which is commonly used (Akermark and Johansson 1992; Azurin et al 1997; Brannigan et al 2000; Hackney 1993; Malycha and Lovell 1992; Martens et al 1987; Polglase et al 1991; Simonet et al 1995; Srinivasan and Schruricht 2002 and Taylor et al 1991) is not an indicator of the functional capacity and the level of impairment in these athletes.

It should be kept in mind that most of the empirical reports on the history of long-standing groin pain emphasizes the overuse-nature and the insidious onset which seems to interfere with the athletes standard of performance, but does not always prevent them from performing (Akermark and Johansen 1992; Brannigan et al 2000; Fricker 2002; Holmich 1997; LeBlanc and Leblanc 2003; Lynch and Renstrom 1999; Malycha and Lovell 1992; Martens et al 1987; Polglase et al 1991 and Renstrom and Petersson 1980).

You could argue that for these athletes, it is not the actual return to the athletic activity that will decide whether the intervention was successful or not, but more so their ability to perform at a pre-injury level without pain or problems.

This again specifies the need for outcome measures that are sensitive and specific to athletes with long-standing groin pain.

Rehabilitation

The importance of rehabilitation of athletes with groin pain has been emphasized in the literature (Dahan 1997; Holmich 2000 and Nicholas and Tyler 2002), however the only identified randomized controlled study involving athletes with long-standing groin pain is a study by Holmich et al (1999). The subjects in this study were all male and primarily soccer players (80%).

This study compared an active training program supervised by physiotherapists to physiotherapy treatment without active training. The active program consisted of an exercise program aiming to improve strength and coordination of the muscles acting on the pelvis. The physiotherapy treatment consisted of different modalities such as laser, transverse friction, stretching and transcutaneous electrical stimulation, put together according to contemporary practice among physicians and physiotherapists working in the sports medicine field. Whether the physiotherapy treatment is an appropriate intervention is uncertain. Stretching has clinically been considered as a contra-indication in these patients because it seems to aggravate their symptoms. You could argue that the intervention might create a negative effect in the physiotherapy-group.

The outcomes from this study showed a significant difference in favor of the active training program with 79 % of the athletes completing the program rating their results as excellent and returning to sports activity at their previous level without any symptoms of groin pain compared to 12 % in the physiotherapy treatment group.

However, Coleman et al (2000) questioned the sensitivity and specificity of the outcome measure (scale) rating patients as excellent, good, fair and poor, which was first introduced by Kelly et al (1984). As mentioned by Coleman et al (2000) this scale is based on patients' perception of pain and "return to pre-injury level of activity". Furthermore Coleman et al (2000) stated that: ".. the definitions of excellent, good, fair and poor require interpretation by either the patient or the person administering the questionnaire, which can lead to the questionnaire being unreliable" (p. 8).

In the study by Holmich et al (1999) this rating was not based purely on subjective perceptions on return to injury level but also involved clinical testing including palpation of the adductors and the insertion at the pubic bone and adduction against resistance.

To be labeled as excellent, no pain was to be recorded in all three categories: 1) clinical testing; 2) with or after athletic activity in same sport and same level; 3) return to the same sport at the same level. More information on the reliability and validity of this rating system is required. Whether this rating system is sensitive and specific in quantifying outcomes in athletes with long-standing groin pain remains uncertain.

A prospective controlled study by Cowan et al (2003) reported that athletes with chronic groin pain showed delayed timing of the transversus abdominis when compared to asymptomatic athletes. Cowan et al (2003) suggested that this supports the current physiotherapy management of athletes with longstanding groin pain, which is based on a core-stability approach. Other studies have recently shown alterations in recruitment of the local and global stabilizing system in patients with pain in the pelvic region (Hungerford et al 2003 and O' Sullivan 2002).

Hungerford et al (2003) showed that patients with pain in the pelvic region showed delayed timing of gluteus maximus. Even though findings in this population cannot be extrapolated to athletes with long-standing groin pain, the role of gluteus function in athletes with longstanding groin pain is an interesting area that haven't been investigated. In the study by Holmich et al (1999) a large emphasis in the exercise program were made on strengthening of the gluteals. Whether this factor could be a significant contributor to the positive outcome should be considered.

As with the rest of the classical literature on altered timing and recruitment in patients with longstanding/chronic problems (Cowan et al 2002; Jull 2000 and O'Sullivan 1997) the question still remains whether altered timing is the cause or the effect in the development of these conditions.

Furthermore, no randomized controlled trials looking at the effect of a core-stabilizing program for athletes with longstanding groin pain have been conducted. Further research is needed to evaluate the efficacy of this sort of intervention.

Pharmacological intervention

The use of pharmacology in the treatment of athletes with long-standing groin pain have been discussed and recommended in the literature (Andersson et al 2001; Holt et al 1995; Johnson 2003 and Lynch and Renstrom 1999).

The only study identified in the literature looking at this sort of intervention in athletes with long-standing groin pain is a case-series study by Holt et al (1995). The study looked at the result of corticosteroid injections in athletes diagnosed with osteitis pubis. Out of 8 athletes with 16 weeks of symptoms three returned to asymptomatic activity within 3 weeks, three athletes had two injections and became asymptomatic within 11-16 weeks, one athlete had three injections became symptom free after 24 weeks and one athlete remained symptomatic after two injections and an inguinal herniorraphy. The authors suggest that a more rapid return athletics may be achieved through the judicious use of corticosteroid injections.

Considering that osteitis pubis has been reported to be a self-limiting disease with an average time to full recovery of 9.6 months (Fricker 1991) the results of this study are not impressive and small numbers, spontaneous recovery and placebo effects are likely to be confounding the results. This particular study highlights the prob-

lems of the “case-series approach” and the need for randomized controlled trials in this area of sports medicine.

Conclusion

Our understanding of the pathology behind longstanding groin pain remains poor. The reason for this might be the presence of multiple pathologies in these patients, which complicates the clinical picture. A comparison of pathologic findings in symptomatic and asymptomatic athletes in well defined subgroups, and exposed to a similar level and amount of activity has not been identified in the literature and should be conducted.

The literature has not identified any reliable or valid tests for assessing long-standing groin pain. The few reports existing on reliability and validity of different diagnostic tools does not provide sufficient information for these results to be accepted with confidence. The development of reliable and validated assessment tools is critical if we are to improve further research and clinical practice in this area.

Assessment tools and outcome measures that address the functional capacity and level of impairment in athletes with long-standing groin pain have not been identified in the literature. This is an important consideration, since “return to sport” is not a satisfactory and valid measure of these athletes level of impairment.

The best available evidence for managing long-standing groin pain in athletes suggests that an active approach in terms of an exercise program aiming to improve strength and coordination of the muscles acting on the pelvis is highly effective and superior to treatment consisting of laser, transverse friction, stretching and transcutaneous electrical nerve stimulation. However, these results need to be reproduced and compared to other modalities of treatment. Finally other treatment modalities including surgery, core-stability exercises and pharmacological interventions need to be evaluated in randomized controlled trials in order to detect their true effect.

The literature on assessment and management of long-standing groin pain is dominated by empirical reports and individual clinical preferences and assumptions. The lack of consensus is unsatisfactory and frustrating for the athletes suffering from this debilitating condition and underlines the importance of more research in order to guide and improve current assessment and management.

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Abstract

Assessment and Management of Long-standing Groin Pain in Athletes. A Review of the Literature

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Background: Groin pain can be a very debilitating and long-standing condition for the athlete (Fricker 2002; Lynch and Renstrom 1999). Reports from the Australian Football League (AFL) have documented a high prevalence of groin injuries, and a high risk of recurrence (Orchard and Seward 2003). The nature of this condition makes it difficult and costly to treat.

Purpose: To highlight the best available evidence on assessment and management of long-standing groin pain in athletes, in order to guide clinicians in their clinical reasoning and determine directions for further research.

Methods: A database search was performed up to August 2003, using Cochrane Library, Medline, CINAHL and Current Contents. The search was limited to the English language and the terms used and combined were “groin pain”, “groin injury”, “osteitis pubis”, “conjoined tendon”, “hernia”, “athletes”, “exercise”, “soccer”, “football”, “epidemiology”, “imaging”, “treatment” and “management”. Bibliographies of relevant papers were searched and all papers relevant to the area were included.

Results: Clear evidence of the pathology behind longstanding groin pain is lacking. No reliable or valid clinical test exists, in detecting long-standing groin pain in athletes. No randomized controlled trials regarding surgery or pharmacological interventions have been identified in the literature.The only RCT identified in the literature, involving long-standing groin pain in athletes, suggests that an active approach, in terms of an exercise program, is highly effective and superior to more passive modalities (Holmich et al 1999).

Conclusion: The understanding of the pathology behind long-standing groin pain is poor. A comparison of pathologic findings in symptomatic and asymptomatic athletes in well defined subgroups, and exposed to a similar level and amount of activity has not been identified in the literature and should be conducted. Assessment tools and outcome measures that address the functional capacity and level of impairment in athletes with long-standing groin pain are needed and should be considered.

The literature on assessment and management of long-standing groin pain is dominated by empirical reports and individual clinical preferences and assumptions. The lack of consensus is unsatisfactory and underlines the importance of more research in order to improve current assessment and management.

Keywords: long-standing groin pain, athletes, assessment, management, review