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GROIN INJURIES IN SOCCER: INCIDENCE, PREVALENCE AND RISK FACTORS

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ABSTRACT

Groin injury is very common in soccer due to the characteristics of the sport in which athletes require quick acceleration, deceleration and the sudden changing of their body direction during playing the sport. Adductor muscles are considered the most frequently injured structure in the groin region as it plays an important role as a stabiliser for the hip joint. This literature review is aimed to manifest the magnitude of the incidence and prevalence of the groin injuries, the risk factors and differential diagnoses that affect the decision making towards groin related injuries. However, studies in this area have revealed that 12-16% of all injuries per season are related to groin injuries and during the season they show that there are 4.7 injuries per 1,000 playing hours, 12.1 for match injuries and 2.7 for training injuries. Only 5% of the groin injuries are sustained due to improper play. Nevertheless, Understanding the groin area anatomy is extremely important because it helps to discriminate between the two musculoskeletal pathologies and non-musculoskeletal pathologies.
Keywords: *Hip joint, myalgia, adductor muscle, physical fitness.*

1. INTRODUCTION

Injuries in sports are liable to occur at any time. The type of injuries may be different from one sport to another because the athlete is exposed to different types of extrinsic and intrinsic risk factors. Soccer is a popular sport all over the world and it also has abundant types of common injuries. A groin muscle injury is one of the most frequent injuries in the soccer player. The groin muscles often refer to the adductor muscles of the hip, from the inner side of the thigh, which is the pectineus, adductor longus and adductor brevis, which are known as the short adductors, which attach to the pelvis on one side and to the femur on the other side, and adductor magnus and gracilis (long adductors). The adductor muscles play an important role as stabiliser for hip joint (Hölmich et al., 1999). Understanding of the extrinsic, intrinsic risk factors, differential diagnosis and the mechanism of injury may help in decreasing the incidence of groin muscle injuries.

The groin region is commonly injured in sports, often due to sudden accelerations, decelerations, and directional changes, which is common in sports like soccer (Jansen et al., 2010). Iliopsoas and abdominal-related injuries can be associated with groin muscle injury (Hölmich, Thorborg, Dehlendorff, Krogsgaard, & Gluud, 2014). A systemic review study revealed that weakness of core muscles and delayed activation of transversus abdominal muscles can increase the risk of strain injuries in the groin region (Maffey & Emery, 2007). Depending upon the time that the injury took to return the player back to full fitness and to take part in the sport, groin injuries are classified into three categories: minor (1-7 days), moderate (8-28 days), and major (>28 days) (Engebretsen, Myklebust, Holme, Engebretsen, & Bahr, 2010).

2. INCIDENCE AND PREVALENCE

Muscle injury constitutes most sports injuries in soccer. It is responsible for 31% of injuries and 27% of total absences from practice and competitions. Most (92%) of these injuries affect the lower limb muscles. In soccer, hamstrings (37%), adductors (23%), quadriceps (19%), and calf muscles (13%) are the most likely to be injured (Ekstrand, Hägglund, & Waldén, 2011). On average, 60% of muscle injuries were recurrent injuries. In a cohort study of soccer players in the Dutch premier league in the Netherlands, injuries were found to affect 62.7% of the players, and most involved were muscular and tendentious injuries of the lower limb. An average of 6.2 injuries per thousand hours of play were reported, of which 2.8 occurred during training and 32.8 during competition, and the majority (68.5%) of registered injuries were

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acute (Stubbe et al., 2015). In a retrospective, descriptive study of male Brazilian professional soccer players, almost 75% of reported injuries were muscle strains, contusions, and sprains (Maffey & Emery, 2007). In soccer, 60%-85% of injuries in both genders occur in the thigh, knee, or ankle. More than half of the injuries were caused by contact between players; the rest occurred during other activities, such as running, turning, and shooting and heading the ball.

The occurrence of the injuries among soccer players was constituted as: goalkeepers (5.3%); of the center backs (15.8%); wing-/fullbacks (11.6%); defensive midfielders (31.6%); attacking midfielders (7.3%), strikers (28.4%) (Fachina et al., 2013). In addition, a retrospective study was conducted to investigate the incidence of lower-leg fractures of all players associated with the Royal Belgium Football Association. The study revealed that the number of fractures of the total of the injuries was 3%, which was in the lower leg. 37% were ankle fractures that were the most common fractures. The foot and tibia fractures were 33% and 22% respectively, which were the second most common fractures. The proportion of 9% was fibula fractures, which were the least common injuries (Vanlommel et al., 2013). However, the average of the incidence of groin muscle injury among soccer players were 13% of the total number of lower limb injuries (Arnason et al., 2004). Studies show that the proportion of groin muscle injury incidence in soccer players was 68% for the dominant leg of the athlete (Hölmich, et al., 2014). Werner, Hägglund, Waldén, and Ekstrand (2009) conducted a prospective study to investigate the groin and hip injuries and its incidence among European football players for consecutive seasons. It showed that 12-16% of all injuries per season were related to groin area among these players. Furthermore, another study conducted by Engebretsen, et al. (2010) to identify the risk factors of groin injuries reported the incidence of groin injury in soccer players during the season was 4.7 injuries per 1000 playing hours, 12.1 for match injuries and 2.7 for training injuries.

3. DEFINITION

Groin injuries are defined in different ways, and there is no consensus on one definition. Some literatures define the groin injuries by their correlation to assessment symptoms in the groin area. For example: pain in the groin area emerging from the iliopsoas and adductor muscle groups or the lower abdominal musculature, palpation of adductor muscles or lower abdominal muscle pain or tenderness, positive test related to the groin muscles (adductors) such as strength test or length test) groin pain influencing the function or the activity of the player (Machotka, Kumar, & Perraton, 2009). There are other definitions that define groin injury as "Any physical symptom in the groin related to participation in soccer training or match play, incapacitating the player while playing soccer or demanding special medical attention for the player to be able to participate or preventing him from participating in the training or in the match" (Machotka, et al., 2009). This definition was written to match the operational sport injury definition, which is "Any physical complaint (caused by a transfer of energy that exceeds the body's ability to maintain its structural and/or functional integrity) sustained by an athlete during competition or training directly related to the sport or exercise activity investigated, irrespective of the need for medical attention or time-loss from athletic activity" (Verhagen & van Mechelen, 2010). The operational definition of sport injury is widely accepted by the rugby union, the football federation (soccer), the athletics federation (track and field), international cricket, and many other sports (Fuller et al., 2006; Fuller et al., 2007; Orchard et al., 2005; Timpka et al., 2014). However, the groin is not an official anatomic definition of the area; it just describes an area that contains the proximal adductor compartment, the distal aspect of the abdominal wall, the inguinal regions, and pubic symphysis (Crockett et al., 2015).

4. RISK FACTORS

4.1 Extrinsic Risk Factors: Many risk factors can be associated with increasing the incidence of groin injuries in soccer players. For example, boot surface design could contribute to the incidence of non-contact ankle sprain injuries and groin injuries (O'Connor & James, 2013; Quinn, 2010). The type playing surface (artificial turf or natural grass), training or exercise load, inadequate equipment, weather conditions, the level of competition, time of play (day or night), duration of the competition, and maximum and minimum temperatures during the match can increase the risk of injuries (Alentorn-Geli et al., 2009; Inklaar, 1994; Orchard, 2001). However, lack of sport-specific training, inadequate warm up are also risk factor for groin injury (Maffey & Emery, 2007; Whittaker, Small, Maffey, & Emery, 2015; Sedaghati, Alizadeh, Shirzad, & Ardjmand, 2013).

4.2 Intrinsic Risk Factor: Joint stiffness, lax ligaments, tight muscles, functional instability, existing injuries, and inadequate management and rehabilitation of previous injuries all constitute intrinsic risk factors for soccer players (Inklaar, 1994). A systemic review by Ryan, DeBurca, and Mc Creesh (2014)

discussed various risk factors that lead to hip and groin injuries in footballers, and they argued that there are two types of risk factors: modifiable and non-modifiable. According to the study, one of the major non-modifiable risk factors is older age. Collagen tissue becomes less elastic and isn't able to absorb more forces in older age. There may be other age-related changes, and the athlete won't be able to respond quickly forced changes or recover from fatigue. Another non-modifiable risk factor is the small diameter of the femoral bone. A third non-modifiable risk factor is an existing injury. Modifiable risk factors include hip rotation (internal and external) and abductor – adductor strength ratio (Ryan, et al., 2014).

5. ONSET OF GROIN INJURY

Groin injury commonly occurs as a non-contact injury with a gradual or insidious onset. It is an overuse injury, and 5% of groin injuries are sustained as a result of improper play during matches. Injuries of the groin rarely occur during the first half of a 90-minute match. Athletes between the ages of 22 and 30 tend to succumb to groin injuries more frequently during matches than younger athletes (Ekstrand, et al., 2011). The acute onset of groin injury correlates with muscle strain and is often related to the adductor muscles, the iliopsoas muscles and the abdominal muscles (Anderson, Strickland, & Warren, 2001). Additionally, instances of acute groin injury onset are typically distributed equally among players in various positions on the field, for example, midfielders, defenders, strikers and goalkeepers (Paajanen, Ristolainen, Turunen, & Kujala, 2011).

6. PHYSIOLOGY

Understanding the ability of the body to adapt to stressors is very important because ageing brings with it a decrease in an athlete's adaptation capability in terms of responding to quick force changes or recovering from fatigue. This is known as the General Adaptation Syndrome (GAS), and it occurs in different phases. The shock or alarm phase is a first response to the training session and includes fatigue, stiffness or delayed onset of muscle soreness. During the resistance phase, the person adapts to a new, higher state or reverts to pre-exercise homeostasis or physiological exhaustion. Lastly, the maladaptation or exhaustion phase involves excessive stress (Brown & Greenwood, 2005; Gamble, 2006; Turner, 2011). The GAS theory may help to reduce the incidence of groin muscle injury, which occurs in the case of training or exercise loads that constitute an extrinsic risk factor. Injured athletes are susceptible to over twice the normal risk of sustaining a new groin injury. In addition, athletes tend to have a four times higher injury risk when they have weak adductor muscles. Furthermore, muscle fatigue and training overload have an impact on muscle function, which could cause impairment and therefore increase the risk of groin injury (Hölmich, et al., 1999).

7. BIOMECHANICS

It is reported that among the muscles of the groin region, the adductor longus is the major muscle most susceptible to injury in the swing phase during the ball kicking cycle in soccer. The cycle starts with an anterior pelvic tilt, followed by external rotation of the hip of the kicking leg. Peak activity of the adductor longus muscle happens immediately after maximal lengthening of the adductors, which is followed by hip extension in the kicking leg shortly after. The adductor longus then reaches maximal length following flexion of the kicking knee. Lastly, abduction of the hip of the kicking leg happens in the short period before ball contact. Furthermore, maximal adductor longus muscle stretching and maximum hip extension happen at approximately 40% of the swing phase. The adductor longus muscle is activated at around 10% to 50% of the swing phase. There is a high risk of adductor longus muscle injury at between 30% and 45% of the swing phase, at which point the muscle undergoes eccentric contraction to support other muscles so that extension of the hip and initiation of flexion can be controlled (Charnock, Lewis, Garrett Jr, & Queen, 2009).

8. DIFFERENTIAL DIAGNOSIS

There are multiple sources of groin pain or injuries due to the variety of anatomical structures in the area, and this type of pain can emerge from intra- and/or extra-articular pathologies. Thus, a good knowledge and understanding of the anatomy of the groin area is important because it helps to discriminate between different musculoskeletal pathologies. Examples of the types of intra-articular structure injuries associated with groin pain include acetabular labral tears, osteonecrosis of the femoral head, chondrolysis, osteoarthritis, femoral neck fractures, instability, septic arthritis, osteochondritis dissecans, avascular

necrosis of the femoral head, synovitis, and slipped capital femoral epiphysis. The extra-articular structure injuries that are associated with groin pain are muscle strain (of the adductor, rectus femoris, iliopsoas, rectus abdominis and sartorius), sport hernias, lumbar radiculopathy, sacroiliac joint disorders, trochanteric bursitis, apophyseal avulsion fractures, nerve entrapment, dancer's hip, psoas abscess etc. There are also other sources of groin pain that need to be considered during evaluation, which may include non-musculoskeletal medical conditions such as intra-abdominal disorders (appendicitis, inflammatory bowel disease, diverticulosis, aneurysm and intra-abdominal abscess) and disorders of the genitourinary system (urinary tract infection, prostatitis, scrotal and testicular abnormalities, gynaecological abnormalities and nephrolithiasis) (Macintyre, Johson, & Schroeder, 2006; Suarez et al., 2013; Shetty, Shetty, & Shetty, 2015). However, practitioners should be competent and skillful in their evaluation and examination techniques so that an accurate diagnosis of the complaint can be established. Groin injury diagnosis is considered a challenge for practitioners due to difficulties differentiating between the sources of groin-related injuries, and their signs and symptoms (Suarez, et al., 2013). Thus, the procedures and processes involved in examining athletes with groin pain should be systematic and comprehensive. In order to facilitate an investigation of all possible diagnoses, practitioners can follow the 'broad to narrow' questioning approach when investigating injured athletes; possible diagnoses then become more focused as the investigation progresses (Suarez, et al., 2013; Reiman & Thorborg, 2014). The subjective information gathered by practitioners throughout their evaluations should be based on the severity, quality, onset, location, and aggravation factors relating to the injury. Whether the symptoms are localized is also important, in addition to patients' present and past history (Suarez, et al., 2013). It has been found that subjective information accounts for 59% to 90% of patients' diagnoses, while physical examinations account for less than 30% (Reiman & Thorborg, 2014), (Peterson, Holbrook, Von Hales, Smith, & Staker, 1992). For example, in the case of Legg-Calve-Perthes disease, which affects athletes between the ages of 3 and 12, the athlete's age clearly narrows down the list of differential diagnoses (Reiman & Thorborg, 2014). In the course of their examinations, practitioners can also observe and assess athletes' posture, range of motion and muscle balance strength in order to detect any potential risk factors (Reiman & Thorborg, 2014).

9. CLINICAL MANIFESTATION

The most common clinical manifestations or entities relating to groin injuries are adductor, iliopsoas and abdominal muscle injuries. The main characteristic of adductor-related groin injury is pain at the superior medial aspect of the groin. The pain is usually focused around the insertion point of the adductor longus muscle near the body of the pubis. Moreover, the pain could refer along the distal part of the adductor muscles. Additionally, adductor muscle weakness is a common sign associated with the pain of groin injury. Clinically, adductor-related groin injury presents as pain and tenderness over the origin of the adductor longus and groin pain when resisting adduction movement. The main characteristic of iliopsoas-related groin injury is pain at the proximal thigh in the anterior aspect; this pain is located more laterally than in adductor-related groin injury. Clinically, iliopsoas-related groin injury presents as tenderness on palpation of the iliopsoas muscle all the way to the lower abdominal wall, and pain during application of the Thomas test. Furthermore, resistance in the hip flexion movement can produce pain in the iliopsoas muscle. The main characteristic of rectus abdominis-related groin injury is pain at the proximal upper edge that is localized above the pubic bone. Clinically, the pain and tenderness associated with rectus abdominis-related groin injury is located over the insertion of the rectus abdominis muscle. Pain also can emerge during resisted abdominal flexion movement (Hölmich, et al., 2014; Smedberg & Roos, 2015).

10. CONCLUSION

In general, the sport of soccer has a high incidence of many common injuries. Groin muscle injury, which commonly affects the adductor muscles, is one of the most frequently occurring soccer injuries, with an incidence of 13% of all lower limb injuries and 68% for the dominant leg of the athlete. Groin muscle injury has a high risk of occurring at between 30% and 45% of the swing phase during the kicking cycle. A number of different factors contribute to groin injury, and understanding the body's ability to adapt to stressors may help to reduce the incidence of groin muscle injuries that relate to exercise load. Improper play leads to 5% of all groin injuries. However, the occurrence of such injuries is frequently non-contact in nature, and they are often characterized by insidious onset. In this regard, discriminating between the sources of groin-related injuries is considered a challenge for practitioners. The necessary skills and knowledge are particularly important in the competent diagnosis of groin-related injuries.

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