Incidencia and clinical presentation of groin injuries in sub-elite male soccer

Per Hölmich,1,2 Kristian Thorborg,1 Christian Dehlendorff,1,3 Kim Krogsgaard,4 Christian Gluud4

ABSTRACT

Background Groin injuries cause major problems in the football codes, as they are prevalent and lead to prolonged symptoms and high recurrence. The aim of the present study was to describe the occurrence and clinical presentation of groin injuries in a large cohort of sub-elite soccer players during a season.

Methods Physiotherapists allocated to each of the participating 44 soccer clubs recorded baseline characteristics and groin injuries sustained by a cohort of 988 sub-elite male soccer players during a full 10-month season. All players with groin injuries were examined using the clinical entity approach, which utilises standardised reproducible examination techniques to identify the injured anatomical structures. The exposure time and the injury time were also recorded. Injury time was analysed using multiple regression on the log of the injury times as the data were highly skewed. Effects are thus reported at relative injury time (RIT).

Results Adductor-related groin injury was the most common entity found followed by iliopsoas-related and abdominal-related injuries. The dominant leg was significantly more often injured. Age and previous groin injury were significant risk factors for sustaining a groin injury. Groin injuries were generally located on the same side as previously reported groin injuries. Adductor-related injuries with no abdominal pain had significantly longer injury times compared to injuries with no adductor and no abdominal pain (RIT 2.28, 95% CI 1.91 to 2.65, p=0.0096). Having both adductor and abdominal pain also increased the injury time significantly when compared to injuries with no adductor and no abdominal pain (RIT=4.56, 95% CI 1.91 to 10.91, p=0.001).

Conclusion Adductor-related groin injury was the most common clinical presentation of groin injuries in male soccer players and the cause of long injury time, especially when combined with abdominal-related injury.

INTRODUCTION

Groin injuries are one of the most common injuries in the football codes.1–5 They represent a major problem because of the high incidence with long-standing symptoms and have a high recurrence risk.6–7 In the majority of the literature, groin injuries are most often described as a single injury, not taking into account that a large number of structures can be injured and, as such, cause groin pain. More details of the anatomical structures injured, the distribution and aetiology of the injuries and the consequences of the various injury types are all necessary to understand the nature of groin injuries and to be able to develop relevant and specific treatment and prevention.

The term ‘adductor-related groin pain’ was coined in the literature in 1998,8 and in 20079 the concept of a clinical entity approach was presented. This approach utilises standardised reproducible examination techniques10 to try and identify the anatomical structures involved in the injury and causing groin pain. The sequence of the papers (1998, 2004, 2007 and 2013) is not logical; however, it is the result of a development process that started in the 1990s where the examination methods and entities were developed and standardised. They have since been the foundation of all the papers.

The present study utilises the clinical entity approach in a cohort of sub-elite male soccer/soccer players followed for a full season. The primary aim was to describe the occurrence and clinical presentation of groin injuries in this cohort; the secondary aim was to examine the characteristics of these injuries.

MATERIAL AND METHODS

The groin injuries sustained by the participants of a previously published cluster randomised controlled trial (RCT) are included in this study.6 The RCT examined the effect of an exercise programme aimed at prevention of groin injuries in soccer players, and recorded groin injuries sustained during a full soccer season. The Ethics Committee of Copenhagen and Frederiksberg Municipalities and The Danish Data Protection Agency approved the study (KF 01-171-97 and 1997-1200-271). All players and trainers gave their written informed consent before entering the study. The trial is registered at ClinicalTrials.gov as NCT00226603.

In cooperation with the Danish Soccer Federation (DBU), we sent an invitation to 120 soccer clubs in the Denmark, Copenhagen and Zealand series and series 1–3. The clubs represented urban and non-urban clubs and were playing at the amateur competitive level, training between two and four times a week; generally, the higher the level, the more are the training sessions. Seventy-eight clubs accepted the invitation to participate, but when the inclusion of players and the implementation of the intervention had to begin, 23 clubs could not cope with the tasks and withdrew without including any players. During the trial, another 11 clubs withdrew (figure 1).

Since no significant differences between the two intervention groups could be found with respect to the type of groin injury (p=0.76), age (p=0.29) and length of injury (p=0.15), the whole cohort is presented as one group in this study, although we adjust for the intervention in the regression models. The cohort consists of 44 soccer clubs that...
completed the trial, representing 998 players with data relevant for this study, of which 907 presented with complete data.

**Injury definition**

A groin injury was defined 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. We later found this definition to be in concordance with the consensus statement by the Injury Consensus Group under the auspices of Federation Internationale de Football Association (FIFA) published in 2006.\textsuperscript{11} A traumatic injury is defined as an injury with a sudden onset and a known cause, whereas an overuse injury is defined as an injury with an insidious onset and no known trauma.\textsuperscript{11}

Groin injuries were classified into clinical entities according to the definitions described previously (table 1).\textsuperscript{9}

**Injury assessment**

A physiotherapist was allocated to each club before randomisation and was, in cooperation with the trainer, responsible for collecting data and reporting to the data manager of the trial. The physiotherapists collected self-administered questionnaires from all players providing information about the age, dominant leg, playing position and previous injury (sustained during 1996 and 1997 until the start of the trial, altogether 20 month) to the groin, knee, ankle and lower extremity muscle. All groin injuries sustained during the study period were reported to the trial profile.

![Trial profile](image)

**Figure 1** Trial profile.

![Table 1](image)

<table>
<thead>
<tr>
<th>Tests required for the three examined clinical entities of groin injury\textsuperscript{9}</th>
<th>Adductor-related</th>
<th>Abdominal-related</th>
<th>Iliopsoas-related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain with adduction of the legs against resistance</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain with palpation of the adductor longus insertion</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pain with palpation of the abdominal muscle insertion</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pain with abdominal flexion against resistance</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pain with palpation of the iliopsoas</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pain with the Thomas test</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
physiotherapist, who attended the club at least every second week and at shorter intervals if needed because of injuries. Prior to the trial, the physiotherapists were trained in the use of the questionnaire and in how to perform an examination using a standardised protocol to classify the groin injuries sustained during the study correctly. To be classified into a groin injury entity according to the classification, a set of two paired tests should be positive (table 1). Any time loss from training and/or match play was registered and the definition and classification used regarding this was in accordance with the FIFA consensus.

No attempt was made to treat the injuries or to register the return to sport. The study-physiotherapists were only there as observers.

The season (from 13 September 1997 to 5 July 1998) included 33 weeks of active training and playing and 9 weeks around Christmas with no training or matches. The coaches in all clubs registered the number of hours and sessions of training and the number of matches. No separate registration was made of whether the injuries were sustained during training or match play.

### Statistical methods

Injury incidence per 1000 played hours was computed considering the players to be at risk during all training sessions and matches they participated in during the study. Injury time was analysed using multiple regression on the log of the injury times as the data were highly skewed. Effects are thus reported as relative injury time (RIT), for example, RIT 2.0 means a twofold increase in the injury time. We included age, intervention and pairwise interactions between entities in the initial model. We then simplified the model using a stepwise backwards elimination (adjusting for the intervention) procedure according to Akaike’s Information Criterion (AIC). The risk of missing a training session/match was analysed using logistic regression. We included age, entities, type of injury (traumatic/overuse) and intervention as potential risk factors in a multivariate model and simplified it using the backwards elimination (adjusting for the intervention) procedure. The risk of a groin injury during the study period was analysed using the Cox proportional hazard model considering previous injuries, age, intervention and duration of previous groin injury as potential factors. The model was simplified using the backwards elimination (adjusting for the intervention) procedure. All analyses were carried out using the statistical software R V2.14.2. p Values below 0.05 were considered significant.

### RESULTS

Descriptive data including baseline and injury information of the participating 998 players are shown in table 2. The total numbers of hours spent on training and match play during the study was 144,757 h, and the total number of injuries (any anatomical part) registered among the 998 players was 494. Accordingly, the incidence of injuries was 3.41 injuries/1000 h.

Fifty-eight groin injuries were recorded in 54 players; the incidence of groin injuries was 0.40 injuries/1000 h. The distribution of injuries among the clinical entities, type of onset (traumatic vs overuse), incidence/1000 h, leg distribution (dominant compared to non-dominant) and median injury time are shown in table 3. Sixteen groin injuries (27%) could not be classified as specific clinical entities since they did not have both tests positive to fulfil the specified criteria. One player had no positive tests; the positive tests of the remaining 15 players are shown in table 4. Thirteen of the 54 players (24%) with groin injury had more than one groin injury entity.

Injury time was moderate (8–28 days) in 43% and severe (>28 days) in 33%. It was significantly related to the entities adductor-related and abdominal-related injuries and their interaction. Adductor-related injuries with no abdominal-related injury had significant longer injury times compared to injuries with no adductor-related and no abdominal-related injuries (RIT 2.28, 95% CI 1.22 to 4.25, p=0.0096). Having adductor-related injuries as potential risk factors in a multivariate model and simplified it using the backwards elimination (adjusting for the intervention) procedure. The risk of a groin injury during the study period was analysed using the Cox proportional hazard model considering previous injuries, age, intervention and duration of previous groin injury as potential factors. The model was simplified using the backwards elimination (adjusting for the intervention) procedure. All analyses were carried out using the statistical software R V2.14.2. p Values below 0.05 were considered significant.

### Table 2 Descriptive data including baseline and injury information

<table>
<thead>
<tr>
<th>Entity</th>
<th>Number</th>
<th>Iliopsoas</th>
<th>Abdominal</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td>30</td>
<td>18</td>
<td></td>
<td>58</td>
</tr>
<tr>
<td>Age (mean (SD))</td>
<td></td>
<td>24.3 (4.6)</td>
<td>24.9 (4.4)</td>
<td>23.9 (5.1)</td>
<td>27.4 (4.9)</td>
</tr>
<tr>
<td>Left leg (n (dominant leg))</td>
<td></td>
<td>13 (2)</td>
<td>7 (3)</td>
<td>4 (0)</td>
<td>18 (5)</td>
</tr>
<tr>
<td>Right leg (n (dominant leg))</td>
<td></td>
<td>19 (18)</td>
<td>10 (9)</td>
<td>7 (7)</td>
<td>27 (25)</td>
</tr>
<tr>
<td>Playing position: injured/total (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several</td>
<td>6/181 (3.3)</td>
<td>5/181 (2.8)</td>
<td>2/181 (1.1)</td>
<td>4/181 (2.2)</td>
<td>14/181 (7.7)</td>
</tr>
<tr>
<td>Goalkeeper</td>
<td>2/75 (2.7)</td>
<td>175 (1.3)</td>
<td>1/75 (1.3)</td>
<td>1/75 (1.3)</td>
<td>4/75 (5.3)</td>
</tr>
<tr>
<td>Defender</td>
<td>9/227 (3.9)</td>
<td>2/227 (0.9)</td>
<td>3/227 (1.3)</td>
<td>7/227 (3.1)</td>
<td>17/227 (7.5)</td>
</tr>
<tr>
<td>Midfielder</td>
<td>10/320 (3.1)</td>
<td>7/320 (2.2)</td>
<td>4/320 (1.3)</td>
<td>4/320 (1.3)</td>
<td>18/320 (5.6)</td>
</tr>
<tr>
<td>Striker</td>
<td>3/134 (2.2)</td>
<td>3/134 (2.2)</td>
<td>1/134 (0.8)</td>
<td>0/134 (0)</td>
<td>5/134 (3.7)</td>
</tr>
<tr>
<td>Players missed training (n)</td>
<td></td>
<td>21</td>
<td>10</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Players missed match (n)</td>
<td></td>
<td>15</td>
<td>9</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Length of injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3 days (minimal)</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>4–7 days (mild)</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>8–28 days (moderate)</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>&gt;28 days (severe)</td>
<td>12</td>
<td>8</td>
<td>7</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Also had adductor</td>
<td>7</td>
<td>9</td>
<td>0</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Also had iliopsoas</td>
<td>5</td>
<td></td>
<td>0</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Also had abdominal</td>
<td>9</td>
<td>5</td>
<td></td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>
related and abdominal-related injuries also increased the injury time significantly compared to injuries with no adductor-related and no abdominal-related injuries (RIT 4.56, 95% CI 1.91 to 10.91, p=0.001). Having both adductor-related and abdominal-related injuries tended to increase the injury time, although not significantly, compared to adductor-related injuries with no abdominal injury (RIT 2.00, 95% CI 0.82 to 4.86, p=0.13). The intervention group had shorter injury times, although not significantly, compared to the control group (RIT 0.56, 95% CI 0.32 to 1.00, p=0.0518).

The incidence of traumatic groin injuries was 0.14 injuries/1000 h (n=20/51; 39%) and the incidence of overuse injuries was 0.21 injuries/1000 h (n=31/51; 61%); in seven patients, the type of onset could not be established. Twenty per cent of the traumatic groin injuries involved contact with another player. The groin injuries were located in the dominant leg (preferred kicking leg) in 68% of the patients and were distributed evenly among the entities (table 3).

In 39 of 58 injuries, time-loss was encountered with at least one training session or one match being missed. Twenty-six players missed at least one match and 38 players missed at least one training session because of a groin injury. There was no significant relation between the entity sustained and the risk of a time-loss injury. The age of the player seemed to be a risk factor (per additional year of age: OR 1.15 (95% CI 1.00 to 1.32); p=0.05) and for missing at least one match (per additional year of age: OR 1.17 (95% CI 0.98 to 1.40); p=0.08).

Having had previous groin injury in the 20-month period prior to the start of the study significantly increased the risk of groin injury (HR 2.13, 95% CI 1.23 to 3.67, p=0.0068). Groin injuries were generally located on the same side as previously reported groin injuries (table 5).

Previous ankle, knee or lower extremity muscle injury could not predict an increased risk of groin injury. Playing position did not seem to affect the risk of groin injury (table 1). No significant difference was found in the risk of groin injury between goalkeeper and field players (p=0.85).

**DISCUSSION**

In male soccer at the sub-elite level, adductor-related groin injuries are the most common entity found followed by iliopsoas-related and abdominal-related injuries. This is in line with the UEFA study by Werner et al finding adductor-related injuries to be the most common groin injury at the elite level. The incidence of groin injuries in the present study (0.40 groin injuries/1000 h) is lower than in the elite study from the UEFA Champions League (1.1 groin injuries/1000 h). Other studies on comparative cohorts from the Nordic countries, playing at similar levels as in the present study, have shown injury incidences ranging from 0.6 to 0.8/1000 h, which suggests that players at the sub-elite level may suffer from fewer groin injuries than those at the elite level. 27 15 The total incidence of all injuries in this study was 3.41 injuries/1000 h, which is also lower compared to the UEFA study on elite players from the Champions League, finding 8 injuries/1000 h.

The classification into clinical entities was made according to a proposed set of criteria utilising a number of reliable examination tests.9 10 To be classified into a clinical entity, two positive tests are needed. In 16 of the players with groin injury, this was not possible (table 4). This could be a result of the entity classification system not being able to identify all types of groin injuries in the athletes, as the groin pain could also relate to other structures not examined systematically in this study. This could include pain from structures such as the low back, the sacroiliac joints, the peripheral nerves, the hip joint or other muscles and tendons, which were not specifically examined in this study.

Previous studies of clinical presentation have found more than one cause for groin pain in large cohorts of athletes.9 16

### Table 3 Distribution and characteristics of the clinical entities of groin injuries (numbers do not add up to the total because some players have more than one entity)

<table>
<thead>
<tr>
<th>Entity</th>
<th>Adductor</th>
<th>Abdominal</th>
<th>Iliopsoas</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of injuries (% of all entities found)</td>
<td>30 (51%)</td>
<td>11 (19%)</td>
<td>18 (30%)</td>
<td>16 (%)</td>
<td>58</td>
</tr>
<tr>
<td>Incidence of injuries/1000 h training and match</td>
<td>0.207</td>
<td>0.076</td>
<td>0.124</td>
<td>0.014</td>
<td>0.401</td>
</tr>
<tr>
<td>Percentage of traumatic injuries</td>
<td>39%</td>
<td>56%</td>
<td>35%</td>
<td>39%</td>
<td>39</td>
</tr>
<tr>
<td>Percentage of overuse injuries</td>
<td>61%</td>
<td>44%</td>
<td>65%</td>
<td>61%</td>
<td>61</td>
</tr>
<tr>
<td>Percentage located on the dominant side</td>
<td>63%</td>
<td>64%</td>
<td>63%</td>
<td>68%*</td>
<td>68%</td>
</tr>
<tr>
<td>Median injury time (range) in days</td>
<td>19 (2–208)</td>
<td>58 (7–208)</td>
<td>16 (1–208)</td>
<td>16 (1–208)</td>
<td>16</td>
</tr>
</tbody>
</table>

*p=0.047.

### Table 4 The number of positive clinical tests among the 16 players with groin injury that could not be classified into one entity (9 players had >1 positive test)

<table>
<thead>
<tr>
<th>Test</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Pain with adduction of the legs against resistance</td>
<td>9</td>
</tr>
<tr>
<td>B Pain with palpation of the adductor longus insertion</td>
<td>6</td>
</tr>
<tr>
<td>D Pain with palpation of the abdominal muscle insertion</td>
<td>3</td>
</tr>
<tr>
<td>E Pain with abdominal flexion against resistance</td>
<td>2</td>
</tr>
<tr>
<td>F Pain with palpation of the iliopsoas</td>
<td>2</td>
</tr>
<tr>
<td>G Pain with the Thomas test</td>
<td>5</td>
</tr>
<tr>
<td>No positive test</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 5 Relationship between location of previous groin injury and re-injury

<table>
<thead>
<tr>
<th></th>
<th>Right groin</th>
<th>Left groin</th>
<th>Bilateral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right groin</td>
<td>5</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Left groin</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Bilateral</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
This finding is confirmed in the present study, as 24% of the injured players had more than one clinical entity.

The distribution of injury time can be seen in table 3. Severe injuries (injury time >28 days) accounted for 33% of all groin injuries, confirming that groin injuries are often a long-standing problem. Having an adductor-related groin injury doubles the injury time compared to injuries with no adductor and no abdominal pain and if it is combined with an abdominal-related injury, the injury time is more than quadrupled compared to injuries with no adductor and no abdominal pain. The role of the abdominal-related groin injuries is not clear. There were very few abdominal-related injuries in this study to analyse this point separately, but in combination with adductor-related injuries, it is clear that they are potentially a major problem. They probably represent a group of patients with a combined injury, where the adductor injury is accompanied by an injury to the rectus abdominis and/or the oblique abdominal muscles, represented by the conjoined tendon inserting into the pubic tubercle, including the possibility of an incipient hernia (posterior wall insufficiency).17 18 The present study contains no data to further investigate this, and additional studies examining and defining these problems are needed. Recent studies on the anatomy of the region have indicated that there is a close anatomical connection and perhaps dependence among the adductor muscles, rectus abdominis muscle and the oblique muscles.19–21

The adductor muscles are important muscles for the soccer player22 23 and there are indications in the literature that the balance of strength between the adductor and abductor muscles is a possible risk factor for groin injuries.24 25 26 While soccer seems to be a strengthening activity for the hip abductors, eccentric strength adaptations in the hip adductors do not seem to be present to the same extent, suggesting an only limited capacity of the adductors for adapting to these high and repetitive loads.26 As soccer is at the same time a sport where repeated kicking and change of direction places great stress upon the adductors, these muscles seem to be at risk of being injured. The high proportion of injuries located on the dominant side (68%) found in our study could also be related to this as the adductor longus appears to be at risk of strain injury during its transition from the hip extension to the hip flexion, probably because of a high eccentric load on the kicking leg during the swing phase.22 The high proportion of adductor-related groin injuries and the long injury time highlights the importance of further research into the role of the adductor muscles and the possibility of prevention, by focusing on improving eccentric strength capacity in the adductors.27

Traumatic injuries constituted 39% of the groin injuries and only 20% of those were contact injuries. Other studies have found less traumatic injuries (24–27%) not giving any information about the percentage of contact involved.14 28 The traumatic acute groin injury is a topic supported by very limited literature. There is no precise information about the anatomical structures injured and the long-term consequences of these injuries are unknown. We found a relatively high frequency of players in whom a traumatic event led to groin injury, but only in one of five situations was contact with another player reported. This implies that the majority (80%) of the traumatic injuries are probably happening as a result of kicking, sprinting or sudden changes of direction, movements where the groin-related muscles are involved at high speed, often with a forceful eccentric element. Further research of the natural history of traumatic/acute groin injuries would be helpful to plan treatment and to develop prevention of these injuries.

As in other studies, previous groin injury is a significant risk factor for a new groin injury2 6 7; in addition, we found the injuries to be located on the same side as the previously reported groin injuries. However, whether it also was the same clinical entity is not possible to establish, as the clinical entity of the previous injuries is not known. The fact that it is the same side that is injured again could be an indication that the injury is the same and/or that the muscles and tendons of the previously involved side are more vulnerable to injury, possibly as a result of the suboptimal strength or endurance capacity obtained after the injury. This is in concordance with the suggestions by Hägglund et al.29 that insufficient treatment and rehabilitation of an injury may provide a possible explanation for re-injuries.

There is consistency in the literature to support increased age as a risk factor for injuries in the hamstring and calf muscles,2 30 31 but not for groin injuries. However, we found that the age of the player seemed to be a risk factor for missing at least one match and for missing at least one training session. This has not been described before. The reason age seems a risk factor could be due to the body’s collagen tissue changes with advancing age, rendering the body less adaptable to quick force changes or fatigue. Additionally, it has been shown that specific muscle strength decreases with advancing age, which may put these muscles more at risk for injury.13

No imaging investigations have been used in this study. A recent review found that radiological evaluation of long-standing groin injuries remains a challenging task and that the current evidence is based on relatively few heterogeneous studies of varying methodological quality.32 The role of imaging in the diagnosis of groin injuries in athletes still remains a question for further research.

The clinical examination techniques used in this study are intra-observer and inter-observer reliable, but no specific validation has been made. However, since there is no consensus on diagnostic definitions and no ‘gold standard’ exists, at present no one investigation is more valid than the other. This represents a major problem.

The first attempt to separate groin injuries according to their anatomical relation was described in Renström and Peterson’s paper from 1980.33 Inspired by this, the clinical entity approach was developed over the years and finally published in 2007.9 This concept of relating the groin pain to the anatomical structure that causes the pain is still a fairly rough way of separating the injuries of the groin; however, it not only allows for further diagnostic methods to be more precisely aimed, but also it can direct the treatment strategy. Using this approach in a randomised controlled trial, we showed that a specific exercise treatment directed at the adductor muscles and their function was very successful.14

The definitions for the clinical term adductor-related groin injury and, in some cases, the clinical entities approach as such have been widely used in research since 200714 35–42 and the increasing use of this approach offers the ability to separate the term ‘groin injury’ into more specific entities. Hopefully, as research systematically uncovers the pathology and aetiology of the injuries in each entity, it will be possible to develop evidence-based diagnosis, understand its relation to the clinical entities and thus be able to establish evidence-based prevention and treatment.

CONCLUSION

Adductor-related groin injury is the most common groin injury in male sub-elite soccer players which causes extended injury time especially when combined with abdominal-related injury.

What are the new findings?

- In male soccer at the sub-elite level, adductor-related groin injuries are the most common entity found followed by iliospasa-related and abdominal-related injuries.
- Having an adductor-related groin injury doubles the injury time compared to injuries with no adductor and no abdominal pain and if it is combined with an abdominal-related injury, the injury time is more than quadrupled.
- A high proportion of the injuries were located on the dominant side (68%).
- The age of the player seems to be a risk factor for missing at least one match and for missing at least one training session.

How might it impact on clinical practice in the near future?

- Provides a better understanding of characteristics of groin injuries in soccer.
- Underlines the usefulness of the clinical entity approach.
- Aids in the planning of soccer training in order to avoid groin injuries.

Correction notice  This article has been corrected since it was published Online First. The second paragraph of the Results section contained an error. In the sentence "Sixteen groin injuries (27%) could not be classified as specific clinical entities since they could not have both tests positive to fulfill the specified criteria", 'they could not' has been changed to 'they did not'.

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