

Incidence of symptomatic femoroacetabular impingement in the general population: a prospective registration study

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ABSTRACT

Groin pain is a frequent cause of discomfort in patients and highly prevalent in active patients. One of the diagnoses causing groin pain is femoroacetabular impingement (FAI). However, the incidence of FAI in the general population is unknown. This study aimed to identify the incidence of groin pain suggestive of FAI in a cohort of 31 451 patients in the Netherlands during 1 year. A cooperation of 16 general practitioners (GPs) participated in this prospective registry. All GPs were educated in the clinical manifestation of FAI and the physical examination for FAI. Patients of all ages were registered when presenting with 'groin pain'. Between July 2013 and July 2014, 84 patients aged between 15 and 60 years of age presented with groin pain, reflecting an incidence of 0.44%. Of these patients, 17% (14 patients) were radiologically diagnosed with FAI. Another 30% of these patients had a high clinical suspicion for FAI. This is the first report on the incidence of groin pain suggestive of FAI in a general population diagnosed by GPs. Of all 84 patients presenting with groin pain, 17% were diagnosed with FAI. Creating awareness of FAI in GPs helps identifying patients that might benefit from FAI treatment.

INTRODUCTION

Groin pain is a frequent cause of discomfort in young and active patients. In sports, incidence rates of groin pain vary from 0.5 to 18%, depending on level and type of sport [1–5]. The pathologies explaining groin pain are in many cases self-limiting. However, 13.5% of all complaints last longer than 3 weeks, and treatment of the underlying pathology is often required [6]. The differential diagnosis of groin pain is broad and contains both sports-related and non-sports-related conditions. Frequently diagnosed conditions are adductor-related tendinitis, snapping hip, inguinal hernia, sportsmen hernia and other ligament-related pain and several bony conditions, such as juvenile osteoarthritis (OA), avascular necrosis of the femoral head or referred back pain [3, 7].

As recently described by the Cochrane Bone, Joint and Muscle trauma group, groin pain in general can be difficult to treat [6]. However, surgical treatment with a good short-term outcome is possible if the groin pain is caused

by femoroacetabular impingement (FAI) [8–10]. FAI is caused by a bony anatomical deformity that causes the hip joint to impinge, which can lead to subchondral or intra-articular damage and pain. Ganz identified two types of deformities: the cam deformity, in which impingement is caused by an osseous deformity of the femoral head-neck contour, and a focal over-coverage of the femoral head by the acetabulum, which is known as pincer deformity [11]. Both deformities rarely occur in isolation and are often combined. Patients with FAI might have a high risk of developing OA of the hip [11]. Therefore, it is important to identify patients with groin pain due to FAI in an early stage, in order to delay or even prevent the development of OA.

While the treatment of FAI has a good short-term outcome [8–10], patients in the Netherlands can only receive the required treatment from an orthopedic surgeon after referral from a general practitioner (GP). This means that GPs need to be able to diagnose FAI in patients presenting

with groin pain. Whether GPs succeed in recognizing FAI is difficult to assess since the incidence of groin pain caused by FAI in the general population is unknown. Several authors have presented prevalence rates of the radiological characteristics of FAI in asymptomatic volunteers as well as in young athletes [12–16]. These prevalence rates ranged from 7 to 14% and 23%. While these studies confirm that FAI is present in the general population, no data exists about the incidence of groin pain caused by FAI. Our hypothesis is that FAI represents a significant group of patients in all patients with groin pain in the general population of GPs. Based on the described prevalence numbers of FAI in asymptomatic volunteers (seven till 23%) [13, 15], we estimated that the incidence of FAI in symptomatic patients with groin pain, will be similar to these numbers, e.g. ~15%.

The objective of this study was to identify the incidence of patients with groin pain caused by FAI in a cohort of patients visiting GPs in the Netherlands during 1 year. Creating awareness of FAI among GPs may help identify more patients with long-lasting groin pain who might benefit from treatment of FAI.

MATERIALS AND METHODS

A cooperation of 16 GPs were invited to participate in this study. The cooperation is located in the province of Noord-Holland (Haarlemmermeer), the Netherlands. According to the data of the local authorities, this area has a population of 31 451 patients [17]. More specifically, the 16 GPs are responsible for the general medical care of 19 185 patients between 15 and 60 years old.

The GPs were asked to register all patients aged between 15 and 60 who presented with groin or hip pain during 1 year, from 1 July 2013 to 31 June 2014. The only exclusion criterion was if the groin pain had already been diagnosed and successfully treated in the past.

Before the start of the study, the participating GPs attended an educational symposium on the pathophysiology of FAI, the clinical presentation of patients and the specific physical examination for FAI. The physical examination included specific FAI tests: the FADDIR test (flexion, adduction and internal rotation of the hip) and FABER test (flexion, abduction and external rotation of the hip), both performed in supine position as described by Martin *et al.* [18]. Also, participants were educated to suspect FAI in case of impaired range of motion of the joint with specific limitation of internal rotation. Whenever patients experienced recognizable pain with these physical tests, the tests were to be considered positive. These physical examination tests are highly reproducible but with limited specificity

[18, 20]. For example, positive testing of the groin with limited internal rotation can also be present in osteoarthritis (OA) of the hip.

Patients were clinically suspected of FAI if they presented with groin pain for the first time or if the groin pain recurred after an inactivity period or after referral to a physical/manual therapist or chiropractor. Groin pain was defined as a painful sensation in the area on either side of the body where the thighs meet the abdomen. Furthermore, if patients described the pain to be present after sports or during bending or twisting of the hip during sports or daily activities, the pain in the groin was suspect for FAI.

All GPs received guidelines for additional diagnostics in case the diagnosis FAI was made after a positive clinical presentation and physical examination. Additional diagnostics included plain radiographs of the hip in anteroposterior (AP) view and frog-leg view (commonly known as Lauenstein view), which were obtained in the nearest hospital (Spaarne Hospital, Hoofddorp) with standardized views. All GPs were asked to specifically enquire information about signs of cam or pincer deformity. If the diagnosis of FAI was sustained by the report of the musculoskeletal radiologist (describing cam deformity, pincer deformity, enlarged alpha angle or a cross-over sign as described by Macfarlane *et al.* [19]), participants were advised to refer the patient to an orthopedic surgeon. The GPs could contact the senior author for advice whenever they were in doubt about the diagnosis. In order to avoid interference with common practice, it was emphasized to all GPs that they were not obliged to refer the patient to any specialist or physical therapist, so all the GPs were free to decide what treatment to start.

A new registry-code was created in the electronic patient files (Medicom Pharmapartners Healthcare and HIS Zorgdossier). During this observational year, all patients who presented with groin pain were categorized under this code. All types of diagnoses causing groin pain were registered.

Once every month, an email was sent to all participating GPs to remind them of the registration. At three months, six months and 12 months, we visited all the participating practices to collect the data.

No compensation was provided for participation.

RESULTS

All GPs agreed to participate. For all the participating GPs, the symposium was the first introduction to FAI. After the symposium, all GPs were familiar with the physical examination for FAI.

Of a total of 19 185 patients in the age range 15–60 years, 84 patients were registered with groin or hip pain, which resulted in an incidence of 0.44%. The male/female ratio of these patients with groin pain was 44/40, and the average age of the entire population with groin pain was 41.2 (16.8–59.5, \pm SD 12.7) years.

The most frequently diagnosed conditions were tendinitis (mostly adductor related), OA of the hip, skin conditions such as Herpes or dermatomycosis, inguinal hernia, FAI and several other conditions, such as herniated discs or lymphadenitis (Table I).

Of the 84 patients with pain in the groin, clinically, physically and radiologically confirmed FAI was present in 17% (14 patients, nine of whom were female). These patients were therefore diagnosed with FAI (Table I). The average age of these patients was 40.5 (21.6–51.6, \pm SD 8.1) years. Of these patients, two had hip dysplasia in their medical history, but they had not presented with groin pain before. All patients diagnosed with FAI were referred to an orthopaedic surgeon in a nearby hospital. At the time of this data analysis, two of the referred patients were diagnosed with labral tears with the use of a MRI scan.

Another 25 patients (30%) were clinically diagnosed with groin pain caused by FAI because of the clinical presentation and positive physical exam tests (Table I). In 12 of these patients, additional radiograph imaging did not reveal large bony deformities. The other 13 patients had not yet received additional imaging at the time of this analysis. All were referred to a physical therapist to exclude adductor muscle-related tendinitis. Two additional MRI scans showed edema in the adductor tendons. In two patients, additional sonograms were made, but they could not

confirm adductor-related tendinitis. In one patient, a CT scan was made, which did not confirm any deformity of the hip.

No further follow-up of these patients has been registered yet.

DISCUSSION

The incidence of groin pain in the study cohort was 0.6%. Of all registered patients with groin pain, 17% were diagnosed with FAI. Moreover, another 30% were clinically diagnosed FAI but were referred to the physiotherapist first. Our data confirms our hypothesis that FAI is a substantial cause of groin pain in a general population. Our estimation that at least 15% of all groin pain might be caused by FAI even proved to be a small underestimation.

In the present study, patients were registered with 'groin pain' during their first presentation at the GPs practice. As we set no limitation on further specific information for inclusion, we also registered patients with diagnoses other than FAI. In this way, we ensured that the registration resembled the differential diagnoses of groin pain in the general population.

With an incidence of almost three patients a year for each GP and with one confirmed diagnosis a year, FAI is a likely cause of groin pain in the practice of GPs in the Netherlands. Nevertheless, the GPs who participated in our study did not have any knowledge about FAI before the start of the study. Moreover, they all were quite convinced that they had never seen patients with such a condition. Before the start of the registration, we tried to optimize the GPs' knowledge of FAI by means of an educational symposium on the clinical presentation and physical examination for FAI. Nevertheless, possible failures in the registration may have occurred if patients were seen by residents of the GPs, physician assistants or temporary replacement GPs, all of whom might have had less or even no knowledge of FAI.

Recognition of clinical presentation and thorough physical examination is important in the identification of FAI. As stated, the physical examination tests have a rather limited specificity, but they are highly reproducible [18, 20]. Positive testing of the groin with limited internal rotation can also be present in OA of the hip. That is the reason why patients with OA of the hip were also identified and registered by the GPs.

Several authors have presented incidences of groin pain in athletes. It has been estimated that over 10% of the consultations in sports medicine centers involve groin pain [1]. These injuries occur most frequently in soccer, field hockey and field-based sports [1, 2]. The incidence of groin injuries among professional athletes is 0.5–6.2% [5],

Table I. Diagnoses made by the GPs

<i>Differential diagnosis</i>	<i>N</i>	<i>Percentage</i>
Tendinitis, adductor related	29	34
Osteoarthritis of the hip	4	5
Skin abnormalities (dermatomycosis, herpes zoster)	15	18
Inguinal hernia	9	11
FAI (clinical, PE and radiological)	14	17
Clinical FAI	25	30
Other (herniated discs, coxitis fugax, testis torsion, lymphadenitis)	13	15

but it is much higher among soccer players, around 10–18% yearly [4]. The cause of this groin pain in athletes is not FAI based. Our study is the first to describe groin pain in the general population due to FAI.

Other authors have presented incidence rates of cam or pincer deformities that might cause FAI in asymptomatic patients. Hack *et al.* [15] described an incidence of 14% in non-symptomatic volunteers. Moreover, Fukushima presented the same rate in the Japanese population, also in non-symptomatic volunteers [13]. Most recently, Frank *et al.* [21] reviewed all the literature about the prevalence of FAI in asymptomatic volunteers and identified a prevalence of 23% FAI in the general population. Khanna *et al.* [14] presented a prevalence of 7% in asymptomatic patients with painful hips during examination and radiological FAI. However, not all patients with a cam or pincer deformity on radiographic images will develop FAI. Bony deformities in asymptomatic patients do not necessarily lead to FAI of the joint, while FAI is the result of impingement caused by a combined movement of the hip joint, which cannot be simulated with plain radiographs [22]. We think that our incidence of 17% of FAI in symptomatic patients is of additional value to these recent publications. Our study adds the valuable information that groin pain is proportionally caused by FAI in our general population.

The average age of our patients seems high, but is similar to what other authors have described in their studies about outcomes after treatment for FAI [8–10]. FAI deformities might be present at a younger age, as was described by Agricola, but the age of onset of groin pain caused by FAI is rather diverse [12]. Therefore, it is not surprising that our population does not only contain young athletes but also middle-aged persons.

The total number of groin pain complaints is almost certainly an underestimation, since not all patients with groin pain present themselves to the GP. A limitation of our study is that we did not register patients who directly visited their physical or manual therapist or any other health care professional without needing any further referral to specialist care. The electronic file system of the GPs has no registration for those types of consultations if there was no prior consultation of the GP. However, we did register all the patients who needed any further consultation of the orthopedic surgeon, since all those patients needed a referral from the GP. In the Netherlands, the health insurance does not cover specialist care without a referral from a GP.

Some patients with clinical signs of FAI were first referred to a physical therapist in order to maintain conservative treatment or to exclude symptoms of adductor muscle related tendinitis. We did not receive information about the follow-up of these patients, so no information

can be given about the recovery or continuation of the groin pain in these patients. It is to be expected that in some of these patients the groin pain has persisted and that the diagnosis FAI might be made at another moment. The lack of follow-up of patients referred to the physical therapist is another limitation of our study.

The diagnoses made by the GPs also included other diagnoses than orthopedic differential diagnoses for groin pain. Groin pain is a very complex condition. A skin abnormality of lymphadenitis is not a cause for groin pain in orthopedic practice. However, we invited the GPs to include all patients who presented with anamnestic groin pain. Groin pain was a frequent cause of complaints in these GPs' general practice, and we decided to present all these conditions, since we present the results collected by the GPs. They have no further value for the diagnoses of FAI or related groin complaints.

Other limitations of our study must be pointed out. The radiographs were made in the hospital nearest to each GP. Since we did not want to interfere with the local guidelines, we had no influence on the standardization of the radiographic images. The reports of the images were made by a musculoskeletal radiologist, but they were not available for the authors. We therefore had to rely on the expertise of the local radiologic department and on the report of the radiologist, since we were not able to measure the alpha angle or the center-edge angle [19, 23].

Groin pain is a very complex diagnosis with a large grey area of conditions. The GP is widely educated in order to be able to make many diagnoses. Depending on anamnestic information, physical examination and additional X-ray and referral, some diagnoses made by the GPs might have changed after inclusion. We had no information on the development of the groin pain (diminishing, progressing) or on the change of diagnoses over time. In order to verify the diagnoses made initially, all patients might have been seen again by the GPs in order to confirm the diagnoses made initially. Since this was not done, we consider this to be a limitation in our registration.

On average, each GP yearly has one patient with FAI and two more who are clinically highly suspected of FAI. In order to present a more reliable incidence and prevalence number for the entire Dutch population, the registration of groin pain and its causes should be managed in a larger cohort from, e.g. the entire province.

Since FAI might be a cause of OA of the hip, it is important to identify those patients who develop complaints of groin pain at an early stage, so that OA might be delayed or possibly even prevented [11]. Further research is essential in order to investigate whether OA of the hip can be prevented by early identification and therapy for FAI.

CONCLUSION

The incidence of FAI in patients with groin pain in the general population is 17%, with an incidence of 0.44% in the entire population. Creating awareness of FAI by educating GPs helps to identify patients who might benefit from treatment for FAI.

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CONFLICT OF INTEREST STATEMENT

None declared.

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