The muscles, tendons, nerves, ligaments and joints in the hip and groin region interact and depend on each other. Pain and dysfunction of the hip joint, whatever the cause, will affect the surrounding muscles and tendons and can lead to secondary problems. Also, primary conditions affecting the surrounding tissues can affect the function of the hip joint leading to synovitis and other painful conditions. This balance and dependence on each other is important to be aware of when diagnosing and treating patients with hip and groin pain.

It is therefore extremely important to examine both the surrounding extra-articular structures and the hip joints systematically. The trunk and the pelvis are joined at the sacroiliac joints and pelvis and the lower extremities are joined with the pelvis at the hip joints. The synergies between the muscles acting across the pelvis, sacroiliac joints and hip joints are important for achieving good function of most movements that involves the extremities. A number of muscle groups interact with the pelvis and hip. The adductors, iliopsoas and abdominal muscles are the primary musculo-tendinous structures at risk of being injured.

In most cases muscles are defined and even named from the concentric action they have on the non-weight-bearing leg. However, the muscles also have a primarily eccentric function as stabilisers of the pelvis including the hip joints and the torso. From this point of view it becomes easier to understand why the adductors are a major stabilising muscle group for the hip and pelvis and not only ‘adductors’ of the femur in the non-weight-bearing situation. The abdominal muscles, including the external oblique, internal oblique, rectus abdominis and transversus abdominis, are also stabilisers of the pelvis and in synergy with the muscles of the back they control the movements of the trunk in relation to the pelvis and the legs. The pubic symphysis and the two sacroiliac joints are dependent on each other. Movements of the sacroiliac joints are small and the ilia, in most situations, move around the sacrum as a unit. The movements are reduced by muscular forces and by increased load.

**The acute strain**

The acute strain (approximately 30 to 40%) usually involves one or more musculo-tendinous structures. In most cases the lesion is close to the muscle-tendinous junction, but in some cases the tendon itself or the entheses where the tendon inserts into the bone is the site of the injury. These injuries happen during forceful action such

**The overuse injury is characterised by a gradual increase in symptoms**
as in kicking and skating and with other sporting movements where the muscle is being stretched during forceful contraction.

**The overuse injury**

The overuse injury is characterised by a more gradual increase in symptoms. In the beginning there is only pain after activity with stiffness of the joint or the muscle group and decreased range of motion of the hip joint, developing to pain in the hip and/or groin at the commencement of sport activity. The pain will often disappear as the athlete warms up, but will recur during the activity. This same overuse pattern can be seen in athletes returning to sport after an initial acute hip and/or groin injury without receiving appropriate and/or sufficient treatment and rehabilitation.

**HISTORY**

If the athlete cannot recall any acute incident it is often helpful to look into the activities the patient has been doing in the period preceding the injury as well as a how the symptoms developed.

- Did the patient change the load of activities?
- More work, sport or other physical activity?
- Was the load increased by longer distances or heavier weights?
- Change of equipment, surface or technique?
- How was the development of problems correlated to the change of load?
- Did the patient have any previous problems of the same kind, perhaps an underlying biomechanical abnormality? Have the symptoms changed?

The complaints are also very important to get a clear description of:

- When does it hurt?
- Where does it hurt and does the pain radiate anywhere?
- What provokes the pain? What alleviates the pain?
- What is the present activity level of the patient both in activities of daily living, work and sport?
- Has it changed because of the pain and dysfunction?
- Did the patient have any treatment until now?
- What was the response to this therapy?

**COMPLAINTS**

The ability to produce fast movements such as in sudden changes of direction, sprinting and kicking is impaired and usually painful when the adductors and the iliopsoas muscles are involved. When the abdominal muscles are involved, strenuous sudden abdominal contractions such as coughing and sneezing can become painful. In some athletes, increased stress on the symphysis joint leading to a stress reaction can also occur; that, combined with the bony changes seen with the enthesopathy of the adductor longus insertion, leads to increased signal when examined with bone scan and with MRI and to irregularities on X-ray. This is sometimes called ‘osteitis pubis’ as it looks like the changes seen with infection of the joint. The changes are, however, not diagnostic of groin injury. The increased signal is primarily related to the amount of stress that activities like soccer or other sports cause or the stress an injury may lead to as a result of unbalanced load distribution across the pelvis. It can be compared with a knee joint effusion. This is in itself is not an injury but a result of an overused or injured knee and not a diagnosis in itself.

**CAN THE COMPLAINTS GUIDE YOU TO THE DIAGNOSIS?**

Buttock and groin pain can indicate hip joint dysfunction, but a more precise
inguinal-related groin pain is not a true hernia

The description of the location should be obtained if possible. A very common sign is the so-called ‘C-sign’ where the patient puts a hand over the lateral part of the hip region pointing with the thumb to the posterior part, with the palm to the lateral part and with the other four fingers to the anterior part indicating that the pain is deep in here where the three ‘points’ meet.

Posterior buttock pain without a groin component is usually seen with lumbo-sacral spine pathology or posterior hip musculature injuries. Lateral hip pain perhaps also radiating to the lateral thigh is more common with greater trochanteric bursitis, gluteal or adductor pain. Pain and sensibility disturbance over the anterior superior iliac spine extending down the lateral part of the anterior thigh is associated with meralgia paresthetica (affection of the lateral femoral cutaneous nerve).

Anterior groin pain in the mid portion of the thigh can be the result of iliopsoas related pain and more medial groin pain can be due to adductor related pain. The possibility of a stress fracture of the pubic bone or the femoral neck should also be considered with anterior groin pain. Hip pain can also be referred to the knee via the obturator nerve. Weight-bearing usually aggravates pain from the hip joint and surrounding soft tissues and rest relieves the pain. A specific position of the limb that exacerbates or relieves the symptoms is often possible to identify and can help identify the cause of the pain. Common complaints are a progressive decrease in maximum walking distance and exercise tolerance and a decreased ability to perform activities of daily living.

ACUTE MUSCLE-TENDINOUS INJURIES IN THE HIP AND GROIN REGION

Acute muscle injury usually occurs close to the myotendinous junction but can also occur in the tendon itself or at the bony insertion. Fatigue, lack of concentration or insufficient muscle co-ordination seems to be important etiological factors. Acute pelvic-related muscle injuries are, in principle, not different from other acute muscle injuries and should be treated initially in the same way. The difficulty related to this region is to re-establish the very sensitive and extremely important pelvic muscular balance.

LONG-STANDING MUSCULAR-TENDINOUS INJURIES IN THE HIP AND GROIN

Symptoms often seem to be contradictory and confusing in the athlete with longstanding groin pain. In about 25 to 35% of patients multiple, causes for the chronic groin pain can be found. Characteristic activities causing pain include sprinting, making cutting movements, kicking the ball and making a sliding tackle. Complaints of pain when coughing and sneezing and pain when standing on one leg to pull on socks or pants are also frequent.

Acute overload, fatigue or overuse of the adductor muscles during sports activities may lead to injuries. The adductor muscles are important stabilisers of the pelvis and hip joint. If the loads on the hip joints and the pelvis are no longer balanced, the adductor muscles are among the muscle groups most likely to be recruited to increase work and thereby risking an overuse situation that might lead to an injury.

Adductor-related pain is localised medially in the groin and may radiate down along the adductor group on the medial side of the thigh. The clinical signs of the diagnostic entity ‘adductor-related groin pain’ are defined as:

1. Tenderness of the origin of the adductor longus muscle and/or the gracilis muscle at the inferior pubic ramus and
2. Groin pain on resisted adduction.

Additionally, decreased adductor muscle strength and groin pain on full passive abduction sometimes with a decreased range of abduction, are also frequent signs. Tenderness over the pubic symphysis is often found concomitant with adductor-related groin pain. Examination techniques for the abovementioned findings have proven to be reproducible.

Iliopsoas-related pain is another common cause of longstanding groin pain and a very important differential diagnosis to hip joint problems. The precise detailed functions of the iliopsoas muscle are not yet fully understood, but the muscle seems to work as a stabiliser for the pelvis and lumbar spine as well as being an important flexor of the hip joint. The workload on the muscle includes a considerable amount of both eccentric and concentric work and fast changes between these work forms. Both strains and overuse injuries in the iliopsoas muscle might develop into a chronic problem.

The iliopsoas-related pain is localized in the anterior part of the proximal thigh more laterally than adductor-related groin pain. It sometimes radiates down the anterior thigh and sometimes involves an element of lower abdominal pain lateral to the rectus abdominis muscle. In differentiating between the intra and the extra-articular problems it is very important to know that the ‘impingement test’ might give rise to pain in the psoas in case of iliopsoas-related groin pain, because of the sore muscle being folded (flexion), twisted (adduction) and pulled (external rotation).

The clinical signs of ‘iliopsoas-related groin pain’ are:

1. Pain when palpating the muscle through the lower abdominal wall and
2. Pain at passive stretching of the muscle using the Thomas test position.

Additionally, the iliopsoas muscle is often tight, and palpating it just distal to the inguinal ligament is often painful. Resisted isometric testing of the muscle at 90° of hip flexion often results in muscle weakness and pain.

Inguinal-related groin pain can probably be attributed to a number of anatomical structures. The problem has been given numerous names in the literature such as sports hernia, sportsman’s hernia, incipient hernia, Gilmore’s groin, pubic pain, athletic pubalgia and others. The lesions as they
are noted in the literature are described as non-specific and with large variations in the patho-anatomy. The primary lesion can be in the rectus abdominis, the external oblique, internal oblique and/or transversalis muscles/tendons or in the conjoint tendon at the pubic tubercle. The nature of the lesion is not clear, since it may be a strain or tear, an inflammation or degeneration of certain points of excessive stress or it may be an avulsion, a haemorrhage or an oedema. These lesions can be precipitated by a traumatic episode over-stretching the front of the groin and lower abdomen as in a forceful sliding tackle in soccer. In other cases the problem has developed in connection with overuse over a period of time. The decreased rotational range of motion in the hip joints often found in patients with femoral acetabular impingement (FAI) might be a precipitating factor for the development of incipient hernia in some patients. The need for a certain degree of hip rotation when participating in sports could lead to excessive overload of the oblique abdominal muscles, and to a sprain or an overuse situation that will weaken the inguinal canal and consequently lead to an inguinal-related groin problem. Adductor-related pain, iliopsoas related pain, femoral acetabular impingement, sacroiliac pain and low-back pain are typically concomitant findings in these patients. Inguinal-related pain is the groin injury that takes the longest time to recover from.

The inguinal-related pain is experienced ‘deep’ in the groin, slightly more proximal than adductor-related pain. The pain tends to diffuse with radiation along the inguinal ligament, the perineum, the rectus muscles, adductor muscles and sometimes also to the opposite side. Increased intra-abdominal pressure such as coughing or sneezing will usually cause increased pain.

The clinical signs of ‘inguinal-related groin pain’ are defined as:
1. Tenderness at the conjoint tendon towards the pubic tubercle and
2. Tenderness of the external ring of the inguinal canal.

Additionally, dilatation of the external ring and tenderness of the posterior wall is often found. Sometimes a bulge can be felt with increased intra-abdominal pressure. The pain may be exacerbated during coughing. It is not a true hernia.

Ultrasonography might be helpful. It has been described in the literature but better scientific evaluation is needed.

OTHER DIFFERENTIAL DIAGNOSIS

Stress fracture

Stress fracture is an important differential diagnosis including stress fracture of the femoral neck, the os sacrum, the os pubis and the os ischium. When there is a sudden onset of pain without an adequate trauma, when weight-bearing is painful and when the pain is persistent sometimes without a corresponding precise tenderness, a stress fracture should be considered. The fracture is usually the result of major changes with increased weight-bearing activity such as running. Also, changes in surface, shoes and load carrying are important factors. As the duration, intensity and frequency of the activities is increased, a gradually worsening deep pain in the hip, groin or thigh develops. As the stress continues, pain occurs during training and becomes more intense. Unless the form of the activity is modified, the pain gradually worsens over a few weeks to the point where the patient is unable to walk without pain. Continued activity will probably result in completion of the stress fracture. The fracture site is painful but it is not always possible to reach it. A quite serious stress fracture of the femoral neck can be especially difficult to
diagnose clinically, since it is not possible to palpate the neck. MRI is very useful when a stress fracture is suspected, as radiological changes often are late, being evident only when the callus formation is visible.

Avulsion fractures
Avulsion fractures around the pelvis should be considered in the adolescent patient. The apophyses are prone to overuse or a traumatic overload has caused a painful lesion. The most frequent locations in the groin and hip region are:
1. Anterior superior iliac spine caused by the sartorius muscle, especially during jumping activities.
2. Anterior inferior iliac spine caused by the rectus femoris muscle during kicking.
3. Ischial tuberosity caused by the hamstring muscles during sprinting.
The history, tenderness of the suspected area and an X-ray will usually reveal the diagnosis.

OSTEITIS PUBIS – A DIAGNOSIS?
Some authors use the term ‘osteitis pubis’ as a vaguely defined differential diagnosis to the soft tissue-related groin problems. Osteitis pubis is a term originally used to describe an infection in the pubic bone around the symphysis joint. The characteristic radiological findings, bone resorption, widening of the symphysis and sclerosis along the rami can often be found in athletes with or without groin problems. Groin straining sports activities such as soccer and ice hockey increase the shearing forces in the symphysis joint. The stress on this joint might thus lead to these radiological signs, merely indicating an increased load of the joint rather than pathology. It can be compared with a knee joint effusion. This is in itself not an injury but a result of an overused or injured knee and not a diagnosis in itself.

‘Osteitis pubis’ should not be used as a specific diagnosis in the case of athletes with groin pain, unless an infection is present in the pubic bone. The term should be reserved to describe ‘osteitis pubis-like’ radiological changes in the pubic bones around the symphysis joint.

Bursitis
Bursitis, either traumatic or inflammatory, should also be considered. The bursae are usually localised between tendons and muscles and over bony prominences. A common example is the superficial trochanteric bursa over the greater trochanter that is often subject to direct trauma and to inflammation due to an external snapping hip. The iliopsoas bursa was earlier considered a major contributor to groin pain in athletes. However recent imaging techniques as ultrasound and MRI have shown that this is rarely the case.

Ultrasonographic examination is very helpful in localising and diagnosing bursitis.

NERVE ENTRAPMENT
Peripheral nerves may become entrapped after direct trauma or due to an overuse condition of the neighbouring fascia, tendons or muscles leading to an inflammatory condition. Nerves most commonly affected are the ilioinguinal, genitofemoral and lateral cutaneous femoral nerves. The diagnosis can be difficult but localised tenderness at the site of penetration through the fascia is common. The pain is usually experienced with hyperesthesia or hypoesthesia of the skin along the specific nerves innervation area. The characteristics of the pain may vary considerably. Ultrasonographic examination is very helpful in localising the nerve. Fibrotic changes, narrowing and signs of inflammation (with Doppler technique) are some of the ultrasonographic findings. Needle electromyography may be helpful in determining the severity of nerve injury.

NEOPLASMS
Even in seemingly healthy athletes, neoplasms should be kept in mind as a possible cause of hip and groin pain. Osteosarcomas, chondrosarcomas and other tumours have been diagnosed often at a late stage, due to both the patient’s and doctor’s delay. Persistent pain or an unexplained ‘mass’ in the hip and groin region should be carefully examined to exclude a neoplasm. Imaging techniques should always be included at an early stage in patients with diffuse and unclear hip and groin pain.

CONCLUSION
A systematic approach based on standardised clinical examination, using reliable examination techniques and well-defined clinical entities is very important to be able to diagnose and plan the correct treatment for footballers with groin pain.

References

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