

## REVIEWS

# Diagnosis and treatment aspects of surgical pathology in athletes

*Patologia chirurgicală la sportivi - aspecte diagnostice și terapeutice*

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### Abstract

Surgical pathology in athletes is an important chapter of modern surgery, and in many cases it also has a high degree of difficulty in terms of a positive diagnosis. Whether chronic or acute, the diagnosis for inguinal pain should be made as early as possible to reduce as much as possible the period during which the athlete is absent from training and competitions, thus speeding up the athlete's comeback. Moreover, the treatment algorithm in these cases must be chosen correctly, the differential diagnosis thus gaining special importance. One should keep in mind that if wrongly diagnosed and treated, this pathology can lead to a premature termination of the athlete's career. On the other hand, the late return of the athlete to the characteristic activity of the chosen sport can have an important economic impact on the club or organization where the athlete is active.

**Keywords:** pain, surgical pathology, athletes

### Rezumat

Patologia chirurgicală la sportivi reprezintă un capitol important al chirurgiei moderne, având totodată, în multe cazuri, un grad de dificultate crescut în ceea ce privește diagnosticul pozitiv. Fie că vorbim despre durerea inghinală cronică sau acută, stabilirea diagnosticului trebuie făcută cât mai timpuriu, pentru a reduce cât mai mult posibil perioada în care sportivul lipsește de la antrenamente și de la competiții, grăbind astfel reinsertia sportivă a atletului. De asemenea, algoritmul de tratament în aceste cazuri trebuie să fie corect ales, diagnosticul diferențial căpătând astfel o importanță deosebită. Această patologie, incorect diagnosticată și tratată, poate conduce la încheierea prematură a carierei sportivului. Pe de altă parte, întoarcerea tardivă a sportivului la activitatea caracteristică sportului ales poate avea un impact economic important din partea clubului sau organizației la care sportivul activează.

**Cuvinte cheie:** durere, patologie chirurgicală, sportivi

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## Chronic groin pain

Inguinal pain is the most common symptom in athletes, occurring in up to 6% of all lesions directly related to performance sports (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Szolga & Alexescu, 2017). In sports medicine terminology, there are several terms to define this pathological condition, including: “sports hernia”, “Gilmore's groin”, “athletic pubalgia”, “pubic inguinal pain syndrome”, “incipient hernia”, or the newer “inguinal disruption” following the consensus meeting in Manchester (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). Chronic groin pain occurs especially in sports involving rapid acceleration or deceleration, torsion, sudden changes in direction, movements that are

encountered in football, rugby, hockey, Australian football, long-distance running (Anderson et al., 2001; Fon & Spence, 2000).

### a) Inguinal hernia

One of the most common causes of chronic groin pain in athletes is inguinal hernia, which according to some authors is present in up to 50% of chronic groin pain with a history of over eight weeks (Kluin et al., 2004).

### - Definition

Gilmore's groin, also referred to as “sports hernia” is defined as the presence of chronic pain in the inguinal region without the palpation of an inguinal tumor. At the objective exam, during the cough effort intensity assessment, this tumor formation is not always palpable (Kluin et al., 2004; Campanelli, 2010). Other authors

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define sports hernia as the presence of a weakness of the posterior wall of the inguinal canal, without the presence of a clinically identifiable hernia (Anderson et al., 2001; Fon & Spence, 2000).

- *Clinical diagnosis*

Clinical diagnosis is based on medical history and a carefully performed physical examination. Symptomatically, the condition occurs as chronic unilateral groin pain or pain in the pubic tubercle, which exacerbates during physical effort and disappears when this stops. Sometimes, the pain only occurs right after the physical activity is over. What is universally accepted is that groin pain reappears when the athlete resumes physical activity and, as a consequence, athletic performance gradually decreases. Groin pain sometimes radiates into the scrotum, the root of the thigh, or the pubic tubercle. Initially, pain occurs after physical effort, then it becomes so strong that the athlete can no longer practice that sport (Anderson et al., 2001; Fon & Spence 2000; Kluin et al., 2004).

Clinical examination should be carefully performed, highlighting possible inguinal tumor masses that would facilitate diagnosis. The palpation of the pubic tubercle, the conjoint tendon, the origin of the adductor longus muscle, the pyramidal muscle and the right abdominal wall muscle is also necessary, which sometimes causes pain (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). When performing taxis maneuver, a dilated superficial inguinal ring or a weakening of the posterior inguinal wall can be evidenced, but the tumor mass typical for inguinal herniation is not evidenced, not even when the Valsalva maneuver is performed by the patient (Anderson et al., 2001).

Some authors believe that the existence of three of the following clinical signs can guide diagnosis towards sports hernia:

- a) Pain with palpation, located immediately above the pubic tubercle, at the insertion site of the conjoint tendon.
- b) Pain with palpation of the deep inguinal ring.
- c) Pain or dilation of the superficial inguinal ring, without a palpable tumor in this region.
- d) Pain in the origin tendon of the adductor longus muscle.
- e) Diffuse groin pain that radiates into the root of the thigh, the perineum or the median line (Anderson et al., 2001).

- *Differential diagnosis*

Diagnosing Gilmore's groin is a difficult task, mainly due to the presence of a small inguinal hernia, which in most cases cannot be clinically identified, requiring paraclinical imaging exams. There are a number of other conditions that help make the differential diagnosis. Thus, among orthopedic disorders, the following should be mentioned: muscular disorders (stretching or rupture of the adductor longus muscle, the right abdominal muscle or the iliopsoas), degenerative or traumatic diseases of the coxofemoral joint, osteitis pubis or athletic pubalgia, stress fracture (pubic ramus fracture or femoral neck fractures), impairment of the ilioinguinal or genitofemoral nerves. Genitourinary disorders include: prostatitis, epididymitis, hydrocele, varicocele, urinary tract infections. Certain gynecological disorders such as endometriosis or dysmenorrhea should

also be mentioned. Last but not least, differential diagnosis is based on intestinal conditions: diverticulitis, irritable bowel syndrome, chronic appendicitis or postoperative adherence syndrome (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010).

- *Paraclinical diagnosis / diagnostic imaging*

From a clinical point of view, diagnosing Gilmore's groin is extremely difficult. As such, paraclinical imaging examinations are required. To establish the diagnosis of inguinal hernia, inguinal ultrasound, in particular dynamic ultrasound of the groin, is necessary and sometimes sufficient. With the 5MHz transducer located at the inguinal level, the patient is asked to perform the Valsalva maneuver in order to visualize a small inguinal hernia, as well as to calculate the size of parietal impairment (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004). Herniography has also been described, which is an invasive imaging technique (after puncture of the linea alba caudal to the umbilicus, water soluble low osmolar contrast medium is injected into the peritoneal cavity, after which the patient is required to perform the Valsalva maneuver). Fluoroscopy is considered positive if contrast extravasation is observed outside the peritoneal cavity (Anderson et al., 2001). The complication rate associated with this invasive maneuver is somewhere between 3-6%, therefore its use is questionable (Anderson et al., 2001).

Nuclear magnetic resonance (NMR) is used not only to diagnose inguinal hernia, but also to exclude other associated pathologies, or to help establish the differential diagnosis (bone marrow edema, fluid in the symphysis pubis joint, osteitis pubis, tendon rupture of the adductor longus muscle or the abdominal muscle) (Anderson et al., 2001; Fon & Spence, 2000). Radiography may also be useful in excluding other pathologies (degenerative lesions or fractures in the coxofemoral joint, the sacroiliac joint or the spine). Changes in osteitis pubis can be highlighted on X-rays, such as periosteal changes at this level, sclerosis or increased space between the two symphyses (Anderson et al., 2001).

- *Treatment / reintegration*

*Conservative treatment*

The literature suggests that symptoms of inguinal pain are rarely significantly relieved by conservative treatment alone. The treatment algorithm in these cases, however, involves the use of conservative treatment, but only for a period of 6-8 weeks. If there is no improvement in the described symptomatology, surgical resolution is indicated (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010; Swan & Wolcott, 2007). Conservative treatment involves rest, nonsteroidal anti-inflammatory drugs, physiotherapy, local ice application, electrical stimulation, massage, injectable corticosteroids (Anderson et al., 2001). Under this treatment, the patient is gradually allowed to exercise, and after 10-12 weeks, if he/she does not accuse pain, he/she can return to performance sports (Biedert et al., 2003; Dimitrakopoulou & Ernest, 2016).

*Surgical treatment*

As stated in the conservative treatment subchapter, surgical treatment should be considered if there is no improvement in symptomatology after 6-8 weeks of

conservative treatment (Caudill, 2008; Joesting, 2002; Van Der Donckt et al., 2003; Farber & Wilckens, 2007; Ekstrand & Ringborg, 2001).

Regarding the chosen surgical procedure (open or laparoscopic), there are many discussions at the moment, with advantages and disadvantages for each chosen approach.

The laparoscopic approach is preferred by many surgeons due to its advantages: a minimally invasive procedure, the short length of hospitalization, faster reintegration into sports activities, the possibility to visualize and dissect the contralateral inguinal region. The laparoscopic approach may be totally extraperitoneal (TEP), or transabdominal pre-peritoneal (TAPP) (Anderson et al., 2001; Fon & Spence, 2000; Kluin et al., 2004; Campanelli, 2010), using prosthetic materials in 100% of cases, compared to only 35% in the case of conventional approaches (Caudill et al., 2008). The reintegration rate following laparoscopy is 1-3 months, compared to 3-6 months in the case of conventional techniques (Dimitrakopoulou & Ernest, 2016). Also, the success rate of laparoscopic techniques is 95% on average (Kluin et al., 2004; Genitsaris et al., 2004; vanVeen et al., 2007). However, some authors report a relapse rate of 10.1% after laparoscopic approach, compared to only 4.9% after conventional approach, mainly due to the fact that the visual field is smaller than with open surgery (Joesting, 2002). Thus, in a previous conventional approach (Bassini, Shouldice, Lichtenstein), the following could be visualized: the aponeurosis of the external oblique abdominal muscles, the pubic origin of the right abdominal muscle, the conjoint tendon or possible damage to the ilioinguinal nerves or the genital ramus of the genitofemoral nerve (Campanelli, 2010; Sheen & Iqbal, 2014; Anderson et al., 2001; Fon & Spence, 2000).

In a study by Ekstrand and Hilding on more than 300 professional football players, the authors concluded that most patients had at least two causes of inguinal pain (Anderson et al., 2001; Fon & Spence, 2000).

Moreover, the success rate of the previous approach is comparable to the laparoscopic one, with no statistically significant differences (Caudill et al., 2008).

On the other hand, the question is whether the contralateral inguinal region should also be treated surgically, even if it is asymptomatic. However, the question remains unanswered. On the one hand, only 5% of surgeons operate the contralateral inguinal region preventively (Steel et al., 2004) and, on the other hand, only 10% of the athletes undergoing surgery on one side later accuse pain in the contralateral inguinal region (Steel et al., 2004). Future prospective randomized studies are needed to compare the two surgical techniques (open vs. laparoscopic), to study the efficacy of prosthetic materials, and thus determine the real effectiveness of each method (Dimitrakopoulou & Ernest, 2016).

#### *b) Chronic pubalgia*

##### *- Definition*

Chronic pubalgia is a non-infectious inflammatory disease that affects the pubic symphysis as well as the adjacent structures. It is mainly correlated with sports involving repeated kicking (football, rugby) and running with sudden change of direction (Anderson et al., 2001;

Fon & Spence 2000). The term chronic pubalgia is similar to that of osteitis pubis, especially if it is closely related to performance sports (vanVeen et al., 2007). The pathophysiological mechanism is overloading of the abdominal muscles, thigh flexors and adductor muscles, especially when suddenly changing direction while running (Kluin et al., 2004).

##### *- Symptoms*

The main symptom encountered in these cases is pain in the pubic region. Pain can radiate into the abdomen, perineum and adductor muscles of the thigh, accentuating during physical effort, especially during sudden changes of direction. The evolution of the disorder involves poorer performance in sport, and later pain during everyday effort (Paul et al., 2002; Dantas de Queiroz et al., 2014).

##### *- Diagnosis*

The diagnosis is established based on careful examination and paraclinical medical imaging. The forced abduction test must be performed during physical examination (Dantas de Queiroz et al., 2014). With the patient in supine position and the lower limbs partially bent and abducted, a forced abduction movement is applied. The examiner's palms are opposed to this forced abduction movement, when pain in the pubic region occurs.

Paraclinical medical imaging includes pelvic radiography and nuclear magnetic resonance. When performing pelvic radiography, the following pathological aspects can be highlighted: abnormalities in the pubic symphysis, narrowing of the space between the two symphyses, bone reabsorption at this level (osteoporosis), small bone fractures (avulsion fracture), sacroiliac joint alterations, or signs of osteoarthritis (bone sclerosis, subchondral cysts or osteophytosis). Nuclear magnetic resonance also helps visualize the presence of bone marrow edema (Dantas de Queiroz et al., 2014).

Differential diagnosis should be based on a series of other conditions, as follows: non-infectious causes mainly associated with urological maneuvers, infectious causes located at this level, degenerative or rheumatic diseases (Dantas de Queiroz et al., 2014). Positive diagnosis should be established as soon as possible, the athlete's reintegration into sports activity being directly proportional to the time elapsed from the first symptom to diagnosis (Batt et al., 1995; Dantas de Queiroz et al., 2014).

##### *- Treatment*

For the treatment of athletic pubalgia, most authors initially recommend conservative treatment consisting of: physical rest, physiotherapy, analgesics, nonsteroidal anti-inflammatory drugs, or corticosteroid infiltrations (Moldovanu & Pavy, 2014). Corticosteroid infiltrations are indicated when there is no response to anti-inflammatory therapy, physiotherapy, rest. At this point, corticosteroid infiltration results are controversial, with studies proving a positive response (Fricker et al., 1991), while other studies show a minimal positive effect (Batt et al., 1995).

Surgical treatment is only indicated when conservative treatment has failed. Here are some of the techniques employed for the surgical resolution of athletic pubalgia: bridging (or fusion) of the pubic symphysis, anterior resection, trapezoidal resection or even pubic symphysis curettage (Anderson et al., 2001; Fon & Spence, 2000).

Pubic symphysis fusion has the advantage of avoiding posterior articular instability occurring after anterior resections, but it also has drawbacks: longer duration of surgery, more difficult recovery, or complications associated with internal fixation (Anderson et al., 2001).

### Acute pain in the inguinal region

The mechanisms that determine the occurrence of inguinal injuries are direct trauma, strong contraction, or chronic, repetitive microtraumas. These result in contractions, muscle tension, ruptures or avulsion. Acute lesions are divided into muscle, bone and joint lesions (Polglase et al., 1991). In this subchapter we will only insist on acute muscular lesions, namely muscle contusions and ruptures.

#### *Muscular lesions*

##### *- Muscle contusions*

Muscle contusions occur especially in contact sports, where there is little protection (football, rugby). The mechanism that produces these lesions is in most cases direct trauma, which leads to compression of the musculature on the bone (Polglase et al., 1991). Muscle contusions occur more frequently in the external and internal skeletal muscles, as well as at the upper third of the thigh (McSweeney, 2012). The diagnosis of these lesions is based on physical examination, in conjunction with soft tissue ultrasound and/or nuclear magnetic resonance (with the possibility of highlighting the hematoma from the muscle body) (McSweeney et al., 2012). If the trauma is strong and the affected musculature is well-developed (such as the quadriceps) complications such as myonecrosis or myositis ossificans may occur (Polglase et al., 1991).

##### *- Muscle rupture*

Muscle ruptures are the most common injuries in the groin and thigh in sports competitions, occurring more frequently in the muscles that cross two joints. The classification of these lesions is as follows: grade 1 - no functional impotence; grade 2 - moderate functional impotence, and grade 3 - total muscle rupture with total functional impotence (Anderson et al., 2001; Fon & Spence, 2000). Ultrasound and/or nuclear magnetic resonance detect for grade 1 - minimal lesions, characterized by the presence of a small hematoma in the muscle body, or the presence of a small amount of perifascial fluid; for grade 2 - muscle rupture, which is not total, in addition to the presence of muscular hematoma; for grade 3 - complete muscle rupture with retraction of the muscle ends (Shelly et al., 2009; Davies et al., 2010; Marshall & Koulouris, 2009). Nuclear magnetic resonance is especially preferred for athletes with well-developed muscles, where sometimes the thickness of the musculature represents a limitation for ultrasound (Ekstrand & Hilding, 1999). There is a directly proportional relationship between the rehabilitation time and the percentage of impaired muscles in cross section (NMR) (Ekstrand & Hilding, 1999).

#### *Treatment of muscle lesions*

Several types of treatment have been used for muscle damage, aimed at accelerating the regeneration of muscle fibers. These include physical rest, which may range from relative to total rest, pain relievers, nonsteroidal anti-inflammatory drugs, corticosteroids, angiotensin II

receptor blockers, insulin-like growth factor (IGF), as well as alternative treatments such as ultrasound, cryotherapy, massage, or hyperbaric oxygen therapy (Anderson et al., 2001; Fon & Spence, 2000).

### Conclusions

1. The most common surgical symptom in athletes is represented by inguinal pain, and one of the most common causes of chronic groin pain is inguinal hernia.
2. Differential diagnosis of chronic groin pain is a difficult task, sometimes due to the presence of a small inguinal hernia, which in most cases cannot be clinically identified.
3. Laparoscopic repair of sports hernia represents an effective approach, and has the advantage of bilateral groin dissection and identification of occult hernias.

### Conflicts of interests

The authors declare no conflict of interest.

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