Hip injuries in skeletally immature athletes

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ABSTRACT

Nowadays, children play no more in the outdoors, while they regularly participate in competitive activities, being guided by specialists. As compared with the past, injuries are bigger in number, since several tissues are more often being exposed to external risk and obviously they are more intensely overworked. The area of pelvis and hip is more often affected. Transient synovitis is the most common cause of painful limpness to the athlete child, apart from other potential severe situations (such us slipped capital femoral epiphysis, Legg-Calvé-Perthes disease, the avulsion fractures or stress fractures of femoral neck) which require our attention. Prevention has reduced the incidence of these injuries and it is considered more important than any other form of therapy. Parenthood is also very important in order to manage the situation. Doctor's advice should be realistic and full of altruism and affection, because children's delicate Psyche should be always respected.

KEY WORDS: sport injuries; hip; pelvis; child

1. Introduction

All scientists claim that moderate natural activity on a systematic basis and in a normal way, has a great amount of advantages for children. Although, international bibliography does not manage to support the benefits to the musculoskeletal system, does not hesitate to admit that natural activity provide positive results with regard to the arterial pressure, the control of obesity and the decrease of serum lipids [1-5]. Regarding to the adults, natural activity combines with low incidence of cardiovascular disease, diabetes type II, osteoporosis, colon cancer and breast cancer.

Doctor's role is very essential. He is called on recommending natural activity to his patients and make all the necessary adjustments to the type of exercise

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according to their condition of health. A systematic training program should be a way of life, especially for those people with low natural activity and reduced sports participation, such as deficient children in social skills and those having a low social-economic status [6]. Apart from suggesting the participation in sports, doctor should also be responsible to choose young athletes according to scientific tests, in addition to the diagnosis and therapy of various injuries [7].

2. Epidemiology and prevention of injuries

In the USA, with a population of 320 million people, almost 30 million children and teenagers take part in competitive activities. Nearly three million injuries are responsible for abstaining from sports [8,9]. Generally, the incidence and the gravity of injuries increase by the age and during adolescence, while they are also related to speed, power and intensity of competition. The acknowledgement of mechanisms that provoke sports injuries, in addition to the promotion of norms which can reduce the possibilities of these mechanisms (such as the punishment of dangerous game) have reduced the frequency of serious trauma. It has also been reduced by removing environmental risks, like trampoline in gymnastics [10].

An injury, sometimes, may be relapsed because of its incomplete treatment. Full recovery reduces the incidence of injuries. In young athletes, a systematic training before the competing period, especially when a great importance is given to spread, flexibility, jumping, springiness, is accompanied by an impressive reduction of the incidence of injuries in sports extremely dangerous, such as football. It has been proven that traditional stretching or massage do not reduce the risk of injury or the feeling of muscle fatigue [11-14]. Preventive physical exam of the child before his participation in various sports, is a good supply in order to define the preventive strategy that, in any case, should be followed [15].

3. Sports injuries treatment

3.1 Acute injuries

Most musculoskeletal injuries are related with strains, ligament failure and muscle strains [7]. The history is not always clear. Serious injuries which usually suggest the presence of a structural disorder, give symptoms and clinical findings, such as swelling, deformation, weakness for the continuation of sports, limpness, painful snapping, mechanical joint locking, or the sense of instability. Some concepts should be clear: The *strain* represents the injury of a ligament or an articular capsule, the "*twitch*" has to do with a muscle or a tendon, the *muscle strain* is referred to a crushed injury of any soft tissue.

Strain is classified in grades 1-3. Grade 1 means that some fibers have been ruptured, although during physical exam no instability of the ligament is found. In grade 2, most fibers have been ruptured, resulting in some instability of the ligament. Grade 3 implies that all fibers have been ruptured and during clinical exam total instability of the ligament is perceptible. The *muscle strain* is also classified in grades 1-3. Grade 1 causes moderate soreness during the exam of the muscle, in addition with minimal muscle weakness. Grade 2 causes a higher intensity pain and moderate weakness during the muscle exam. Grade 3 means total muscle or tendon tear and causes pronounced weakness and palpable gap on the muscle belly or on the tendon itself.

3.2 Overuse injuries

These injuries are caused by repeated microtrauma which exceed healing potential of the tissues [7]. They concern muscles, tendons, bones, capsules, cartilages and nerves. Those injuries may by observe in all sports, but they are more frequent in sports which require repetitive movements (such as running, swimming, tennis, gymnastics).

Causal factors are distinguished in extrinsic (trainer mistakes, lacking equipment, unsuitable exercise surface) and intrinsic (anatomical structure of the athlete, and/or pathological processes) [16]. Mistakes during sports activity are most perceptible predisposition factors. As usual, at the beginning of the competitive period, athletes break the "rule of 10%" (*it is not allowed to increase the time or intensity of training more than 10% weekly*).

Intrinsic factors are related with biomechanical disorders because of leg length discrepancy (LLD), pes

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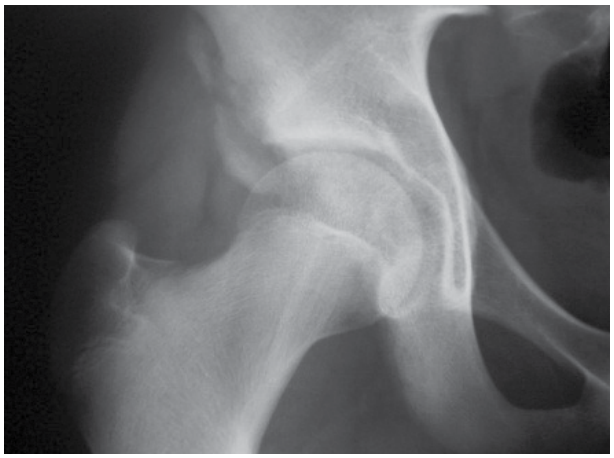

Fig 1. *In a 15-years-old boy with acute pain on right groin during running, the radiography showed an avulsion fracture of anterior superior iliac spine and the acetabular ridge due to intense pull of rectus femoris muscle*

Fig 2. *Avulsion of ischial tuberosity due to intense pull of hamstrings in a 13-years-old sprinter. The diagnosis was carried out with only the radiological assessment, in accordance with the information from history and clinical examination*

planus, cavovarus foot, tarsal coalition, calcaneovalgus foot, external tibial torsion, or femoral anteversion. They also are related with muscle imbalance, inflexibility of muscles, as well as with other various pathological situations (such as lacking physical condition, inadequate nutrition, amenorrhea, obesity) [7,17].

During medical interview, the little athlete gives information about the special characteristics of the sport. For example, runners should be asked about the shoes, the orthotics, the surface on which they run, the number of kilometers which they run every week (or the time they spend practicing every week), the intervals trainings, or the training who made on the mountain, in addition with previous injuries and periods of rehabilitation [18]. When all factors are appreciated, there is a break (or a modification) of the sport in order to avoid the recrudescence of the injury.

For hard–training athletes who develop an overuse injury, it is not considered necessary to stop exercising. As a rule, it is advised a program of rehabilitation which allows the athletes to return to sports as soon as possible, and at the same time they are not vulnerable in front of a possible relapse [19]. Early appreciation of an overuse injury requires changes to a smaller degree in training program.

One of the goals of the treatment is to control the pain and the muscle soreness, and secondly flexibility, strength, endurance and proprioception must be restored [20]. In many injuries caused by overuse, the inflammation has an insignificant role. For example, in most tendon injuries the term "*tendonitis*" is considered obsolete, since the pathology of the tendons does not reveal the presence of inflammation. On the contrary there is a scar tissue devoid of vessels. Most of these entities are now called "*tendinosis*", and the administration of anti-inflammatory drugs in them is considered insignificant, except for their analgesic effect.

3.3 Injuries of pelvis and hip

Hip and pelvic injuries represent only a little amount of sports injuries, but they are often severe and they require appropriate and early diagnosis [19]. Hip diseases are often manifested by knee-ache, without pathological signs from the physical exam of the knee.

In children who do physical activity, the ***transient synovitis*** is the most common cause of pathology of the hip. It is usually manifested by acute onset pain and limpness [21,22]. The child refuses to use the suffering extremity, while during physical exam he

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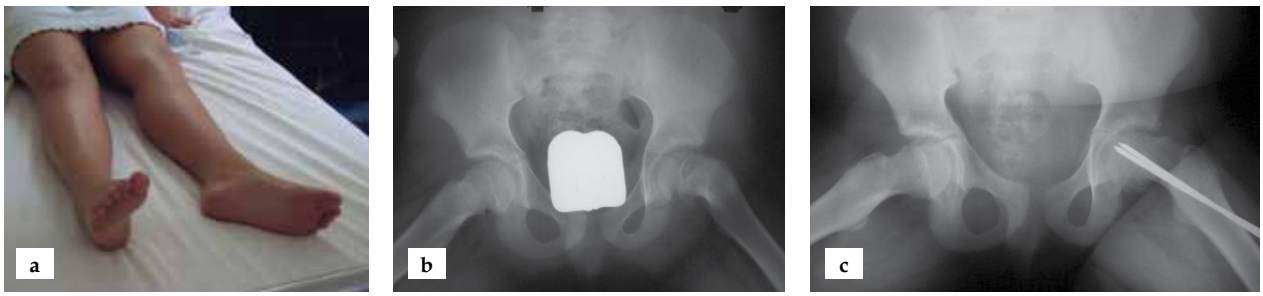

Fig. 3. *Slipped left capital femoral epiphysis* ***a.*** *Clinical signs* ***b.*** *Preoperative radiography and* ***c.*** *Postoperative radiography showing the management of epiphysiolisthesis in situ*

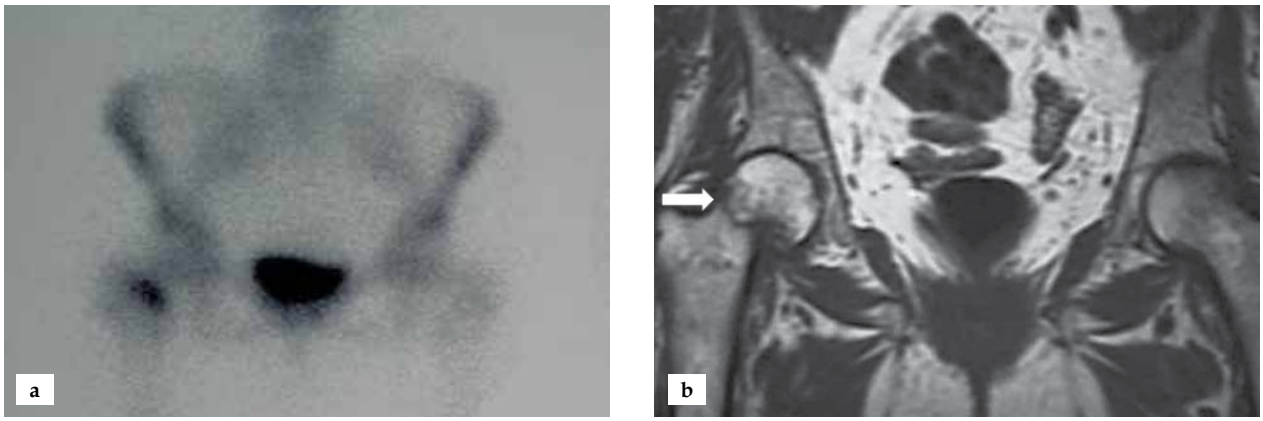

Fig. 4. *Stress fracture of right femoral neck of a young athlete with no obvious findings* ***a.*** *An increased concentration of radioisotope during bone scanning* ***b.*** *MRI shows the fracture (arrow)*

seems to suffer when he moves the hip. In the history, a minor injury is being reported. It is about a self-limiting process, usually restored between 48-72 hours after onset.

The ***Legg-Calvé-Perthes disease*** is also appeared during childhood, with gradual onset of limpness and hip ache [23]. Predisposing factors of the disease are hyperactivity or lack of concentration of the child, in addition with various nutritional habits.

Till the skeletal maturity, young athletes are vulnerable to injuries of apophysis (for example, anterior superior iliac spine). The ***iliac apophysitis*** is the most common in this area and it appears whether as a result of overuse, or by direct blow [22,24]. Treatment is, basically, conservative and it requires the temporary restriction of activities.

The ***avulsion fractures*** are mostly related to teenagers who participate in sports requiring a sudden beginning (**Fig. 1**). As soon as large muscular groups are contracted, the applying forces are greater than those which bones can tolerate [25,26]. Frequent sites of avulsion fractures are the anterior superior iliac spine (due to traction of sartorius), the anterior inferior iliac spine (rectus femoris), the lesser trochanter (iliopsoas) and the ischial tuberosity (posterior femoral muscles). The symptoms are located pain, tenderness, and swelling, loss of muscular strength and limitation of hip motion. Radiograms are necessary (**Fig. 2**). The initial treatment includes ice, analgesics, rest and exercises without causing pain. It is usually recommended the use of crutches for patient's ambulation. Surgical treatment is rarely required, since most of these fractures are satisfactorily healed, even if there is an important displacement.

The ***slipped capital femoral epiphysis*** often appears in ages 11-15 years old, during growth spurt in

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the adolescence (**Fig. 3**). Apart from traumatic causes, hormonal factors are also implicated [16]. Treatment must be operative. Osteonecrosis of the femoral head is the most frequent complication [27,28].

Stress fractures of the femoral neck are usually manifested by progressively increasing pain in the area of hip, in children who practice resistance sports[29]. Girls are more vulnerable, especially those who manifest the so-called "Athletic Triade", meaning the combination: alimentary disorders-secondary amenorrhea-secondary osteoporosis. During physical exam, pain is present every time that flexor hip muscles are contracted or torsional movements of the hip are realized. If x-rays do not succeed in evidencing the characteristic periosteal reaction (compatible with the stress fracture), then bone scan and MRI are required (**Fig. 4**). It is recommended to visit an Orthopaedic Surgeon, because stress fractures of femoral neck tend to conduce on nonunion or displacement, due to an insignificant trauma or continued bearing, since diagnosis is late [30,31]. Displacement may, more often, occurs to the cortex which supports tensile forces and, more rarely, to the opposite cortex which get compressive forces. This fact justifies preventive internal fixation of the fractures of the first group. These fractures are implicated for high risk of osteonecrosis of the femoral head [32,33].

The ***osteitis pubis*** represents an inflammation of pubic symphysis and it is caused by repetitive trauma during the broadside movements of pelvis. It appears in every athlete who participates in running activities, but it is more frequent to sports which require an action of the adductors muscles of hip, like hockey and football[34]. Athletes usually feel a vague, ill-defined pain in anterior pelvic region, unilateral or bilateral. On physical exam, a tenderness directly over the pubic symphysis, and sometimes to the central part of adductors muscles, is palpated. Any test which requires adductors contraction, evokes pain. There are no specific radiographic features (areas of bony erosions or sclerosis, diastasis of pubic symphysis with osteolysis), excepting the symptoms insist for 6-8 weeks. Bone scan shows an increased activity in area of pubic symphysis, while MRI can demonstrate an early bone marrow edema. Rest for a period of 6-12 weeks will be useful. Some patients turn to steroid injections, as a supplementary treatment.

Tears of the acetabular labrum may occur to the hip at the same way as the corresponding tears of the glenoid labrum happen [35]. The patient may refer a previous trauma, while he complains about an acute pain to the anterior surface of the hip, associated with a sensation of snapping or locking. Physical exam is not sufficient for the diagnosis. MRI arthrogram is the study of choice and has a sensitivity of 92% for detecting labral tears [22].

The ***snapping hip*** is caused whether by iliopsoas tendon sliding over anterior bursa of the hip, or by the iliotibial tract sliding over greater trochanter. It happens frequently to ballet dancers and runners in their teens. It may happen as a result of overuse (more frequent), or as an acute injury [36]. Athletes have a painful or painless snapping sensation located to the external or/and anterior surface, deep inside the articulation. Physical exam often reproduce the symptom. X-rays are not helpful. Treatment includes analgesics, rest, bio-mechanical assessment, and stretching and flexibility exercises [37]. The athlete returns to his sport activities as soon as possible.

Hip bursitis is caused by inflammation of any bursa which surrounds the hip, such as the insertion of iliopsoas on the lesser trochanter, the insertion of middle gluteal muscle on the greater trochanter and the origin of knee's flexors muscles on the ischial tuberosity [38]. By rule, treatment is conservative and it includes exercises following a specific weekly algorithm (stretching, isometric, isotonic with or without bearing).

4. Useful recommendations to parents

Children should not be forced to participate in a sport, just because ergonomic physiological control revealed that they can have a satisfying efficiency [7,16]. On the other side, they should not be excluded by their favourite sports just because their constitutional issues showed that they might be physically impaired. Unreasonable press by the parents and coach define if the child will be happy with this sport, and if he will continue to practise it during and after adolescence.

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Parents who give great importance to victory bring stress to their child until he arrives to believe that he does not deserve it. He prefers not to participate in sports in order to avoid the delusion of failure. Children should learn how to lose and we should teach them the way to get over the feeling of failure, assuming to help them trying again.

Coach and sports teacher are essential. If they have their own lack of self-confidence, then it is obvious that they will keep on trying the athlete child beyond his personal limits, aiming only for winning, just because victory means recognition. Children do not need to be surrounded by selfish people. Only if they socialize with mature people they will have the opportunity to maturate normally.

Conflict of interest:

The authors declared no conflicts of interest.

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ΠΕΡΙΛΗΨΗ

Τα παιδιά στις μέρες μας έπαψαν πλέον να παίζουν ελεύθερα σε ανοικτές αλάνες, ενώ συμμετέχουν συστηματικά σε οργανωμένα αθλήματα υπό την καθοδήγηση εξειδικευμένου προπονητή. Σε σύγκριση με το παρελθόν οι τραυματισμοί είναι περισσότεροι, καθώς οι διάφοροι ιστοί εκτίθενται συχνότερα σε εξωτερικούς κινδύνους και σαφώς καταπονούνται εντονότερα. Η περιοχή του ισχίου και της λεκάνης προσβάλλεται συχνά. Η παροδική υμενίτιδα είναι η συνηθέστερη αιτία επώδυνης χωλότητας στο αθλούμενο παιδί, πλην όμως διάφορες άλλες δυνητικά σοβαρότερες καταστάσεις, όπως η ολίσθηση της άνω μηριαίας επίφυσης, η νόσος των Legg-Calvé-Perthes, τα αποσπαστικά κατάγματα ή τα κατάγματα κόπωσης του μηριαίου αυχένα, απαιτούν την προσοχή μας. Η πρόληψη έχει μειώσει τη συχνότητα αυτών των κακώσεων και θεωρείται σημαντικότερη από οποιαδήποτε μορφή θεραπείας. Στην αντιμετώπιση επίσης σημαντικό ρόλο μπορούν να παίξουν οι ίδιοι οι γονείς. Οι συμβουλές του ιατρού οφείλουν να στηρίζονται σε ρεαλιστική βάση και να διαπνέονται από αίσθημα αλτρουισμού και αγάπης, καθώς ο ευαίσθητος ψυχισμός των παιδιών πρέπει πάντα να γίνεται σεβαστός.

ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ: αθλητικές κακώσεις, ισχίο, λεκάνη, παιδί