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Information médicale

Medical Information

Enfant, adolescent et pratique sportive
Diagnostic et traitement des pathologies spécifiques

Children and Adolescent in Sport
Diagnosis and Treatment of specific Injuries

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CHILDREN AND ADOLESCENT IN SPORT
DIAGNOSIS AND TREATMENT OF SPECIFIC INJURIES

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There are 5 concepts that are essential in understanding the goals of sports medicine treatment:

a child is in a constant state of physical and psychological growth as he/she moves toward adulthood: he/she has a vacillating free will which is influenced by those around him/her;

sport must remain a fun activity, chosen and loved by the child who practises it;

a child is a mosaic of growth cartilage. Acute trauma or chronic micro-traumas will often cause growth cartilage injury;

overtraining has a counterproductive effect and results in deteriorating performance levels or effects essential areas of the child's overall well-being, such as loss of motivation, pain, asthenia, relational disturbances, emotional disorders, sleep or eating disorders, troubles in keeping up with educational demands etc. Therefore a balance must be established between the needs of the child and the demands of sport

the execution of certain elements must be limited once distress has been identified.

Growth Reference Points

Puberty (pubic pilosity) begins at 11 years bone age in girls and 13 years bone age in boys. Menstruation begins around 13 years bone age.
Girls reach their adult height at 15 years bone age, boys at 17 years bone age.

Certain primarily female sports (notably artistic gymnastics, figure skating, classical dance), when practised intensively, may affect the rate of growth: there may be a parallel deceleration of bone maturation (sometimes up to 4 years retarded growth as compared to real age) and a subsequent delay in growth to mature adult height, though the child's adult height will not be different from what it would have been had he not practised a sport. This deceleration of bone maturation explains delayed puberty and subsequent delayed muscular development, which has an impact on the muscular capacities of young athletes and which explains delayed growth cartilage pathologies.

It is important that the Physician does not oversee hormone deficiency disorders in these cases, so a full serological hormone evaluation must be made.

Role of a paediatric sports physician

The role of a physician here is of primary importance. The physician must encourage without forcing and should be able to evaluate an athlete's talents, keeping in mind both supervised and unsupervised activities, and may assist in recommending an appropriate sport for the juvenile athlete based on the athlete's sporting adaptability, observed talents, physical condition and state of health (e.g. asthma, excess weight, osteochondrosis, etc.). The physician should also be able realistically evaluate an athlete's ability to be active even if they have a cardiac murmur, scoliosis or some other form of disability that may or may nor affect their sporting ability.

It is important to monitor young athletes, to detect signs of overexertion early on. A physician may need to curb, modify and modulate the child athlete's sporting activity at an early stage in order to help the child stay in that particular sport.

The physician should educate the young athlete on the need to have respect for a healthy lifestyle with proper nutrition, (4 meals, complex sugars, water, calcium etc.) and inform on the benefits of sport, the need to respect the rules of sport and fair-play, the need to be able to control minimal pain and finally endeavour to induce a level of psychological stability (motivation, pleasure, mastery, pursuit of glory) in the young athlete. A physician should explain to an athlete's parents that their role differs from that of a coach and that the parents must be aware of danger signs such as excess psychological pressure being applied by domineering coaches. The physician should offer information on doping matters and prevent creating a bond between the unnecessary intake of food supplements, e.g. vitamins, with sporting success and thus subsequent dependency tendencies that may lead to doping at a latter stage.

A physician must inform the young athlete of the importance of systematically inquiring of his doctor or pharmacist if a prescribed medication is on the WADA Prohibited List, in order to foster a sense of responsibility in relation to doping matters.

A child is a mosaic of growth cartilage

It is important to realise that acute trauma in a child may result in injuries to the epiphyseal or apophyseal growth cartilage.

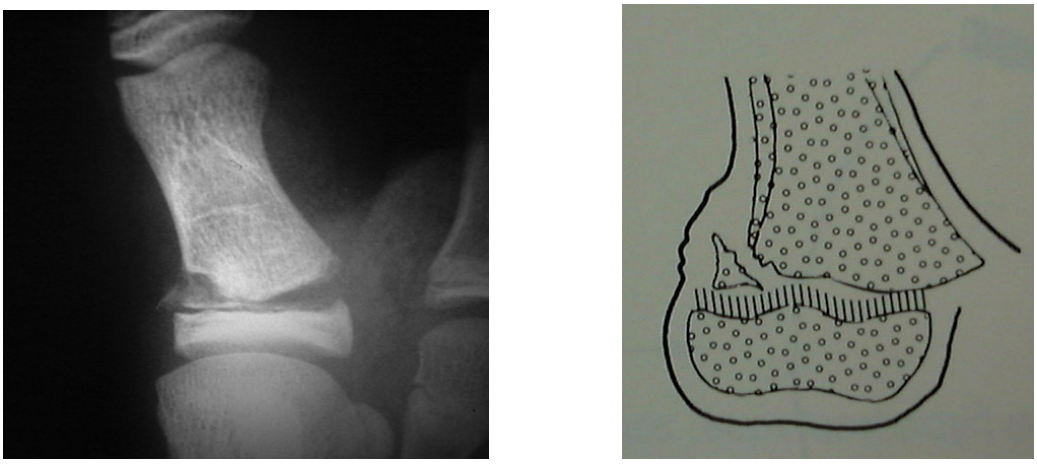


Fig. 1: separation of epiphysis Salter II

Chronic overexertion with direct impact on apophyseal growth cartilage may in a child lead to osteochondrosis, whereas in an adult it would lead to tendonitis.

Acute trauma

Fractures in children have their own pathogenisity including frequency, anatomical relationship to diaphyseal or epiphyseal areas etc. While many fractures will only cause moderate discomfort for a period of time – other fractures may cause serious initial damage and may be associated with injury to the growth plates and result in growth cartilage disorders.
The sports most commonly associated with injuries in young athletes usually involve running and jumping, but also contact and combat sports, where injuries are often associated with blows or falls.

Fractures

Metaphyseal fractures:

Fractures to the radial metaphysis are the most frequently seen fractures in children. Associated scaphoid fractures are often present (and overlooked) and must be systematically eliminated. Typically, these fractures occur when trying to break a fall with an extended wrist. .

Fig. 2: fracture to the radial metaphysis

Diaphysis:

The most frequently seen fractures are of the clavicle, the radius and ulna. metcarpals, the tibia and the fibula. If not grossly distorted or dislocated, or associated with soft tissue injuries, diaphyseal fractures are usually less severe in that growth cartilage is not affected. Reduction that would be necessary in an adult, is often unnecessary in a child due to their ability to remodel bones, however orthopaedic casts are usually necessary. Epiphyseal dislocation usually occurs at the wrist, ankle, knee humeral head and elbow epiphyses.

Fig. 3: Salter I distal radius epiphyseal separation

In children, cartilage is like a nail and ligaments are like strings attached to that nail. If you pull on the string, the nail may give way. A muscle sprain sustained by a child athlete can often be associated with an epiphyseal cartilage fracture and should be treated as such until proven otherwise. Similarly, a muscle tear in children should be treated as an apophyseal cartilage fracture until proven otherwise.

An epiphyseal fracture (separation) is serious in that it has an impact on growth cartilage. The risk of epiphysiodesis (premature ossification of the growth plate) may lead to shortening or angulation of the bone. Reduction or relocating must be exact. In most cases of displacement, surgical treatment is necessary.
Avulsion of the ischial tuberosity ossification nucleus, at the point of tendinous insertion can, as we all know, also occur in adults.

Fig. 4: Avulsion of the ischial tuberosity ossification nucleus

In the child athletes knee, meniscal lesions usually affect the lateral meniscus and may result in constitutional discoidal dysplasia. The decision to operate on meniscal lesions in children is often individual but most agree lesions in areas with good blood supply should be sutured. Tearing of the anterior cruciate ligaments is rare; avulsion of the Tibial Tuberosity at the point of Patellar Ligament insertion is a more common injury. This avulsion fracture is a disabling injury, as stabilising surgical treatment requires a bone maturation of age 15 years, after the patellar epiphyses have reached full ossification.

The cervical spine is also at risk in certain contact or vaulting sports, notably rugby, with the swift engaging at the scrum, the banging of heads, scrum collapse and head to head collisions being prevalent. All spinal traumas must be considered serious, even if an athlete is able to stand up. The same is true for any cranial trauma accompanied by loss of consciousness. A cervical sprain or vertebral fracture is potentially unstable and should be considered a neurological risk. Athletes should desist from training immediately, until a complete medical examination can be performed.

External patellar dislocations occur in adolescents with existing patellofemoral dysplasia and may be the result of painful chronic patellar instability, or the due to acute trauma.

As for wounds and bumps, they are countless.

It is imperative that an injured child terminates training immediately. Only after a full medical examination has been completed should a young athlete recommence training, and then only if the athlete so desires and is not in pain.

Broken teeth: react quickly

Dental trauma requires rapid intervention – the quicker the athlete is treated, the greater the chance of salvaging the tooth in working condition. If a tooth has been evulsed, it should be re-implanted within 20 minutes of the accident.

Chronic repetitive trauma

Tendonitis and muscular tearing are very rare in children, whose tendons are attached to unossified apophyseal cartilage. In cases of intense and repeated tensile stress or multiple percussions, the tendon resists, growth cartilage begins to bulge and dissipate; the result is apophyseal osteochondrosis.

Fig. 5 : Fragmented appearance of tibial apophysis of the knee

Osteochondrosis represent 80% of chronic micro traumatisms in children, which result from the following strenuous efforts:
tensile stress on the apophyseal cartilage (secondary or accessory ossification nucleus, nonarticular, at the insertion point of the tendon).
Apophyseal osteochondrosis is to children what tendinitis is to adults.
compression of the articular enchondral cartilage (articular osteochondroses).

Osteochondrosis is a common condition in active children and adolescents between the ages of 7 and 16 who participate regularly in sport. It is caused by overexertion, incorrect training or by training on incorrect surfaces. It results in pain and functional disability, especially in the lower limbs (take-off and landing, acceleration, kicking, abrupt changes in direction), but also in the upper limbs (throws, flips).

In Gymnastics, symptoms appear while the athlete is in action and subside with rest. Palpation of the affected ossification nucleus is painful and swelling is often found. Alternate contraction and overstretching of the adjoining muscle is painful; the patient identifies this pain. Usually, no effusion in the adjacent joint is noted. Clinical signs are often sufficiently characteristic, however the radiological findings of the ossification nucleus can be extremely varied showing a shattered or fragmented and irregular appearance. Supplementary radiological examination should be considered even if the clinical findings are normal, in order to eliminate the possibility of a skeletal tumour, osteomyelitis or other inflammatory condition.

Obesity contributes to the onset of these conditions, as do precocious intensive training, repetitive movements, exclusive resistance training, insufficient warm up, a poorly designed training exercise or overly intensive training (duck walk, squats, jumps, hopping on one or two feet, push-ups).

The most common sites are the posterior calcaneus, at the point of insertion of the Achilles tendon (Sever's disease), presenting between the ages of 7 and early puberty,

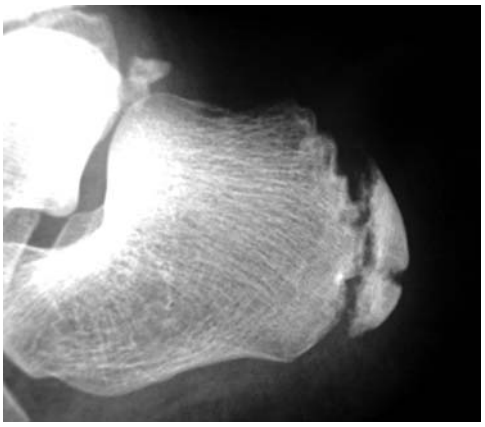


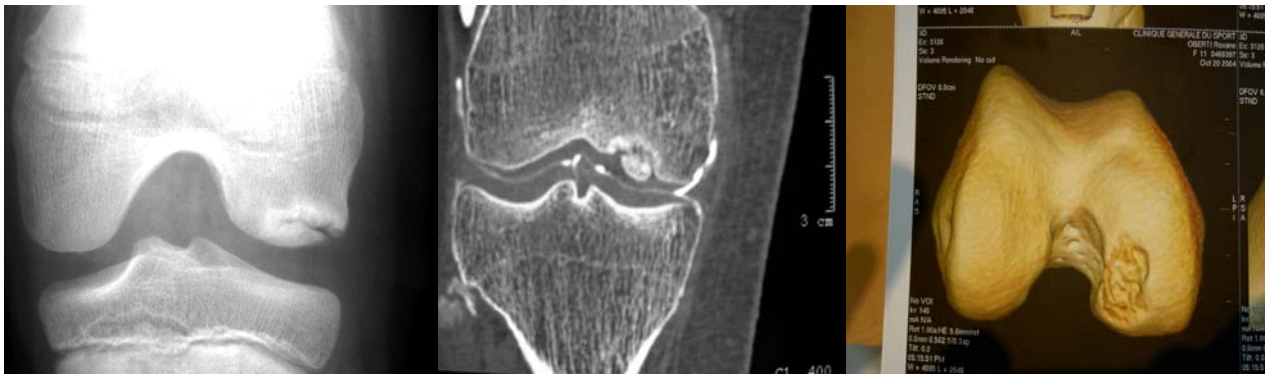
Fig. 6: Sever's Disease

The anterior tibial tuberosity, at the point of insertion of the patellar tendon (Osgood-Schlatter's Disease), most common in 9-15 year olds.

Fig. 7: Osgood-Schlatter Disease

Other areas can be affected depending on types of activity:

the anterior superior iliac spine,
midpoint of the kneecap,
epicondyle or epitrochlear nuclei of the elbow.
the femoral condyles,
the patellar facets,
the ankle bone
tarsal navicular bone,
proximal part of the 2nd metatarsal and the humeral condyle, which bring a necrotic pain in the primitive ossification nucleus.



X-Ray, MRI, 3D Scan

Fig. 8 : Internal condylus osteochondritis

Accessory ossification nuclei may also be affected:

accessory tarsal scaphoid,
vesalian bone at the base of the 5th metatarsal,
sesamoid at the top of the 1st metatarsal.

Scheuermann's disease, or juvenile vertebral epiphysitis is caused by repetitive intervertebral stress (lifting, jumping), the disease being characterised by the advent of dorsal or dorsal lumbar pain during puberty and after heavy strain or after holding a prolonged static position. Complications may include permanent kyphosis of the upper spine).

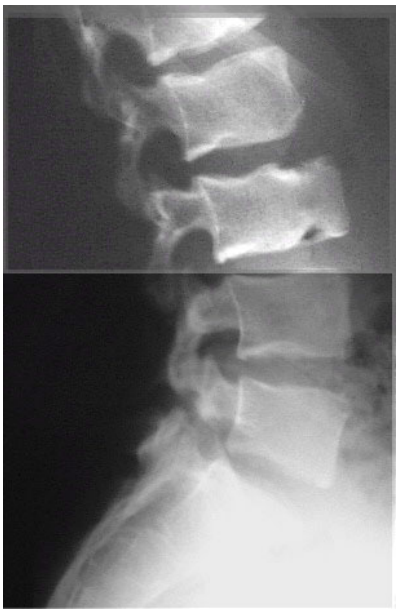


Fig. 11: Scheuermann's Disease

Treatment of osteochondrosis

is quite simple to explain; practical enforcement (patient compliance) is quite another issue. No formal sports restrictions should be given to children, rather let the level of pain decide the appropriateness of any given activity. Rest is often necessary, but must be justified and relative. There is no use prohibiting a child from practicing a sport if he's running up the stairs, playing at school breaks, roller-skating with his friends or carrying a heavy backpack. Thus, treatment includes informing physical education teachers, coaches and parents, as well as heightening awareness in the children themselves. Immobilisation is justified in unmanageable hyperalgia only, and for a duration of three weeks.

Surgery may be involved for cases involving complications and repercussions (residual intratendinous osseus sequestration, surplus bone excision).

Back braces may become necessary as the kyphosis (Scheuermann's disease) progresses.

Spondylolisthesis :

Lumbar pain in athletes is the consequence of excessive strain, which combines vertebral compression and rotational motions with an exaggerated lumbar curve. Stress of this kind may lead to a fracture when there is an acute trauma to the isthmus of the 5th lumbar vertebra, caught in a pincer movement between the vertebrae above and below. This is isthmus lysis. The posterior process of the vertebra having been broken, the vertebra slips forward (much like a slippery bar of soap), resulting in spondylolisthesis.

6% of the non-sporting general population present with this type of lysis. Its onset occurs progressively, starting at the age of 2-5 years when a child begins to walk and explore his sense of equilibrium at the expense of a lumbar curve which more or less compresses the 5th lumbar vertebra. Pain may become aggravated during adolescence when inappropriate or overly intense lumbar stress is applied.

While an acute traumatic fracture justifies immobilisation using an orthopaedic brace for a 2-3 month period, painful decompensation of a pre-existing isthmus lysis is not a contraindication to sport practice, intensive or otherwise, providing the activity does not trigger too much pain.

Early and rigorous pain management is effective in the treatment of pathologies involving overexertion of this kind; the child and his caregivers must remain vigilant. From an unpleasant sensation to the violent externalisation of pain, discomfort is expressed in a way which reflects a child's age. The child's perception of pain differs depending on the maturity of nociception, the way he communicates and how he expresses emotion in a relational context.

A child will need to learn to identify pain and communicate it to receptive caregivers, who will explain its cause clearly and in simple terms. The child respects his condition by easing up, and modifying or terminating an activity after pain onset. A great many pathologies involving overexertion could be avoided if only a child would learn to effectively manage his pain.

Treatment may also involve alterations to a training programme or of technical elements, modifications to equipment, adequate physical preparation, a progressive training method and sufficient warm-up.

Conclusion:

Responsibility for a juvenile athlete falls to coaches, educators, parents and doctors; it is a task which requires diligence and sensitivity. These individuals will need to be on the lookout for signs of overexertion or poor training techniques, which will translate into a general imbalance in the life of a young athlete: lack of motivation, counter performance, asthenia, social and emotional disturbances.

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