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## Osgood-Schlatter disease in young athletes

Katarzyna Ciechanowska

Department of Laser Therapy and Physiotherapy, Nicolaus Copernicus University in  
Toruń Collegium Medicum in Bydgoszcz, Poland

### Correspondence address:

Nicolaus Copernicus University in Toruń

Collegium Medicum Ludwika Rydygiera w Bydgoszczy

Department and Laseroterapii i Fizjoterapii

ul. Techników 3, 85-801 Bydgoszcz

email: [kasia.ciechanowska@gmail.com](mailto:kasia.ciechanowska@gmail.com)

### Abstract

Avascular necrosis constitute a syndrome characterized by the withering away of bone tissue and cartilaginous tissue without the participation of pathogenic microorganisms. This disease often occurs in the roots of the growing bones of children and young people and

is a consequence of the lack of connection between vessels and the metaphyseal bone epiphysis (lack of collateral circulation) during growth.

The aim of this article is to review the literature on the characteristics of Osgood-Schlatter disease, its etiology, diagnosis and physiotherapy.

**Key words:** sterile necrosis of bone, Osgood-Schlatter disease, physiotherapy

## **Introduction**

Sterile osteonecrosis is a disease syndrome that is characterized by the death of bone tissue and cartilage without the involvement of pathogenic microorganisms. In 1910, the German surgeon Georg Axhausen introduced this term to medicine. This condition often occurs in the roots of the growing bones of children and adolescents and is a consequence of the lack of connections between the vessels of the epiphyses and the metaphyseal bone (no collateral circulation) during the period of growth. Sterile bone necrosis is a term for approximately 40 disease entities. Their common feature is a similar clinical course and a similar picture of anatomopathological changes [1]. The most common diseases in children and adolescents are: Perthes' disease (necrosis of the Legg-Calvé-Perthes type) - necrosis of the head and femoral neck, Osgood-Schlatter disease - tibial tuberosity necrosis, Freiberg-Köhler disease II - necrosis of the head II, less frequently III of the metatarsal bones, Köhler's disease I - osteonecrosis of the boat, Haglund-Sever disease - calcaneal basal necrosis and Scheuermann disease - necrosis of the vertebrae of the vertebrae.

One of the most common sterile bone necrosis in children and adolescents practicing various sports is Osgood-Schlatter disease (OSD - Osgood Schlatter disease). It was described in 1903 in two independent works by Robert Bayley Osgood and Carl Schlatter. Despite the fact that the disease has been known for over 100 years, its etiology is still not fully understood. Originally, the most popular theory regarding the causes of tibial tuberosity damage was idle necrosis of the tibial tuberosity [1, 2]. Other researchers

consider the basis of the disease to be the avulsory effect of the patellar ligament, which is caused by frequent and repeated intensive work of the quadriceps muscle of the thigh. However, the effect of this is defragmentation of the nucleus of ossification of tibial tuberosity [3, 4]. Osgood-Schlatter disease appears in children between 8 and 15 years of age, more often in boys, 20-30% on both sides. Increased risk of the disease occurs in children practicing sports, in particular such disciplines as: volleyball, basketball, athletics, football, gymnastics or figure skating [3, 4].

Wool necrosis of tibial tuberosity largely excludes from participating in training for a long time. The group especially exposed to injuries of the knee are footballers. Frequency of training, continuous movement and short time for regeneration adversely affect the joints. At the beginning, children signal pain around the knee joint, with time the pain builds up and increases after each workout. At a later stage, in many cases, sterile necrosis of the tibial tuberosity is diagnosed. Ailments associated with the occurrence of this disease exclude young players from participation in classes and trainings for a few weeks or even months [5, 6].

## **Diagnosis**

The etiology of the disease is not fully understood. The cause of the disease is inflammation of the joint, which persists for a long time, as well as disorders of blood circulation caused by embolism, microinjuries or hormonal disorders, as well as disorders of the coagulation process. Diagnostics OSD is based on the interview, clinical examination and assessment of X-ray (X-ray). Some authors also propose ultrasound examination (USG) as available, fast, harmless, and above all giving measurable results. Both computed tomography and magnetic resonance imaging should be considered only in non-typical cases [7, 8].

Young athletes who are suspected of sterile osteonecrosis most often complain about tenderness about 5-7 cm below the kneecap, as well as pain that increases during or after physical activity. It is possible that swelling occurs in the region of tibial tuberosity due to the long-term effect of the disease. With high physical activity and many months of pain, athletes also complain of pain, which occurs all the time even when touching the painful area or can also radiate upwards on both sides of the kneecap. X-ray examination shows the growth of

tibial tuberosity and / or its defragmentation. In the USG examination, additional edema of the superficial and deep superficial bursa and also increased blood supply to the patellar tendon [8, 9].

Osgood-Schlatter disease is a common cause of pain and swelling in the area of tibial tuberosity, which results in reduced physical activity of adolescents aged 11-14. There was also observed the dependence of the occurrence of sterile bone necrosis on the practiced sport. According to the authors, athletics and football are the most predisposing sports to the occurrence of OSD in connection with the largest amount of exercises and movements consisting in knee joint extension from bending above 40 degrees [8, 9].

In the studies of other authors, the frequency of Osgood-Schlatter disease in the youth practicing football was evaluated. The relationship between the disease and the intensity of training, the effect of rehabilitation on the course of the disease was also checked and the occurrence of Osgood-Schlatter disease was analyzed for genetic inheritance. Lewandowska and co-authors stated that the intensity of training does not affect the occurrence of OSD and the rehabilitation and learning of correct attitudes has a big impact on the speedy recovery and prevents the recurrence of the disease. It has been observed that the incidence of Osgood-Schlatter disease in adolescents training in football depends on many factors first and foremost on rapid growth as confirmed by the results of the research [10].

## **Treatment**

OSD treatment is mainly associated with conservative treatment. It mainly involves limiting physical activity, which exacerbates the symptoms of the disease. Non-steroidal anti-inflammatory drugs (NSAIDs), physiotherapy, manual therapy as well as physiotherapeutic treatments are also used. Currently, there is no protocol in evidence based medicine - EBM, which would address the problem of sterile bone necrosis [8, 11].

In the treatment to improve the Osgood-Schlatter disease, it is advisable to use physiotherapeutic treatments aimed at reducing the symptoms. In the acute phase, analgesic and anti-inflammatory treatments that do not increase the temperature of the local tissues: cold therapies, low energy laser therapy and magnetotherapy can be used in the acute phase. In subsequent phases, the following may be included in the physical procedure: sonotherapy or phonophoresis (impulse wave), high-energy laser therapy, interference currents, impulsive

short-wave diathermy, phonophoresis consists in introducing an analgesic and anti-inflammatory medicine by means of ultrasound wave. The effects of ultrasound penetration of drugs applied to the skin surface is more effective. Physical methods are an important element of rehabilitation. From a physical point of view, the use of physical methods is based on the delivery of a specific energy to the body using various forms of its transmission. The effectiveness of the methods used is conditioned by many factors that must be taken into account during the planning and implementation of physical therapy [12].

Low-energy laser radiation is now an increasingly popular therapeutic agent. In practice, it mainly uses its analgesic, anti-inflammatory, anti-swelling effect and accelerates wound healing. The analgesic effect of laser therapy is not clearly demonstrated and is a contentious issue among researchers. Various results of scientific research contributed to this, as well as the lack of explanation of the neurophysiological mechanism of analgesic effect of laser therapy [13].

During acute pain, relief from the patients is provided by treatment with cold, or cryotherapy. This treatment by reducing the temperature of the skin and other tissues reduces the pain associated with a decrease in the conductivity of the nerve fibers, inhibition of nociceptors in the skin, partial or complete blockage of C fibers and reduced release of pain mediators. It also inhibits the inflammatory process, which is explained by a decrease in the local metabolic activity of the cells affected by inflammation and the reduction of enzymatic reactions, which means a reduction in the activity of inflammation mediators [14].

A characteristic feature of the magnetic field is penetration through all structures of the system. It distinguishes the magnetic field from other forms of energy that are absorbed into a specific depth of tissue. The best-known ones include, among others, the stimulating influence of the field on cellular respiration processes and tissue regeneration. Magnetic field affects the improvement of tissue oxidation and respiration, angiogenesis and revascularization (vascular regeneration), intensification of soft tissue regeneration, acceleration of bone adhesion formation, anti-inflammatory and anti-swelling effects, analgesia [15].

In addition to physiotherapeutic treatment, the authors pay attention primarily to limiting physical activity. In addition, gentle stretching of the straight thigh muscle - its proximal attachment, kinesiotaping in order to relieve the patellar tendon or the hypothalamus as well as stabilization exercises. Dziak and co-authors in some cases propose

to limit running for 12 weeks and also to modify sports footwear. In contrast, in advanced cases associated with a multi-week pain in the area of tuberosity of the tibia, they recommend immobilizing the limb in the orthosis with access to the pain site. In this area, they recommend the use of therapeutic cold treatments to reduce pain. They also suggest a different physical procedure, such as iontophoresis, in which a painkiller and an anti-inflammatory drug is introduced using direct current. According to the authors, also thermotherapy treatments can be used in sterile tibial tuberosity of the tibia. With increased muscle tension in the anterior and posterior areas of the thigh, warm compresses can be used. Apart from physical procedures, it is also suggested to stretch and strengthen the quadriceps [16].

In the studies of other authors, in which 261 patients with Osgood-Schlatter disease were examined, up to 90% of patients responded well to the reduction of physical activity and the use of non-steroidal anti-inflammatory drugs. 24 patients without improvement were subjected to a surgical procedure. Other authors also recommend rest and limitation of physical activity among young athletes. Researchers recommend a break in training between 3.2 and 7.3 months [17, 18].

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