

Overuse Knee Injuries in Athletes

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ABSTRACT

According to many statistics over 55% of all sports-related injuries are incurred in the knee joint (active sportsmen and recreationists). The statistics definitely differ, depending on type of sport and specific movements habitually performed in a particular sport. Therefore, in addition to acute knee injuries overuse syndromes are common in the knee area also due to specificities of patellofemoral joint just because specific diseases like „jumper's knee“ and „runner's knee“ are related to certain sport activities. Generally speaking, these syndromes occur due to poor orientation of the knee extensor mechanism, i.e. friction of iliotibial band and patellofemoral chondromalacia. It is believed that about 45% of all overuse syndromes in the knee area occur as a result of running.

Key words: Knee, Overuse, Sport.

Dear Editor-in-Chief:

Given the anatomical structure of the knee, where the upper surface of femur is of relatively curved shape like skis and "slides" against the flat lower tibial surface, it is the most frequently injured region not only in acute injuries, but also as a result of overuse¹. Major role in maintaining knee joint stability is played not only by its bone congruence but also by numerous tendons and ligaments insertions, joint capsules and bursa mucosa. All these knee stabilizers are divided into so-called active and passive stabilizers. It is therefore not surprising that in the knee joint and around it microtraumatic cumulative disorders manifested by occurrence of so-called painful syndromes do not occur so rarely. Depending on their anatomical localization, these syndromes are divided into four groups: anterior, posterior, medial and lateral².

Anterior knee pain is related to the main sport activity with lot of jumping and landing components, which significantly increases mechanical overload of knee extensor mechanism. Anterior knee pain presupposes so-called jumper's knee, Morbus Hoffa and pathological changes in patellar cartilage (chondromalatio)^{2,3}.

Jumper's knee as an overuse syndrome is certainly one of the most common injuries that happen in sports, which have a large number of jumps. Some authors state that even 45% of elite male volleyball players have experienced difficulties of this type during their careers. Strength of front thigh muscles (quadriceps) is significantly higher of the posterior muscle group (biceps femoris) which consequently leads to enthesopathy of proximal and distal insertion of the patella. Ferretti reports that jumper's knee represents 28% of all sport injuries in volleyball. In addition, he concludes that the type of training plays minor role in contrast to the quantity and length of practice, as well as physical characteristics and biomechanics of lower extremity in a particular athlete⁴.

During five-year research, Kujala et al reported that 26.4% of athletes among 2762 with knee disorder who were treated in outpatient unit have had jumper's knee. That is why he believes

that this injury has greater incidence than any other knee injury like meniscus tear or anterior cruciate ligament (ACL) tear⁵. Pečina et al. found that in 21.3% pathological changes affected quadriceps tendon insertion to patella, 72.1% involved inferior patellar pole and 6.6% involved tibial tuberosity^{2,6}.

The main symptom is pain in the inferior or proximal pole of the patella. The pain is sharp, of varying intensity and usually develops gradually without any association with a direct trauma. In the beginning of the disease, pain occurs after training or a match, and disappears after a short period of rest. If training process continues without adequate treatment procedures, pain becomes stronger and lasts throughout sporting activity and after it. In addition to spontaneous pain when the knee is bent (receiver volleyball position), a slight pressure occurs in the distal pole of the patella, as a characteristic diagnostic sign. In advanced cases, the functional ability of the knee is reduced and accompanied by feeling of weakness and kneeling and sports activity becomes practically impossible. Therefore, the characteristics of overuse syndrome of jumper's knee would be pathological changes in tendon insertions of extensor mechanism (leg extensor) of the leg. Since they generally occur in athletes who heavily load their quadriceps during sports activity (volleyball and basketball players, skiers, jumping disciplines, weightlifters rarely others), the reasons for occurrence of these injuries should be primarily sought in the characteristics of a particular sport, constitution type of the participants in these sports activities, and then in the planning of training and training errors that occur during its performance⁷.

Constitutional type would in principle fit to Sheldon's classification of ectomorph type, whose characteristics are: tall stature, slim figure, high forehead, thin face, pointed nose, long and thin neck, narrow chest and abdomen, rather long, thin arms and legs with long and narrow muscles⁸. If elements of an eventual deformity of valgus or varus of knees or lower legs are added to this constitution type, it is clear that there is an unbalanced load transfer to elements of the knee extensor mechanism.

It is certain that biomechanics disorders of the foot and its static and dynamic functions are not rare and insignificant

reason for the occurrence of overuse syndrome of the whole extremity. Length of lower - extremity lever is significantly higher in tall people than in short, so therefore the range of motion of the knee is much higher. The existence of a database of anthropometric values and the anatomical and physiological characteristics of athletes would facilitate decision making for possible causes of frequency of their injuries.

After long-term overuse in inadequate and uneven load during the training process it comes to sensitivity, illness of the weakest part of the extensor mechanism, which is often distal or proximal pole of the patella. One of the causes of jumper's knee occurrence may be the sudden beginning of normal activities after a long break, without previous adequate preparation of musculature and insertion sites of the extensor mechanism⁹.

At top-level players, who are in a continuous process of training, overuse syndrome may mean the introduction of some new exercises with higher loads or number of repetitions that they had not done before. Combination of large number of repetition of certain movements that is associated with jumps is also possible (strengthening exercises - quadriceps strengthening exercise), for example smash exercise targeting specific areas in a deep squat position during landing, with previous or later exercises in the gym on the same day which contain ejection with loads greater than 10 kilos and compulsory jump at the end of the exercise. Continuous repetition of new half-squat exercises, with repetition of technical errors during performance of the element itself and a greater load of one side can also be the reason for the occurrence of overload in the knee area¹⁰.

Fitness training has an important role in any professional and recreational sport. Many sports should involve skillfulness, agility, good coordination, jumping ability and explosiveness, extremely well developed general and specific strength, and therefore the reason for the high quality fitness training is great. Knowledge of the elements and characteristics of a particular sport requires serious and studious approach to planning and programming of fitness training. That is why every physical conditioning coach must take account of several important factors, including: the anthropological characteristics of players, their individual current motor skills, requirements for conducting fitness training, calendar of championship and important matches and, at the end, the basic elements and the essence of sport.

According to some authors, the foundations of fitness training are:

- Explosive strength training 50% (jumps, sprints etc.);
- Strength training 25-30% (specific and general strengthening exercises);
- Aerobic training 20% (high-intensity interval training).

It is certainly indispensable the training of coordination, as well as training of skillfulness and agility, as the basis of motor abilities of each athlete in general.

Morbus Hoffa syndrome is the name for symptoms incurred by traumatizing the intrapatellar fat pad during repeated knee extension movement. The characteristic pain occurs during sudden passive hyperextension of the knee, with occasional blockages that are similar to meniscus injuries (Smiley's sign). Treatment of this syndrome is rarely surgical and requires rest, therapy with non-steroidal anti-rheumatic drugs (NSAIDs), isometric exercises, cooling, wearing orthotic insoles support heels pads and reduced knee hyperextension¹¹.

Chondromalacia patella results from degeneration of cartilage of a various degree, while there has been no change in

subchondral bone. Initially, these changes are reversible and later irreversible due to severe degenerative changes. There are a lot of divisions of joint cartilage destruction, but the Outerbridge classification is the most commonly used where chondromalacia of the first grade is manifested as softening or swelling of cartilage, while the fourth grade is cartilage destruction with exposed subchondral bone¹².

The syndrome of lateral hiperpressure of the patella is the anterior knee pain with no patellar instability. Pain or discomfort occurs during forced flexion of the knee, when going down the stairs and downhill, but also during forced and prolonged sitting or running. Pain occurs during these activities, but more often after the activities, at rest. During examination lateral facets of the patella is painful when palpated. Upon patellar flexion of the knee, a shortened lateral retinaculum can be seen, followed by inability to move medially^{12,13}. X-rays axial images of the knee held in 30 ° of flexion show a different degree of knee flexion, the so called patellar tilt as well as subchondral sclerosis of the lateral facet.

Patellar Subluxation Syndrome is the most common syndrome within the framework of Patellofemoral dysplasia (PFD). Patients experience blockage of movements and an unstable kneecap (a feeling of the knee "giving way"). The pain occurs in lateral facet of the patella, and if occurs parapatellarly medially, it is due to inflammation of the medial parapatellar plica as a result of lateral patellar dislocation¹⁴.

Medial Knee Pain is associated with the synovial fold syndrome and the three most important are: plica suprapatellaris, plica infrapatellaris and plica synovialis medialis. Fibrotic changes of a medial synovial fold cause impacts with medial facet of the patella, resulting in a sound phenomenon of "clicking" in the ankle with occasional blockages. In indicated cases (of particularly hypertrophic type), this so-called "third meniscus" must be removed with arthroscopic knee surgery^{15,16}.

M.semimembranosus syndrome is characterized by pain in the posterolateral corner of the knee just below the joint cavity and is often replaced by symptomatology of meniscus injury. Treatment is generally conservative, and only rarely does a surgical intervention become necessary.

Pes anserinus syndrome occurs frequently in long-distance runners and those athletes who have abnormal biomechanics of the lower extremity (valgus and external rotation of the tibia). Bursitis is more common and is easily diagnosed clinically and by ultrasound, but the problem of tendon enthesitis pes anserinus represents much bigger problem. Treatment of pes anserinus syndrome is typically nonsurgical and includes administration of local anesthetic with corticosteroids.

Swimmer's knee mostly occurs in breaststroke swimmers, but also in other swimming disciplines, and is considered to be the cause of the symptoms of enthesitis of the medial collateral ligament insertions on the medial femoral epicondyle. It frequently affects both knees, and the most important prevention of symptoms is proper swimming technique.

Lateral knee pain is usually manifested by iliotibial band friction syndrome (ITBFS) that results from activity comprising many repetitive flexion and extension movements of the knee, during which rubbing of the band against the lateral femoral epicondyle occurs. This produces irritation and subsequent inflammatory reactions within the iliotibial band or formation of underlying bursa and secondary inflammation. This syndrome is the most common in runners, especially in recreational joggers, but also in all other sports, whose activities entail a lot of running¹⁷. Causes for occurrence of iliotibial band friction syndrome are multiple, but the most frequent are abnormal biomechanics of the lower extremities (for example, knee

varus) or errors made during training. This syndrome is characterized by pain on the outer side of the knee (lateral knee pain), in the lateral condyle of the femur 2 cm. above the joint cavity Lidenberg has proposed four-grade classification of injury grade according to symptoms in ITBFS. At grade 1, pain comes on after the run, but does not restrict distance or speed. At grade 2, pain comes on during the run but does not restrict distance or speed. At grade 3, pain comes on during the run and restricts distance or speed. At grade 4, pain is so severe that it prevents running.

Treatment of iliotibial band friction syndrome is frequently non-surgical. It is necessary to perform stretching exercise for iliotibial band, which is usually shortened in these athletes and proven by Ober's test. For the success of treatment, it is very important to correct biomechanical imbalances of the lower extremity, which is achieved by a suitable sport shoes with orthotic shoe insoles according to the computer model derived. Injection of local anesthetic with corticosteroid injected between the band and lateral epicondyle of the femur can be a very successful treatment, especially if inflammation of bursa occurred. In some cases resistant to conservative therapy, the surgical treatment is necessary, which consists of a limited resection of a small triangular piece at the posterior part of the iliotibial band covering the lateral femoral epicondyle^{17,18,19}.

Popliteus Tendon Syndrome is the pain in the area above the origin of the popliteal muscle on the lateral part of the lateral femoral condyle. Excessive and/or extended pronation of the foot during running is considered to be a predisposing factor in developing this syndrome. For clinical examination, the knee is placed in the so-called „figure four position” when the pain is palpated in the front and distally from the origin of the lateral collateral ligament²⁰.

Posterior knee pain is manifested in so-called fabellitis or fabella syndrome, which is present in 10 to 18% of the population, i.e. in those ones who have sesamoid bone fabella located on the posterior side of the lateral femoral condyle in the lateral head of the gastrocnemius muscle. Symptoms occur as a result of overuse of cartilage of the fabella whether it is a direct trauma to the fabella or arthritic changes in the fabella. The pain occurs gradually and is associated with knee movements, either due to extension of the muscles during hyperextension of the knee or due to direct pressure on the fabella, e.g., when sitting with legs crossed. Pain is provoked by applying pressure to the fabella, in the area posterior to the lateral femoral condyle and above the joint line. If the usual non-operative treatment does not produce improvement, the fabella is extirpated surgically^{20,21}.

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PRENAPREZANJA U PODRUČJU KOLJENA KOD SPORTISTA

S A Ž E T A K

Više od polovine svih sportskih povreda (preko 55%), kako kod aktivnih sportista, tako i kod rekreativaca, dešava se na koljenom zglobu. Taj broj svakako varira obzirom na vrstu sporta i specifičnost pokreta koji se u određenom sportu izvode. Pored akutnih povreda koljena, česti su i sindromi prenaprezanja. To se objašnjava specifičnostima patelofemoralnog zgloba. U vezi sa nekim specifičnim sportskim aktivnostima dešavaju se specifična oboljenja kao što su „skakačko koljeno“ i „trkačko koljeno“. Uopšte gledajući ovi sindromi nastaju zbog lošeg usmjerenja ekstenzornog aparata koljena, odnosno trenja iliotibijalnog traktusa i patelofemoralne hondromalacije. Smatra se da oko 45% svih sindroma prenaprezanja u području koljena nastaje kao posljedica trčanja.

Cljučne riječi: koljeno, prenaprezanje, sport.