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KNEE JOINT INJURIES IN TABLE TENNIS PLAYERS

Abstract

Table tennis is assumed to be a sport with practically no injuries. This is a very common prejudice within general sports medicine community. In contrast, table tennis is accompanied with different types of injuries. There are two patterns of injuries in active table tennis players, first caused by single impact trauma, and second related to repetitve microtrauma. The latter has much higher incidence.

The purpose of this paper is to analyze available literature with respect to injuries involving knee joint.

Percentage of knee injuries in overall number of injuries in table tennis are reported to be within the range of 10 to 15 %. Most common injuries to the knee joint caused by single impact trauma are meniscal tears followed by much lower incidence of ligamentous injuries and osteochondral lesions. Rotating movements on pivoting knee causes meniscal tear. Overuse injuries around knee involve patellar tendinitis (jumper's knee), quadriceps tendinitis, semimembranosus tendinitis and rarely iliotibial band friction syndrome.

There are not many available data in the literature concerning specific knee injuries in table tennis players, in spite of the fact that overuse injuries are very often assessed in clinical practice.

Key words: *table tennis, injuries, knee joint*

Anatomy and function of the knee joint

Evolution of different tools and technologies that are available in medicine helps scientists to comprehend organic systems like knee joint on a more complex level. With time, old-fashioned picture of knee as a simple mechanic transmission has evolved with the understanding of biology. The knee is much more than a simple hinge joint, because both gliding and rolling are essential to its kinematics. It is a self-maintaining and to a certain extent self-repairing system of one trillion living metabolically active cells. Depending on the activity it endures 2 to 8 million load cycles in a year. Capability of self repairing and maintaining is in direct relation with activity. Ligaments are not just tissue bands but sensate adaptive linkages with numerous proprioceptors. It is well known that proprioceptors play major role in the nervous steering of the whole knee system. The role of the ligaments of the knee is to provide passive restraints to abnormal motion. Menisci are mobile and sensate bearings built of cartilage tissue with various functions. The collagen fibers of the menisci are arranged radially and longitudinally which allows the meniscus to expand under compressive forces and increase the contact area of the joint. Hyaline cartilage of the knee joint is a sophisticated structure composed of collagen fibers that embed gel structure with proteoglycans and water. Cartilage tissue provides elasticity to the whole joint and absorbs axial and shear forces. As long as cartilage tissue layer is fully intact the dynamic movements and full range of motion are possible. With time and repetition of loading cycles this layer is being thinned which restricts the function of the joint. Muscles that have their insertions around knee joint are extremely important for motion of the whole body. Quadriceps, hamstrings, sartorius, popliteus and biceps femoris muscle contribute to the whole range of flexion/extension and rotation movements of the knee joint.

Mechanism of injuries

Traumatic impact causes injury of a certain anatomic structure. Due to evolution and improvement of diagnostic methods, annihilation of structural elements can be observed as an outcome of stresses on a different scale. Traumatic stress may cause delicate changes in structure of e.g. muscle or cartilage collagen fibers without any traces assessable with common tools like ultrasound or MRT. Various tools like atomic force microscope or scanning electron microscope opened new perspectives. Internal reaction of a certain tissue to the applied force is called stress. Knee joint is exposed to compressive, pulling and shear forces, in static and dynamic type of loading. Injuries occur if stress exceeds level of non-damaging impact. Single impact trauma causes major structural changes and micro trauma causes minor structural changes (Figure 1).

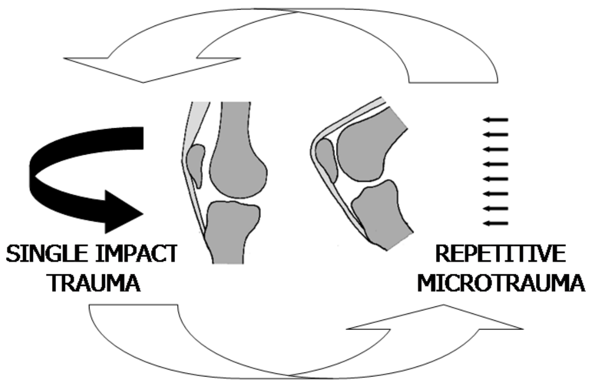

Figure 1. Mechanism of injuries

Overuse disorders can be considered injuries to normal tissue as a result of cumulative, repetitive sub maximal micro trauma due to inadequate time for recovery between stress episodes (Krivickas, 1977). The response of various tissues to stresses is different. Tendons, muscles and bones around the knee joint endure relatively lower level of damaging impact but have good healing response. In contrast, cartilage endures different repetitive loading patterns but once when injured has a very low healing capacity. Menisci are made of fibro cartilage tissue and have certain healing capacity if injured in the zone with good blood supply. Respective specific knee joint kinematics, torsion and compressive forces cause meniscus tears.

Sport results are in good proportion to effort (training and practice) to a certain extent. Athletes and their coaches have to be aware of the fact that at one point they reach the state where maximum possible effort is invested for maximum physiological payoff. Every effort beyond this point leads to injury and does not payoff.

Table tennis specific movements

Table tennis is concerned to be a low rate injury sport, especially for those players that do not have professional training and competition schedule. In cases of frequent and intensive playing, table tennis can cause characteristic injuries in different groups of players regarding age and type of game (Godeke 1998). Typical classification distinguishes three major types: offensive, defensive and half-distance players. This classification can be used only as a rough guide in understanding of specific movements because the game has evolved in the direction where many highly-competitive players mix these patterns. Players who prefer offensive game produce swift and short movements. Top-spin is usually being imposed from the beginning of the rally followed by further top-spins or a counter-attack. Due to extremely tight position to the table players have to move their upper extremities very fast and backwards, causing strain. Upper part of the body including shoulders rotator cuff, pectoral muscles and dynamic segments of spine suffer in this type of game. Affected muscles are either asymmetrically shortened affecting range of motion or overuse injuries of tendons may take place. Due to rapid acceleration and deceleration, presence of a certain form of jumper's knee in this group of players is to be expected with a very high incidence. Defensive players deploy their movements on exchange between long and short running pathways. By switching between these pathways players produce extremely fast stopping movements, simultaneously burdening lower extremities, especially knees. During the game these players maintain a very deep flexion position of the knees which may primarily affect femoropatellar joint with its cartilage layers as well as patellar tendon and insertion of quadriceps tendon. Muscles must have high proprioceptive capabilities in order to respond to the changes of pace otherwise sprains or even ruptures may occur. Half-distance players switch between different game patterns within a single rally. Therefore it is more difficult to consider this group as independent with specific injuries. Nevertheless elbow is very often affected due to the change of pace and top-spin strokes with backhand and forehand side. These movements may disturb ossification in young athletes causing juvenile osteochondrosis.

Localization of injuries in table tennis

Higher expectations of professional players and their teams impose more accurate predictions and understanding in diagnosis and treatment. There are only few studies focused on medical aspect of table tennis. Shida et al reported 25.1% injuries of waist, 15.7% of shoulder and 14.1% of knee joint (Shida, Shida et al. 1994). Kondrič et al. reported 23.3% injuries of shoulder, 9.3% of knee and 9.3% of ankle among table tennis and badminton players (Kondrič Furjan-Mandić et al. 2006). The same group of authors showed interesting distribution of injuries in various tissues. Table tennis has 52.90% of muscle injuries, 17.60% of tendon and 5.90% of joint injuries. Compared with badminton injuries percentage of muscle injuries in table tennis is significantly higher.

Types of knee injuries

The knee joint is engaged in all sport activities and due to that fact knee injuries are very common, affecting all athletes regardless of age or table tennis tactics. All injuries can be divided as shown in Table 1 into group of overuse injuries, single impact trauma and ostechondroses in young athletes.

OVERUSE INJURIES		SINGLE IMPACT TRAUMA	OSTEOCHONDROSES
Anterior Aspect	Patellofemoral pain syndrome	Meniscus tear	Osteochondritis dissecans
	Patellar tendinitis (Jumper's knee)	ACL (anterior crutiate ligament) tear	
	Stress fracture of the patella		
	Fat pad syndrome	Medial collateral ligament tear	
Medial aspect	Plica syndrome		Osgood Schlatter's disease
	Semimembranosus tendinitis		
	Pes anserinus tendinitis (bursitis)	Cartilage lesions	
	Breaststroker's knee		
	Medial retinaculitis		
Lateral aspect	Iliotibial band friction syndrome (runner's knee)	Patellar tendon rupture	Sinding-Larsen-Johansson's disease
	Popliteal tendinitis		
	Bicipital tendinitis		
Posterior aspect	Fabellitis	Quadriceps tendon rupture	

Table 1 Types of knee disorders following sport activities

Jumper's knee

By far most commonest injury affecting knee joint is disorder called jumper's knee or patellar tendinitis. In the literature this clinical entity is also referred to as patellar tendinosis, quadriceps tendinitis, and patellar apicitis or enthesitis apicis patellae. Jumper's knee is closely related to sports where athletes use the knee extensor system in repetitive manner. Rapid acceleration, deceleration, jumping and landing are provocative activities. Among all these activities maximum biomechanical load of quadriceps tendon and patellar ligament is achieved during stopping movement or deceleration in the landing phase (Pećina, Bojanić et al. 2001). Kujala et al report that 26.4% of athletes among 2762 who were treated in outpatient unit with knee disorder have had jumper's knee (Kujala, Osterman et al. 1986). This implies that this injury has greater incidence than any other knee injury like meniscus tear, ACL tear etc. Ferretti reports about incidence and etiology among volleyball players (Ferretti 1986). 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 athlete. Pećina 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 (Pećina and Pećina 1999). This responds to the clinical localization of pain. Athletes characterize this type of pain as sharp, cutting, various intensity pains, evolving gradually with no relation to single impact trauma. Functional impairment responds to the pain intensity of affected knee. Patellar tendinopathy has traditionally been graded from grade I to grade IV on the basis of pain and its relation to activity according to the Blazina scale (I-pain after activity only; II- pain before and after exercise, gradually lessening during exercise; II pain with activity causing restriction of activity; IV-pain during everyday activities). Medical history and clinical assessment play major role in diagnostics. Additionally, ultrasound, X-ray and MRT can support the diagnosis. Treatment usually starts with conservative approach avoiding provocative activities, correcting biomechanical deformities with insoles and evaluating sport shoes. Depending on the clinical grade rest is also recommended with gradual return to activities. Stretching exercises play major role in prevention, special care must be taken for hamstrings stretching. Anti-inflammatory drugs can be given over a short period accompanied with criotherapy and other procedures of physiotherapy. In long-lasting cases of non-responding to conservative treatment surgical procedures may be undertaken.

Conclusion

Table tennis is associated with low rate of injuries and no recent scientific paper has studied knee injuries in table tennis. However, clinical practice with table tennis players and studies on general sporting population show that these types of injuries have very high incidence and a very disturbing influence on the function of an athlete. Therefore studies involving this population might bring benefit in better understanding of various and specific risk factors.

Appropriate training schedule has vast influence in prevention of knee injuries. Practically all overuse injuries can be prevented with stretching and taking care of muscle balance. All joints must have full range of motion and biomechanical factors influencing the game of table tennis have to be considered. Demands and stakes of an athlete are rising with more and more competitive surrounding and inadequate warming-up and lack in stretching exercises prior to competition or practice can be first step on the way to an injury.

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