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РОЛЬ ФАКТОРОВ РИСКА В РАЗВИТИИ ХРОНИЧЕСКОЙ ПОСТТРАВМАТИЧЕСКОЙ НЕСТАБИЛЬНОСТИ ГОЛЕНОСТОПНОГО СУСТАВА

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Повреждения голеностопного сустава (ГСС) являются наиболее часто встречающимися травмами опорно-двигательного аппарата и распространенной причиной обращения пациентов за медицинской помощью. Перегрузки связочного аппарата ГСС как наиболее частый механизм травмы возникают при беге, занятиях спортивной деятельностью, неожиданном «проваливании» ноги в неровности дороги или попадании каблуков в ребристые покрытия эскалаторов метро, при резкой остановке общественного транспорта, ношении обуви на высоком каблуке и т.п. У 20-40% пациентов в дальнейшем развивается клиническая картина хронической нестабильности голеностопного сустава. В статье проводится анализ литературных данных о роли факторов риска в развитии хронической посттравматической нестабильности голеностопного сустава. В результате авторы делают вывод, что влияние внутренних факторов риска на развитие хронической нестабильности голеностопного сустава изучено недостаточно и для решения этого вопроса требуются дальнейшие исследования. Это научное направление представляется актуальным и имеющим высокую практическую значимость, т.к. его результаты должны повлиять на разработку алгоритма выполнения органосохраняющих операций на голеностопном суставе, что позволит с учетом критериев оптимизации лечебно-хирургической тактики сократить число пациентов, имеющих инвалидность, возвратить пациентов к труду, занятиям спортом.

Ключевые слова: *голеностопный сустав, травма, этиология, факторы риска, хроническая нестабильность, профессиональная деятельность, спортсмены.*

ROLE OF RISK FACTORS IN DEVELOPMENT OF CHRONIC POSTTRAUMATIC INSTABILITY OF ANKLE JOINT

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Injuries of the ankle joint (AJ) are the most common traumas of musculo-skeletal apparatus and a common reason for seeking medical advice. Overstrains of the ligament apparatus of AJ are the most common mechanism of traumas in running, sporting activity, in unexpected fallings into rough surfaces or getting with a heel into ribbed coverings of metroescalators, in a sharp stoppage of public transport, in wearing footwear on high heels, etc. 20-40% Of patients develop a clinical presentation of a chronic instability of the ankle joint. In the article the analysis of the literature data on the role of risk factors in development of a chronic posttraumatic instability of the ankle joint is given. In result the authors make the conclusion that the influence of the internal risk factors on development of a chronic posttraumatic instability of the ankle jointis studied insufficiently, and further in-

vestigations in this direction are required. This scientific trend is important and is of high practical significance, since its results could be used for elaboration of the algorithm of organ-saving operations which will permit to optimize medico-surgical approach, to reduce the number of patients with disability and to return patients to their professional and sporting activity.

Keywords*: ankle joint, trauma, etiology, risk factors, chronic instability, professional activity, athletes.*

Injuries of the ankle joint (AJ) are the most common traumas of the musculoskeletal apparatus and a common cause of seeking medical advice [1].

H. Polzer, et al. (2012) note that acute injuries of the ligamentous apparatus of the ankle joint constitute from 6 to 21% of all traumas [2]. Of much attention among damages to the soft tissue structures of the ankle joint region are isolated injuries to the capsular ligamentous apparatus which make 70-75% of all traumas of the AJ [3].

Overloads of the ligamentous apparatus of the AJ are the most common mechanism of traumas that occur in running, in sports activity, in «falling» into roughness of the road, getting into a ribbed covering in metro, in sharp stoppage of public transport, in wearing footwear on high heels, etc.

These traumas are recorded at average frequency of about 1 case per 10,000 individuals a day, with symptoms of chronic instability of the ankle joint (CIAJ) seen in 40% of patients [1]. In the USA more than 2 million cases of acute injuries to the ligaments of the AJ, 1.2 million referrals into the medical institutions are recorded annually, and the total expenses on medical assistance make about 2 billion dollars per years [4].

Despite a great interest of scientists in this problem and recent progress in diagnosis and treatment of traumatic injuries of AJ ligaments, the results of treatment do not satisfy either traumatologists, or their patients. Thus, research data of Russian authors (V.G. Golubev, Yu. G. Postnov, 2015) and experience of Moscow healthcare service show that in 20-40% of cases acute traumas of AJ lead to CIAJ, and in 72% of cases the residual phenomena of damage to the ligaments persist after 6-18 months [5]. Study of the mechanism and of risk factors that determine development and clinical peculiarities of AJ pathology is an important direction in creation of the program of prevention of AJ traumatism [6].

In some categories of people whose occupational activity is associated with significant physical loads (military service members, ballet dancers) the incidence of injury to ligaments is much more common than in other groups of population [7-9]. Besides, a social group of patients with a still higher risk of damage to ligaments of the ankle join that may lead to CIAJ are paratroopers and parachute jumpers [10,11]. Traumas of AJ ligaments in this category of patients constitute from 9 to 33% of all traumas of musculo-skeletal apparatus associated with parachute jumps, and traumas of AJ ligaments occur in 1 to 4.5 cases per each 1000 parachute jumps [12].

It should be noted that the initial acute trauma of ligaments increases the risk of getting repeated injures of AJ in parachute jumps and sports activity, which cause additional pathological alterations of the morphological structures of the joint with development of CIAJ in future [1,13,14]. These injuries often seem innocent, but even after a single trauma of the ligamentous apparatus of AJ many patients subsequently feel instability and discomfort in the joint [1,15,16].

CIAJ may also develop as a result of incorrect or inadequate treatment of the initial acute trauma of AJ ligaments.

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In the practice of a traumatologist of an outpatient clinic, patients complaining of a long-persisting pain in the AJ after injury to the ligament are a common case [17]. It should be noted that traumatologists in their clinical practice give the main attention to treatment of injuries of the bones of AJ and do not give sufficient attention to injuries of the ligamentous apparatus. The medical statistics does not show the true share of these injuries in the structure of traumas of the musculo-skeletal apparatus, since many patients of this category do not visit a doctor and use home remedies. There exists a mistaken opinion among the population that the injury of ligaments will «go away by itself». Even some doctors are inclined to think that traumas of the ligamentous apparatus of AJ are damages that do not deserve the due professional attention [17].

However, experienced specialists both in our country and abroad know that the outcomes of treatment of damaged ligaments are much less predictable than the results of treatment of bone fractures [15,17,18]. Although 80-85% of acute injures of AJ are successfully treated by conservative methods and by programs of functional rehabilitation [19-21], the rest 15-20% of patients suffer from repeated traumas and recurrent post-traumatic instability of AJ which, in the opinion of R.J. Shakked, et al. (2017), entails the necessity of surgical intervention [23-24].

The results of treatment of patients with injury of AJ ligaments are determined by completeness and duration of therapeutic immobilization. According to the data of V.S. Dedushkin and S.G. Parfeev (2004), in rendering the first medical aid (including a specialized one in traumatology stations), in 79.5% of cases the ankle joint is immobilized with soft-fabric bandages. After wearing cross-bandages within many days some patients developed persistent dense edema on the rear surface of foot of the local lymphedema type [17]. The data about duration of therapeutic immobilization both with soft bandages and with plaster splints are also open to criticism since here immobilization did not exceed two weeks on average [17,18]. Besides, practically each second patient did not observe doctor's recommendations concerning loads on the damaged joint. During a long time a significant part of patients reconciled with pain syndrome and discomfort in walking which resulted in a negative influence on the condition of paraarticular tissues in the long-term [18]. It is noted in some works that even with distinct instability of AJ, patients, unfortunately, continued using soft bandages on the AJ neglecting doctor's recommendations. Consequently, many of them presented with clinical picture of post-traumatic CIAJ with reliable X-ray evidence of local osteoporosis [18]. The consequences of overlooked or undertreated acute instability of AJ are well known and described in the medical histories of patients, 60% of which further suffer from CIAJ [22-24].

Thus, incorrect initial treatment, incomplete restoration of ligaments of AJ and rehabilitation, and also repeated trauma with impairment of the quality of tissues finally lead to CIAJ [25-27].

Recently there has been noted an increasing popularity of different kinds of sport which resulted in increase in the level of sport-related traumatism. According to the existing data, an acute trauma of AJ ligaments is the most common trauma among athletes that makes up to 40% of all sport-related injuries [13,28-30]. In sports medicine, 85% of injuries of AJ involve the lateral ligamentous complex and most commonly the anteriortalofibular ligament [1,13,15]. Further rehabilitation of patients depends on the degree of severity of the trauma and the concomitant pathology [20,23,27].

In most kinds of sports the ligamentous apparatus of the AJ is constantly exposed to extremal loads. The analysis of the data of the national USA electronic system of regis-

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tration of traumas showed that 49.3% of traumas were associated with sports activity, of them 41.1% with basketball, 7.9% with football, and more than half the traumas were obtained in track-and-field athletics activity [4].

D.T. Fong, et al. (2007) carried out a systemic review of sport-related traumas recorded from 1977 to 2005 which showed that in 33 of 43 kinds of sports activity, injury to ligaments of AJ was the main trauma of the musculo-skeletal apparatus [31].

In different games-based sports – football, rugby, basketball, volleyball – the risk of trauma of AJ ligaments is enhanced [27-29]. Some authors note that basketball is sport №1 for AJ trauma and injury to ligaments [27,29]. Thus, according to H. Liska, et al. (2016), inversion trauma of AJ accounts for 45% of all traumas in basketball, and up to 31% in football. It is inversion trauma that leads to CIAJ in professional athletes with subsequent development of osteoarthritis of the joint [27,30].

Results of numerous research works helped identify certain risk factors for injuries of the capsular-ligamentous apparatus of AJ among different groups of population. The majority of authors, after J.G. Williams (1971), traditionally classify the factors into *external* and *internal* [4,7,28].

External risk factors are ecological factors (weather conditions in the game), sports activity (basketball, tennis, football, cross-country run, game situations, means of protection (type of footwear), human factor (teammates), tight schedule of matches, the level of competition, use of means of the external fixation of the joint (non-elastic sports bandages) [4,28,32]. It is out of doubt that sports activity in poor weather conditions, wearing soft quarter footwear, fatigue of patients, poor preparation of the playground or of its covering may cause injuries of the AJ ligaments.

Internal risk factors may include individual characteristics of the patient: age, gender, height, weight, anatomical and biomechanical peculiarities of the AJ, existence of past injures of AJ ligaments, time of muscle reaction, myosthesia, domination of the limb, the level of sports training, etc. [33-35].

Recently some authors give their attention to study and identification of the *modifiable* ((weight, body mass index (BMI), means of fixation, footwear, nerve-muscle control, postural stability, muscle force, sports activity, covering of the playground, the level of training), and of *non-modifiable risk factors* (gender, age, race, anatomical structure of AJ, past traumas, CIAJ), which are associated with this common trauma of the ligamentous apparatus of AJ [7,36]. Understanding of the factors that are variable in this concept may be useful for identification of the groups of population at higher risk [7]. Besides, identification of modified risk factors in certain groups of population enables creation of the program for prevention of traumatism [8].

Analysis of numerous publications evidences that previous rather mild primary injuries of the ligamentous apparatus of AJ and dislocations of AJ, especially in athletes and individuals leading active way of life, are the main factor for development of CIAJ [1,23,25]. This kind of increased risk may be associated with insufficient period of the previous treatment and rehabilitation of the trauma [13,17,19].

Besides, the history of the previous traumas of AJ ligaments may be an independent risk factor for development of recurrent instability of AJ ligaments. Many injuries of ligaments often lead to alterations in the morphological structure of the lateral ligaments responsible for stability of tibio-talar joint, and promote development of subsequent functional disorders. And at last, the initial inflammatory reaction to acute injury to AJ ligaments leads to formation of scars which, in contrast to undamaged tissues, enhance the probability for unfavorable outcome [28].

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Results of research of B.J. McCriskin, et al. (2015) conducted among athletes show that traumas of AJ ligaments are more commonly encountered in patients with talipes valgus or with varus deformity of shins. Valgus or varus position of the ankle bone significantly changes the angle formed by the calcaneofibular ligament and fibular bone. The calcaneofibular ligament is tensed in valgus position and relaxed in varus position. This fact, in the opinion of the authors, can explain the probability of traumas even without excessive bending and unbending of foot [28].

F. Halabchi, et al. (2016) in their research work conducted on athletes, traces the connection of some internal risk factors with the past acute traumas and repeated injuries of the lateral ligamentous complex of AJ. The authors emphasize that repeated injuries of AJ ligaments are one of the main contributors to development of CIAJ in athletes, 80% of which present with signs of osteoarthritis in future [29].

In association with increase in participation of women in different kinds of sports activity, some research works establishthe dependence of traumas of the musculoskeletal apparatus on gender and are important for identification of potential differences between male and female athletes.

However, studies of evaluation of the influence of gender on development of instability of AJ, provide controversial results. Thus, some research conducted among military service members, showed 21% higher incidence of injuries of AJ ligaments in women that in men [8]. Research conducted among students of higher educational institutions did not show any gender differences in the occurrence of the studied nosology [7,34]. A recent research of J.M. Wolf, et al. (2015) showed that traumas of AJ ligaments are more common in women than in men which can be attributed to anatomically weaker AJ ligaments in women in comparison with men [35].

On the whole, on the basis of the data of analyzed publications it may be noted that the frequency of injuries of the lateral ligaments of AJ is higher in women. However, fundamental differences in participation in different sports activities and in the level of risk associated with specific kinds of activities can invalidate this evident difference which creates necessity for a further study of this problem.

Besides, risk for development of CIAJ increases with increase in weight and, consequently, with increase in the mass moment of inertia that produces influence on AJ. The work of R.R. Waterman, et al. (2011) showed that the frequency of injuries of AJ in students of a military academy with increased BMI was higher than in their colleagues [34]. The height and weight as risk factors increase the value of rotation moment in inversion of the foot, and in his way increase the risk of injury to AJ ligaments [19,27]. On the contrary, other studies did not confirm the conclusion about weight (or BMI) as independent risk factors for development of injuries to AJ ligaments and of CIAJ [33,35].

Certain kinds of sports activity provoking traumas of AJ ligaments in athletes, also can vary depending on age. Such traumas are more common in young patients that practice track-and-field athletics professionally or as amateurs. Acute trauma of AJ ligaments is the most common trauma in young athletes [3].

In foreign publications the factor of domination of a limb is considered as a risk factor for CIAJ, especially in athletes. However, these results are also controversial. According to F. Halabchi, et al. (2016), 58.5% of basketball players and 14.2% of football players have repeated traumas of the same limb in medical history. According to the authors, injuries of AJ are more common in the dominating leg [29]. Other researchers could not show a cause-and-effect relationship between susceptibility of AJ and a specific limb [36].

Besides, one more modifiable risk factor for CIAJ may also be the level of competitiveness. With the increase in the level of competitiveness the risk for injury of the AJ ligament rises: athletes get about 55-66% of traumas in the game, but not in training or in regular sports activities. This can be most probably attributed to increase in the tempo during a game and a tendency of the players to perform more risky actions [34].

And at last, on the basis of the results of analysis of a small amount of works concerning anatomical factors, the critical factor for stabilization of the joint ligaments is considered to be the nerve-muscle mechanism [38-40].

Conclusion

Thus, analysis of the literature data concerning chronic instability of the ankle joint for the recent decade shows that the given pathology is the most common, complicated but the least solved medico-social problem in traumatology which in most cases results from the past trauma of one or several anatomical components of the capsularligamentous apparatus of the ankle joint.

Despite the fact that the results of the research completed by the moment, are sometimes contradictory, a conclusion can be made that certain groups of individuals – those leading the active way of life, athletes, members of sports teams – are under a high risk of injuries of the ankle joint. According to literature data, there exists a relationship between different external factors (kinds of sport, the level of competitiveness, etc.) and the risk of injury of ligaments of AJ with subsequent development of its chronic post-traumatic instability.

The influence of internal risk factors of the development of chronic instability of the ankle joint still remains insufficiently studied, although most authors consider nerve-muscle mechanism as an important mechanism of stabilization of the joint ligaments [38-40].

In our opinion, further study of the risk factors for chronic instability of the ankle joint, especially in patients with the active way of life, should result in elaboration of the algorithm of implementation of organ-saving operations on the ankle join and rehabilitation of patients which will permit to optimize surgical strategy, to reduce the number of patients with disability and to return them to labor and to sports activity.

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