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Review Article

Lower Limb Injuries in Sport

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ABSTRACT

The practice of sports is and has been the cause of numerous injuries in various studies. The evidence that costs amounted to AUD 265 million over a seven-year study in young people and adults. Particularly notable is the substantial impact on professional sport, where losses over two seasons of the English football league have been estimated at GBP 74.7 million. The impact on the well-being and health of the people affected is even more notable in light of the fact that injury may make it impossible to engage in the activity itself or, for professional athletes, causes missed training sessions and competitions.

Keywords: Sport; Injury; Lower limb; Athlete

INTRODUCTION

In order to study the incidence of these injuries and ensure comparability across disciplines and periods, data is collected for every 1000 hours of practice or competition. This considers the frequency of injury incidence and the number of new injuries occurring in a population at risk over a period divided by the total number of athletes [1-3]. Of equal importance and current complexity is the injury classification system. As the most studied sport, football makes widespread use of the Orchard Sport Injury Classification System (OCICS) [4], which indicates the importance of all medical care required by the athlete even if no training or competition has been missed. This is the distinctive feature to define an injury since, according to one of the reference studies [5], injury will appear during a training or planned match, causing the athlete to miss the next. These classifications reveal the particular relevance of certain injuries, such as those recorded by area of the body, where, according to the OCICS (Table 1), injuries corresponding to the lower limb (LL) are the most numerous in a wide variety of sports, both during seasons lasting several months [6] and in shorter competitive periods, such as the Olympic Games [7]. Together with this greater incidence, the characteristics of the injuries must be taken into account so as to make a complete assessment of the problem based on the severity thereof, depending on the days missed in training and/or competitions. Severity categories are divided into minimal (1-3 days missed), medium (4-7 days), moderate (8-28 days) and severe (>28 days) [8].

Table 1: Category of LL injuries in football based on the OCICS (Orchard 2010).

Area of the body	Injury category	Examples of specific diagnoses
Hip/groin/thigh	Groin strains and pubic osteitis	Adductor muscle strains
	Hamstring strains	Hamstring strains, tendonitis
	Quadriceps strains	Rectus femoris strains

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	Thigh and hip sprains	Thigh haematoma (bruising)
	Other groin, hip and thigh injuries	Acetabular rim injury
Knee	Anterior cruciate ligament (ACL)	ACL of the knee (± other pathologies)
	Medial collateral ligament (MCL)	Isolated MCL injury
	Posterior cruciate ligament (PCL)	LCP of the knee
	Knee cartilage	Meniscus tears, cartilage injury
	Patelar injuries	Dislocated, patellofemoral joint pain
	Tendon injuries of the knee and patella	Patellar tendonitis, popliteal tendonitis
	Other knee injuries	Tibiofemoral joint disruptions.
Shin, ankle, foot	Ankle sprains, joint injuries	Ankle sprain, Syndesmotic ankle sprain
	Calf strains	Gastrocnemius strain, soleus strain
	Achilles tendon injuries	Achilles tendon rupture, tendonitis
	Leg and foot fractures	Tibial fracture, fibula fracture
	Stress leg and foot fractures	Metatarsal stress fracture
	Other leg/foot/ankle injuries	Plantar fasciitis

Several factors predisposing to LL injury can be differentiated. Dealt with here in a superficial manner are the extrinsic factors, with further attention given to intrinsic factors below.

DISCUSSION

Among the former, the following have been described: the hardness and condition of practice surfaces, the return to training after a holiday period, inadequate footwear, high-intensity training [9], the level of practice [10], repeated competitions as a further prolongation of injuries [11], weather conditions, equipment, rules of the game and foul play [12]. Although these extrinsic factors may seem more stable than those inherent to the athlete, it is interesting to note that inconclusive data crops up in the related studies, as can be seen in a systematic review of knee pads effect on preventing ligament injuries [13].

As regards intrinsic factors, prior injuries stand out as the most important risk factor for re-injury. Recurring injuries of the same type and in the same location can lead to chronic injuries, especially as the athlete ages. Accordingly, the literature has reflected an increase in injuries with age [14], where the intense practice of sport hinders the optimal recovery periods for different tissues and the risk of identical injuries recurring increases during later years [15]. This risk factor may lead to the chronification of an injury and is often caused by an incomplete recovery after an injury has occurred [16]. As widely seen example of LL, the hamstring musculature is one of the areas that bears witness to a large amount of recurring injuries rising with age and mainly due to the formation of poor-quality scar tissue, which is especially formed at the myotendinous junction [17].

Although muscle injuries are a major source of recurrences, the external ligament complex in the ankle is the tissue that most suffers from LL repetitive injury [18]. In addition to the decrease in stability that it causes, joint tissue injury leads to a deterioration in the proprioceptive capacity of this structure, which positions proprioceptive alteration as a risk factor [2], causing errors in the precision of the joint position. The persistence of this proprioceptive alteration fosters the recurrence or even appearance of a new injury and draws the focus on the need for caution during tissue maturity processes, especially ACL grafts after injuries requiring surgery [19]. The difference in kinaesthetic capacity between genders has also been studied. Generally, women enjoy greater joint mobility, which causes lower proprioceptive alertness detected in certain ligaments when limiting a potentially harmful movement such as hyperextension of the knee [20]. Joint laxity behind a high range of motion and increased compliance in joint tissues increase the risk of injury to this structure, [21] in addition to the known relationship between increased joint laxity and increased electromechanical delay of muscle tissue as a possible contributing factor to the injury also studied in the hamstring group [22]. Similarly, it is common to identify a lack of muscle extensibility as a risk factor for injury, but this relationship has only occurred in certain muscles and with inconclusive results in quadriceps and hamstring muscles [23].

Continuing along with intrinsic factors, several studies show that a force deficit above the physiological between the antagonist muscle around a joint is a risk factor for injury to the ACL or hip adductors [24]. Force deficits have especially been measured among the quadriceps and hamstring muscles; however, it should be noted that they are often isokinetic measurements, which have numerous interpretative limitations since they stand far from the physiological reality of the athlete [25]. Joint stability depends on passive structures and the musculature as an active stabiliser and, therefore, an alteration in force can lead to a decrease in joint control. A noticeable alteration of force through long-term coordinating tasks (as in sports, where there are continuous jumps and changes in direction, as well as a large number of changes in speed and acceleration) can lead to decreased explosive force capacity and an increased risk of injury due to the lack of capacity by the muscle and tendon tissue to absorb potentially harmful energy [22]. Athletes with greater explosive force capacity have more harmful incidence at muscular and tendinous level, as seems to be indicated in studies on sports such as volleyball [26]. A decline in various physical qualities, such as strength, stemming from fatigue causes alterations in neuromuscular coordination that can predispose an athlete to suffer an injury [27]. Systematized low-intensity work on the explosive musculature can lead to a progressive disadaptation of the physiological properties of this type of muscle, which can increase the risk of injury when the muscles have to act in high-speed situations [2]. Of the LL muscle groups at risk, the biarticular muscles suffer the greatest number of injuries; this seems to be the case due to the type of explosive action, due to its faster fibrillar component and the high mechanical stress it undergoes in tension from at least two different joints.

Studies on the differences of risk in relation to gender indicate that female athletes suffer injuries such as ACL rupture with greater frequency and severity at earlier ages than the normal population. Biomechanically, it seems that female athletes develop motor patterns that foment greater injuries compared to male athletes. Hormonal factors have been studied to see if they are related to the greater or lesser incidence of injury, mainly ACL rupture, where joint laxity is known to vary in line with a woman's menstrual cycle [28]. It seems that in female athletes most of the cases of this injury occur during the preovulatory phase of the menstrual cycle is the period where (Shultz et al. 2008).

Based on the OCICS, injuries can be highlighted based on the area of the body in the LL that present a particular incidence in different groups of athletes.

Accordingly, in the hip/groin/thigh region, the practice of a high-intensity sport is known to speed up hip arthritis, especially if the athlete presents some type of extraarticular deformity, such as cam or pincer [29]. In a comprehensive study [30] of different sports populations with pain in this region, injury in the pubic aponeurosis was identified as the most frequent (62.8%), followed by injury in the hip joint (21.2%) and the adductors (14.7%). The most common injury within this area is acute muscle rupture due to a direct blow or intrinsic mechanisms, the most common of which are mentioned above, especially the eccentric solicitation of the quadriceps, hamstring or adductor muscles, with hamstring strains found to be the injury that makes up nearly half of LL muscle injuries [31].

In the knee, the most common injuries are to extensor complex of the knee, with the patellofemoral syndrome or anterior knee pain the most common reason for athletes under 20 years old. Intraarticular injuries relating to meniscal or ligamentous structures are of greatest importance, with ACL injuries being one of the most common injuries, which can keep athletes out of play for the longest period of time and may be associated with meniscal injuries [32]. Within the extensor apparatus, patellar tendonitis is the main injury. Together with myofibrillar ruptures, injuries in the rectus femoris muscle most frequently occur in propulsion-based activities [9].

In the shin/ankle/foot, in index injury it is the second most common injury, along with the knee. The most common injury is an ankle sprain of the lateral compartment, with the anterior talofibular ligaments being the most affected [33]. One of the most common injuries is Achilles tendonitis, as the tendon that is most affected in running sports, where injuries also stand out in the fibula and posterior tibial, which can present with partial tear (Cook, Purdam 2009). At muscular level, medial gastrocnemius tears show significant incidence [34] and are frequently complicated by the accumulation of blood in the intermediate fascia that divides the medial gastrocnemius of the soleus [35]. Anterior ankle impingement syndrome also stands out as an example of incidence in chronic injuries in contact sports, with striking and the reiteration of striking areas having been studied as possible causes [36]. Tendon injuries in the foot relate to tendonitis of the plantar fascia as the main structure injured, which may present with fasciopathies or partial tears due to overuse, especially in repetitive impact sports [37]. Other injuries of notable incidence are stress fractures in the metatarsals and damage to the first ray of the foot, occurring in disciplines such as dance, sprinting, and sports with a large volume of repeated jumps [38].

CONCLUSION

Lastly, as methods of treatments, they require a specific and multidisciplinary study among sports doctors, orthopaedic surgeons, rehabilitator specialists and physiotherapists, sports therapists, physical trainers and the entire technical staff. The prevention of injury is the best method, followed by the suspicion and early detection, taking into account the characteristics of acuity or chronicity and also stress injuries. Familiarity with the standard diagnostic methods (Rx,RM,scans and CT scan) is required.

In addition, decision making is determined by the appearance of the injury in training, competition or as a casual finding, since the true medical debate arises in the decision to allow the athlete to continue training or playing, as well as after the treatment, with the maximum decision to return to play.

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