

Injury Incidence, Risk Factors, Prevalence and Rehabilitation of Injuries of Ankles in Professional Basketball Players

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Abstract. Basketball, as one of the most famous sports in the world, has resulted in numerous injuries to professional basketball players. The most common injuries during basketball games are tooth damage, knee meniscus injury, collateral ligament damage, lumbar disc herniation, triangle cartilage disc of the wrist damage, knuckle contusion, active and passive strain, and ankle injuries. Ligaments in the ankle are easily injured; the severity of the injury is determined by the angle of the ankle sprain and the extent of ligament damage. Inadequate preparation, injury histories, age, and so on can all be risk factors. When an ankle sprain occurs, people should treat it properly, such as the Ice treatment and the well-known protection, loading optimal, ice, compression and altitude treatment and etc. In the short run, ankle rehabilitation training can be an effective treatment when the ankle is sprained. If it has the ankle spraining performance, Coaches and athletes are more likely to take countermeasures aimed at reducing the risk of injury.

Keywords: Rehabilitation; Ankle Injuries; Basketball Player.

1. Introduction:

Basketball is one of the commonest sport all over the world. In the last 20 to 30 years, changes in rules, such as shorter shooting time and lighter women's ball, have accelerated the competition, causing players to change their physiologic adaptations for the game. Physical injury is unavoidable during the game because players will use a lot of physical play to help them score. In musculoskeletal injuries, the most common one is ankle injury[1,2], which occurs when athletes overstretch their anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL), and deltoid ligament (DFL). In Western countries, nearly one person in every 10,000 suffers an ankle sprain every day [1,3]. Nearly 40% of traumatic ankle injuries and ankle sprains occur during sports[4,5], with basketball having the highest injury rate (41.1%)[4,6,7]. The purpose of this review was to examine the causes and treatment strategies for ankle joint injuries in basketball players.

There are some treatments available now that can improve the efficiency of ankle injuries. Early mobilization and external support are examples of functional treatment. It improves ankle function and stability when compared to minimal treatment or immobilization[8]. Although cold therapy does not improve symptoms compared with placebo, it can reduce edema compared with hot bath or contrast bath[8]. In the short run, elastic bandage and tape of lace-up ankle support will be more effective in curing swelling than semi-rigid ankle support[9].

PubMed, Google Scholar and CrossRef were used for computerized literature retrieval. This review includes randomized controlled English trials published between 1841 and 2022, and analyzes ankle joint treatment of lateral ankle sprain with different types of functional treatment.

2. Injury in Basketball Game:

There are some direct causes of sports injuries. The first one is sports specific technical factors, each sport has its technical characteristics, and the load borne by various parts of the human body is different and the force is not balanced. Long-term training in a special subject will cause various chronic injuries to the parts with the heavy load. Knee injuries of football players and high jumpers. Besides, from the point of view of anatomy and biomechanics, the structure of the human body still has some weak links that are not suitable for sports. (e.g. joints) Blind recklessness and carelessness during the game also can be a cause of sports injuries, etc. Traditionally, the most common injuries during a basketball game are ankle sprains and anterior cruciate ligament (ACL) ruptures[10].

Many different kinds of injuries happen during basketball games. (1)The tooth damage, which caused by variety of violent acts on the teeth, most commonly in the upper and lower incisors. (2)Knee meniscus injury, which severe grinding of the meniscus between the femoral condyle and tibial plateau can cause various types of meniscal injuries, such as meniscal rupture, crush injury and semilunar cysts. (3)Damage to the collateral ligament of the knee, by excessive valgus of the knee joint. (4)Lumbar disc herniation, the annulus fibrous rupture and nucleus pulposus protrusion caused by sudden torsion during bending. Such as weight lifting, falling, hurdling, throwing, and other sports where the spine is subjected to uncoordinated forces. (5)The damage of triangle cartilage disc of the wrist, fall hand support ground, wrist joint overextension caused. (6)Contusion of knuckles, Excessive flexion or extension of the finger and metacarpophalangeal joints, resulting in tear of the ligaments and capsule of the metacarpophalangeal joints or interphalangeal joints, and even contusion of articular cartilage. It is more common in basketball, volleyball and other sports. (7)Active strain and passive strain, due to the muscle doing the active when it contracts violently, with more force than the muscles themselves can bear, and when the muscle is stretched too hard, respectively.

The incidence of some sports such as basketball, football/soccer, volleyball and ankle injuries is particularly high[11]. Pain and intermittent swelling usually confined to the manic side of the foot are the most common residual problems[11]. The remaining complaints include mechanical instability and stiffness [11]. The higher incidence of residual complaints is in people with more serious cartilage damage [11]. In the long run, under the condition of continuous or repeated instability, the initial traumatic cartilage damage of degenerative changes may be caused, [11]. New injuries may increase with each further sprain [11].

3. Ankle Sprain:

In ankle, anterior talofibular ligament is the easiest injured ligament, and it is the commonest Injuries observed in the emergency room[12]. This ligament plays an important role in limiting the anterior displacement of the talus and the plantar flexion of the ankle joint, which plays an important role in our body[13].The anterior talofibular ligament of the forearm arises from the anterior margin of the lateral malleolus, which is easy to get hurt. According to measurements along the axis of the fibula, the center is 10 mm from the end of fibula on average[14]. From its starting point, it extends from the outside ankle surface to the helicopter insertion. The ligaments are almost flush with the ankle in a neutral position, but they tilt upward when dorsiflexion and downward when plantar flexion. Only in the latter position, especially when the foot is upside down, can the ligament be strained and injured[15]. The calcaneofibular ligament, also injured popularly, in flexion and neutral ankle positions, the ligaments relax, whereas in dorsiflexion the ligaments tense[16].It is tense in flexion and relaxes as the plantar flexes, so trauma that causes the ankle to be forced back into flexion can be assumed to result in ligament injury or rupture, or osteochondral avulsion. Bending of the plantar can cause it to relax and easily get trapped between the tibia and the the talus, leading to an impact[16]. Then, anterior tibiofibular ligament or anterior inferior ligament. The joint mechanical changes of LCL injury determine the impact of the distal bundle of the anterior tibiofibular ligament, which will increase the relaxation of the anterior and posterior ankle joints[17], Inserting the distal end of the neutral position may lead to increased ankle ligament contact, and the higher the possibility of ligament lesions. Understanding this structure is important for understanding the anatomical basis of anterolateral soft tissue impact. Pain may be caused by abrasion between the distal bundle of the anterior tibial ligament and the talus[16].

Soft tissue impingement syndrome usually precedes ankle sprains. Specific ligaments and ligaments may be damaged, by the injury mechanism [18]. Anterior sliding arm ligament injury is the most common injury after ankle sprain. Most of the time, this is an isolated injury; However, in about 20% of patients, the achilles tendon ligament is also injured [19].

4. Risk Factor:

For people who often participate in various sports activities, lateral ankle sprain (LAS) is the most common injury[20]. For the injured, these injuries will cause serious consequences, including medical expenses and time lost in work or sports[21]. This injury may be aggravated by the high development of long-term symptoms, which may lead to chronic ankle instability (CAI)[20].

In the public, the incidence of ankle sprain (IR) is affected by age[21]. In females, the peak infrared of ankle sprains occurred from 10 to 14 years of age, while in males, the peak infrared occurred from 15 to 19 years of age, which proofed by author of a recent meta-analysis[22], who reported higher ankle sprain infrared in children than in adolescents and adults[22]. BMI is an important risk factor for ankle sprain, for high school football players [23]. They reported that the infrared ray of ankle sprains with normal body mass index of athletes was 0.52, and that of overweight athletes was 2.0[23]. In addition, the previous injury history also plays an important role. 26% of the players who had ankle sprains have subsequent ankle sprains. In contrast, only 11% of the players who has no history of ankle sprain had ankle pain during the study period [23]. The highest incidence rate of all lower limb musculoskeletal injuries is ankle sprain, and the risk of re injury is doubled one year after injury[24]. Muscle Strength Weak ankle and wrist muscles may increase the risk of ankle sprains[25].

5. Rehabilitation:

During participation, lateral malleolus sprains have been documented as the most popular lower limb injury in sports [26-29]. About 85% of ankle sprains are caused by varus mechanism and lateral ankle ligament complex injury[30]. Injury to the lateral ligamentous complex due to the pain, swelling, and limited bone kinematics[31]. After a lateral ankle sprain, high wall joint is usually the point of loss of ankle dorsiflexion[32-37]. Ice is the most common means of achieving cooling. To reduce the metabolic demand, induce vasoconstriction and limit bleeding, limit the damage caused by injury, and reduce the temperature of the injured tissues, ice is a good solution. It can also increase the national level of free nerve endings and synapses, and promote the latency of analgesia through nerve conduction, thus reducing the pain level[38].

3 stages of biological ligament healing; Inflammation stage, proliferation stage and remodeling or maturation stage are consistent with the treatment of lateral ligament tear[39].Initially, avoiding swelling and persistent injury is the treatment goal of the inflammatory stage. This is achieved by the police in the first 4-5 days through protection, optimal loading, icing, compression, and altitude agreements[40]. Oral or local non steroidal anti-inflammatory drugs (NSAIDs) can reduce pain without adverse events[41]. Bare handed treatment of ankle injuries is almost useless and should be discouraged [42]. Low intensity ultrasound, laser therapy or electrotherapy have not been found to have any effect [42]. Compared with functional treatment, long-term fixation of two weeks or more will lead to worse results [43, 44]. However, fixation in plaster or removable boots below the knee for up to ten days may result in more severe lateral ligament tears than the recovery of compression bandages[43, 45]. The use of semi-rigid stents in the proliferative phase is the first choice, and its advantages are fewer skin complications and lower cost-effectiveness. The combination of exercise therapy and progressive weight-bearing can also be used in the important stage of functional treatment of acute lateral ligament sprain[46]. Intensive training, proprioception training and functional training are after the early range of motion training[39]. Jumping, turning and twisting should gradually simulate the physical requirements of each movement mode in practice and competition at the final stage of the activity[39].

Season time, athlete expectation, specific ankle joint load, personal history, athlete career stage, time from trauma to diagnosis, compound injury and access to professional medical imaging and treatment should all be taken as evaluation characteristics when athletes consider hand skills[47]. Table 1 and 2 illustrated randomized trials about non-operative treatment and prevention of sprains with external ankle support between 2002 and 2012[48-53].

Table 1. Randomized trials about non-operative treatment with external support between 2002 and 2012

References	Follow up	Treatment groups	Results	Conclusions
Boyce et al. [48]	48–72 h, 10 days, and 1 month	Elastic support bandage (N=25), Aircast ankle brace (N=25)	No significant differences in pain scores (mean 6.2 and 5.8, respectively)	“The use of an Aircast ankle brace for the treatment of lateral ligament ankle sprains produces a significant improvement in ankle joint function at both 10 days and 1 month compared with standard management with an elastic support bandage”
Cooke et al. (CAST trial) [49]	4 weeks, 3 and 9 months	Tubular bandage, 10 days below knee cast, Aircast ankle brace or Bledsoe boot	The below knee cast offered a small but statistically significant benefit at 4 weeks in terms of pain, foot- and ankle-related quality of life and the physical component of the SF-12 At 12 weeks the below knee cast was significantly better than tubular bandage in terms of pain, activities of daily living, sports and QoL, and the Aircast brace was better only in terms of ankle-related QoL and mental health	“The below knee cast and the Aircast brace offered cost-effective alternatives to tubular bandage for acute severe ankle sprain, the former having the advantage in terms of overall recovery at 3 months. As there were no differences in long-term outcome, practitioners should consider likely compliance and acceptability to patients when choosing a brace”

Table 2. Randomized trials about the role of external ankle support for the prevention of sprains

References	Treatment groups	Results	Conclusions
McGuine et al. [50]	Group treated with a lace-up ankle brace and non-braced control group in high school basketball	The rate of acute ankle injury (per 1,000 exposures) was 0.47 in the braced group and 1.41 in the control group (Cox hazard ratio [HR] 0.32; 95 % confidence interval [CI] 0.20, 0.52; P < 0.001)	Use of lace-up ankle braces reduced the incidence but not the severity of acute ankle injuries in male and female high school basketball athletes both with and without a previous history of an ankle injury
McGuine et al. [51]	Group treated with a lace-up ankle brace and non-braced control group in high school football	The rate of acute ankle injury (per 1000 exposures) was 0.48 in the braced group compared with 1.12 in the control group	Players who used lace-up ankle braces had a lower incidence of acute ankle injuries but no difference in the incidence of acute knee or other lower extremity injuries. Braces did not reduce the severity of ankle, knee, or other lower extremity injuries
Babins et al. [52]	Group treated with a lace-up ankle brace and non-braced control group in high school basketball	The overall incidence of acute ankle injuries was lower in the braced group than the control group (27 vs. 78 injuries; rate, 0.47 vs. 1.41)	Acute ankle injuries among high school basketball players assigned to wear lace-up ankle braces were reduced by 68%. The braces did not affect the severity of the injury or the rates of knee or other lower extremity injuries

6. Conclusion

This research shows the popular evidence on injury incidence, Risk Factors, Prevalence and rehabilitation of ankle injuries in professional basketball players. In professional basketball players, the most common injury is ankle injury. Risk factor can be physical level and mental level. Most players’ ligament will get hurt when the ankle sprain happened, 3 phases of biological ankle’s ligaments healing are based on treatment of sprained ankles ligaments, physical requirements of the

respective movement patterns during practice and competition, including jumps, turns and twists is also important on rehabilitation of ankle spraining. Follow the countermeasure can proof the ankle sprains and treat ligaments efficiently.

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