EPIDEMIOLOGY IN KNEE INJURIES IN VOLLEYBALL PLAYERS

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Abstract

Volleyball enjoys one of the highest participation rates of any sport in the world. By most estimates, volleyball ranks second only to football in terms of global popularity. As well as indoor volleyball, the (still ever growing) discipline of beach volleyball is also played. Because in volleyball the two teams are separated by a net, there are less injuries as a result of contact with another player. In the area around the net, players do run the risk of landing on another player's feet after a jump. The regular jumping necessary in volleyball increases the risk of ankle, calf and knee injuries. Volleyball is a ball sport with many 'overhand' techniques. The smash, the service and the set-up. Overhand techniques increase the risk of an overuse injury around the shoulder joint. One of the most appealing aspects of the sport is that it can be played indoors and outdoors, by the young and the old, by males and females, and by both the able bodied and those with physical impairments.

Keywords: Epidemiology, knee injuries, **player,** volleyball,

Introduction:

As with all sports, those who enjoy either of the two volleyball disciplines assume a certain risk of injury the moment they step on to the court. The knee is the most frequent site of injury in volleyball players. Although volleyball is a sport without contact between players, traumatic acute injuries are more frequent and more serious than would be expected. There has been a significant increase in the numbers of people playing indoor and beach volleyball report consequently an increase in injuries. It is therefore important to emphasize that volleyball must be considered among the high risk sports that expose the knee not only to twisting, but also to contact with other players. Generally, the lesions are caused by frequent jumps with loss of balance and a consequent 'one-footed' landing.

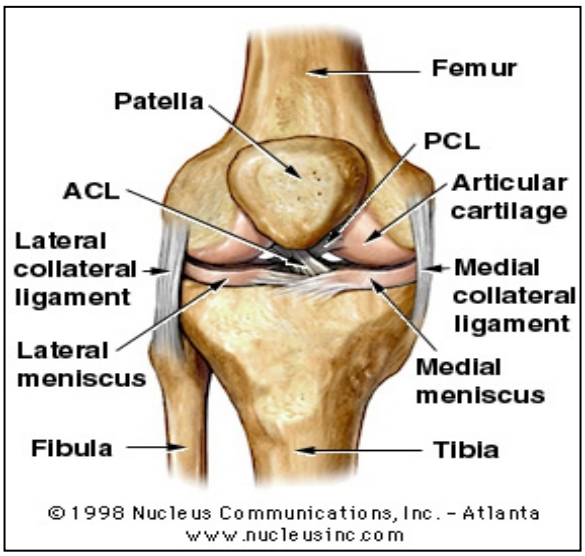


Fig. 1 Knee anatomy

More than 45% of high level players suffer overuse injuries during this activity, this particularly painful syndrome is caused by the amount of jumping typical in volleyball play, and in its training which aims at strengthening the quadriceps muscle.

In volleyball players the extensor apparatus is subject to continuously high stress and the bone tendon junction, being the weakest point, is susceptible to lesion. Due to its construction and function, the knee joint is a joint susceptible to damage. The knee joint consists of a large bone (the femur) in the upper leg and the shin bone (tibia) and calf bone (fibula) in the lower leg. To ensure a better joint between the bones of the lower leg and the upper leg, two menisci are located between the two halves of the leg. An inner (medial) and an outer (lateral) meniscus. The menisci are made from cartilage and as well as a control function, also have an important task in shock absorbance.

At the front of the knee is the kneecap or patella. The kneecap is embedded in the tendon of the knee's large extensor. The bones of the upper and lower leg are held together by the capsule on the inside and outside, supported by ligaments (inner = medial collateral ligament) (outer = lateral collateral ligament). Right at the center of the joint, the upper and lower leg are held together by the cruciate ligaments.

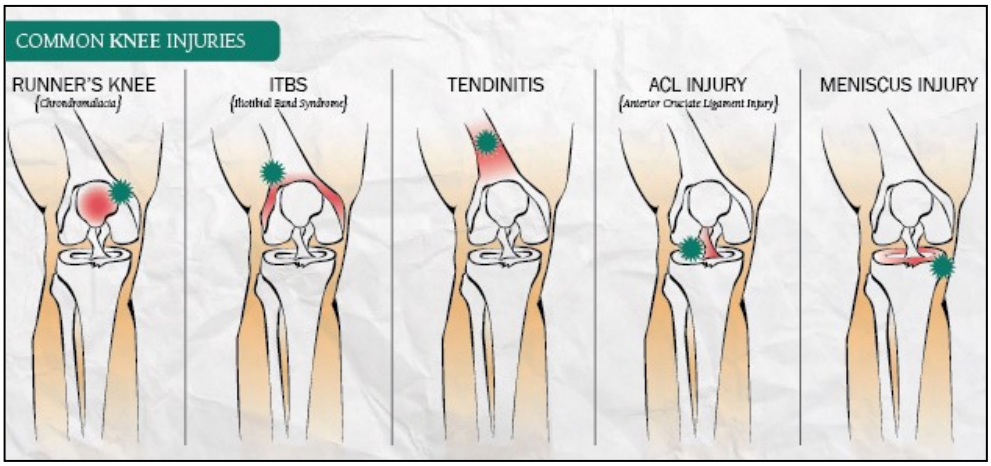


Fig. 2 Main knee pains

An acute injury to the knee occurs generally as a result of an uncontrolled movement (as a result of which the coordination between the upper leg and the lower leg fails to function), a collision with another player, or a fall. In any of these events, the ligaments and/or menisci may be damaged.

Such injuries must always be examined by a sport physiotherapist, sport physician and/or orthopedic specialist. The ligaments on the side generally heal without an operative intervention. The cruciate ligaments do not recover by themselves. Depending on the level of sport and the nature of the daily activities of the individual, the decision must be taken as to whether an operation is or is not necessary.

Patellar tendonitis is the most frequent overuse injury in volleyball.

The most common site for pain is at the bottom of the kneecap, where the tendon originates. Tendinosis is the more accurate term since the injured tendon actually consists of fibrosis or scar tissue, not inflammatory cells.
Volleyball athletes at all levels are committed to jump training as part of their regimen, perhaps more so than athletes in any other sport. The biggest challenge for coaches and strength and conditioning personnel seems to be finding the fine line between performance enhancement and risk of injury. If we could clearly define this line for each athlete, it would be easier to prevent tendonitis.

Athletes who generate the greatest power during vertical jumping see m to be at greatest risk. Since these are the athletes who already jump the hi ghest, it may be advisable for them to devote less time to jump training and plyometrics. Athletes with increased external tibial torsion and deeper than 90 degree knee flexion at takeoff are also at increased risk. So coaching att

ention to technique and amount of time spent jump training should help decr ease the risk of patellar tendinosis.

Adequate strength training to high impact jump training and plyometric is believed to be an important part of decreasing the risk of tendon injury. An essential emphasis when the c6focus is on prevention of kneecap tendonitis, is to eccentrically load the muscles during strength training. This means "working the negative" during resistance exercises. This is best done in a closed-chain fashion, with the foot in contact with the ground. So leg presses, for example, are much more beneficial than quadriceps extensions. Wall slides are a simple preventive exercise that does not require any special equipment. The athlete starts with her knees straight and back flat against a wall, then slowly slides down the wall into a "wall sit" position, holding for few seconds, then sliding back up; she should do two sets of 15 repetitions. Half-squats and power clean exercises may also be beneficial, but athletes must be coached to emphasize the negative phase of the contraction "going up fast and down slowly, work against gravity on the way down."

Female athletes suffer many different knee injuries, but we am going to focus on the serious anterior cruciate ligament (ACL) tear.

Over 70% of ACL tears come from non-contact injuries. ACL tears occur most frequently from 3 types of movements:

1. stopping suddenly
2. sudden change of direction
3. landing after jumping with knee extended

In a sport like alpine skiing, athletes are particularly susceptible to ACL tears when landing jumps, skiing moguls or during twisting falls. Low speed twisting falls where bindings fail to release are a common cause of ACL tears in skiers.

Especially in sports such as skiing, soccer, and basketball, females are between two and eight times more likely than males to tear an ACL. Many theories have been proposed by medical researchers to explain this phenomenon:

1. Females are smaller and have smaller ACLs, which tear more easily.
2. The notch in the knee that the ACL passes through is narrower and sharper in females, and it can shear off the ACL with hard cutting and pivoting.
3. The "Q angle" (the angle at which the thigh bone enters the knee joint) in women is not as suited to running and jumping.
4. Women in general are more flexible, with looser ligaments, tendons and muscles. While this prevents certain injuries, it increases the risk of ACL rupture.

5. Monthly hormonal fluctuation may relax ligaments at certain times, increasing risk of ACL tear.
6. Muscles are important stabilizers of all joints, and females in general have smaller and less developed muscles, increasing ACL tear risk.
7. Females in general do not grow up playing as many sports as males, and therefore lack the same level of coordination and balance that can help prevent injury.
8. Females, when tested, consistently have weaker hamstring muscles (back of thigh) relative to their quadriceps (front of thigh) as compared with males, and this imbalance increases risk of ACL tear.
9. Women generally play sports in a more upright position than men. The less flexed the knee is, the greater the risk of ACL tear, especially when stopping suddenly.

When studied and tested, none of these hypotheses alone could explain the higher rate of ACL tears in women, but taken together, they may begin to explain the discrepancy. A couple of studies indicate that muscular imbalance and hamstring weakness may be the most important variables. This, we believe, is good news, because hamstring strength and balance are things that we can do something about.

PURPOSE

This article has the purpose to make a clinical epidemiology of knee injuries in this category of sport. The study has the aim to report the incidence, risk, and severity of knee injuries across genders, level of preparation and type of exposure.

METHODS

A prospective cohort study of acute injuries in the 'Jordan Misja' high school and 'Luigj Gurakuqi' University volleyball players was carried out during the 2012-2013 period. Volleyball players sustain thousands of injuries annually during this activity. The group of study consist in 300 volleyball players, both boys and girls at the age of 17-21.

They confirm to take part in this study and were asked to complete pre-participation forms including information on previous playing experience (division, number of years, team participation), number of previous injuries to right and left knee, time since last injury and regular use of knee protection for their right and left knee. The related injury data were collected in 12 months. An injury was registered if it resulted from a sudden event during organized volleyball training or match, and caused an absence of one or more days of training or match play. All the injured players consented to participate in a telephone interview.

Working with epidemiological studies it is obvious that some confusion exists about terms such as injury incidence, rate, risk, frequency and prevalence. Injury incidence was the number of injuries per player per 1000 volleyball hours played; injury risk was the number of injuries per player per year; and injury rate was injuries in a specified group expressed as percentages of all injuries.

The injury risk was expressed as the number of knee injured as a percentage of the total number. Comparisons of activity type (match vs. training), and gender were done using the Mantel-Haenszeltest. The Mantel Haenszel risk ratio (RR_{MH}) can be computed as follows:

$$RR(MH) = \frac{\sum_1^i (a_i Tu_i)/T_i}{\sum_1^i (c_i Te_i)/T_i}$$

In which:

a and *c* are the number of cases exposed and unexposed in a stratum
Te and *Tu* are the total number exposed and unexposed in a stratum
T is the total of a stratum
The sums ∑ are calculated for the *i* strata.

Gender	**Cases**	**Total**	**Attack Rate**	**RR**
Boys	100	300	40%	ref
Girls	200	300	60%	4.52

Calculating injury incidence the coaches reported 130 acute injuries. The most frequent injury type observed was the knee injuries (55% of all injuries).

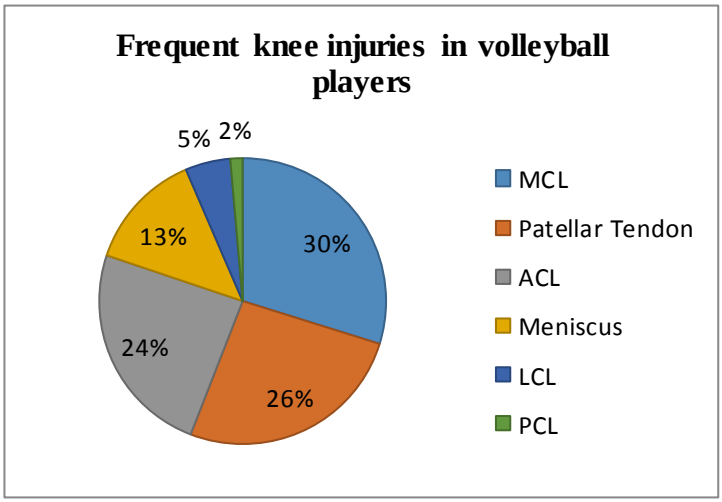
Results

Knee injuries were more common in competition than in practice. This type of injuries was more frequent than other injuries like sprain muscle, wrist fracture, back pain etc.

Injuries were more frequent during games than training. Girls had significantly higher knee injury rates than boys. The most frequent mechanism of injury was landing from a jump in the attack zone.

The study shows that the most commonly involved structure was the medial collateral ligament (reported in 30.1% of knee injuries), followed by the patella/patellar tendon (26.5%), anterior cruciate ligament (24.4%), meniscus (13.0%), lateral collateral ligament (5.0%), and posterior cruciate ligament (2.1%).

Girls were significantly more likely to sustain anterior cruciate ligament injuries than boys.



Conclusion

- The prevention and treatment of the knee requires a high degree of cooperation among trainers, doctors and athletes. Although volleyball is a sport without contact between players, traumatic acute injuries are more frequent and more serious than would be expected.
- It is therefore important to emphasize that volleyball must be considered among the high risk sports that expose the knee not only to twisting, but also to contact with other players. Knee injury patterns differ by grade of preparation and sex.
- This study showed that knee injuries are more frequent in volleyball players. Girls are more affected than boys. Several intervention strategies have been proposed in an effort to reduce the risk of knee pain, including modification of the center line rule, improving attacker spike approach technique, the quality of rehabilitation and the use of an external support (tape or brace) in an effort to protect the knee from injury.
- Important concepts for coaches are primary and secondary injury pre vention, pain vs. injury, jump rate, stretching, and overuse injuries in volleyball players. These concepts should help build a frame work for injury prevention in volleyball. Primary prevention is defined as measures taken to prevent injury before it ever occurs.
- This type of prevention is essential for severe season ending injury such as anterior cruciate ligament (ACL) injury. Secondary prevention focuses on preventing a re-injury after a previous injury has occurred.

- Continuing efforts to develop preventive interventions could reduce the burden of these injuries. Accurate diagnoses, rest and rapid surgical treatment after the first injury are recommended in order to avoid chronic knee instability with subsequent meniscal lesions and post-traumatic osteoarthritis.
- Other studies are need to be done to evaluate this affirmation.

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