Injury in Professional Basketball Players and Medical Support

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Objective: The aim of this study was to investigate basketball related injury and describe medical support for basketball players.

Materials: Data were collected retrospectively for ten consecutive seasons from a men's professional basketball team that presently belongs to the B.League. Cumulative total number of players were 139.

Methods: An injury was defined as follows: (1) developed as a result of participation in basketball practice or competition, (2) diagnosed by a team physician or trainer, and (3) resulted in restriction of participation for more than one day after the injury.

Results: A total of 190 injuries developed, with an injury rate of 6.4 per 1,000 AE (12.5 and 4.8 for competition and practice, respectively). The risk of injury was significantly higher in competition than that in practice. The ankle was the most common injury site, and ligament sprain was the most common diagnosis.

Conclusions: We investigated basketball related injury and described medical support for basketball players. It is important for the team physician to recognize characteristics of basketball injury and specific medical problems.

Key words: basketball, injury, medical support

Introduction

Basketball is one of the most widely played sports in Japan. The Japan Basketball Association (JBA) had 34,069 teams with 632,883 licensed players in 2017 (<http://www.japanbasketball.jp>). Basketball is characterized by running, jumping, landing, sudden stops, and cutting. Despite its origins as a noncontact sport, the game has evolved to become a physical contact sport. Therefore, there has been an increase in the incidence of injuries. An epidemiological study of injury in the National Basketball Association (NBA) showed that there was a progressive increase in measures of injury until the team expansion for seasons ending 2006-2010¹⁾. Although there is a wide range of roles of a team physician, injury prevention is important and the

first priority. In order to prevent sports injuries effectively, the first step is to identify and describe the extent of the injury problem²⁾.

The author (SGK) has been a team physician of a men's professional basketball team for more than 10 years. The aim of this study was to investigate basketball related injury and describe medical support for basketball players.

A survey of injuries in a professional basketball team

1. Materials and Methods

Data were collected retrospectively for ten consecutive seasons, 2007-2008 to 2016-2017, from a men's professional basketball team (Sunrockers Shibuya) that presently belongs to the B.League.

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The number of team roster was from 11 to 16 per year. Cumulative total number of players were 139 (mean $\pm$ SD; age, 27.1 ± 3.4 years; age range, 21–35 years; height, 191.9 ± 10.3 cm; body mass 87.7 ± 15.2 kg). The number of games per year has increased as the league that the team belongs to has changed. The Japan Basketball League (JBL) had 46–55 games in 2007–2013 season, the National Basketball League (NBL) had 56–63 games in 2013–2016, and B.League had 64 games in 2016–2017. The numbers included the games of the playoffs and the All Japan Emperor's Cup. An injury was defined as follows: (1) developed as a result of participation in basketball practice or competition, (2) diagnosed by a team physician or trainer, and (3) resulted in restriction of participation for more than one day after the injury. Injury rates are calculated per 1,000 athlete exposures (AE).

Statistical analyses were performed using GraphPad Prism 6 software (GraphPad Software, Inc, San Diego, CA, USA). The results were analyzed using chi-square test or Fisher's exact test for comparing two groups. P-values < 0.05 were considered to indicate statistical significance.

2. Results

A total of 190 injuries developed, with an injury rate of 6.4 per 1,000 AE (12.5 and 4.8 for competition and practice, respectively). The risk of injury

was significantly higher in competition than that in practice (RR, 2.61; 95% CI, 1.96–3.48; $p < 0.0001$). Overall, the injured body sites were the ankle/foot (33.9%), trunk (22.2%), knee (10.6%), head/face/neck (9.5%), hip/thigh/upper leg (9.5%), lower leg (5.3%), lower arm/hand (4.2%), upper arm/shoulder (2.6%), and others (1.1%) (Figure-1). The injury diagnoses were ligament sprain (35.6%), muscle/tendon strain (35.6%), contusion (12.2%), concussion (4.3%), fracture/dislocation (2.7%), and others (9.6%) (Figure-2). Injury rates in the competition were higher than those in practice among all injury sites and diagnoses. The number of injuries was the highest in September and increased gradually towards the end of the season that included playoff games (Figure-3). Thirteen surgical treatments were performed: anterior cruciate ligament (ACL) injury (2 cases), meniscus tear (2 cases), Achilles tendon tear (2 cases), Jones fracture (2 cases), lumbar disc herniation (2 cases), ankle debridement (1 case), knee cartilage injury (1 case), and nasal bone fracture (1 case). All players returned to sports after the surgeries.

3. Discussion

Several studies describing basketball injuries have previously been reported^{3)–8)}. In this study, injury rates in the competition was 12.5 per 1,000 AE. The previously reported high school boys'

Figure-1 The injured body sites
The ankle/foot was the most common injury site.

Figure-2 Diagnoses (injury types)

Ligament sprain and muscle/tendon strain were the most common injury types.

Figure-3 Monthly injury cases

The number of injuries was the highest in September, just before the season starts, and increased gradually towards the end of the season that included playoff games.

basketball injury rate was 2.93 per 1,000 AE³⁾. In collegiate men's basketball, injury rate was reported as 7.97⁸⁾. Drakos *et al.*⁵⁾ reviewed of the injuries in the National Basketball Association (NBA) over a 17-year period and reported that the incidence was 19.1 per 1,000 AE. Professional basketball players had higher injury rate than that of collegiate or high school players. In this study, injury rates in competition were higher than the rates in practice among all injury sites and

diagnoses. These results suggest that increased physical demand causes higher injury rates.

The ankle was the most common injury site, and ligament sprain was the most common diagnosis in this series. Despite the differences in exposure data collection, these findings are consistent with those of previous studies^{3) 5) 8)}. Because of the high recurrence rate of ankle ligament sprain⁹⁾, prevention strategies are greatly important. Prophylactic taping, ankle braces, and proprioceptive training

have been shown to be effective^{10) 11)}.

Concussion comprised 4.3% of all injuries. According to the Fédération Internationale de Basketball Amateur (FIBA) Medical Commission, the Basketball's Concussion Guidelines follow the guidance provided by the 2012 Zurich¹²⁾ and 2016 Berlin¹³⁾ Concussion Consensuses. A player diagnosed with concussion cannot return to play in that game and must be medically cleared before fully training or playing (<http://www.fiba.basketball>). It is imperative to educate athletes, trainers, coaches, and officials on recognition and management of concussion, with a focus on proper return to play⁸⁾.

The number of injuries was the highest in September, just before the season starts, and increased gradually towards the end of the season that included playoff games. Many injuries in the important period for the team may affect the team's poor results. Assessment of the prevalence of overuse injuries and relationship with training load is important for the prevention and treatment¹⁴⁾. Optimal training load might help reduce injury risk¹⁵⁾.

In NBA, players undergoing Achilles tendon rupture repair or arthroscopic knee surgery had significantly worse performance postoperatively compared with those undergoing other surgical procedures¹⁶⁾. Fortunately, all of the players undergoing surgical treatment in this study returned to play. However, some players had declines in postoperative performance, and some players had short career length. The team staff should be aware of the risks that each surgical procedure is associated with¹⁶⁾.

Medical support for basketball players (roles of a team physician)

1. Management of injury and illness

The team physician has a responsibility for the medical care of players. The majority of basketball injuries could be handled by the team physician who was an orthopedic surgeon. However, some injuries, such as nasal bone fracture, needed to be examined by specialists. Although a team physician's education, training, and experience should be adequate to provide optimal medical service to players, there is no systematic educational system to become a sports physician in Japan. Physicians

who want to specialize in sports must accumulate experience by themselves at this time. Construction of the system will be a future consideration¹⁷⁾.

2. Prevention

Prevention of injury and illness should be the first priority of the team physician. As mentioned above, the ankle sprain was the most common injury in basketball. Because of the high incidence of recurrent sprain, the importance of prevention of ankle injury should not be undervalued. Furthermore, optimal training load and proper rest might reduce overuse injury risk¹⁵⁾. Some epidemiological studies have compared injury rates between genders^{3) 8)}. Borowski *et al.*³⁾ reported that the most common injury requiring surgery in female athletes was knee ligament sprains. Several ACL injury prevention programs have been developed¹⁸⁾⁻²⁰⁾. However, it is unclear whether prophylactic interventions are effective in reducing the risk of ACL injury rates¹¹⁾. Although it is impossible to prevent all injuries and illnesses, cooperation with trainers is important.

3. Medical check

All players must have a medical screen annually prior to a competition in B.League. This includes personal and family history taking, physical examination, blood test, urine test, chest X-ray, and electrocardiography (ECG). It is mandatory for rookie and transferred players to undergo echocardiography and exercise ECG. In the National Collegiate Athletic Association (NCAA), the athletes with the highest sudden cardiac death rates were male basketball players²¹⁾. Careful cardiac screening is very important to avoid this catastrophic event.

4. Anti-doping

FIBA's anti-doping regulations are compliant with the World Anti-Doping Code of the World Anti-Doping Agency (WADA) (<https://www.wada-ama.org>). Although all players should review the WADA prohibited list, the team physician is obliged to educate players about anti-doping issues. Moreover, the team physician should know the Therapeutic Use Exemption (TUE) process for when the TUE request is needed.

5. Support for young players

A fundamental principle of medical support for young players is the same as that for adult players. The Japanese men's national team has not competed in the Olympics for four decades. In order to strengthen the Japanese team, it is necessary to recruit and train promising junior players. The B.League requires clubs to have their own youth teams for players' resource development. However, many young players have never had medical screenings. Because basketball is a sport wherein tall players have advantages, many players are taller than other sports players. Tall players have been rarely diagnosed with Marfan syndrome at a medical check for sports. Abnormalities of the heart and blood vessels are common in Marfan syndrome. Cardiac screening is also important for young players.

6. International travel

When a team, especially the national team, travels abroad to participate in an international competition, the team physician should deal with problems that could occur in foreign countries. The team physician should try to know the climate, hygienic environment, medical system, and epidemics of the destination. Players should receive appropriate vaccinations, if necessary. Based on the duration of stay, health system, and environment, the team physician should prepare adequate medical supplies.

Conclusion

We investigated basketball related injury and described medical support for basketball players. It is important for the team physician to recognize characteristics of basketball injury and specific medical problems.

Conflict of interest

The authors declare they have no conflict of interest.

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