

Injuries in a Developing Sport, Cachibol (Newcomb Ball)

Uri Farkash MD¹, Oleg Borisov MD¹, Iftach Hetsroni MD¹, Ezequiel Palmanovich MD¹, Edna Zohar MD² and Meir Nyska MD¹

Departments of ¹Orthopedic Surgery, ²Anesthesiology and Critical Care and Pain Management, Meir Medical Center, Kfar Saba,+9 affiliated with Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel

ABSTRACT: **Background:** Cachibol (known as *kadureshet* in Hebrew) is a team ball game whose characteristics are similar to those of volleyball. The game is becoming increasingly popular, particularly among adult women and is the fastest growing female sport in Israel. Despite its growing popularity, data on the epidemiology of injuries incurred from this sport are sparse.

Objectives: To investigate the incidence and severity of injuries among adult female cachibol players.

Methods: We conducted a cross-sectional survey and observational cohort study of 612 amateur female cachibol players participating in a 3 day national tournament; 355 players completed questionnaires relating to traumatic injuries incurred during previous cachibol activity (58% response rate). All injuries sustained during the tournament were reported.

Results: Fingers were the most commonly injured part of the body, mostly due to a direct hit by the ball. Finger injuries, though considered mild, may have long-term implications: over 50% of the injured players reported long-term finger discomfort. After finger injuries, ankles and knees were the second most commonly injured parts of the body, with a higher rate of absence from sports activity and work and for a longer time compared to finger injuries.

Conclusions: Due to the unique characteristics of cachibol, the rate of finger injuries is higher than in volleyball. Injuries are a growing cause for concern in view of the rapidly increasing number of cachibol players. Our findings may be useful for developing effective injury prevention programs for cachibol players.

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KEY WORDS: cachibol, Newcomb ball, *kadureshet*, sports injury, finger injuries

Cachibol (also known as *kadureshet* in Hebrew) is a team ball game with characteristics similar to those of volleyball. The game was invented in 1895 by Clara Gregory Baer, a pioneer in the field of physical education at Sophie Newcomb College in Louisiana, United States [1]. In both games the aim is to get the ball into the opposing court over the net. However, in contrast to volleyball, instead of volleying, passing, hitting or striking the ball, cachibol players are allowed to catch the ball in their hands for a period of up to one second. Due to the characteristics of the game, players of virtually any age or level of fitness may

learn, participate and enjoy this sport. Cachibol is thus becoming increasingly popular, particularly among adult women.

The game is known as cachibol in South America and other Spanish-speaking countries, or as Newcomb (sometimes spelled Newcombe) in Australia, the United States and Canada. In the last decade, cachibol has evolved from a recreational activity to a competitive sport and is now the fastest growing female sport in Israel. Thousands of women join teams and participate weekly in several amateur leagues, including national leagues, workplace leagues, and “Mamanet,” a league specifically designed for, and suited to, mothers.

Understanding the type and mechanism of injuries resulting from specific sport activities is invaluable for sports medicine professionals, both for treating patients and for designing injury prevention programs. However, despite the growing popularity of cachibol, data on the epidemiology of injuries in this type of sport are sparse. We therefore conducted an epidemiological investigation of the variety and incidence of acute injuries among amateur female cachibol players, and tested the association between their physical characteristics, time spent training, and the occurrence of reported injuries. We hypothesized that the most prevalent injuries would be to the upper and lower limbs, with particular emphasis on finger injuries resulting from repeated contact between the fingers and the ball.

PATIENTS AND METHODS

The study was conducted in 2014 during a 3 day tournament of the “Sportiada” games and was approved by our institutional review board. We conducted a retrospective cross-sectional survey by interviewing players regarding previous injuries due to cachibol. Additionally, prospective injury registration was performed during the tournament. A cachibol-related injury was defined as any physical complaint resulting from cachibol training or play, irrespective of the need for medical attention or time lost from the sport. This definition was adapted from the consensus statement on injury definitions, and data collection procedures in studies of football injuries [2]. Overuse injuries were not included in the study.

RETROSPECTIVE SURVEY

All players who registered for the tournament were asked to fill out a questionnaire. All players belonged to teams from the

workplace or from “Mamanet” leagues. An investigator personally distributed questionnaires to players at the competition site. The goals and methods of the research were explained, players were informed that participation was voluntary, and they were assured that information given was confidential. Players were free to ask questions about the research.

The questionnaire consisted of two parts. The first part was a general information section on participants’ age, height, weight, and hand dominance. Data were gathered about their involvement in cachibol, the position held by the player in the team, and their involvement in other sports. These variables were analyzed in relation to injury type and prevalence. The second part of the questionnaire dealt with any past traumatic injuries incurred during cachibol-related activity. Reported injuries were subdivided by anatomic region. Information was gathered regarding the type and circumstances of the injury, whether the injury occurred during practice or a game, treatment received by the player, and whether the player still suffered from an injury-related complaint.

PROSPECTIVE STUDY

With the assistance of the tournament medical personnel we attempted to register all injuries that occurred during the tournament. An injury report form was prepared which included questions on type, location and circumstances of the injury. Injured players were contacted at the completion of the tournament in order to document subsequent medical treatment received, the final diagnosis, and time lost from sports in the period following the tournament as a result of injury.

DEFINITIONS

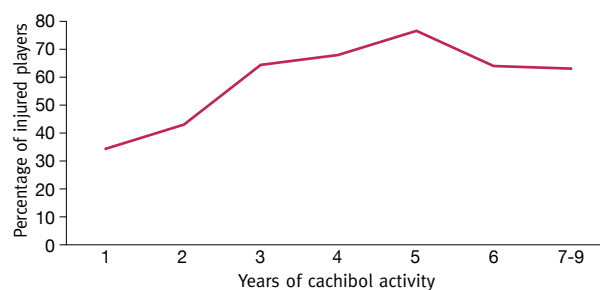
Athletic exposure (AE) is defined as one athlete participating in one game [3]. The AE rate for any specific team was calculated as the number of players registered in the team roster, multiplied by the number of games played by the team. AE during the tournament was calculated as the cumulative exposure of all teams. Descriptive statistics included injury rates which were calculated as injuries per 1000 AEs.

All injuries were classified by the loss of training time and absence from work, if relevant. Using previously published criteria [4], incidental injury was defined as injury that resulted in no time lost from competition or training, “minor” if it interrupted participation for a period of less than 1 week, “moderate” if it necessitated absence for more than 1 week but less than 1 month, and “major” if the injury caused absence of more than 1 month.

STATISTICAL ANALYSIS

Continuous variables were represented by means and standard deviation of the means, and categorical variables by absolute and relative frequencies. The Mann-Whitney test or *t*-test (whichever was appropriate) was used for com-

Figure 1. Percentage of injured players per years of cachibol activity



parisons of continuous variables, and the chi-square test or Fisher exact test (whichever was appropriate) for categorical variables. Level of statistical significance was set at $P < 0.05$ for all analyses. All statistical analyses were conducted using SPSS-22 software.

RESULTS

RETROSPECTIVE SURVEY

Of the 612 female players who participated in the tournament, 355 filled out and returned the questionnaire (58% response rate). The average age of the players was 42.3 ± 7.9 years (range 22–64). They reported engaging in cachibol activity for an average of 2.7 ± 1.5 hours per week for the last 3.4 ± 3.3 years. Among 355 respondents, 190 (54%) reported sustaining at least one cachibol-related injury; 34 players reported injuries to more than one part of the body. Players reported substantially more finger injuries than injuries to other parts of the body: 148 reported finger injuries, as compared to 61 ankle injuries, 19 knee injuries, 7 hand and wrist injuries, 7 shoulder, 6 hip and leg, 5 back, 3 foot, and 2 face injuries. Figure 1 shows the percentage of injured players per number of years of cachibol activity.

We compared age, height, weight, body mass index (BMI), and engagement in other sports activity between non-injured and injured players in order to determine the relationship between risk factors and injuries. Players who incurred ankle injuries were significantly taller than players with no ankle injuries (169.1 ± 5.8 cm in the injured group vs. 165.7 ± 6.1 cm in the non-injured group, $P < 0.0001$). No other correlations were found.

Table 1 shows recovery time (time when players could not train or play due to injury), prevalence, median and range of reported time lost from work due to common injuries, as reported by the players. Since some of the players who reported having been injured did not answer questions on time lost from sport or work, the total numbers in Table 1 differ slightly from those mentioned above.

In addition to the finding that fingers were the most commonly injured parts of the body, 57 of the 148 players who reported sustaining a finger injury injured their fingers more

Table 1. Severity of players' reported injuries and days lost from work

	Finger	Ankle	Knee
Injury severity			
Incidental, n (%)	62 (45%)*	9 (15%)*	6 (31%)
Minor, n (%)	30 (21%)	11 (19%)	4 (21%)
Moderate, n (%)	14 (10%)	19 (33%)	2 (11%)
Severe, n (%)	33 (24%)	19 (33%)	7 (37%)
Total responses	139	58	19
Absence from work			
No. of players absent from work (%)	33 (24%)**	27 (49%)**	9 (47%)**
No. of work days lost (median)	7	7	15
No. of work days lost (range)	1-60	1-90	6-240
Total responses	139	55	19

†Classified according to Morgan and Oberlender [4]

* $P < 0.0001$

** $P < 0.02$

than once. Thirty-six percent of finger injuries occurred during a game and 64% during training. Finger injuries were distributed evenly between the right and left hands, and no correlation between hand dominance and injured side was found. Most finger injuries were to the little and ring fingers (65 and 55 respectively). Most finger injuries (79%) were caused by the ball, 15% by hitting another player, and 6% by hitting the floor or the net. Of those injured by the ball 89% were injured while attempting to catch it and the others while attempting to block or hit the ball. Only 45% of players who suffered a finger injury reported that the finger regained normal function. The other 55% reported continued pain, limited range of flexion or extension, angulation or stiffness of the finger.

The ankle was the second most frequently injured body region, with 61 players reporting an ankle injury; 15 of these players injured the ankle more than once. Most ankle injuries occurred during a game or a practice simulating a game, with 76% occurring at the frontline of the court and 13% at the back. The other 11% occurred during practice that did not simulate a game. Of the players who recalled the circumstances of injury, 60% injured the ankle while landing on the floor, 30% landing on an opponent's foot, and 10% landing on a teammate's foot.

PROSPECTIVE STUDY

During the tournament 65 teams comprising 612 players participated in 119 games of cachibol, with a total of 2365 athletic exposures. Altogether, 26 players reported a total of 27 injuries and the overall injury rate was 11.4/1000 AE. Table 2 shows the distribution of injuries by severity and location. The most frequently injured areas involved the fingers, followed by knees, ankles, head, shoulders, and wrists.

Ten of the 27 injuries were incidental injuries causing less than 1 day of absence from sports activity; 80% of incidental injuries involved the fingers. Seventeen injuries were severe enough to result in at least 1 day absence from games during

Table 2. Distribution of acute injuries during the tournament by severity† and body location

Body region	Incident	Injury severity			Total (%)
		Minor	Moderate	Severe	
Finger	8	3	1	3	15 (56%)
Knee	–	–	3	2	5 (19%)
Ankle	1	1	–	–	2 (7%)
Head	1	1	–	–	2 (7%)
Shoulder	–	2	–	–	2 (7%)
Wrist	–	–	1	–	1 (4%)
Total	10	7	5	5	27 (100%)

†Classified according to Morgan and Oberlender [4]

the tournament. The injury incidence rate causing absence of at least 1 day from sports activity was 7.2/1000 AE. Ten injuries were moderate or severe, resulting in loss of ≥ 7 days participation in sports activity. Five of these injuries involved the knee (one case of a ruptured anterior cruciate ligament and four cases of sprains of the medial collateral ligament), four involved the fingers, and one involved the wrist.

Of the 15 players who suffered finger injuries during the tournament, 3 injured more than one finger. The little finger was the most affected (8 players), followed by the ring finger (n=5), index finger (n=3), middle finger (n=2) and thumb (n=1). The most frequent joint injured in the finger was the proximal interphalangeal joint: seven players suffered a sprain and two players suffered avulsion fracture of the volar plate of this joint. The ball caused most injuries in general, and finger injuries in particular, causing all but one of the finger injuries. Nine finger injuries occurred while attempting to catch the ball, and five while blocking or striking it. Besides a direct blow from the ball, injuries were also associated with falls (three cases) and landing on the opponent's foot (one case).

DISCUSSION

When choosing to engage in athletic activity, especially amateur activity intended for fun and well-being, one does not anticipate incurring injury although the possibility does exist. Even sports that are not considered strenuous, such as golf, carry the risk of injury [5]. To the extent that recreational participation in a given sport is guided by anticipation of possible injury, the decision to play or not to play must be an informed one.

Many studies have investigated the incidence of sport-related injuries in various sports activities. The risk of acute injury varies enormously, with contact sports carrying much higher risk than endurance sports [6]. Some investigators [6,7] found that injury rates in popular team games such as soc-

cer, volleyball and basketball lie somewhere in between. The National Collegiate Athletic Association (NCAA) has been collecting injury and exposure data from different collegiate sports activities in the Injury Surveillance System since 1988 [8]. The NCAA criteria for a reportable injury is that the injury occurred during an organized practice or game, it required medical attention, and it resulted in restriction from participation in sports activity for one or more days after the injury. In women's volleyball, the NCAA data show game injury rates of 4.6 per 1000 AE, and that the risk of injury in a game situation is only slightly higher than in a practice setting [9]. Since cachibol, like volleyball, is a non-contact sport in which players are separated from the opposing team by a net, we expected the incidence of injuries to be similar. However, in our study of women's cachibol, the injury rate was 7.2 per 1000 AE, according to the same NCAA criteria for injury. This is more than 50% higher than the rate in volleyball. Further analysis of the data is required to explain this finding.

When comparing cachibol to other team sports, it is important to compare the player populations that have similar training, background and skill level. The player population at the Sportiada differs substantially from the population reported in studies of volleyball, and this fact may explain the difference in injury rates. Since cachibol is a growing and developing recreational sport in recent years, most players are relatively new to the game and to sports activity in general. They are therefore less skilled than players who have engaged in sports activity since high school. Although some investigators [10] did not observe a relationship between risk of injury and age, experience or skill level in volleyball players, others demonstrated that the injury incidence in soccer was inversely related to training level, i.e., teams that had more training time experienced fewer injuries [11]. Although teams playing in the Sportiada tournament are relatively skilled, improvement in skill as an adult player may have a long learning curve and the players are therefore exposed to specific injuries.

Since cachibol has many characteristics similar to those of volleyball, we expected injury distribution to be similar. While there is ample information on volleyball injuries in the literature, these reports relate to young, more active participants. A report from the NCAA [12] found that more than 55% of all injuries in women's volleyball were to the lower extremities, particularly the knee and ankle. Similar injury distribution with predominance of lower extremities, particularly ankle sprains, was also reported by others [13,14] and only 7–10% of injuries in volleyball involved the fingers [10,15]. Both our retrospective survey and prospective study show that the fingers were the most frequently injured part of the body in cachibol, exceeding by far lower extremity injuries. The same type of ball is used in both cachibol and volleyball. We assume that the unique characteristic of cachibol, which allows catching the ball instead of hitting it, exposes cachibol participants

to unique finger injuries where the ring and little fingers are most vulnerable.

Some authors [14] have noted a high prevalence of finger sprains in volleyball, but since many players use taping or strapping of the fingers and continue playing, these injuries rarely cause loss of playing time during training or games and, therefore, may be under-reported in studies of injury incidence. Our study also confirms that finger injuries are milder compared to other frequent lower extremity injuries. While many of the finger injuries did not cause loss of playing time or work absence, most ankle and knee injuries resulted in absenteeism from sports activity and work, and for a longer time.

Although finger injuries are regarded as “mild injuries” and may be considered by many players as part and parcel of cachibol, these injuries have both short and long-term implications. We found that one-third of players with finger injuries reported absence from sporting activity for more than one week, a quarter reported absences from work because of finger injuries, and 27% of finger injuries sustained during the tournament were moderate or severe. These findings indicate that these injuries are not really “mild.” Moreover, 55% of injured players reported long-term consequences, namely pain, limited range of motion, angulation or stiffness of the injured finger. Clearly, these injuries should be taken seriously.

Players in our survey reported that the ankle was the second most commonly injured body part. This is similar to the published data indicating that volleyball athletes appear to be at greatest risk of acute inversion sprains of the ankle [16]. An interesting finding in our study was that players who injured their ankle were taller than those who did not. Van Mechelen et al. [17] investigated the effect of selected subject-related risk factors for sports injuries in a group of young adults. These factors included body height, weight and BMI, but no correlation was found between these factors and the risk of being injured. We assume that the height of a player is, in and of itself, not a risk factor for injury but that taller players tend to play closer to the net, jump for blocking or spiking, and are therefore at greater risk of ankle injuries.

The knee was the third most commonly injured body part according to the retrospective survey, but during the tournament knee injuries were more prevalent than ankle injuries. As shown in previous studies [11] knee injuries usually involve non-contact activities. Nevertheless, knee injuries in cachibol are relatively common and may also be relatively serious in this specific (adult women) population. All knee injuries that occurred during the tournament were severe enough to result in loss of participation in sports activity for at least 10 days, compared to only 55% of knee injuries in the NCAA report [12].

Our study has several limitations. The retrospective survey reports the cumulative incidence of player-reported injuries, a statistic influenced by the player's perception of injury and recollection bias, and does not accommodate

the different length of exposure time and follow-up among athletes. However, it provides important information for athletes interested in answering the question that concerns them, “What is the risk of injury if I play cachibol?” [17]. An additional limitation is that our study deals only with players who participated in the tournament. Women who ceased playing after a severe injury, or those who choose to quit after suffering minor injury for fear of incurring further injuries are not represented in our study, thus our retrospective data may be an underestimation of the injury rates in cachibol. A nationwide prospective study collecting data relating to all injuries sustained during a season of cachibol may better reflect injury incidence in this sport. Nevertheless, although the two methods used have different strengths and weaknesses, it is interesting that both highlight finger injuries as an issue that needs to be addressed.

We acknowledge the health benefits of physical activity in general and the positive aspects of cachibol, which include friendly and professional competition, good sportsmanship, social networking, and local pride. These have resulted in the increasing popularity of this sport among adult women in Israel in recent years, but as the number of players increase, cachibol-related injuries should not be overlooked. Strategies proposed for the prevention of volleyball-related injuries may only be partially suitable for cachibol as they focus mainly on prevention of ankle sprains, patellar tendinopathy, and shoulder overuse injuries [16,18,19]. Further research should focus on the mechanism of finger injuries among cachibol players in order to identify risk factors that are modifiable and thereby plan injury prevention programs to reduce the risk of injury.

In conclusion, the current study shows that cachibol has a unique player population and game characteristics resulting in a higher injury rate compared to volleyball. Fingers were identified as the most vulnerable body region, followed by ankle and knee injuries. Lower limb injuries had a higher impact on the ability to return to play, but finger injuries also carry considerable risk of long-term discomfort. We hope our study will help initiate an intervention program aimed to reduce the incidence of such injuries and their long-term consequences.

Correspondence

Dr. U. Farkash

Dept. of Orthopedic Surgery, Meir Medical Center, Kfar Saba 44281, Israel

Phone: (972-9) 747 2824

Fax: (972-9) 747 2631

email: urifarkash@gmail.com

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“People who demand neutrality in any situation are usually not neutral but in favor of the status quo”

Max Eastman (1883-1969), American author, poet, and prominent political activist. He supported socialism and liberal and radical causes. In later life, however, Eastman changed his views, becoming highly critical of socialism and communism after his experiences during a two-year stay in the Soviet Union in the 1920s