Sports Scientists Views in
Indian Journal of Physical Education, Sports & Applied Sciences
I.J.P.E.S.A.S
Available Online
www.sportscientistsviews. com
Journal DOI-05-2016-44975451
Scientific Journal Impact Factor-5.684

PREVALENCE OF GROIN PAIN ON THE BASIS OF THEIR PLAYING POSITIONS IN DISTRICTLEVEL BASKETBALL PLAYERS

Dr. Ambuja Bhardwaj[1] & Dr. Devabrata Kalla[2]

Affiliations:

[1] Assistant Professor, Department of Physiotherapy, RIMT University, Punjab (India)
E-mail: ambujabharadwaj@gmail.com

[2] Professor, S.L.N.G. College of Physiotherapy, Jodhpur, Rajasthan, (India), Email: devabratakalla @gmail.com

ABSTRACT

Groin pain in competitive sports is a frequent and complex ailment accounting for 2–5% of all sports-related pain development. This pain may be unilateral or bilateral, may involve one or more sites from time to time, and may present acutely, sub acutely or by gradual onset. It typically presents during or after sudden change of direction running where limitation of rotation of the hip is thought to be a contributing factor. The aim of this study is to check the prevalence of Groin Pain on the basis of their Playing Position in basketball players, to estimate the percentage of Basketball Players having Groin Pain and to detect the risk of chronic or longstanding Groin Pain. Based on Inclusion and Exclusion criteria 100 subjects were selected by purposive sampling with 20 players of all positions each. The HAGOS scale was filled by subjects which is a patient-reported outcome measure employing five-item Likert scales.Data was collected according to the scale.The results of the study show that maximum pain prevalence represented by lower HAGOS scores are seen in players who play at Center, Shooting Guard and Power Forward Positions compared with those who play at Point Guard and Small Forward Positions.

Key Words: Groin Pain; Basketball Players; Playing Positions

1. INTRODUCTION

Groin pain may originate from muscles, tendons, bones, bursae, fascial structures, nerves, and joints. With respect to causes of downtime, inguinal pain is in third place, behind fractures and injuries to the anterior and posterior cruciate ligament. It may present acutely or otherwise, and may arise from more than one source **(Lovell, 1995).**

Groin pain is a frequent and complex ailment in competitive sports accounting for 2–5% of all sports-related pain development, with an incidence of 5–18% among professional soccer and tennis players. In sports, chronic groin pain frequently leads to extended time lost due to injuries despite all therapies **(Striegel, Best and Nieb, 2010**).

Groin pain typically presents during or after kicking and running, and is seen most often in footballers (soccer and Australian football players) where limitation of rotation of the hip is thought to be a contributing factor. This limitation is believed to transfer stress (either by shearing or distraction) across the symphysis and thus contributes to disruption of this fibro cartilaginous joint **(Williams,1978).**

Younger athletes participating in high impact sports have an increased risk of developing cam-type deformities and eventual osteoarthritis **(Agricola et al. 2014).** Historically, many hip injuries in athletes have been neglected because of a lack of specific diagnostic criteria and undefined treatment modalities. However, recent developments in magnetic resonance arthrography, hip arthroscopic surgery, and biomechanics have led to advances in the diagnosis and treatment of nonarthritic hip and groin conditions. Main cause of groin pain is mainly hip disorders, and it can be diagnosed correctly via both clinical symptoms and imaging examinations such as plain radiographs or magnetic resonance imaging (MRI). However, there are patients with groin pain with no specific image findings around the hip joint **(Kurosawaa, 2017).**

Athletic Groin Pain (AGP) is a common chronic presentation in professional and amateur sport. A recent systematic review in football reported an incidence of AGP between 0.2 and 2.1/1000 hour in men; hip/groin injuries were the third most common injuries (14%) **(Werner et al. 2009).**

The rate of incidences are similar in field sports such as Rugby Union, Australian Rules Football and Gaelic football which share the common requirement of acceleration, deceleration, kicking and 'cutting'**(Wilson et al. 2007).** In sports for the evaluation of groin pain, biomechanical segmental coordination (i.e. relationships between segments articulating at the hip, knee and ankle joints) during movements has never been considered whereas segmental coordination is intrinsic to an athlete's ability to control change of direction and produce power to execute movement **(Thorborg et al. 2010)**

In athletes loss of segmental coordination may lead to tissue injury, if the magnitude, rate and direction of the loading of muscles around a joint or joints exceeds that of tissue tolerance. This coordination can be examined using a three-dimensional motion analysis system. Three-dimensional motion analysis systems have successfully identified pathomechanics of anterior cruciate ligament injuries and might also help explain causes of painful structures encountered in AGP. Therefore, studying the movement strategies during a multidirectional movement task might reveal potential injury mechanisms **(Havens and Susan, 2015).** Chronic inguinal pain is another term accounting for the groin injuries in sports. It is defined as the presence of pain in the groin region for more than 6 months. The causes of groin or pelvic pain in females include disorders of musculoskeletal, gynecologic, urologic, or gastroenterological organs **(Apte et al. 2011).**

Basketball is an aerobic-based anaerobic sport which requires high intensity activities such as jumping (for rebounds, blocks and shots), turns, dribbles, sprints, screens and low intensity activities such as walking, stopping and jogging. These activities are reported to be the cause of injuries **(Ayegbusi et al. 2017).** From aggressive, low post play to high-flying dunks, the physical nature of the game has become extremely aggressive. Sports injuries can be expected to result with the type of sport it has become and the grueling length of each season **(Anderson, 2001).**

The game of basketball carries a higher risk of injury than most other sports, and some have demonstrated that female basketball players are more prone to injury than their male counterparts **(Chandy and Grana, 1985).**Women's injury frequency is 1.6 times that of men. Women sustained significantly more knee and thigh injuries as well assprains, strains, and contusions. Men had significantly more muscle spasms. Other injuries occurred in similar patterns in both sexes. Alterations in training programs are suggested with emphasis on women's strengthening and men's flexibility. Although there is a heightened understanding of intraarticular hip pathology, most athletic-related injuries to the hip are extra-articular **(Zelisko, Bates and Marrianne, 1982).**11.5% of all injuries in professional basketball players were related to the hip, with the majority of these being muscle strains and contusions **(Drakos et al. 2010).**

The most commonly injured body area, accounting for more than half of all orthopaedic injuries in basketball is lower extremity. . The scope of conditions that NBA athletic trainers and team physicians must be familiar with is much broader. The causes leading to injuries in basketball involve abruptly flexing and rotational movements in the hip joint and groin with rapid changes of direction and high torqueing. Position of the player in the court accounts for the metabolic load experienced during a game as it varies according to playing position **(Chad, 2000).**

Player's physiological characteristics differ according to their position and role on the court. The straining of fascias as well as musculoskeletal structures of the thigh and caudal abdominal musculature during game leads to pain **(Omar, Zoga and Kavanag, 2008).**

A validated Patient Reported Outcome (PRO) questionnaire was developed in accordance with the consensus-based standards due to the emphasis on valid and reliable evaluation of hip and groin pain. The Copenhagen Hip and Groin Outcome Score (HAGOS) consists of sixseparate subscales assessing pain, symptoms, physical function in daily living, physical function in sport and recreation, participation in physical activities and hip and/or groin-related quality of life and is recommended for use in interventions where the patient's perspective and health-related quality of life are of primary interest **(Thorborg et al. 2014).**

1.1 Theoretical Framework

As we try to understand this study, we have listed a few researches that might help explain the science behind the drive to conduct a study on groin injuries in athletes and how it is related to playing position of the player. **Igor Tak et al. (2017)** conducted a systematic review on role of lower hip range of motion as a risk factor for groin pain in athletes and found that total hip ROM is the factor most consistently related to groin pain in athletes. Screening for hip ROM is unlikely to correctly identify an athlete at risk of developing groin pain because of the Small ROM differences found and poor ROM measurement properties. **(Kerbel, Christopher, John and Marry, 2018)** studied epidemiology of hip and groin injuries in collegiate athletes in the United States and found that hip/groin injuries are most common in sports that involve kicking or skating and sudden changes in direction and speed. Most hip/groin injuries in collegiate athletes

are noncontact and do not result in time lost from competition, and few require surgery. This information can help guide treatment and prevention measures to limit such injuries in male and female collegiate athletes. **Henry et al. (1982)** conducted a study on the injury rate in professional basketball and described that Foot, ankle, knee, back, and hand injuries were found to occur most often. The most common as well as the most severe injuries were those of the ankle and knee. The average time loss from play due to injury was amazingly consistent for each specific injury. Rehabilitation of injuries varied from no playing time loss to two years. Even though knee injuries carry a poor prognosis, the authors conclude that the incidence of severe injury in professional basketball is low.

A study on hip and groin pain in sub-elite south African footballers and stated that the prevalence of groin injuries in this population is relatively high (57%) and requires lengthy rehabilitation time.The HAGOS is a suitable tool to identify groin pain in this population within the sports and recreation and quality of life subscales. Isokinetic hip strength and range of motion testing lacked sensitivity in detecting deficits in players with a previous groin injury. Only two-thirds of injured players consulted a medical practitioner, increasing the likelihood that rehabilitation was inadequate. It is therefore recommended that player/coach education regarding injury **(Dowson et al. 2015).**

1.2 Aim

The aim of study was to check the prevalence of groin pain on the basis of their playing positions in district level basketball players by using HAGOS scale as a diagnostic tool.

1.3 Objectives

1. To estimate the percentage of Basketball Players having Groin Pain.
2. To estimate the percentage of Basketball Players having Groin Pain referring to specific Playing Position in the court.

1.3 Hypotheses

H:1. The score outcome of HAGOS will be different for each playing position.

H:2. There will be a positive correlation between the two variables.

1.4 Research Questions

1. Is there a relationship between Groin Pain and Playing Position?
2. Which Position accounts for maximum cases of Groin Pain?

1.5 Operational Definition

For a better understanding of the variables in the study, an operational definition is given. The variables are Groin Pain and Basketball.

1.5.1 Basketball

Basketball is defined as a game played between two teams of five players in which goals are scored by throwing a ball through a netted hoop fixed at each end of the court as stated by (Clarendon,1991).

1.5.2 Groin Pain

It is defined as tendon enthesitis of adductor longus muscle and abdominal muscles that may lead to degenerative arthropathy of pubic symphysis in an advanced stage as mentioned by (Jankovic et al. 2001).

2 METHODOLOGY

2.1 Sample

The sample comprises of 100 sports players from various Academies and Stadiums of Punjab.The subjects were selected by Purposive Sampling technique. The age group of the subjects taken for study was from 19 to 29 years.

2.2 Inclusion criteria and Exclusion criteria

Inclusion criteria- Comprise of basketball players from various academies and stadiums of Punjab state. The age group of the subjects taken for study was from 19 to 29 years. Those Subjects were taken who regularly played basketball at least an hour a day, three or more days per week for at least a year.

Exclusion criteria- Sport players who were having history of recent surgery, recent fracture, musculo-tendinous injury in the 12 weeks before the study as reported by the subject. Basketball players with neurological deficit or spinal pathology were also excluded.

2.3 Research Design

This study used the descriptive epidemiology design.

2.4 Description of Tools U

Copenhagen Hip and Groin Outcome Score (HAGOS) was created by Thorborg, Branci, Stensbirk, Jensen and Holmich in 2011. It consists of six separate subscales assessing Pain, Symptoms, Physical function in daily living, Physical function in Sport and Recreation, Participation in Physical Activities and hip and/or groin-related Quality of Life. Test-retest reliability was substantial, with Intraclass Correlation Coefficients (ICC) ranging from 0.82-0.91 for the six subscales. Construct validity and responsiveness were confirmed with statistically significant correlation coefficients (0.37-0.73, $p<.01$) for convergent construct validity, and for responsiveness from 0.56-0.69, $p<.01$ as mentioned by (Thorborg et al.2010).

2.5 Procedure

Based on the Inclusion and Exclusion criteria 100 subjects were selected by purposive sampling. Subjects were the district level Basketball players and divided according to their playing positions as 20 players of each position which includes center, Power Forward, Small Forward, Shooting Guard and Point Guard. Informed consents were taken from all the subjects.The subjects were assessed through general assessment forms.The players were interviewed and questioned regarding injuries sustained in previous years. Purpose of the study that was, to check the prevalence of Groin Pain in the basketball players and to check the player playing at which playing position is more susceptible to groin injuries was explained to the subjects.They were assessed using HAGOS questionnaire, which covered six dimensions including Symptoms, Pain, Function in daily living (ADL), Function in sport and recreation (Sports/Rec), participation in physical activities (PA) and hip and/or groin-related quality of life (QOL). The subscale Symptoms included questions regarding discomfort in hip or groin, presence of clicking sound, difficulty in stretching legs far out to the side, difficulty in full stride, presence of sudden twinging or stabbing sensation in hip or groin and stiffness after first awakening in the morning or lying, sitting and resting.

The subscale Pain included questions regarding pain in the areas other than hip and groin which according to subject can be related to hip or groin pain and presence of pain while movements like straightening of hip, bending, stair climbing sitting or lying. The subscale of ADL included the questions concerned with physical function in which the player had to indicate the degree of difficulty, due to hip and groin pain, experienced by him in activities like walking up stairs, bending down, getting in or out of car, lying in bed and heavy domestic duties. The subscale of Sports/Recreation included questions concerning physical functions when participating in higher–level activities such as squatting, running, twisting or pivoting on a weight bearing leg, walking on an uneven surface and sudden explosive movement that involve quick footwork, such as accelerations decelerations and change of direction. The subscale of PA

included the questions which were about the ability of the player to participate in his/her preferred physical activities at their normal performance level.

The subscale of QOL included the questions regarding modifications made by the subject in the life style to avoid activities potentially damaging hip or groin and restrictions due to hip or groin problem. Verbal introduction of the questionnaire was given to subjects. The 6 HAGOS subscales are scored separately: Symptoms (7 items); Pain (10 items); ADL (5 items); Sport/Rec (8 items); PA (2 items) and QOL (5 items). The past week was taken into consideration when answering the questions. Standardized answer options were given (5 Likert boxes) and each question gets a score from 0 to 4, where 0 indicates no problem. The six scores are calculated as the sum of the items included, in accordance with score calculations of the HOOS score. Raw scores are then transformed to a 0-100 scale, with zero representing extreme hip and/or groin problems and 100 representing no hip and/or groin problems, as common in orthopaedic scales. Scores between 0 and 100 represent the percentage of total possible score achieved. An aggregate score is not calculated since it is regarded desirable to analyze and interpret the different dimensions separately. Data was collected from the players playing on different positions according to the questionnaire.

2.6 Data Analysis

Descriptive Variables were presented as mean± SD. As the dependent variables (HAGOS) did not show a normal distribution ,non-parametric statistics were used for all analyses. Data was meaningfully assorted through calculation of Mean, Standard Deviation, ANOVA. “ANOVA” test was used to investigate effect of playing position on the subscales of HAGOS. The level of significance for all statistical tests was set at $p<0.05$ followed by least significant difference test for comparisons in case of significance. The level of significance for all statistical tests was set at P-value less than 0.05.

3. RESULTS

Data was meaningfully assorted through calculation of Mean, Standard Deviation, ANOVA. The percentage distribution score for pain subscale of HAGOS in the positions were as follows Center (12%), Shooting Guard (16%), Point Guard (26%), Small Forward (27%) and Power Forward (19%).

TABLE 1
DESCRIPTIVE STATISTICS OF PAIN SUBSCALES OF HAGOS

Variables	Mean	SD	Median	Maximum	Minimum	Range	N
Age	22.02	1.94	23	26	19	7	100
Years of Playing	5.86	1.17	6	8	4	4	100
Playing Hours per Week	11.37	2.02	12	19	8	11	100
Symptoms	47.90	10.96	46	71	21	50	100
Pain	46.10	14.29	45	70	13	58	100
ADL	43.25	19.36	40	70	5	65	100
Sport/Rec.	41.82	16.12	41	66	9	56	100
PA	49.00	15.56	50	75	25	50	100
QOL	47.05	16.19	50	70	10	60	100
Overall Score	45.41	13.92	43	66	22	45	100

The above table 1 denoted the descriptive scores according to demographic variables of ages of the groups. There was no significance difference between groups on the HAGOS subscales with the age, years of playing and playing hours per week variable of the groups. The Means ± SD value of the Symptoms was 47.90±10.96 ,Pain was 46.10±14.29, ADL was 43.25±19.36, SPORT/REC was 47.90±16.12and PA was 49±16.19 and QOL was 45.41±13.92.

TABLE 2

COMPARISON OF PLAYING POSITIONS AND HAGOS OVERALL SCORE

Variables	Positions	Mean	SD	N	F -ratio	P Value	Result
Overall Score	Centre	26.29	2.83	20	646.935	0.000	Significant
	Shooting Guard	35.84	2.61	20			
	Point Guard	59.19	2.35	20			
	Small Fwd	62.00	2.53	20			
	Power Fwd	43.74	3.01	20			

Table No.2 shows the comparison of Overall Score of HAGO Samong Playing Position. The comparison of Playing Positions is being measured. The Mean±SD of the Overall Score was 26.29±2.83 of Centre position, 35.84±2.61of Shooting Guard, 59.19±2.35 of Point Guard, 62.00±2.53 of Small Fwd and 43.74±3.01of Power Fwd. The result was statistically significant at p< 0.05.other.

TABLE 3

COMPARISON OF PLAYING POSITIONS AND HAGOS PAIN SUBSCALE

Variables	Positions	Mean	SD	N	F Test	P Value	Result
Pain	Centre	27.25	5.84	20	157.847	0.000	Significant
	Shooting Guard	36.88	5.55	20			
	Point Guard	58.75	6.31	20			
	Small Fwd	62.75	4.72	20			
	Power Fwd	44.88	3.49	20			

Table No.3 shows the comparison of Pain Subscale of HAGOS among Playing Position. The comparison of Playing Positions is being measured. The Mean±SD of the Pain was 27.25±5.84 of Centre position, 36.88±5.55of Shooting Guard, 58.75±6.31 of Point Guard, 62.75±4.72of Small Fwd and 44.88±3.49of Power Fwd. The result was statistically significant at p< 0.05.other.

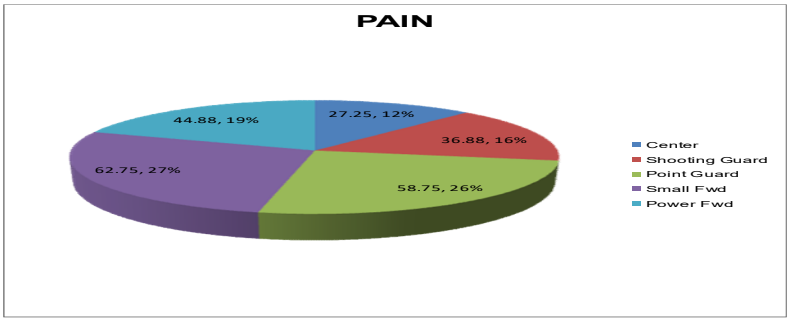

Fig 1. Pie-chart presentation of pain percentage in Playing Position with 0 representing severe pain and 100 representing no hip/groin pain.

4. DISCUSSION

The purpose of this study was to investigate if position of the player in the court influences the incidence of groin pain in basketball. The data was analyzed for the comparison between the playing positions using HAGOS (The Copenhagen Hip and Groin Outcome Score). The percentage distribution score for pain in the positions were as follows Center (12%), Shooting Guard (16%), Point Guard (26%), Small Forward (27%) and Power Forward (19%). Thus presenting maximum pain distribution in Centers followed by Shooting Guard, Power Forward and minimum in Point Guard and Small Forward. The score for subscales of HAGOS for the Center position included Symptoms (21%), Pain (17%), ADL (12%), Sport/Rec (11%), PA (23%) and QOL (16%). The score of HAGOS for position of Shooting Guard included Symptoms (21%), Pain (17%), ADL (14%), Sport/Rec (15%), PA (17%) and QOL (16%). The score for position of Point Guard included Symptoms (16%), Pain (16%), ADL (17%), Sports/Rec (16%) and QOL (17%). The score for position of Small Forward included Symptoms (16%), Pain (17%), ADL (18%), Sports/Rec (15%) and QOL (17%). The score for position of Power Forward included Symptoms (17%), Pain (17%), ADL (15%), Sports/Rec (16%) and QOL (19%).

The findings demonstrated higher frequency of groin pain in players positioned at center position in the court followed by shooting Guards and Power Forwards. Centers are responsible for shots within the key, which involve disputes for defensive and offensive rebounds and shots that require the use of brute force when varying for space **(Meeuwisse et al.2003)**

Jamie (1998) stated that the centers are often the tallest players on the team, and they are preferred to have high muscle and body mass. Their position requires using height to score and defend closer to the basket. **Franciele et al. (2013** mentioned that centers and shooting Guards which are the taller athletes reported more injuries than shorter athletes as they are the athletes with offensive functions and play closer to the basket. Thus, their greater height is needed in order to perfect the handling of rebounds and score a field goal. These actions also require greater physical contact, which predisposes these players to groin and hip pain, therefore explaining the greater occurrence of injuries among taller players.

In this study shooting Guards accounted for the second most vulnerable position to groin pain and injuries after centers. Shooting Guards are responsible for the preparation of the shot and therefore play more in terms of volume, blending agility, speed strength, and Power. As decisive offensive players, Shooting Guards suffer more checking which explain more occurrences of injuries. Groin injuries occur due to abrupt flexing and rotational movements in the hip joint and groin with rapid changes of direction and high torqueing. As a consequence, the fascias as well as musculoskeletal structures of the thigh and caudal abdominal musculature are strained **(Weber et al.2010).**

The study by **Moriera et al. (2003** demonstrated that individual characteristics of the players are related to the occurrence of injuries. The biotype of players is considered to be another common determining factor regarding the position played on the court. Regarding body mass, a greater frequency of injuries occurred among heavier athletes. Point Guards normally play further away from the net and consequently execute fewer jumps and absorb less impact. Thus, the dynamics of this position does not explain the greater occurrence of players injury among heavier Point Guards; however, body weight is no less an important factor with regard to occurrence of injuries among these players.

Centers, on the other hand, need greater weight for blocking and occupying space close to the basket during offensive and defensive rebounds, the absorption of impact during the constant jumping and landing promotes the occurrence of injuries among heavier players.

Our results suggested that game location could influence differently the performances of. The findings of this study confirmed the HAGOS as a responsive measure of hip and groin disability outcome and injury status in this population, specifically in the pain and physical activity subscales. **(Thorborg et al. 2015)**

5. CONCLUSION

The present study concludes that Groin Pain is prevalent in basketball players and it depends on the position of the player in the court. The centers present the highest score of pain distribution in groin region followed by shooting Guards and Power Forwards. With the awareness of the types of injuries that occur in groin region, injury prevention strategies focused on these will be beneficial to players and teams at all levels of competition. HAGOS is a suitable tool to identify groin pain in athletes with other subscales including quality of life, symptoms, physical activity, ADL and sports and recreation.

6. SIGNIFICANCE

Basketball is a sport which requires high intensity activities such as jumping, turns, dribbles, sprints, screens and low intensity activities such as walking, stopping and jogging. The constant practice of this sport involves repetitive motor actions and excessive joint load, which increases vulnerability to injuries. There is a lack of information to enable the determination of association between sports injuries and position in court. Studies have shown that most common injuries in basketball affect the lower limbs. Groin injuries accounts for 2% to 5% of sports related injury. Inadequate evaluation of these injuries can result in premature ending of competitive careers. Therefore, proper evaluation and appropriate treatment of groin pain particularly in a competitive athlete are paramount and can be very challenging. So, the current study estimates the percentage of groin pain cases according to their playing position, it will be able to identify at risk individual. Early recognition will reduce the number of players suffering from the long term effect associated with groin pain. It will help to establish physiotherapy interventions for treatment and prevention in field in of basketball at national and international level.

REFERENCES

Apte G, Patricia N, Jean M, Gregory D, Rafael J, Phillip S. (2011) Chronic Female Pelvic Pain. Pain practice, 12, 88-110.

Aiyegbusi A, Oluseun O, Ayobami A. (2017). Vertical jump performances in recreational basketball players: the role of physical characteristics and anthropometric parameters of the lower limbs. Medicina Sportiva, 12(1), 2853-2859.

Agricola R, Marinus P. Heijboer, Abida Z. Ginai, Pauline Roels, Amir A. Zadpoor, Jan A.N. Verhaar, Harrie Weinans, Jan H. 2014). A cam deformity is gradually acquired during skeletal maturation in adolescent and young male soccer players: development of a cam deformity. 42, 798-806.

Anderson K, Sabrina M, Russell W. (2001). Hip and groin injuries in athletes. The American journal of sports medicine, 29(4), 521-533.

Chandy S, Grana W. (1985). Secondary school athletic injury in boys and girls: a three comparison. Physician Sportsmed., 13, 6-14.

Chad S. (2003). Injuries and illnesses in the national basketball association: A 10-year perspective. Journal of athletic training, 35(2), 161-167.

Drakos M, Benjamin D, Chad S, Allen M. (2010). Injury in the national basketball association: A 17-Year Overview. Sports Health, 2(4):284-290.

Franciele M, Fabio N, Italo R, Carlos M. (2013). Sports injuries among adolescent basketball players according to position on the court. International archives of medicine, 6(5), 1-4.

Havens K, Susan M. Joint. (2015). Segmental mechanics differ between cutting maneuvers in skilled athletes. Gait and posture. 41, 31-38.

Jaime S. (1998). Game location influences basketball players' performance across playing positions. Journal of Science and Medicine in Sport. 1998;7:29-37.

Kurosawaa D, Eiichi M, Toshimi A. (2017). Groin pain associated with sacroiliac joint dysfunction and lumbar disorders. Clinical neurology and neurosurgery, 161, 104-109.

Lovell G. (1995). The diagnosis of chronic groin pain in athletes: a review of 189 cases. Australian Journal of Science and Medicine in Sport, 27, 76-9.

Moreira P, Daniel G, Oliveira G. (2003). Prevalence of injuries of Brazilian basketball national team during 2002 season. Rev Bras Med Esporte, 9(5), 263-266.

Meeuwisse W, Rory S, Hagel B. (2003). Rates and risks of injury during intercollegiate basketball. The American Journal of Sports Medicine, 31(3), 385.

Omar IM, Zoga AC, Kavanag C. (2008). Athletic pubalgia and sports hernia: optimal MR imaging technique and findings. Radiographics, 28, 1415-1438.

Striegel H, Best R, Nieb A. (2010). The "Sportsman`s Hernia" as possible cause for chronic groin pain. Deutsche Zeitzchrift for sportsmedizin, 2, 33-39.

Thorborg K, Bandholm J, Petersen, K, C. Weinold, B. Andersen, A. Serner, S. P. Magnusson, P. Holmich. (2010). Hip abduction strength training in the clinical setting: With or without external loading? Scandinavian journal of medicine and science in sports, 20, 70-77.

Thorborg K, Sonia B, Frederik S, Jesper J, P Hölmich. (2014) Copenhagen hip and groin outcome score (HAGOS) in male soccer: reference values for hip and groin injury-free players. British journal of sports medicine, 48, 557-559.

Williams JGP. (1978). Limitation of hip joint movement as a factor in traumatic osteitis pubis. British Journal of Sports Medicine, 12, 129-33.

Werner J, Agglund H, Walden M, Ekstrand J. (2009). UEFA injury study: a prospective study of hip and groin injuries in professional football over seven consecutive seasons. British Journal of Sports Medicine, 43, 1036-1040.

Wilson F, Caffrey S, King E, Casey S, Gissane C. (2007). A 6-month prospective study of injury in gaelic football. British Journal of Sports Medicine. 2007; 41:317-321.

Wilson F, Caffrey S, E King, K Casey, C Gissane. (2007). A 6-month prospective study of injury in Gaelic football. British journal of sports medicine, 41, 317–321.

Zelisko J, Bates N, Marrianne P. (1982) A comparison of men's and women's professional basketball injuries. American journal of sports medicine, 5(10), 297-299.