THE INFLUENCE OF JOINT HYPERMOBILITY SYNDROME ON THE INCIDENCE OF SHOULDER COMPLEX PAIN IN VOLLEYBALL PLAYERS

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Abstract

The main aim of this study was the analysis of Joint Hypermobility Syndrome (JHS) occurrence in Polish volleyball players. The research group consist of 61 active players, aged between 16 and 33. Hypermobility of the joints was estimated using Beighton scale. All participants filled anonymous questionnaire prepared by the Authors. In 18 (78.3%) out of 23 participants with increased JHS we reported pain symptoms during or after playing. Only 14 (36.8%) out of 38 participants without JHS.

Key words*: Joint Hypermobility Syndrome, shoulder complex, volleyball players*

Introduction

In the shoulder girdle the most affected by injuries is glenohumeral joint. It has the widest range of motion out of all of the synovial joints in the human body This leads to higher incidence of pathological movements of the joint, especially in highly active people whose duties require them to raise their hands above the head repeatedly, such as, swimmers, tennis, baseball and volleyball players (Russek 1999; Lo et al. 1990). Shoulder pathology is not as common as renal insufficiency (Chojak-Fijałka & Smoleński 2010), cardiovascular disease (Filar-Mierzwa et al. 2017) or obesity (Pengpid & Peltzer 2017) but its prevalence among athletes is close to 60%.

Joint Hypermobility Syndrome (JHS) is characterized by increased range of motion (ROM) and increased risk of injuries compared to general population based on age, sex and ethnicity (Russek 1999; Simmonds & Keer 2007). JHS is a general insufficiency of connective tissue (Grahame et al. 2010) and it can lead to diseases in different organs composed of connective tissue (Handler et al. 1985; Grahame 1990).

JHS is usually symptomless, but it may present with chronic pain and sensation of instability (Simmonds & Keer 2007). JHS symptoms can also include typical signs for sprains, meniscal injuries, bruises, acute or recurrent dislocations and subluxations, as well as tendinopathies and rotator cuff injuries (Kopff & Raczkowski 2011; Hakim & Grahame 2004; Grahame et al 2010). The sensation of joint instability, frequent pain symptoms without detectable reason and recurrent injuries has its influence on frequent anxiety episodes. (Mishra et al 1996; Russek 1999).

In order to diagnose joint hypermobility different scales and questionnaires are being used i.e. five points hypermobility questionnaire, Beighton's, Carter's, Wilkinson's and Bulben's scales. Those refer to range of motion of the joints. Diagnosis of isolated JHS is difficult because the objective diagnostic criteria doesn't exist (Kopff & Raczkowski 2011; Simpson 2006). Patient's history is very helpful, especially information regarding present and previous symptoms with emphasis on soft tissue trauma, joint pain, subluxations and dislocations as well as posttraumatic healing (Simmonds & Keerb 2007).

In current literature there is a lack of evidence regarding influence of JHS on pain symptoms of shoulder joint. Therefore the aim of this study was to estimate the correlation of JHS on frequency, intensity and time span of pain symptoms among Polish volleyball players with particular emphasis on shoulder joint.

Methods

Participants
The research was performed among Polish volleyball players. Research material included 61 participants, (28 males, 46% and 33 females, 54%) between 16 and 33 years of age. The average age of all participants was 21.89 years (SD 4.09), for men – 23.64 years (SD 3.98) and for women – 20.39 years (SD 3.60).

The average career length was 9.02 years (SD 4.35, range 2-25 years). Men trained on average for 10 years (SD 4.60, range 4 – 25 years) and women trained on average for 8.18 years (SD 4.00, range 2 – 18 years).

This study was conducted in accordance with research ethics and the Declaration of Helsinki (1964).

The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation.

Measures and Design Procedures

In order to collect data we used our own questionnaire and Beighton scale to estimate Joint Hypermobility of participants. In order to evaluate collected data we implemented methods of descriptive statistics and statistical analysis. Our anonymous questionnaire was composed of 18 questions out of which eight were type of closed questions, four semi open and six were open questions. First part of questions pertained to physical attributes of participants i.e. sex, body height, body weight and dominant hand. Further part of the questionnaire was composed of questions pertaining to career length and number of practice sessions during the season. Remaining ten questions dealt with injuries sustained within last year with particular emphasis on the shoulder joint. Last question included VAS scale, which was used to estimate average intensity of the pain of shoulder joint during and after the play.

After filling up the questionnaire each participant was evaluated with Beighton scale in regards to increased range of motion of the joints. In our study in order to diagnose JHS the cut off was > 4/9. To estimate increased range of motion of the joints five manoeuvres were performed: hyperextension of the elbow joint >10 degrees, passive thumb – forearm touch, hyperextension in MCP 5th joint >90, hyperextension in the knee joint >10 and the ability of placing both hands flat on the floor with knees in extension (Kopff & Raczowski 2011).

Statistical Analysis

To assess the correlation coefficient of chosen variables two statistical test were used – Chi square (x2) and t-Student. The level of statistical significance was set at alpha=0.05 ($p<0.05$).

Results

The first described factor was pain of the shoulder area experienced by volleyball players. About half of female group was experiencing pain during and after the game. In the male group the pain symptoms were present more often during the game.

Table 1. The occurrence of pain symptoms of the shoulder in research group.

		Women		Men		Total
		N	%	N	%	N
Pain during the game.	Yes	16	48.5	16	57.1	32
	No	17	51.5	12	42.9	29
Pain after the game.	Yes	16	32.1	12	32.1	26
	No	19	67.9	16	57.1	35

All participants that reported pain also determined its duration after finishing the play. To evaluate the intensity of pain the visual analog scale was used (VAS), where 0 was no pain and 10 meant severe pain. Some of the participants also declared that because of the shoulder joint pain had to stop or skip practice sessions. Thirteen players (21.3%), including eight men (28.6%) and five women (15.2%) at least once had to stop playing due to pain symptoms.

Table 2. The characteristics of pain symptoms in research group.

		$\bar{x}$	SD	Min	Max
Duration of pain after finishing the game (H)	Total	10.6	18.14	0.5	72
	Women	10.32	22.27	0.5	72
	Men	10.92	13.3	2	48
Visual analogue scale (VAS)	Total	4.03	1.71	1	7
	Women	3.94	2.01	1	7
	Men	4.13	1.36	2	6
Interrupted or skipped practices due to shoulder pain.	Total	3.77	2.42	1	10
	Women	5	3.32	1	10
	Men	3	1.41	1	5

During the research all volleyball players were assessed using Beighton scale. The scores among all participants were in between 0 and 7. Ten participants were not able to perform any of the maneuvers, 12 got 1 point, 11 got two points, five got three points, seven got four points, twelve got five points, one person six points and three got seven points. Taking for consideration Beighton scale with cut off 4/9 to diagnose JHS 23 out of all examined participants (37.2%) were considered hypermobile. Almost half of the women's group (15 participants – 45.5%) and 8 men (28.6%) showed increased joint mobility.

Table 3. The characteristics of joint hypermobility according to Beighton scale.

		$\bar{x}$	SD	Min	Max
Beighton scale	Total	2.69	2.06	0	7
	Women	3.18	2.07	0	7
	Men	2.11	1.93	0	7

In 18 (78.3%) out of 23 participants with JHS we reported pain symptoms during or after playing. Only 14 (36.8%) out of 38 participants without increased range of motion experienced pain. The pain of the shoulder joint area was present in 16 (69.6%) participants with JHS and only in 10 (26.3%) without JHS.
The pain symptoms of the shoulder in people with JHS lasted on average for 7.78h, while in people without hypermobility it was 15.2h. The intensity of pain in group with hypermobility was 3.79 points (according to VAS scale), whereas for participants without JHS it was 4.33 (according to VAS scale).

Table 4. The characteristics of pain symptoms in researched volleyball players with and without hypermobility.

		$\bar{x}$	SD	Min	Max
Prevalence of pain symptoms after the end of the play (H). Participants with hypermobility.	Total	7.78	12.30	0.5	48
	Women	6.83	15.46	0.5	48
	Men	9	7.51	2	24
Prevalence of pain symptoms after the end of the play (H). Participants without hypermobility.	Total	15.20	24.46	1	72
	Women	16.80	30.88	1	72
	Men	13.60	19.65	2	48
The intensity of pain (VAS scale)- patients with hypermobility.	Total	3.79	1.69	1	7
	Women	3.58	1.98	1	7
	Men	4.14	1.07	3	6
The intensity of pain (VAS scale)- patients without hypermobility.	Total	4.33	1.76	2	7
	Women	4.67	2.07	2	7
	Men	4.11	1.62	2	6

Among 23 players with JHS seven had to stop or skip the training session at least once during last year due to pain of the shoulder joint. In the group of 44 players without hypermobility this situation was experienced only by 6 of them (15.8%). Three out of eight male players and four out of 15 female players with JHS stoped the play at least once.

The first measured correlation was the influence of the sex on incidence of hypermobility and pain symptoms (during the game and after finishing the game) and duration and intensity of pain symptoms in participants. There were no statistical significant correlation between gender and any of the above factors. Second analyzed correlation was the influence of hypermobility on pain of the shoulder joint. The incidence of hypermobility was statistically significant in regards to occurrence of pain symptoms during and after the game. There was no statistical correlation between duration and intensity of pain symptoms and hypermobility.

Table 5. Influence of hypermobility on shoulder pain.

	coefficient	p
Incidence of pain symptoms during the game.	9.856	0.01
Incidence of pain symptoms after finishing the game.	10.959	0.001

The correlation between JHS and pain symptoms of the shoulder was analysed according to the sex of the participants. It was observed that hypermobility had statistically significant influence on pain symptoms occurrence during the game in all players and persistence of pain after the game in men. There were no statistical correlation between duration and intensity of pain symptoms and sex of the players.

Table 6. Influence of hypermobility on shoulder pain according to sex of participants.

		coefficient	p
Incidence of pain symptoms during the game.	Women	6.798	0.01
	Men	4.215	0.05
Incidence of pain symptoms after finishing the game.	Women	3.479	Irrelevant
	Men	9.115	0.01

Discussion

The straight forward diagnosis of JHS is still problematic. There is still lack of one unified and valid diagnostic criterium of JHS considering influence of factors such as age, sex or ethnicity. This leads to the situation where the results in different publications vary from 0.6% to 39.6% and are mostly determined by diagnostic criteria used in the research (Mishra et al 1996).

Among the articles describing the influence of Joint Hipermobility Syndrome on incidence of injuries and musculoskeletal complains, there is still very few publications dedicated to shoulder joint. Due to the lack of any articles about Joint Hypermobility Syndrome in volleyball players and its influence on incidence of injuries and pain of the shoulder joint, we collected and analyzed such data and compared it to the results of researches describing this influence in regards to other sport disciplines.

Aagaard and Jorgensen (Aagaard & Jorgensen 1996) in 93/94 season run a questionnaire on 137 players (70 women and 67 men) from Danish Volleyball League. They defined injuries as incidents that took place during the game and limited its continuation or players required medical assistance such as taping or doctor's consultation. Shoulder joint injuries comprised 17%, out of which 22% were women and 13% were men. The authors concluded that women injure the shoulder joint more often and it has more severe course. Our research proved the opposite. Almost as much as twice more often men had to stop playing due to shoulder pain. The duration of symptoms and intensity of pain after finishing the game was similar for both men and women.

Kucuk and Bavli (2013) examined 84 volleyball female players coming from 12 teams of Turkish League. Among all team members as much as 77.3% of players sustained an injury within past two years out of which 27.4% of them experienced shoulder problems. This is as much as two times more than in our project (taking for consideration female players who had to stop, skip the practice session or the game at least once due to shoulder pain). However, the difference in the results could be caused by the shorter time of observation in our study which lasted for one year in comparison to Kucuk and Bavli who were conducting their research for two years.

Stewart and Burder (2004) examined 51 professional New Zeland's male rugby players in regards to hypermobility, sustained injuries and muscle strength. In their research they used Beighton scale to estimate JHS with 4/9 points cut off. Among all players the presence of JHS was lower (24%) than in our study.

In 1995 Decoster at all (1999) gathered a group of 310 (147 men and 163 women) from 17 NCAA Lacrosse teams. In their study they were examining JHS with the use of Beighton scale with the diagnostic cut off 5/9 for JHS and injuries of the players during the season. In both women (33.1%) and men (13.6%) the percentile of players with JHS was lower than in our study. This can be due to a higher diagnostic cut off used by Decoster at all.

In 2009/2010 season of English Premier League Konopinski at all (2012) examined 54 football players. Using Beighton scale with cut off 4/9 they estimated the incidence of JHS within this group of players. They observed higher incidence of joint hypermobility within the football players (33.3%) than we did in group of male volleyball players in our study. Konopiński at all (2012) also graded the influence of JHS on frequency of injuries, their severity and duration of off period before returning to training. Players with JHS sustained the injuries more often compared to athletes with normal joint mobility. Footballers who scored four or more points on Beighton scale missed more training sessions after sustained injury than players without diagnosed JHS. We also observed in our study that male volleyball players with JHS tended to skip the practice session or the game due to the shoulder pain more often in comparison to group with normal joint mobility.

In current literature there is still little said about JHS and without a doubt further researches should be conducted in order to correctly unwind its characteristics. Proper evaluation of the influence of JHS on frequency of injuries of musculoskeletal system can help to find solutions of preventing contusions and to form efficient treatment protocols.

Conclusion

There was a statistically significant correlation between JHS and the incidence of shoulder joint pain during and after the game in researched group.

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