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Hip joints mobility in patients with lumbosacral disc disorders

Stanisław Krajewski^{1,2}, Małgorzata Krajewska², Magda Kucharczuk-Kopycińska³, Aleksander Litwinowicz¹

¹ Neurosurgery Unit 10th Military Research Hospital and Polyclinic in Bydgoszcz, Poland

² Bydgoska Szkoła Wyższa, Bydgoszcz, Poland

³ Surgery Unit, 10th Military Research Hospital and Polyclinic in Bydgoszcz, Poland

Address for correspondence:

Stanisław Krajewski

Kaźmierowo 14

89-120 Potulice

krajewskirehabilitacja@wp.pl

+48 601 296 393

Abstract

Purpose. The authors were influenced to carry out the research by observing the patients suffering from discopathy with frequent faulty positioning of lower limbs – genu valgum, which was accompanied by increased range of external hip joint rotation. The assumed thesis was that wrong mobility of hip joints is conducive to development of lumbosacral disc disorder. *Methods.* 73 people were subjected to the research among whom 36 had discopathy and were qualified for surgical treatment in Neurosurgery Clinic of 10th Military Hospital in Bydgoszcz. The rest (control group- 37 people) did not have any lumbosacral disc disorders. Hip joints mobility was measured according to SFTR method. The range of mobility was measured in all planes. *Results.* The relation between occurrence of discopathy in LS spine and increased values of mobility in hip joints was noted. The most substantial mobility differences between the research and control groups were related internal / external rotation. *Conclusions.* The development of disorders in these segments of spine is influenced by biomechanical factors in pelvis and lower limbs. Confirmation of the results in a bigger-scale

research may result in introduction of prophylaxis of disc disorders in people with hypermobility of hip joints even at their teen age.

Keywords:

Lumbosacral disc disorders, hip joints range of motion, hypermobility, prophylaxis

Introduction

Spinal pain syndrome is one of the most important health problems of the society in the twenty-first century. There are many statistical studies indicating the size of its social and economic burden. The most common cause of back pain is discopathy - intervertebral disc disease. Prevalence data reveal that about 1/3 of disc diseases refer to the cervical spine, thoracic discopathies are relatively rare, while 2/3 of all disc diseases are located in the lumbosacral segment. Subsequently, 80% of that number concerns the two lowest movable segments of the spine, namely the L₄-L₅ and L₅-S₁ discs [1,2,3].

Human spine is exposed to excessive load from an early age. Although physiological adaptation of the spine to fulfill supportive functions, over the years processes leading to the formation of lesions or due to aging of the organism occur. Problems usually start between 30-40 years of age and they intensify over the time causing in some people a total inability to work and function in society. A major role in this process play: a sedentary lifestyle and low physical activity during the day. Among other factors predisposing the formation of pathology in the intervertebral discs are: genetic factors, obesity, previous injuries, abnormal static positions and poor movement habits during work and leisure [4,5,6].

An important element influencing the function of the spine are anatomical and biomechanical conditions within the lower limbs and pelvis as well as the spinal-pelvic connections [7,8]. Incorrect position of the pelvis in both the sagittal plane (pelvis highly assimilated or pelvis overloaded), frontal plane (pelvis oblique) and combined plane (pelvis twisted) affects the formation of various disorders within the hip joints, the sacroiliac joints and lower segments of the spine, and secondarily contributes the dysfunction of the entire spine [9,10,11]. Subsequently, abnormal position of the pelvis can be affected by the anatomical situation below, namely within the knee joint and the ankle joint[12].

Doctors and physiotherapists observed that many patients suffering from lumbosacral discopathy have a noticeably incorrect lower limbs setting, manifested by crooked knee or unnatural hip joints position when walking, standing or resting. This fact inspired to carry out tests in order to verify whether there is a relationship between impaired mobility of the hip joints and lumbosacral spine discopathy.

Material and methods

The study was conducted from April to September 2014 in the Neurosurgery Clinic of the 10th Military Clinical Hospital in Bydgoszcz. The number of 36 patients have been examined, who at that time were surgically treated due to the lumbosacral segment discopathy. The results were compared with data obtained for a control group, which consisted of 37 subjects without spinal pain. The groups were similar regarding age, sex, nature of work and the way of spending free time (tab. 1).

For data acquisition a research chart was used which consisted of four parts. The first part included questions about data such as age, sex. The second part contained questions about the spine disease. The third part included questions related to possible ailments and diseases of the hip joints. And the last section contained a table of measurements of the hip joint mobility made and recorded in accordance with the SFTR methodology. Measurements in sagittal and frontal planes were performed, rotation movements were assessed and also the occurrence of pain during the test was evaluated. The study was approved by the Bioethics Committee of the Nicolaus Copernicus University in Torun, Collegium Medicum in Bydgoszcz (KB 312/2014).

Correlation between two variables was calculated using the R Spearman coefficient. Also the non-parametric U Mann-Whitney test was used to evaluate the differences of one feature between the two groups.

Results

Table 1. Comparison of the study group and the control group – age, sex, nature of work, ways of spending free time.

	Focus group n=36	Control group n=37
Age – average	47,5 (SD 10,9)	49,5 (SD 9,2)
Age – min – max	23 - 66	28 – 66
Women / men	17 / 19	19 / 18
Physical / intellectual work / unemployed	17 / 17 / 2	16 / 21 / 0
Free time physical activity Yes / No	14 / 22	13 / 24

The L4-L5 disc was the most often surgically treated – 26 patients (72,2%). The second most common discectomy concerned the L5-S1 segment (11 patients – 30,6%). The herniated disk surgery in the L3-L4 segment was performed only in case of 2 patients (5,6%). Three patients from the study group (8,3%) had the surgery performed on both segments simultaneously.

The number of 4 patients (11,2%) from the study group reported the occurrence of

periodic pain around the hip joints. One person (2,9%) reported the occurrence of the hip joint injury in the past. It was a contusion surrounding the right hip joint.

The passive range of motion measurements in the hip joints were performed in three planes, however the interpretation of results obtained in the sagittal plane was withdrawn. The measurement was difficult to perform in some patients due to problems associated with the perioperative period (radicular syndrome) or disorders of muscle tension (“muscular spasm”).

The number of 5 patients of the study group experienced pain during passive abduction of the right hip joint and 7 patients during passive abduction of the left hip joint.

Table 2. Average motion ranges of the right hip joint in the frontal plane.

Group	N	Mean	SD	confidence interval -95,0%	confidence interval +95,0%	minimum	maximum	Q25	median	Q75
study	36	37,8	10,243	34,31	41,24	15,0	55,0	32,5	40,0	45,0
control	37	42,7	8,130	39,99	45,41	25,0	60,0	40,0	40,0	45,0
together	73	40,3	9,497	38,06	42,49	15,0	60,0	35,0	40,0	45,0

Table 3. Average motion ranges of the left hip joint in the frontal plane.

Group	N	Mean	SD	confidence interval -95,0%	confidence interval +95,0%	minimum	maksimum	Q25	mediana	Q75
study	36	39,4	7,817	36,80	42,09	20,0	50,0	35,0	40,0	45,0
control	37	43,4	7,365	40,92	45,83	30,0	60,0	40,0	45,0	45,0
together	73	41,4	7,794	39,62	43,26	20,0	60,0	40,0	40,0	45,0

Table 4. Average rotation ranges of the right hip joint.

Group	N	Mean	SD	confidence interval -95,0%	confidence interval +95,0%	minimum	maximum	Q25	median	Q75
study	36	74,6	21,493	67,31	81,86	35,0	120,0	57,5	75,0	90,0
control	37	70,8	13,515	66,30	75,32	40,0	90,0	65,0	75,0	80,0
together	73	72,7	17,875	68,50	76,84	35,0	120,0	60,0	75,0	85,0

Table 5. Differences in rotation ranges of the right hip joint between the two groups.

Sum of rangs study group	Sum of rangs control	U	Z	Z corrected	p value	N study group	N control group
1143,5	1557,5	477,5	-2,074	-2,079	0,038	36	37

Interesting results were recorded by comparing rotation ranges of the hip joints between the two groups. The average motion range of the right hip joint was 72,7⁰ among all patients. A higher average motion range was recorded in the study group – 74,6⁰ with an average in the control group 70,8⁰. Due to the level of significance (p <0.05), there was a statistically

significant difference between groups in terms of motion ranges in the transverse plane of the right hip joint (table 4 and 5).

Similar measurement values were obtained for the rotation of the left hip joint, but no statistical significance were observed (table 6 and 7).

Table 6. Average motion ranges in rotation plane of the left hip joint.

Group	N	Mean	SD	confidence interval -95,0%	confidence interval +95,0%	minimum	maximum	Q25	median	Q75
study	36	74,4	18,585	68,16	80,73	35,0	105,0	60,0	80,0	90,0
control	37	71,8	13,345	67,31	76,21	40,0	100,0	65,0	70,0	80,0
together	73	73,1	16,086	69,33	76,84	35,0	105,0	65,0	75,0	85,0

Table 7. Differences in rotation ranges of the left hip joint between the two groups.

Sum of rangs study group	Sum of rangs control	U	Z	Z corrected	p value	N study group	N control group
1230,0	1471,0	564,0	-1,120	-1,122	0,262	36	37

Table 8 shows the number of patients whose rotation range significantly exceeds the value considered to be normal for this age group (total external and internal rotation range - 70°). The study group contained 8 patients, whose sum of external and internal rotation exceeded 95° in the right hip joint and 7 patients - in the left hip joint. The control group contained only one such person.

Table 8. Number (%) of the people, whose total rotation range (external + internal rotation) was more than 95°.

	Focus group n=36		Control group n=37	
	n	%	n	%
Right hip joint	8	22,2	0	0
Left hip join	7	19,4	1	2,7

Table 9. Number (%) of the people whose range of internal rotation was more than 35°.

	Focus group n=36		Control group n=37	
	n	%	n	%
Right hip joint	13	36,1	3	8,1
Left hip join	11	30,6	3	8,1

Similarly, individuals in both groups were counted, whose range of internal rotation exceeded the norm (35°). The study group contained 13 and 11 patients exceeding this value in

relation to - respectively - the right and the left hip joint, and the control group contained only three such patients (Tab. 9).

An attempt was made to verify if the motion range of the hip joints is varied by previously selected variables.

Due to the level of significance ($p > 0.05$), there were no statistically significant differences between women and men in terms of motion ranges in both frontal and lateral planes of the hip joint. A similar lack of statistically significant differences was observed in reference to the nature of work (physical – mental).

Results with borderline significance were achieved by examining the correlation between the subjects' age and motion ranges of the hip joints (except abduction in the left hip). Also in relation to the way of spending leisure time (physically active or without physical activity) results of the left hip joint rotation were recorded on the borderline of significance. Greater range of motion in all planes of the hip joint, was reported in the group of physically active patients.

Discussion

The study focused on measuring ranges of motion in the hip joints in patients operated due to discopathy in the lumbosacral segment of the spine. Contribution to the research were the authors' own observations that many patients qualified for the spine surgery demonstrate gait and standing posture disturbances, so clear that no measurements are required. In the same group of patients a characteristic arrangement of lower limbs in lying position - both back and front - was observed. The relation between the function of lower limbs and the development of discopathy was noticed by many authors [7,9,13]. There are only few measurements of joint mobility allowing to demonstrate the correlation between these two elements of the biokinematic chain - hips and lumbar spine.

The results were compared not only between the study group and the control group, but also with the standards set out after about 300 000 measurements by Zembaty et al. [14]. Mean values of all research subjects were approximate to data presented by Zembaty, but the rotation ranges in the study group were highly exceeded in about 20% of patients (only 1 person in the control group). It means that in these individuals the total range of rotation of the hip joints, which is the measured from maximum external rotation to maximum internal rotation, exceeded 95° , with average values from own research and standards set by Zembaty amounting to 70° . Also, in this group of patients, more than 30% of the subjects had a higher range of internal rotation (approximately 8% in the control group). There were also differences in mean values of the hip rotation measurements found between the two groups at statistically significant level.

Research should be expanded in order to confirm the results presented above for a

larger group of patients. However, it should be performed in patients with confirmed discopathy, but at a time when there are no acute symptoms, to prevent measurement disorders by pain-caused factors or defensive reaction of muscles acting directly and indirectly on the hip joints.

Confirmation of results on a wider material would be an indication to initiate a back pain prevention program starting in school-aged children. Individuals exhibiting excessive mobility of the hip joints should be primarily covered with education. It would apply not only to children but also parents. It would have to cover a theoretical basis associated with the formation of disc herniation, but also learning the proper functioning in everyday life which includes adopting to the correct position during work and leisure, selection of appropriate forms of movement during a recreational activity, selection of appropriate sports, and drawing attention to risks and ways to deal with them if the child would decide on training the discipline for him unrecommended. Also a notice should be taken to remember the potential problem in the context of job selection. Apart from physical activity appropriate exercises should be suggested and implemented in rehabilitation to reduce the threat of slipped disc in the future [27].

Conclusions

1. A relationship between discopathy occurrence in lumbosacral spine and increased values of ROM in hip joints was confirmed, which means that biomechanical conditions in the pelvic girdle influence the development of disturbances in lower parts of the spine
2. The results of the research may suggest the need to repeat them with a broader material. Its confirmation may result in the introduction of prophylaxis of discopathy disorders among people with hypermobility of hip joints even at the school age (the creation of dyspansery group).

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