DYSFUNCTION OF SACROILIAC JOINT IN PATIENTS WITH SCOLIOSIS AND ITS CONNECTION WITH THE SETTING OF THE PELVIS

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Objective: The purpose of the work was to evaluate the function of the sacroiliac joint in patients with scoliosis and to define the dependency between possible dysfunction and the setting of the pelvic space.
Material: 68 patients with diagnosed idiopathic scoliosis in the 7 - 21 years age group
Method: Examination included interview and clinical examination. Sacroiliac joints function was evaluated on the basis of 5 movement tests and pelvic symmetry performed with the use of inclination meter. On this basis pelvic setting type is defined.
Results: Dysfunction of sacroiliac joint is noted in 54% of patients with scoliosis. 3% of patients in the studied group have a completely symmetrically placed pelvis. Analysing the connection between the occurrence of dysfunction of the discussed joint and in particular types of pelvic setting, no significant dependencies were confirmed. Neither was a connection found between dysfunction and other variables.
Conclusions: Regarding the lack of noting of significant dependencies it is supposed that connections with presence or lack of dysfunction should be sought in very complex models rather than in single function mechanisms.

Key words: idiopathic scoliosis, sacroiliac joint, pelvic setting, dysfunction

Introduction

Lateral curvatures of the spine (Latin. *Scoliosis idiopathica*) concern multi-plane structural changes of the spine, in which besides curvature in the frontal plane there is also occurrence of deformation of shape and size of saggital curvature and also the rotation and torsion of the vertebrae. The term lateral curvature encompasses a group of distortions not only of the spine itself, but also changes directly or indirectly connected with it, primarily in the area of the shoulder girdle, chest and pelvis [1].

The pelvis as an element of the biokinematic chain connects the trunk with the joints of the lower extremities and constitutes a significant compensation link for asymmetry appearing in the areas of these parts of the body. In lateral curvatures of the spine secondary derangement of the spatial setting of the pelvis is observed, the purpose of which is to equalise axial derangements of the body, or to maintain optimal scoliosis equilibrium. This situation is an example of spontaneous, automatic compensating processes utilising functional reserves of body segments not affected by the most frequent original changes [1, 2, 3].

Spatial derangements of the pelvic setting appear as clinical asymmetry of the setting of posterior superior iliac spine (PSIS) and anterior superior iliac spine (ASIS) in frontal, sagittal and transverse plane [2].

In the literature several classifications are described of various types of pelvic settings, including Graff [4] and Saulicz [3]. This research is based to a great extent on the division proposed by Graff with own modification, detailing the principles of classification for particular types. Thus are differentiated:

- symmetric pelvis: where anterior superior iliac spine and posterior superior spine are set symmetrically;
- asymmetric pelvis: where the difference in height of the assessed bone points is less than 0.5 cm;
- slanted pelvis: where anterior superior iliac spine and posterior superior iliac spine are set higher on the same side of the body, and the difference in height with reference to the second side amounts to at least 0.5cm;
- rotational pelvis: where anterior superior iliac spine and posterior superior iliac spine are set higher on opposite sides of the body in relation to the second iliac pair, and the difference between them amounts to at least 0.5cm;
- mixed pelvis: where the anterior superior iliac spine is symmetric or asymmetric to an extent less than 0.5cm, and the posterior superior iliac spine is set at least 0.5 cm asymmetrically or the reverse when the posterior superior iliac spine is set symmetrically or to an extent less than 0. 5cm, and the anterior superior iliac spine is set asymmetrically to an extent of at least 0.5cm.

The pelvis, as the skeletal element linking the trunk and the lower limbs, plays an important role in the standing position in the maintenance of body equilibrium and also the appropriate coordination, which ensures minimal postural muscular exhaustion and energy expenditure [3]. It is possible because of appropriate setting of iliac bones together with sacrum, which is equally proper function of the sacroiliac joints. Movement in sacroiliac joint includes nutation and contranutation of the sacrum and also anterior-posterior rotation of pelvis bone in relation to the sacrum [5]. Sometimes this movement is subject to aberration and progresses to dysfunction of sacroiliac joint. Clinical dysfunction of sacroiliac joints may be recognised with the aid of special manual tests.

Polish medical literature provides relatively numerous works concerning derangement in the pelvic area in patients with scoliosis. Many researchers also draw attention to the proper function of the sacroiliac joints in scoliosis therapy. There are works evaluating independent function of the sacroiliac joints in patients with scoliosis and the pelvic space setting. Few researchers however have undertaken the study of the dependency arising between these parameters. With regard to the small number of works in literature from the last 10 years concerning this aspect it was decided to undertake research in the areas described.

Dysfunction of the sacroiliac joint is defined as a condition of changed biomechanics, which is typified by increased or reduced mobility in relation to normal or the presence of pathological mobility. On the basis of the above definitions, dysfunction of the sacroiliac joint should be deemed as recognition of a nature being patho-mechanical rather than pathological [6].

To present a diagnosis of dysfunction of the sacroiliac joint it is essential to have medical history and conduct a clinical objective component examination of range of motion and also special tests specifically recognised for the sacroiliac joint. Among the specific tests referred to it is necessary to distinguish positional palpitation tests, mobile palpitation tests and also provocative tests [6]. The medical history provides information concerning painful ailments, which are commonly associated with dysfunction of sacroiliac joint. Because of the variable and extensively developed system of sacroiliac joint enervation, pain originating from this anatomical structure appears in various radiation patterns. Traditionally it is described as a single sided pain, of a dull character, located above the buttock. It may radiate to the groin, along the rear or front surface of the thigh, at times even reaching the feet or toes [6].

Confirmation of recognition of pain originating from the sacroiliac joint is joint blocks, or injection supplying anaesthetic substance [6]. With regard to the use of this method much research has taken place concerning location of pain arising from the dysfunction of the joint referred to. The research of Fortin at al. [7, 8] proves that this pain most frequently is located in the area of a right angle approximately 3cm wide and 10cm long lying somewhat below the posterior superior iliac spine. Pain radiation indicated specifically in this area by the patient was introduced to the literature under the name of the Fortin finger indication test [9]. In turn the research of Van der Wurff at al. [10] reports a lack of pain in the area of the tuber area in patients with sacroiliac joint pathology, it is however characteristic for patients with pain in the area of L-S spine without dysfunction of this joint.

However sacroiliac joint dysfunction may not be connected with a feeling of pain. A situation is possible of incorrect action of this joint in the form of stiffness or instability without the painful ailments. Patients also exist with apparent unimpeded mobility and stability of sacroiliac joint, which report positive reaction, or pain relief, after the use of pain blocks. Lee [5] on the basis of the research of Maigne considers as probable, that sacroiliac joint pathologies are responsible for disorders of soft tissue adjacent to joints. Another explanation is the fact that arthrodesis of the joint is an additional burden on adjacent joints, which in time may cause symptoms.

The objective of the work

The objective of the work is the evaluation of the function of sacroiliac joints in patients with idiopathic scoliosis and the definition of the dependency between possible dysfunction of these joints and the location of the pelvic space. Achieving the so indicated objective may also obtain answers to several particular questions:

1. Whether and how frequently in patients with scoliosis does dysfunction of sacroiliac joints appear?
2. Is the position of the pelvis symmetrical in the examined persons?
3. How frequent is asymmetrical pelvic position occurrence?
4. What type of asymmetry may be differentiated?
5. Does the presence of dysfunction of sacroiliac joints indicate a connection with defined derangement of pelvic symmetry or with type and direction of curvature?

Material

The research material encompassed 68 patients (58 girls and 10 boys) with diagnosed idiopathic scoliosis. The research group consisted of patients of the Paediatric Orthopaedic and Traumatology Clinic of the Poznań University of Medical Sciences and also persons with scoliosis attending the Orthopaedic Rehabilitation Postural Faults Clinic of Clinical Hospital no. 4 in Poznań.

Method

Examination in all patients in the studied group was conducted according to a uniform assessment card. The card included interview and clinical examination.

The interview was intended to obtain information regarding the personal details of the patient and assessment of possible painful ailments in the pelvic area (Fortin area and tuber area).

Clinical examination was preceded by marking ASIS and PSIS on the skin of the patient with the use of anti-allergic felt tip pen designated for skin painting. The felt tip pen possessed a certificate stating its harmlessness. The examination included assessment of the sacroiliac joints on the basis of mobility tests, i.e.:

- iliac spine test [2],
- Piedallu test in standing and sitting positions [11],

- Derbolowsky test [12]
- knee bending test in position lying on front [13].

Dysfunction of sacroiliac joint on one side of the body was confirmed by a positive result in at least three of them. The spinal test enabled evaluation of bilateral dysfunction of sacroiliac joints. One-sided dysfunction of joint was noted in positive tests: Piedallu in standing and sitting position, Derbolowsky and also knee bending lying on front position test.

Furthermore assessment of the pelvic symmetry was conducted by examining the ASIS and PSIS setting using inclination measuring instrument placed on stand. The appliance enabled measurement in degrees of angle and centimetres and also assessment of possible higher position of one of them. Due to this it was possible to define the type of pelvis space setting and additionally define the pelvis setting in the crosswise plane by analysis of protrusion of one ASIS in relation to another.

Measurement appliances used in the research

Measurement appliances used in the research (figure 1) for the setting of the iliac spine was specially constructed for the requirements of this research. It consists of stand and supporting frame, on which is placed an electronic Geo-Fennel S-Digit mini inclination meter and slides with measuring rods. The stand consists of a metal frame constructed with vertical supporting rods and two horizontal crossbars, the height and protrusion of which may be regulated. The crossbars define the posture of the person examined. The person examined stands on the appliance standing with thighs and shins against the horizontal crossbars. The appliance is constructed to enable change the setting of measuring rods, which are set parallel to the base indicating differences of position of bone points in degrees of angle or vertical setting, with additional indicators, in centimetres. The digital inclination meter measures to a precision of 0.1˚ or 0.1% angle of incline, which is displayed on LCD screen.

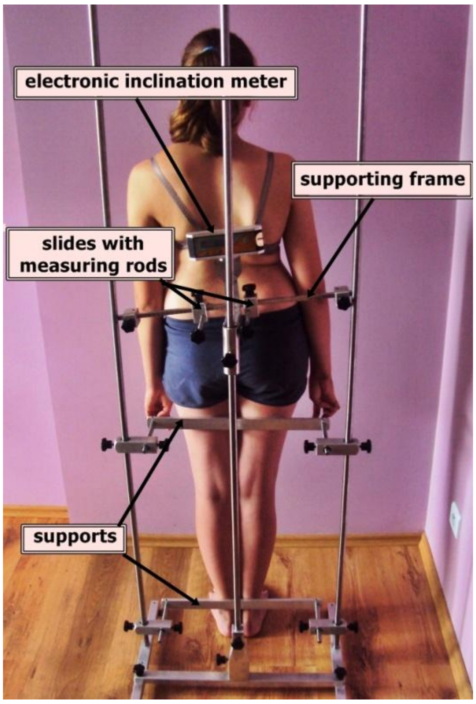

Figure 1. Position the patient during ASIS setting evaluation in angle degrees. *Source: own material.*

For the conduct of the above examinations consent was obtained from the Bioethical Commission of the K. Marcinkowski University of Medical Sciences in Poznań. In the case of patients who were minors, consent was in addition obtained from parent or guardian for participation in the research project.

Statistical analysis

To compare our parameters within the groups we used the Fisher Exact test, chi-squared test (χ^2) and maximum-likelihood estimation. The phi coefficient (Φ Yule) and Pearson correlation coefficient (C Pearson) were used to measure of the strength of dependence between tested groups. Hierarchical clustering (Ward method) was performed for statistical significant data. To obtain the differences between parameters (such as SIAS and SIPS [cm] and [°], Cobb Angle [°] or protrusion ASIS) in tested groups we used analysis of variance (one-way ANOVA). We set up a statistical level on $p = 0.05$. Statistical analysis was performed with R statistical packages.

Results

Studied group characteristic

The definition of the examined group regarding age, height body weight and Cobb angle are shown in table 1.

Tab. I. Charakterystyka materiału badawczego. SD – odchylenie standardowe, min- wartość minimalna, max – wartość maksymalna

Parametr	Wiek [lata]	Wzrost [cm]	Masa ciała [kg]	Kąt Cobba [°]
Średnia±SD	14,4±2,65	162,4±12,9	51,1±11,7	38,81±21,73

Tab. I. Definition of research material. SD – standard deviations, min- minimal value, max – maximal value

Designation of Cobb curvature value for each patient enabled division of the studied patients into three scoliosis subgroups: I, II and III degrees. The most patients presented II° of scoliosis – 44%, 40% of patients had III° scoliosis, and 16% - I°.

Among the patients of the Children's Orthopaedic and Traumatology Clinic (n = 15) an additional division was made regarding full Lenke classification. Among the patients of the Postural Faults Clinic (n = 53) this was impossible because of the lack of images in lateral projection and also in side bending. In this group the type of curvature (according to Lenke classification) was defined conventionally on the basis of an analysis of images in anterior-posterior projection without modification of lumbar curvature and thoracic kyphosis modification.

Division of the studied group with regard to type of scoliosis is shown in figure 2. In the research material patients presenting Lenke classification type 1, which is single arc thoracic curvature, were in the majority. In the case of one person that type of scoliosis was not determined, because the curvature did not correspond to the spinal distortion model according to Lenke classification.

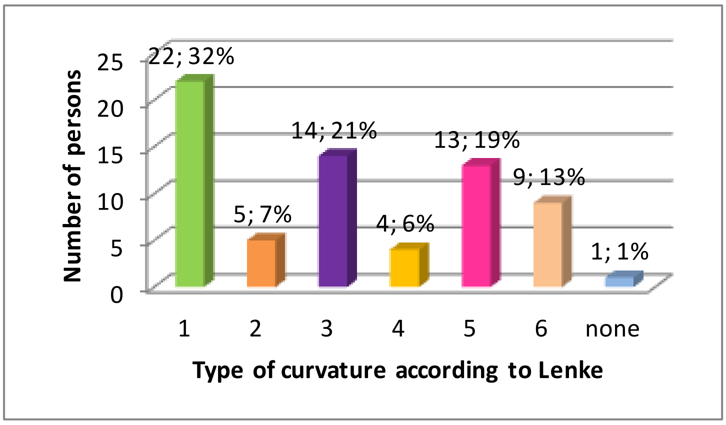

Figure 2. Division of the studied group with regard to type of scoliosis according to the Lenke classification.

The studied group was also divided with regard to the side of primary curvature (figure 3). In the case of bi or tri-curvature scoliosis, the curvature was noted with the highest value of Cobb angle. If however curvatures had the same angle value, the side of the scoliosis was marked as left-right-sided or right-left-sided depending on the sequence and direction of the curvatures occurrence, analysing the spine in the caudal direction. As shown in figure 3 the majority of patients in the research group presented right-sided curvature (68%).

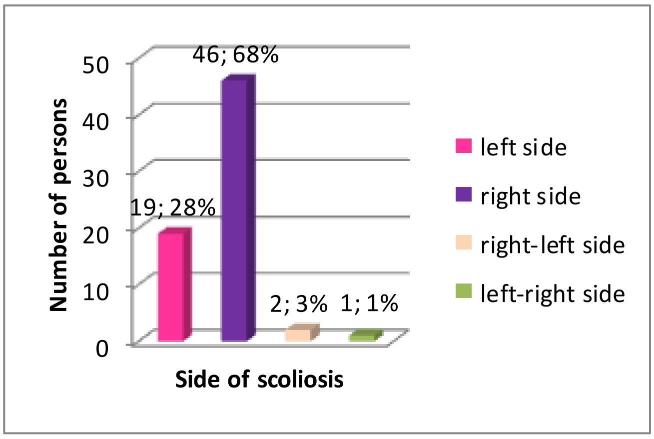

Figure 3. Division of research group with regard to scoliosis sidedness.

Results of tests evaluating sacroiliac joints

According to the accepted assumption (3 positive tests for the same side proved dysfunction) in 37 (54%) persons of the 68 persons examined, sacroiliac joint dysfunction was noted. Left-sided dysfunction was more frequently proved. It was found in 21 (31%) of examined persons.

As a result of comparison amplitude of iliac spine movement in Piedallu standing tests (TFD) and sitting tests (TFA) greater amplitude of iliac spine movement was noted during test in the standing position (n = 43; 63%), which indicates greater frequency of iliac spine bone dysfunction than sacral bone dysfunction.

Evaluation results of painful ailments

Subjective examination showed that 6 patients (9%) complained of painful ailments in the Fortin area. In response to the questions about painful ailments in the sciatic tuber area 1 patient (1%) confirmed pain on the left side.

Pelvis setting examination results.

Equally the measurement in [cm], as in [°] indicated higher setting of the right ASIS. This was evident in 34 examined patients (50%) according measurement in [cm] and 36 patients according measurement in [°]. Also in the case of PSIS both measurements confirmed that the iliac spine is set higher on the right side more frequently than the left (n = 44; 65% according measurement in [cm]; n = 43; 63% according measurement in [°]). In turn examination of ASIS protrusions showed, that among a significant part of the studied group (n = 42; 62%) left-sided iliac anterior protrusion is greater than right-sided.

On the basis of analysis of the setting of ASIS and PSIS with regard to each other, the studied group was divided into particular types of pelvic space setting, which is shown in figure 4. The most frequently found pelvis type was the mixed pelvis (n = 32; 47%), the most seldom was the symmetrical pelvis (n = 2; 3%).

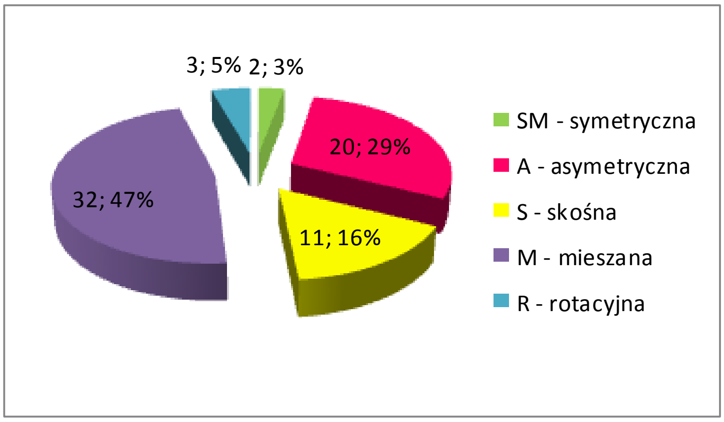

Figure 4. Division of types of pelvic setting

Analysis of the dependency between dysfunction of the sacroiliac joint and different variables

From all the statistical analyses including scoliosis types according to Lenke classification, 1 patient was excluded after examination, because the curvature did not correspond to any Lenke classification of spinal distortion.

From the conducted analysis it emerges that only the types of pelvis setting have a connection with lack of dysfunction or the side of dysfunction (right/left), however the connection between these groups is clearly not strong (Yule and C. Pearson coefficient – table II and III). The division into particular pelvic types in the studied group is shown in figure 5. Particular pelvic types are associated with studied groups – results presented on dendrogram (figure 6).

The results obtained indicate that the slanted and asymmetric pelvic types are associated with lack of dysfunction (slanted type – 8.83%, asymmetric type – 19.13%) and clearly appear more frequently than in groups with right sided dysfunction: 4.41% - slanted and 2.97% - asymmetric and correspondingly for left-sided – 2.94% and 7.35%). A connection was observed also between right-sided dysfunction and the rotation pelvic type, however the number of persons is insufficient to enable considering results as significant (n=3). The mixed pelvic type is associated with left-sided dysfunction, but it is as frequent in each of the analysed groups: lack of dysfunction – 17.65%, left-sided dysfunction – 17.65%, right-sided – 11.76%. One may thus suppose that only the asymmetric pelvic type has significant association with lack of dysfunction.

No dependency was found in the studied group with others symbolic variables (higher setting of ASIS and PSIS, protrusion of ASIS, side of lumbar or thoracic curvature, side and localization of primary curvature, the angle of scoliosis, type of scoliosis according to Lenke classification) and numerical variables (Cobb Angle [°] of primary curvature curving, height differences of ASIS and PSIS [cm] and [°] and also differences of ASIS protrusion [cm] – table II.

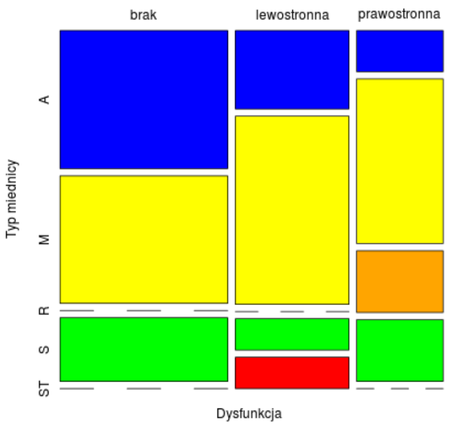

Figure 5. Distribution of types of pelvic setting with regard to division into: lack of dysfunction, left-sided dysfunction and right-sided dysfunction. (Pelvic type: A - asymmetric, M - mixed, R – rotational, S – slanted, ST- symmetric)

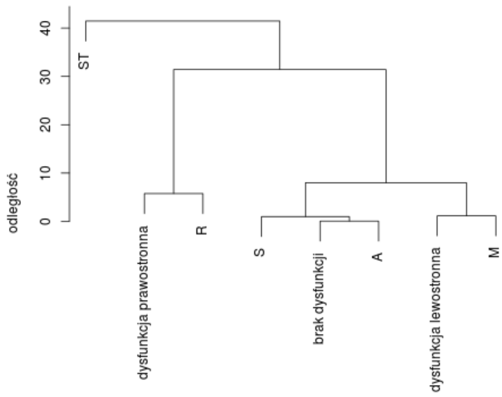

Figure 6. Grouping of types of pelvic setting according to the presence of right and left sided dysfunction and also lack of dysfunction.

Tab. II. Zależności między dysfunkcją stawu krzyżowo-biodrowego a zmiennymi. (NW –największa wiarygodność)

Zmienna	Testy (wartość p)

	Fisher	χ^2	NW	ANOVA
Kąt Cobba [°]	-	-	-	0.9476
Który i o ile KBPG ustawiony wyżej według pomiaru w [cm]?	0.09905	0.076522	0.094428	0.4056
Który i o ile KBPG ustawiony wyżej według pomiaru w [°]?	0.1876	0.15666	0.13677	0.6613
Który i o ile KBPG wysunięty według pomiaru w [cm]?	0.7256	0.69870	0.54946	0.628
Który i o ile KBTG ustawiony wyżej według pomiaru w [cm]?	0.2404	0.23746	0.14374	0.9147
Który i o ile KBTG ustawiony wyżej według pomiaru w [°]?	0.2061	0.21774	0.13733	0.7292
Strona skrzywienia w odcinku lędźwiowym	0.3226	0.34440	0.30993	-
Strona skrzywienia pierwotnego	0.4048	0.46996	0.39156	-
Rodzaj skoliozy według Weisfloga	0.7803	0.72851	0.74424	-
Lokalizacja największego skrzywienia pierwotnego	0.06983	0.091991	0.034793*	-
Typ skoliozy według Lenkego	0.6504	0.68317	0.40021	-

* istotne statystycznie, $p < 0.05$

Tab.III.Zależność między dysfunkcją a typem ustawienia miednicy(Dysfunkcja: B - brak, L - lewostronna, P – prawostronna; NW- największa wiarygodność; Typ ustawienia miednicy: A- asymetryczny, M- mieszany, R- rotacyjny, S-skośny, ST-symetryczny).

Typ ustawienia miednicy	Dysfunkcja (liczebność)			Testy (wartość p)			Współczynniki	
	B	P	L	Fisher	χ^2	NW	ΦYule	C Pearsona
A	13	2	5	0.03121*	0.012697*	0.015235*	0.535	0.471
M	12	8	12					
R	0	3	0					
S	6	3	2					
ST	0	0	2					

* istotne statystycznie, $p < 0.05$

Discussion

Analysing Polish medical literature, one may find works of research giving attention to the function of sacroiliac joints in scoliosis patients. Skolimowski et al. [14] confirmed the derangement of movement of this joint in 67% of persons studied. Equally Walaszek et al. [15] examined the iliac spine and confirmed blocked sacroiliac joint in 79% of patients with scoliosis. In this work joint dysfunction was noted in 54% of patients. These differences may arise from the number and characteristics of the research material, and also the selection of tests evaluating the function of this joint. The works of Skolimowski and Walaszek were based on research conducted on a smaller population (Skolimowski: n = 43; Walaszek: n = 52) and they used a smaller number of tests (Skolimowski - 4, Walaszek- 2).

The results of tests on sacroiliac joints are not always explicit. Instances occur when several tests indicated dysfunction of the left side, while others showed movement derangement of the right side. Equally Skolimowski [14] reports such incidents. He explains this by the varied mechanism of compensation changes happening in the pelvic area in various types of scoliosis. Walaszek [15] reports frequent occurrence among patients with scoliosis of left-sided dysfunction, which was confirmed also in this work.

Attention was also given to the function of the sacroiliac joints by other researchers. Saulicz et al. [16, 17, 18, 19] prove the effectiveness of passive mobilisation of these joints in symmetrically correct setting of the pelvis and also general body statics improvement. In their work the authors assess the effectiveness of applied mobilisation depending on the location of the primary curvature [16], they show that they influence the centralisation of the general centre of gravity [18] and the reduction of the extent of rotation in all body parts [19].

The results of the assessment of painful ailments in the studied patients show a sub-clinical status of patients with sacroiliac joint dysfunctions. Despite movement derangement of these joints, characteristic painful ailments were not confirmed in them. Lee [5] reports the possibility of occurrence of joint dysfunction without pain. Krawczyk-Wasielewska et al. [20], do not agree with this and quote the results of the IASP (*International Association Society for the Study of Pain*) from 1994. They say that the basis for making a diagnosis of sacroiliac joint dysfunction is occurrence of painful ailments in the vicinity of these joint, ailments evoked by clinical tests characteristic for the joint and reduction of or suffering pain as a result of injection with anaesthetic. These criteria are however very useful for patients with low back pain, among whom 16-30% of the cause of the ailment is found in sacroiliac joint dysfunction [20]. Thus it is not excluded that among the studied patients with scoliosis, among which lack of pain indicates a sub-clinical condition that in the future such ailments will appear.

The research conducted also enabled the definition in each patient of the type of pelvis setting. This issue has been taken up by many researchers [3, 4, 14, 16, 21], yet it is difficult to compare the results of particular research works with each other, because each author accepts another division of pelvis space setting. Some of them define the method of measurement with little precision and insufficiently described the characteristics of the given pelvis type. In own researches with regard to the possibility of very precise measurement 5 pelvis types are identified. The necessity to modify own available classification was connected with the occurrence of cases, which could not be qualified in whichever group suggested by other researchers. The observing of slanted, rotational (corresponding to twisted pelvises in other works) or mixed pelvises occurred with confirmation of asymmetry with specified bone points with the given numerical values. As the critical value 0.5 cm, was accepted which is according to the assumptions accepted in the works of Tylman [21] and Graff [4]. All spinal setting asymmetries of less than 0.5 cm despite the fact that they theoretically revealed slanted or rotation traits were deemed to be of asymmetric pelvis type. Such an assumption seems to be appropriate, when one considers the manner of marking the given bone points. Iliac spines are large projections of bone, the peak of which is not a single vertex point. Thus 0.5 cm constituted as it were a margin of error value. Additionally results of the examination of setting of iliac spines indicated divergence between measurements in [cm] and in [°] with reference to the side of higher spinal setting. They arise from the very great precision of the digital inclination meter, which reacts to the smallest change of setting and at very small asymmetry indicates a difference of the angle of bending with a precision to 0.1°. All divergences observed in the research of these two measurements were noted in patients with asymmetry of iliac spinal setting of less than 0.5 cm.

Furthermore there is no accepted norm for the setting of the pelvis in healthy people. Research into the pelvis settings of people with scoliosis and among healthy people was undertaken by Graff et al. [4] and Standera [22]. Graff [4] reports of the frequent occurrence of asymmetry of pelvic setting in the population of girls at the developing age. Among healthy girls one observes the dominance of symmetrical pelvic setting, however in the group of persons with lateral spinal curvature more frequent occurrence is confirmed of slanted and mixed pelvis (another characteristic of mixed pelvis in comparison with the assumptions of this work). In turn Walaszek [15] observed that 40% of examined healthy children showed blocked sacroiliac joint.

Analysing dependency between sacroiliac joints dysfunctions and derangement of symmetry in the pelvic area no significant connection were noted. One may only suppose that types of asymmetric pelvis type occur frequently in patients without confirmation of dysfunction of the sacroiliac joints. To prove this hypothesis however it would be necessary to conduct further analyses involving a greater examination and control group. Available works in medical literature do not contain research work on similar issues. With regard to the lack of clear significant dependencies it was decided to examine the dependency between dysfunction of the sacroiliac joint and other variables equally symbolic as numerical. No significant connections were noted. A dependency seemed probable regarding the side of lumbar curvature, because it is the spinal section connecting with the pelvis and theoretically having the greatest influence on its setting and biomechanics. Analysis of results did not however confirm this hypothesis.

The cause for the lack of unambiguous and significant dependency between dysfunction of sacroiliac joint and a specified variable may also be the fact of the occurrence of great variation equally between the sexes as also between individuals and additionally the structure of the right and left side of the pelvis [5]. Standera [22] also gives attention to the lack of symmetry between the right and left sacroiliac joint in histopathological examinations. In turn Saulicz [3] confirms a certain influence of sex and age on the occurrence of particular models of pelvic spatial asymmetry. One may therefore conclude, that such great variability in the construction of the pelvis may result in a different biomechanics, in the same differing processes causing dysfunction in the area of the sacroiliac.

There are varied propositions clarifying the appearance of pelvic distortions and the occurrence of spinal curvature. According to Standera [22] blocking of the sacroiliac joints leads to functional asymmetry of the sacral bone, subsequently distorted arrangement of the pelvic static arrangement, which may cause its twisting and asymmetrical muscular contraction reaction. In response to this the spine strives to compensate for the incorrectness in the area of the pelvis. It is thus the position of the primary arrangement of pelvic symmetry and secondary curvature of the spine. Standera [22] in his assumptions did not support the statistical examinations, they are thus theoretical solutions. Tylman [21] however considers the situation otherwise, when the primary changes in the area of the spine cause disturbance of the static arrangement of the pelvis. Therefore the aetiology of scoliosis is not clarified, also the causes of the occurrence of dysfunction in the area of the sacroiliac joints are currently still not completely understood.

Conclusions

1. Dysfunction of the sacroiliac joints occurs sufficiently commonly among patients with idiopathic scoliosis. Left-sided dysfunction predominates.
2. Among patients with idiopathic scoliosis there is occurrence of pelvic setting asymmetry. One may distinguish the following types of pelvic setting: asymmetric, rotation, slanted and mixed. Few patients have a completely symmetrically positioned pelvis (symmetric pelvis type).
3. On the basis of analysis of the arrangement of types of pelvis in the study group it is not possible to definitively state that the appearance of whichever type of pelvic setting has a connection with the presence of sacroiliac joint dysfunction. A connection has similarly not been found between dysfunction and type or direction of spinal curvature.

4. It is supposed that connections with the presence or lack of dysfunction must be sought in much more complex models than single function mechanisms.

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