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Parameters of dermatomal somatosensory evoked potentials in normal conditions and patients with clinical symptoms of low back pain

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ABSTRACT

Introduction. Dermatomal somatosensory evoked potentials (DSEP) are used to assess the function of afferent pathway following electrical stimulation of the skin around selected dermatomes of single spinal roots.

Aim. The aim of the study was to characterize the parameters of DSEP latencies for assessment of L5 and S1 nerve root transmission in healthy people taking into account the important diagnostic difference between the right and left side and the impact of height, age and sex on values of DSEP latencies.

Materials and Methods. DSEP tests were performed in the control group of 30 healthy volunteers and in the patients with low back pain radiating to one of the lower extremities for comparison. Disc-root conflict was confirmed in MRI studies. Clinical examination included assessment of muscles strength innervated from the L5 and S1 roots and the sensory perception from L5 and S1 dermatomes. In all patients straight leg raising (SLR) and Schober's tests have been performed. To assess the severity of pain, the visual analogue scale (VAS) was used. The clinical and neurophysiological evaluation of patients was performed before and after 4 weeks of the physiotherapeutic exercises selected for this study.

Results. Results indicated statistically significant relationship between the DSEP N33, P40, N50 components latencies and the height. The gender and age did not affect DSEP latencies. Values of DSEP latencies in the first and second periods of observations were normal and no sensory and motor disturbances have been observed in patients. DSEP test showed the high conformity with the results of clinical studies.

Conclusions. DSEP diagnostic determines well the subjective sensation changes in patients suffering from low back pain. Kinesiotherapy treatment of patients with low back pain without neurological deficits seems to be the appropriate therapeutic method.

Keywords: dermatomal somatosensory evoked potentials; low back pain.

Introduction

Dermatomal somatosensory evoked potentials (DSEP) are used to assess the function of afferent pathway by electrical stimulation of the skin around the selected dermatomes of single spinal roots, that triggers synchronous wave stimulation transmitted along the peripheral nerve trunk, posterior column-medial lemniscus pathway of the spinal cord, thalamocortical tract and to the appropriate fields of contralateral somatosensory cortex. The most useful parameters in

the evaluation of DSEP are latencies and interlatencies between the individual components of the somatosensory response. The amplitude and shape of the response are less important [1].

Dermatomal somatosensory evoked potentials was a technique introduced in the early eighties [2]. DSEP method is effective in the diagnosis of the consequences of inflammation to sensory spinal roots, tumors of the cauda equina and radiculopathy. It involves stimulation of the skin areas innervated by individual roots.

As innervation of individual roots (dermatome) partially overlap each other, the areas on the skin have been determined in which the overlapping is minimized. Dermatomal fields are excited by electrical stimuli with appropriate parameters, and the responses are recorded from the dermal surface of the skull of the cortical representation associated with the sensory innervation. Responses are averaged and represent the negative or positive waves with reference to the iso-electric line. Latency response, i.e. the time of onset of each wave after stimulus application and their amplitude are recorded and compared. The P40 wave is the most characteristic and constant component of DSEP. Its absence, increased latency or significant difference in latency between left and right side lead to the conclusion of root damage [1–7].

Aim

The aim of the study was to characterize the parameters of DSEP latencies for assessment of L5 and S1 nerve root transmission in healthy people taking into account the important diagnostic difference between the right and left side and the impact of height, age and sex on values of DSEP latencies. A preliminary comparison of selected parameters of DSEP in patients with unilateral sciatica to values obtained in healthy volunteers have also been performed as well as the comparative analysis of results from clinical trials and DSEP studies in the group of patients before and after the specially designed conservative treatment.

Materials and Methods

Subjects

The control group consisted of 30 healthy volunteers, including 25 women and 5 men aged from 22 to 57 years (mean 26.1 ± 7.2) and height from 158 to 191 cm (mean 171.6 ± 7.4). The aim of examination in this group was to ascertain the normative values of latency of each dermatomal somatosensory evoked potentials. The obtained results are presented in **Table 1**.

The control group included patients who had never reported pain in the lumbosacral spine or there were only sporadic episodes, which did not last longer than four weeks. The pain sensation was limited only to the lumbosacral segments without radiation to the lower extremities. Prior to the test, a thorough medical history has been collected from each volunteer with a focus on potential contraindications for the examination. Each volunteer was informed about the purpose of the study and signed the informed consent form, according to the valid questionnaire in the Depart-

Table 1. Reference values of recorded DSEP components latencies (ms) in a group of healthy volunteers after stimulation of nerves in right and left extremities. Values refer to results calculated following stimulation on both sides (N = 60)

		N33	P40	N50	P60
L5	Mean	39.8	47.8	58.4	71.0
S1		41.8	49.5	59.4	71.6
L5	Median	39.3	47.2	58.1	70.7
S1		41.5	49.2	59.2	71.5
L5	SD	3.7	4.0	4.3	5.6
S1		3.7	3.3	4.0	5.0

Abbreviations: N33, P40, N50, P60 – DSEP components; L5, S1 – sensory dermatomes

ment of Pathophysiology of Locomotor Organs, University of Medical Sciences in Poznań. Group of patients were those with pain syndrome at lumbosacral spine with pain radiation to one of the lower extremities in the disc-root conflict, documented with magnetic resonance imaging (MRI). The study group consisted of 5 patients (4 women and 1 man), aged 24 to 47 years (mean 38 ± 10.4) and height of 160 to 183 cm (mean 170.2 ± 8.4).

Before performing the study, a medical history has been collected and physical examination has been performed. Each patient was informed about the study and its progress and gave a written consent to the study. Inclusion criteria for patients were pain syndrome in lumbosacral region of the spine with pain radiating to one of the lower extremities in disc-root conflict on the L5 or S1 level, documented with magnetic resonance imaging (MRI), no other contraindications for examination. Exclusion criteria were a state after implantation of the pacemaker, cochlear implant, insulin pump and other electronics devices used for therapeutic purposes in an individual, no MRI of lumbosacral region confirming the diagnosis, symptom duration of less than 4 weeks, history of trauma or surgery of the spine, diabetes, polyneuropathy, history of injuries and fractures of the lower extremities.

Instruments

Clinical evaluation

In past medical history we collected information on the current episode of pain, i.e. since when and how long the pain lasts, what is the pain like and how often it appears during the day. Additionally, we have asked for coexisting diseases in accordance with the exclusion of patients from the study.

Examination consisted of assessing the strength of muscles innervated from the L5, S1 root, sensory disturbances from L5 and S1 dermatome, patellar tendon

Table 2. Characteristics of the study group including elements of a clinical study before and after rehabilitation treatment

Clinical test	Patient 1		Patient 2		Patient 3		Patient 4		Patient 5	
	I	II	I	II	I	II	I	II	I	II
Schober test	14	15	15	15	13,5	15	15	15	12	15
	8	8	8	8	8	8	8	8	8	8
SLR	+ 30°	-	+ 30°	-	+ 40°	-	-	-	+ 40°	-
VAS	6	0	6	0	10	5	5	1	10	3
Sensory test	N	N	N	N	N	N	N	N	N	N
Pain radiation	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Left	YES		YES		YES		YES			
Right									YES	

Abbreviations: I, II – First and second examinations, N-normal, + positive, - negative

and Achilles tendon reflex testing. In all patients the straight leg raising test (SLR) and Schober's test have been performed. To assess the severity of pain the visual analogue scale (VAS) was used. Characteristics of the study group including elements of a clinical study before and after rehabilitation treatment are presented in **Table 2**.

Kinesiotherapy program

Patients performed exercises therapy towards low-back pain for 4 weeks. In the recommendations, they were to systematically perform 10 repetitions of each exercise, every day for 4 weeks (patients were supposed to perform 10 repetitions of each exercises, every day for 4 weeks' time). In the case of pain appearing the patient should adjust the number of repetitions to their (his/her) abilities and always remembered about breathing exercises (take a deep breath in through a nose, exhale through your mouth). A set of exercises has been explained to each patient individually. A set of exercises was as follows:

- Exercise lying on their backs
 - Lying down with legs bent, hands under the lumbar region of spine. Approximating the navel to the spine ("press the navel to spine") with a stand for 5 s
 - Lifting the head and shoulders from the ground. Both legs bent at hips and knees. Hands pushing knees. Legs at a standstill. Hold for 5 s
 - Lifting the head and shoulders from the ground. The left hand pushes the right knee. Hold for 5 s, than swap.
 - Raising the pelvis to a height of 10–15 cm. Arms along the body, withstand at 3s
- Exercise front lying (folded blanket / towel under the abdomen)
 - Lifting the head up-looking ahead. Withstand 3 s

- Lifting the right upper extremity and left lower extremity. Withstand 3 s, than swap
- Exercise in kneeling (bottom to heels stretch)
 - Bend forwards and rest your forehead on the floor with the arms stretched in front of you.
- Exercise in kneeling
 - "Cat-camel" exercise (10 repetitions)
 - The "Bird-Dog" exercise. Simultaneous raising of right upper extremity and the left lower extremity. Withstand 5 s, than swap.
- Breathing exercises
 - Upright kneeling position
 - » Inhale – raising arm up and elongating the spine
 - » Exhale – lower arm sideways down

A set of exercises has been explained to each patient individually. For the first time, patients performed exercises under the supervision of a physiotherapist.

DSEP test

Cutaneous areas of L5, S1 sensory roots were stimulated in both lower limbs with the electrical impulses of 0.2 ms duration, frequency of 3.3 Hz and intensity 3 times higher than the sensory threshold determined individually for each subject. Stimulating electrode was located at a distance of 4 cm from the base of the fifth finger, on the outer edge of the foot for S1 root, 3 cm from the base of the big toe and the second toe on the dorsal surface of the foot for L5 root. Silver, the cup-shaped recording electrodes were placed in the following location: active electrode in position 2 cm at the rear of Cz, the reference electrode in the position Fpz in accordance with the international system 10–20. Grounding electrode was located on the side of the neck. DSEP test was performed according to the method described by Rakowicz et al [3]. Responses have been analyzed after averaging of up to 500 waveforms, twice, in order to verify the reproducibil-

ity of responses. Analyzed parameters were latencies of N33, P40, N50 and P60 components and the latency difference between the right and left side. Tests have been performed in Department of Pathophysiology of Locomotor Organs University of Medical Sciences in Poznan in the Wiktor Dega Orthopaedics and Rehabilitation Hospital using an integrated diagnostic system KeyPoint (Medtronic A/S, Skovlunde, Denmark).

The clinical examination and DSEP test in patients were performed twice, before and after the period of regular exercises specially designed for this study.

The implementation of the research was approved by the Bioethics Committee of Poznan University of Medical Sciences (Resolution No. 496/15). All personal data of patients have been kept confidential.

Statistical analysis

For statistical analysis of the results of the latencies recordings of each DSEP components dependence on the sex, age and height nonparametric Mann-Whitney U test and Spearman rank correlation coefficient were used. A statistically significant difference in the latency

of each DSEP wave on the right and left side of the respective root in the control group was calculated by paired Student t test. Test results with significance level of $P < 0.05$ were considered statistically significant. Calculations were performed using STATISTICA v. 10 StatSoft. Quantitative variables were expressed as the mean, median and standard deviation.

Results

All the selected locations of stimulation allowed for the recordings of well formed, repeatable, of similar shape dermatomal potentials. N75 latencies due to the difficulties in the correct determination of the latency of the component and its low stability when comparing the two consecutive curve potentials were not analysed (Figure 1).

The latency normative values of each DSEP component for L5 and S1 roots are presented in Table 1.

Table 3 shows the diagnostically significant differences in latency of each DSEP component between the right and left side. The number of results shown in this table was $N = 60$, because it was calculated as

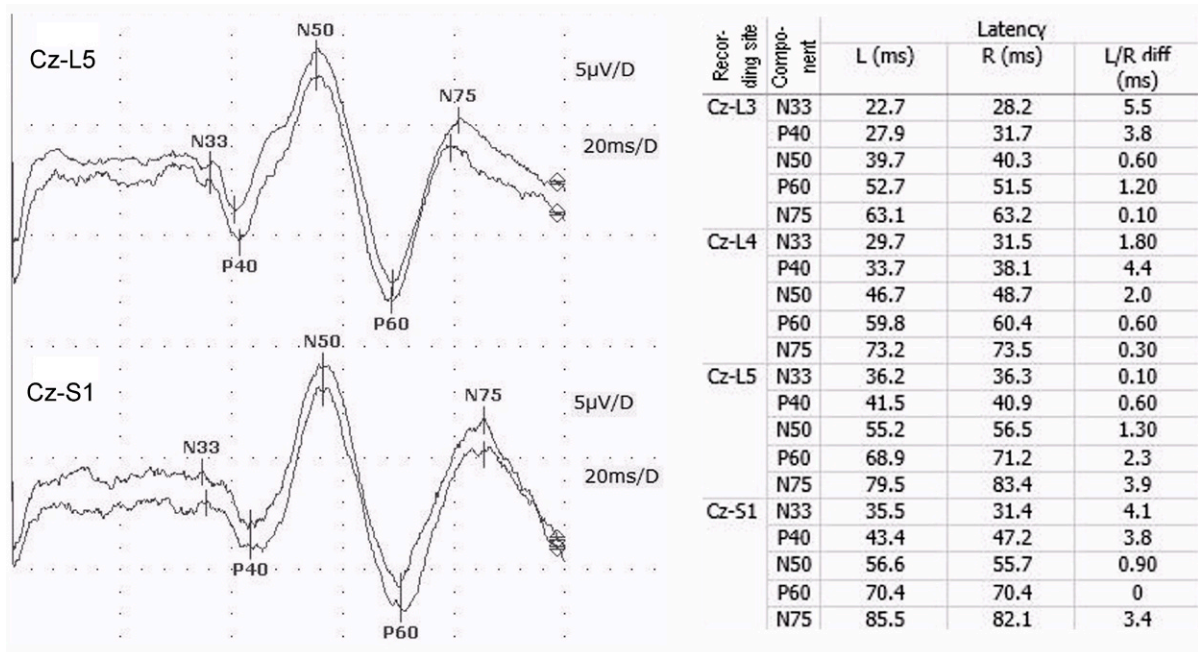


Figure 1. Examples of dermatomal evoked potentials recorded after stimulation of the L5 and S1 sensory areas on the right and left side in a healthy 28 years old women, with the values of each DSEP peak latency for the right and the left side

Table 3. Reference values (mean \pm 2SD) of latencies (ms) for particular DSEP components recorded in healthy volunteers ($N = 60$). Statistical significant differences in recorded latencies following stimulation of nerves on right and left extremities at $P < 0.05$ are marked with asterisks

	N33	Right vs left difference	P40	Right vs left difference	N50	Right vs left difference	P60	Right vs left difference
L5	39.8 \pm 7.4	1.1*	47.8 \pm 8	1.0*	58.4 \pm 8.6	0.8	71.1 \pm 11.2	0
S1	41.8 \pm 7.6	0.2	49.5 \pm 6.6	0.8	59.5 \pm 8	0.3	71.7 \pm 10	0.3

Abbreviations: N33, P40, N50, P60 – DSEP components; L5, S1 – sensory dermatomes

the average value of the latency of each DSEP wave obtained in a group of 30 healthy volunteers together from the right and left lower extremity.

A statistically significant difference between the values of N33 and P40 latencies in recordings following the stimulation of both legs from the L5 root dermatome have been found. Diagnostically important it proved to be the difference latency equal to or greater than 1 ms.

There was also performed an additional analysis of the dependence of the latency of each dermatomal evoked potentials components in the control group (N = 30) from gender, height and age. The results are summarized in **Tables 4, 5 and 6**.

The values showed in Tables 4 and 5 indicate no statistically significant differences, which meant that the gender and age did not affect the results of DSEP parameters.

The results summarized in **Table 6** indicate the statistically significant dependence of the latencies of N33, P40, N50 components of dermatomal evoked potentials from height. It is a positive relationship. There was no statistically significant correlation of P60 component latency from height of a subject.

Table 2 shows the characteristics of the patients including data from medical history and clinical examination in the first and second period of observation, i.e. before and 4 weeks after the introduced treatment.

Table 4. Correlation results between DSEP latencies and gender in the control group of healthy volunteers (N = 30)

	Rank sum Women	Rank sum Men	U	Z	P-value	Z adjusted	P-value	Women	Men	P-value*
N33 dexter	381.5	114.5	56.5	-0.900	0.368	-0.9	0.36	25	5	0.364
N33 sinister	380.5	115.5	55.5	-0.950	0.342	-0.95	0.34	25	5	0.338
P40 dexter	402	94	73	0.0750	0.940	0.0	0.94	25	5	0.94
P40 sinister	393.5	102.5	68.5	-0.300	0.764	-0.3	0.76	25	5	0.751
N50 dexter	377	119	52	-1.125	0.260	-1.12	0.26	25	5	0.268
N50 sinister	375	121	50	-1.225	0.220	-1.22	0.22	25	5	0.227
P60 dexter	408.5	87.5	66.5	0.400	0.689	0.4	0.68	25	5	0.678
P60 sinister	408	88	67	0.375	0.707	0.37	0.70	25	5	0.714

Abbreviation: *calculated with Mann-Whitney U test, a P< 0.05 was accepted as significant

Table 5. Correlation results between DSEP latencies and age in the control group

	Number of participants (N)	rS	t (N-2)	P-value
Age vs N33 dexter	30	0.203612	1.119943	0.271928
Age vs N33 sinister	30	0.280641	1.574575	0.126202
Age vs P40 dexter	30	0.202828	1.115449	0.273817
Age vs P40 sinister	30	0.314620	1.784923	0.084739
Age vs N50 dexter	30	0.261212	1.457266	0.155787
Age vs N50 sinister	30	0.326986	1.863302	0.072576
Age vs P60 dexter	30	0.174023	0.951665	0.349132
Age vs P 60 sinister	30	0.170638	0.932592	0.358731

Abbreviations: r_s - Spearman's rank correlation coefficient, a P< 0.05 was accepted as significant

Table 6. Correlation results between DSEP latencies and height in the control group of healthy volunteers

	Number of participants (N)	rS	t (N-2)	P-value
Height vs N33 dexter	30	0.4287	2.5559	0.0160
Height vs N33 sinister	30	0.6565	4.6869	0.0000
Height vs P40 dexter	30	0.3679	2.1306	0.0417
Height vs P40 sinister	30	0.5172	3.2544	0.0028
Height vs N50 dexter	30	0.4363	2.6117	0.0141
Height vs N50 sinister	30	0.6547	4.6645	0.0000
Height vs P60 dexter	30	0.0652	0.3520	0.7273
Height vs P60 sinister	30	0.2325	1.2876	0.2080

Abbreviations: r_s - Spearman's rank correlation coefficient, a P< 0.05 was accepted as significant

The patient group consisted of 5 people with low back pain and one-sided sciatica. Four patients reported a pain with radiation to the left lower extremity and one to the right lower extremity. The physical examination of all patients showed no sensory disturbances within the dermatomal areas of skin innervated by L5 and S1 nerve roots, sensory perception was comparable to the asymptomatic side. Also, the patellar tendon and Achilles tendon reflexes and strength of tibialis anterior muscle, extensor digitorum brevis muscle and gastrocnemius group muscles on the symptomatic side were correct. Every of the patients stood on toes and heels. Three patients had the left L5 disc-root conflict, one person the right S1 and one person left S1 disc-root conflict detected in MRI imaging. Radiation of pain in all patients was consistent with the results of MRI. The SLR test result during the first assessment was positive in 4 patients from the study group. Only one result was negative. Straight leg raise was regarded as positive to the angle of 60° of hip flexion [8]. However, in the

second study, every individual test result was negative (Table 2). A comparison study of pain intensity VAS scale in subjects revealed, that the therapy resulted in a substantial reduction from the mean value of 7.4 to 1.8, as it is shown in Figure 2.

Comparison of Schober's test results of subjects showed that the therapy improved the range of motion in the lumbar region of spine. The extension range remained unchanged and fitted in the standard, while the range of flexion increased from the 13.9 cm to the value of 15 cm, which is shown in Figure 3.

The latencies of N33, P40, N50, P60 components to the standard values obtained in healthy volunteers of the control group were compared. Both in the first and in the second study, all patients latencies values of DSEP components were within the range of normative values (Table 7). For the correct N33, P40, N50, P60 latencies values, the average value \pm 2.0 SD was taken. The difference between the latencies of DSEP recorded from the symptomatic (Table 8) and asymptom-

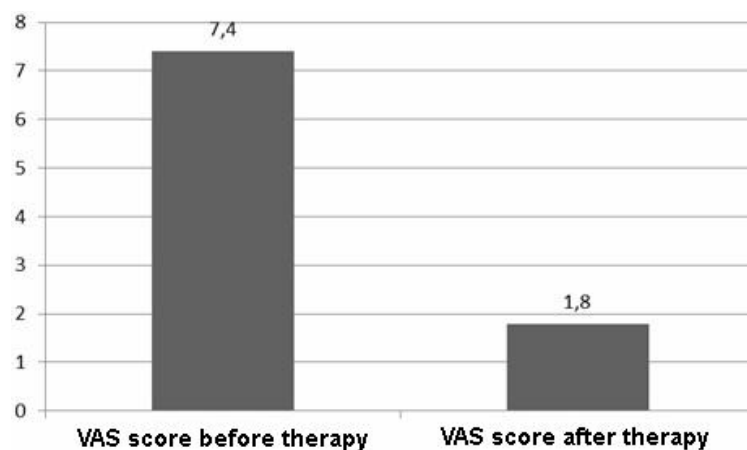


Figure 2. Results of pain intensity assessment in VAS scale before and after therapy in the patients group

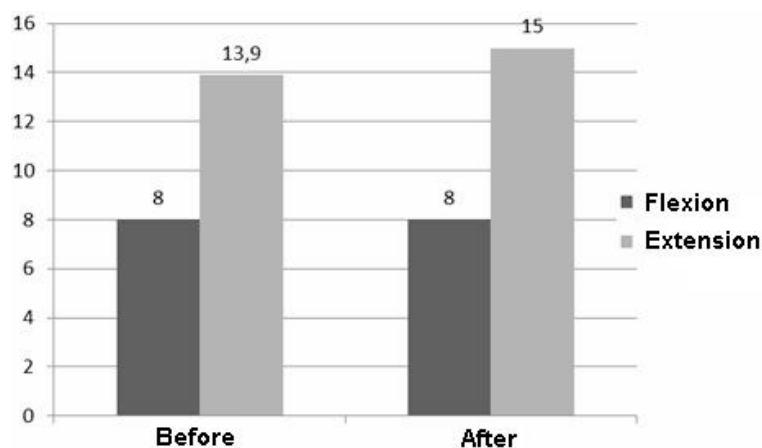


Figure 3. Results of range of motion assessment of the lumbar spine using the Schober's test

Table 7. The values of DSEP latency (ms) in patients group (N = 5)

		N33		P40		N50		P60	
		Test I	Test II	Test I	Test II	Test I	Test II	Test I	Test II
L5	Mean	41	40.9	49.3	48.7	60	59	72.9	71.5
S1		41.6	42	49.3	49	60.1	57.7	71.4	69.3
L5	Median	38.9	39	47.3	47.5	59.6	58.3	70.5	69.9
S1		40.7	40.3	47.4	46.9	57.9	57	71.3	67.6
L5	SD	4.2	4.1	4.8	4.2	3.5	4.2	7.7	3.7
S1		4.8	4	3.9	3.7	4.1	3.7	5.2	5.4

Table 8. The values of DSEP latency on symptomatic side of patients group (N = 5)

		N33		P40		N50		P60	
		Test I	Test II	Test I	Test II	Test I	Test II	Test I	Test II
L5	Mean	39.2	41.2	48.3	48	59.3	57.2	71.1	67.7
S1		43.9	41.9	51.8	50.1	61.2	54.1	72.6	73.3
L5	Median	38.9	39.3	45.8	46.6	58.3	56.4	71.3	67.6
S1		43.9	41.9	51.8	50.1	61.2	54.1	72.6	73.3
L5	SD	2.9	3.6	4.7	3.4	3.9	3.7	4.3	2.6
S1		7.6	5.7	8.5	9.1	5.5	5.7	8.8	6

Table 9. The values of DSEP latency on asymptomatic side of patients group (N = 5)

		N33		P40		N50		P60	
		Test I	Test II	Test I	Test II	Test I	Test II	Test I	Test II
L5	Mean	41	39.9	49	48	59.2	57	74	71.6
S1		41.6	42.3	48.2	47.5	50.3	49.4	55.5	55.1
L5	Median	39.4	39.9	39.4	46.6	57.6	57.5	71.3	67.3
S1		41.6	42.3	48.2	47.5	50.3	49.4	55.5	55.1
L5	SD	4.7	0.7	2.9	3.4	3.1	4.2	7.8	9.4
S1		5.7	7.4	13.6	13.6	6.8	5.3	13.6	15.2

atic side (**Table 9**) was also analyzed in the group of patients. The values were compared to the diagnostically relevant differences in latency values calculated in healthy volunteers which are shown in **Table 3**. There was no recorded the diagnostically significant increase of DSEP latency in the symptomatic side compared to the asymptomatic side. Due to the very small number of patients (N = 5), differences of DSEP component latency in the first and in the second study were not subjected to the statistical analysis.

Discussion

The normal values of N33, P40, N50, P60 latencies were found to be comparable to those published in other studies [3, 9–11].

Similar to the presented studies we also did not record the statistically significant correlation between the age or gender of a patient and the value of DSEP wave latency, especially P40 latency, which is the most easily detectable DSEP component [3, 10].

In studies of Albeck et al [12], in 40% of patients with disc herniation, the DSEP study was incorrect and

only in 15% of patients the results were consistent with the level of damage confirmed by CT scans. It therefore can be concluded that the examination should be considered as a supplemental test in neurophysiological diagnostics, especially in patients with symptoms of sensory disturbances.

Many authors emphasize the importance of dermatomal somatosensory evoked potentials in the diagnosis of patients with lumbosacral discopathy [13–17]. Sitzoglou and his colleagues [14] also draw the attention to the noninvasiveness of this technique. Dumitru et al [15] and Florczak et al [16] in their studies evaluated the N33 and P40 components latencies and DSEP amplitudes. According to the other authors [3,16], the most common DSEP abnormality observed in patients with sciatica and damage to the lumbosacral spinal nerves is a prolongation of DSEP latency. These authors also highlighted the importance of diagnostic P40 latency difference between the symptomatic and asymptomatic side. In our study N33, P40, N50 and P60 wave latency of DSEP parameters were assessed. DSEP amplitudes have not been analyzed, because dur-

ing the test in a control group of healthy volunteers the attention was drawn to the significant difference in DSEP amplitudes in people of the same sex and of the same age which is consistent with studies of Katifi and co-workers [10].

The results presented in this study showed in all patients that DSEP latency was correct, although in a clinical study in those patients the numbness from the L5 or S1 dermatome and neurological deficits from relevant muscles of lower extremity have not been recorded. In study of Florczak et al [16], the increase of P40 wave latency parameter had coincided with impaired sensory sensation in the clinical trial. Also in Wasilewska and Kotowicz study [2] who evaluated the patients with lumbo-sacral discopathy in whom in a DSEP study a prolonged latency of each wave has been observed, were characterized by the presence of lower extremity neurological deficits. As it was presented in our study, in patients group the DSEP test showed a high conformity with the results of a clinical study despite the presence of disc-root conflict showed in the MRI results.

Quante et al [18] presented in their studies a new method of neurophysiological, dermatomal laser-evoked potentials, used to evaluate the root impulses transmission in early monosegmental radiculopathies.

Therapeutic treatment for lumbosacral region pain episode is quite complex. Lack of appropriate treatment regimen, the duration of the disease process and neglect in the sphere of prevention and lack of ergonomics are the reasons for this phenomenon. The treatment should be focused on improving the range of motion of lumbosacral segment and strengthening the back muscles, which are a kind of stabilizing corset [19–22]. This study evaluated the efficacy of physiotherapy treatment in the cases of lumbosacral pain. According to the previous descriptions [20, 21], the efficacy of physiotherapy in such cases may reach 80%. Indeed, only properly selected physiotherapy is able to improve the health status of the patient. In all patients after four weeks kinesiotherapy, the range of motion in lumbo-sacral region and the reduction of pain intensity had improved, although the study was conducted on a small number of patients. Świącicka and Świącicki conducted a study on a group of 190 patients [20] and Suszynski et al [21] on a group of 40 patients.

According to the statement of Lisiński et al [22], the kinesiotherapy is the primary method of treatment for back pain, while the electrotherapy is only complementary to the proceeded physiotherapy. In this study, patients during the study period were treated only

with kinesiotherapy, which proved to be fully effective method and allowed to obtain the satisfactory therapeutic results.

Functional tests are a valuable complement to the diagnosis of low-back pain. Positive tests indicate damage or irritation of neuromuscular structures, which can cause the pain radiating to the lower extremity. Well-conducted tests complement the diagnostic data and are necessary to determine the need for further imaging tests. For the evaluation of nerve root components the SLR test was used. The sensitivity and specificity of the SLR test was presented in the analysis conducted using the MEDLINE and EMBASE databases. We found that the SLR test showed a high sensitivity – 91%, but low specificity – 26% [23]. In the first conducted clinical study, four patients showed positive scores of SLR tests. Only in one case test result was negative, while the disc root conflict was confirmed on the basis of the result of MRI in all patients.

According to several authors, in the diagnosis of back pain the important element of the study is to evaluate the sensation disturbance [1, 20, 24]. In our clinical trial, in the patients group no sensory disturbances have been observed. Clinical trial results in this study are compatible with the results of the DSEP study, because also in the DSEP examination there have been no patients with diagnostically significant prolongation of DSEP latency.

According to Depa et al [25], in the subjective sensation of pain it is also important to assess an efficacy of physiotherapy. In this study we used VAS for assessment of pain intensity as a tool evaluating the effectiveness of applied kinesiotherapy. The results of this study show the importance of rehabilitation in patients with low back pain. The use of appropriate diagnostic methods together with complex therapeutic treatment determines meeting the expectations of the people suffering from back pain, which is also consistent with studies of other authors [20–22].

Conclusion

DSEP study is a simple, noninvasive method for evaluating nerve conduction of L5, S1 dorsal nerve roots neural transmission. DSEP examination seems to be a good diagnostic tool determining the subjective pain in patients suffering from low back pain. Kinesiotherapy treatment of patients with low back pain without neurological deficits seems to be the appropriate therapeutic method.

Taking into account the results of presented study, the future studies should be extended to a group of

patients including those in whom a clinical study concludes lower extremities neurological deficits.

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Conflict of interest statement

The authors declare no conflict of interest.

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