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## Evaluation of Pain in Patients with Lumbar Disc Surgery Using VAS Scale and Quantitative Sensory Testing

### Ocena bólu u pacjentów operowanych z powodu dyskopatii lędźwiowej za pomocą skali VAS i ilościowego pomiaru czucia

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;  
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### Abstract

**Background.** Pain is interpreted at the cortex level, however, pain signaling stimuli arise at the periphery and are conveyed by nociceptive A delta and C fibers.

**Objectives.** Evaluation of pain using the VAS scale in pre- and postoperative S1 sciatica patients with regard to thermal thresholds in the corresponding dermatome.

**Material and Methods.** Twenty-six S1 sciatica patients with herniated disc on an MRI, non-responsive to conservative care, were involved in the study. Pain in the affected leg was measured using the VAS scale and thermal thresholds in S1 symptomatic dermatome using Quantitative Sensory Testing (QST).

**Results.** Pain intensity as well as thermal thresholds were increased in sciatica patients compared to controls. Disc surgery resulted in a pronounced lowering of pain in each of the operated patients. From the whole group, 21 subjects were examined postoperatively six months later. In the group with complete clinical recovery, thermal thresholds were within normal limits. In those patients with residual pain disability, normalization of thresholds has not been achieved.

**Conclusions.** Pain in sciatica patients may be objectively measured by QST (Adv Clin Exp Med 2013, 22, 3, 411–419).

**Key words:** monoradicular sciatica, VAS scale, QST, disc surgery.

### Streszczenie

**Wprowadzenie.** Ból jest zjawiskiem złożonym i jego interpretacja następuje na poziomie kory mózgowej, do której informacja o szkodliwych bodźcach jest przewodzona z obwodu nocyceptywnymi włóknami A delta i C.

**Cel pracy.** Ocena bólu z wykorzystaniem skali VAS w odniesieniu do funkcji włókien A delta i C w uszkodzonym dermatomie u chorych z jednopoziomowym bólowym zespołem korzeniowym przed i po zabiegu dekomprezji korzenia.

**Materiał i metody.** 26 chorych na ischialgię S1, nieodpowiadających na leczenie zachowawcze, z potwierdzonym uciskiem korzenia przez dysk poddano zabiegom discektomii. Ból w zajętej kończynie oceniano w skali VAS, a progi czucia metodą ilościowego pomiaru (QST) w dermatomie S1 bezpośrednio przed i 6 miesięcy po zabiegu.

**Wyniki.** U wszystkich chorych przed zabiegiem wykazano podwyższenie progów czucia. Po zabiegu u wszystkich badanych intensywność bólu znacznie zmalała. 21 chorych poddano powtórnym badaniom 6 miesięcy po zabiegu. U pacjentów z całkowitym ustąpieniem bółów progi wróciły do wartości prawidłowej. U chorych z niepełną poprawą progi czucia pozostały nieprawidłowe.

**Wnioski.** Badanie progów czucia metodą QST może służyć obiektywizacji doznań bólowych (Adv Clin Exp Med 2013, 22, 3, 411–419).

**Słowa kluczowe:** jednopoziomowe uszkodzenie korzeniowe, skala VAS, ilościowy pomiar czucia (QST), dekomprezja korzenia.

Sciatica is characterized by radiating leg pain and related disabilities in dermatomal distribution. The disease results mainly from nerve root compression by herniated disc [1]. The conservative management of pain should be introduced first. However, with persistent, intractable pain non-responsive to 6 to 8-week pharmacological treatment with rehabilitation, disc surgery should be taken into consideration [2]. Pain reported by patients differs in intensity which depends on many factors such as self-experience, personality, cultural and environmental conditions. From a neuropsychological point of view, pain is a complex phenomenon and its interpretation takes place at the cortex level. However, pain information is transmitted from the periphery by afferent nociceptive pathways into the central nervous system (CNS). At the periphery, small myelinated A delta fibers and unmyelinated C ones are involved in the process of pain signaling, which has been proven on animal models and confirmed among people by selective blocking of the nerve's fibers in sensory cutaneous nerves [3]. Approaches towards pain assessment have resulted in the introduction of different types of scales, among them the numerical Visual Analogue Scale (VAS) and scales which determine the intensity of pain based on the degree of restrictions in everyday activities [4, 5]. Recently, a new neurophysiological method, Quantitative Sensory Testing (QST), has been applied to study the functional changes in the sensory fibers of peripheral nerves [6, 7]. QST determines skin thermal thresholds in the area supplied by nerve. Each modality of thermal sensation is conveyed by selective types of sensory fibers. The threshold for cold sensations (CS) is tied to the A delta fibers' function, and for warm sensations (WS) the function of C fibers specific to temperature in the innocuous range, respectively, while thresholds for cold pain (CP) and heat pain (HP) determine the function of polymodal C fibers responsive to noxious cold and heat, respectively [8–11]. Bearing in mind that pain information is transmitted from the periphery by A delta and C fibers, the authors have decided to compare the pain intensity estimated by the VAS scale in the affected leg with the function of A delta and C fibers in the affected dermatome in S1 sciatica patients just prior and 6 months after disc surgery.

## Material and Methods

Twenty-six patients (14 males and 12 females, aged 22–59 years, mean  $36.8 \pm 8.7$  years) with monoradicular sciatica corresponding to S1 root distribution were included in the study. All of them complained of severe, intractable pain which

did not diminish after 2 to 16 weeks of conservative care. In all of them, disc herniation was confirmed by an MRI exam. Patients were referred to a neurosurgeon who, on the basis of an interview, the VAS scale, a physical examination, and MRI findings, finally decided whether surgical intervention should be taken. The neurosurgeon was the operator of all of the included patients. The time period from the onset of radicular pain to decompression lasted from 2 to 18 weeks (mean  $8.7 \pm 5.7$  weeks) and from neurosurgical assessment to operation, the time period lasted not more than 2 weeks. None of included patients presented positive familial history of peripheral nervous system disorders. Neither metabolic nor toxic damage to the peripheral nerves was revealed in the examined group. After admission to the neurosurgical ward, the clinical and electrophysiological evaluations were carried out within two days before the operation. The clinical exam consisted of neurological and VAS scale evaluation and electroneurographic tests composed of the conventionally-performed neurographic analysis of motor conduction nerve studies – MCNS (peroneal and tibial nerves) and sensory nerve conduction studies – SNCS (sural n.) [12]. Conduction studies were performed on both legs and QST studies in the affected dermatome. For motor studies, distal latency (DL), amplitude of compound motor action potential (CMAP) at distal point of stimulation, and velocity just between two points of stimulation were analyzed. The sural nerve (n.) was stimulated antidromically at one-third of the length of the calf in the medial posterior line, with a superficial recording electrode placed behind the lateral malleolus. Distal latency, amplitude of sensory nerve action potential (SNAP) and velocity just between points of stimulation and recording were reported. Conventional neurographic studies were performed using a Viking Quest electromyograph. QST measured the thermal thresholds: CS, WS, CP, and HP [6]. Results were obtained with the Sensory Analyzer TSA-II. The neurosensory analyzer is a computer-controlled device capable of generating and recording a response to repeated thermal stimuli (temperature range  $0^\circ$  to  $50^\circ\text{C}$ ) through a thermode placed on a body surface. In present patients, the thermode was placed in the distribution of S1 dermatome, in the lateral part of the foot. The method of limits was used [13]. At first, a temperature of adaptation was generated ( $32^\circ\text{C}$ ), at which the subject did not feel any temperature. Subsequently, the temperature was lowered ( $1^\circ\text{C}/\text{sec}$ ). As soon as the subject realized the temperature sensation under the thermode, he/she pushed the button which stopped the cycle. On the display, the level of temperature (threshold) was shown. Then the temperature returned to  $32^\circ\text{C}$  and the

cycle was repeated. The mean from 4 cycles stands for the threshold for CS. The same procedure was performed in order to obtain WS threshold but, instead of lowering, an increase of temperature was applied [14]. The thresholds for CP and HP (first, unpleasant feeling of temperature with changes of  $2^{\circ}\text{C}$  per sec) were obtained in the same way as the three cycles for each modality. The electrophysiological evaluation was performed in a silent room at a stable temperature of  $25^{\circ}\text{C}$ . The above listed exams were performed 6 months later. The control group consisted of 30 age- and sex-matched healthy controls (aged from 21 to 50 years, mean  $36.6 \pm 7.6$  years, 13 women and 17 men). Neurographic studies were performed on the left side in the control group. All subjects signed informed consent. The study was approved by the Local Ethics Committee at the Wroclaw Medical University, no 530/2009.

The statistical analyses were performed using STATISTICA 10.0 PL. The t-Student test for independent samples was used to compare the means in the two groups. The t-Student test for dependent samples was used to compare the means before and after operations. The results are presented as means  $\pm$  SD. The association between two variables was examined by Pearson's correlation coefficient. Statistical significance was accepted at  $p < 0.05$ .

## Results

All patients complained of radiating pain along the affected leg in the distribution of S1 der-

matome. Upon neurological examination, mild hypoesthesia localized to S1 was presented in 18 cases. All patients experienced pain at straight leg raising. The Lasegue's sign was positive at a mean value of  $30.2 \pm 11.7$  degrees. There was also a discrete lowering of dorsiflexion (4 or 4/5 point) on the 6-point Lovett's scale in 3 and diminished ankle reflex in 11 patients. The mean score of pain intensity on the VAS scale in the affected limb was  $8.04 \pm 2.13$ . The mean value of VAS on the first visit when the neurosurgeon classified patients for disc surgery was  $9.25 \pm 1.01$ . Conventionally-performed motor nerve conduction studies on both sides in the S1 sciatica group did not reveal any abnormalities (results not included in paper). The preoperative parameters of the sural n. study and CS, WS, CP, and HP thresholds on the affected side in patients with S1 sciatica and in controls are presented in Tab. 1 and Tab. 2, respectively. The parameters of sural n. did not differ between the examined groups, while there was significant increase in each examined threshold in patients compared with the controls (for WS  $p = 0.0001$ , for CS, CP, and HP  $p < 0.0001$ , respectively).

The correlations between thermal thresholds in symptomatic S1 dermatome and the value of VAS and Lasegue's sign are listed in Tab. 3. CS did not correlate with either VAS or the Lasegue's sign. WS correlated with VAS ( $p = 0.007$ ) while not with Lasegue. Both CP and HP were highly correlated with VAS ( $p < 0.0001$ ) and Lasegue ( $p < 0.0001$ , and  $p = 0.0006$ , respectively).

Twenty-one patients who underwent S1 decompression were evaluated 6 months later. The

**Table 1.** Sural nerve conduction studies on the symptomatic side in preoperative S1 sciatica patients and healthy controls

**Tabela 1.** Parametry przewodnictwa czuciowego w n. łydkowym po stronie korzeniowego zespołu bólowego S1 przed zabiegami i w grupie kontrolnej

Sural nerve (Nerw łydkowy)			
	Distal latency (Latencja dystalna) (msec)	SNAP Amplitude (Amplituda) ( $\mu\text{V}$ )	Sensory velocity (Szybkość przewodzenia czuciowego) (m/sec)
S1 sciatica group (Grupa chorych) (n = 26)	$2.86 \pm 0.62$	$15.92 \pm 5.15$	$50.82 \pm 6.97$
Control group (Grupa kontrolna) (n = 30)	$2.65 \pm 0.47$	$16.17 \pm 5.63$	$51.37 \pm 5.20$
p	ns	ns	ns

n – number of patients/healthy controls.

ns – not significant.

n – liczba pacjentów/osób z grupy kontrolnej.

ns – bez istotności statystycznej.

**Table 2.** Thermal thresholds in the S1 dermatome on the symptomatic side in preoperative S1 sciatica patients and healthy controls  
**Tabela 2.** Progi czucia w dermatomie S1 po stronie korzeniowego zespołu bólowego S1 przed zabiegiem i w grupie kontrolnej

Thermal thresholds (Progi czucia)				
	Cold Sensation (CS) (Próg czucia zimna) [°C]	Warm Sensation (WS) (Próg czucia ciepła) [°C]	Cold Pain (CP) (Próg czucia bólowego zimna) [°C]	Heat Pain (HP) (Próg czucia bólowego ciepła) [°C]
S1 sciatica group (Grupa chorych) (n = 26)	24.80 ± 5.36	38.77 ± 3.95	11.90 ± 9.59	45.24 ± 3.71
Control group (Grupa kontrolna) (n = 30)	29.36 ± 0.90	35.67 ± 0.94	21.65 ± 3.54	41.33 ± 1.79
p	< 0.0001	< 0.0001	< 0.0001	< 0.0001

n – number of patients/healthy controls.

ns – not significant.

n – liczba pacjentów/osób z grupy kontrolnej.

ns – bez istotności statystycznej.

**Table 3.** Correlations between thermal thresholds in S1 dermatome and pain intensity on VAS scale, and Lasegue's sign on the symptomatic leg in S1 sciatica patients

**Tabela 3.** Korelacje między progami czucia w dermatomie S1, natężeniem bólu w skali VAS i objawem Lasegue'a u chorych z jednopoziomowym zespołem bólowym korzeniowym S1 po stronie uszkodzenia

Thermal thresholds (Progi czucia)	Visual Analogue Scale (VAS) (Skala VAS)	Lasegue's sign (Objaw Lasegue'a)
Cold Sensation (CS) (Próg czucia zimna)	r = 0.35 p = 0.076	ns
Warm Sensation (WS) (Próg czucia ciepła)	r = 0.52 p = 0.007	ns
Cold Pain (CP) (Próg czucia bólowego zimna)	r = -0.75 p < 0.0001	r = 0.52 P = 0.0006
Heat Pain (HP) (Próg czucia bólowego ciepła)	r = 0.69 P < 0.0001	r = -0.52 P = 0.006

mean VAS value in this group in the affected leg was  $0.38 \pm 1.02$  points, which was significantly lower than before the operation ( $7.81 \pm 2.23$ ,  $p < 0.0001$ ). The residual features of sensation disability (pain) recognizes a division of patients into 2 groups: 1) with complete recovery ( $A_1$ ) which means with VAS = 0, and 2) with incomplete recovery ( $B_1$ ). The mean VAS value in the  $A_1$  group before disc surgery ( $A_0$  group) was  $7.21 \pm 2.22$ . In the  $B_1$  group before the operation ( $B_0$  group), the mean VAS value was 9.0. The preoperative values of VAS in  $A_0$  and  $B_0$  groups did not differ significantly. Upon neurological examination after disc surgery no motor deficit was found. Repeated conventionally-performed MNCS and SNCS in the  $A_1$  group did not differ from the

results obtained in the same group just prior to the operation ( $A_0$  group). There were also no differences in the MNCS and SNCS parameters between  $B_1$  and  $B_0$  groups (data not included in this paper).

The postoperative QST data in the  $A_1$  group with preoperative QST findings ( $A_0$ ) and the post-operative QST data in the  $B_1$  group with preoperative QST findings ( $B_0$ ) are listed in Tab. 4. There was significant improvement in all four thermal thresholds in the  $A_1$  group compared to the results obtained before disc surgery ( $A_0$ ) (for CS  $p = 0.02$ , for WS  $p = 0.01$ , for CP  $p = 0.01$ , for HP  $p = 0.04$ ). The thresholds in the  $A_1$  group did not differ from the results obtained in the control group. Thermal thresholds in the  $B_1$  group did not differ signifi-

**Table 4.** Preoperative ( $A_0$ ) and postoperative ( $A_1$ ) thermal thresholds in S1 dermatome in the group of patients with complete recovery and preoperative ( $B_0$ ) and postoperative ( $B_1$ ) thermal thresholds in the group of patients with incomplete recovery**Tabela 4.** Przedoperacyjne ( $A_0$ ) i pooperacyjne ( $A_1$ ) wartości progów czucia w dermatomie S1 u chorych z pełną poprawą po zabiegu oraz przedoperacyjne ( $B_0$ ) i pooperacyjne ( $B_1$ ) wartości progów czucia w dermatomie S1 u chorych z niepełną poprawą

	Cold sensation (CS) [°C] (Próg zimna)	Warm sensation (WS) [°C] (Próg ciepła)	Cold Pain (CP) [°C] (Próg bólowego zimna)	Heat Pain (HP) [°C] (Próg bólowego ciepła)
$A_0$ (n = 14)	26.79 ± 2.73	36.94 ± 2.42	15.11 ± 8.74	44.06 ± 3.26
$A_1$ (n = 14)	28.63 ± 1.68	35.98 ± 1.74	21.49 ± 3.88	41.92 ± 3.03
$B_0$ (n = 7)	24.59 ± 3.37	40.36 ± 3.88	8.14 ± 10.11	45.74 ± 4.65
$B_1$ (n = 7)	25.3 ± 4.96	41.74 ± 3.21	9.56 ± 10.0	46.91 ± 2.85
p	$A_0$ vs $A_1$ : 0.02 $B_0$ vs $B_1$ : ns $A_0$ vs $B_0$ : 0.01	$A_0$ vs $A_1$ : 0.01 $B_0$ vs $B_1$ : ns $A_0$ vs $B_0$ : 0.0006	$A_0$ vs $A_1$ : 0.01 $B_0$ vs $B_1$ : ns $A_0$ vs $B_0$ : 0.02	$A_0$ vs $A_1$ : 0.04 $B_0$ vs $B_1$ : ns $A_0$ vs $B_0$ : ns

$A_0$  – preoperative thermal thresholds in a group of S1 sciatica with complete recovery.

$A_1$  – postoperative thermal thresholds in a group of S1 sciatica with complete recovery.

$B_0$  – preoperative thermal thresholds in a group of S1 sciatica with incomplete recovery.

$B_1$  – postoperative thermal thresholds in a group of S1 sciatica with incomplete recovery.

n – number of patients.

$A_0$  – przedoperacyjne wartości progów czucia w dermatomie S1 u chorych z pełną poprawą po zabiegu.

$A_1$  – pooperacyjne wartości progów czucia w dermatomie S1 u chorych z pełną poprawą po zabiegu.

$B_0$  – przedoperacyjne wartości progów czucia w dermatomie S1 u chorych z niepełną poprawą po zabiegu.

$B_1$  – pooperacyjne wartości progów czucia w dermatomie S1 u chorych z niepełną poprawą po zabiegu.

n – liczba pacjentów.

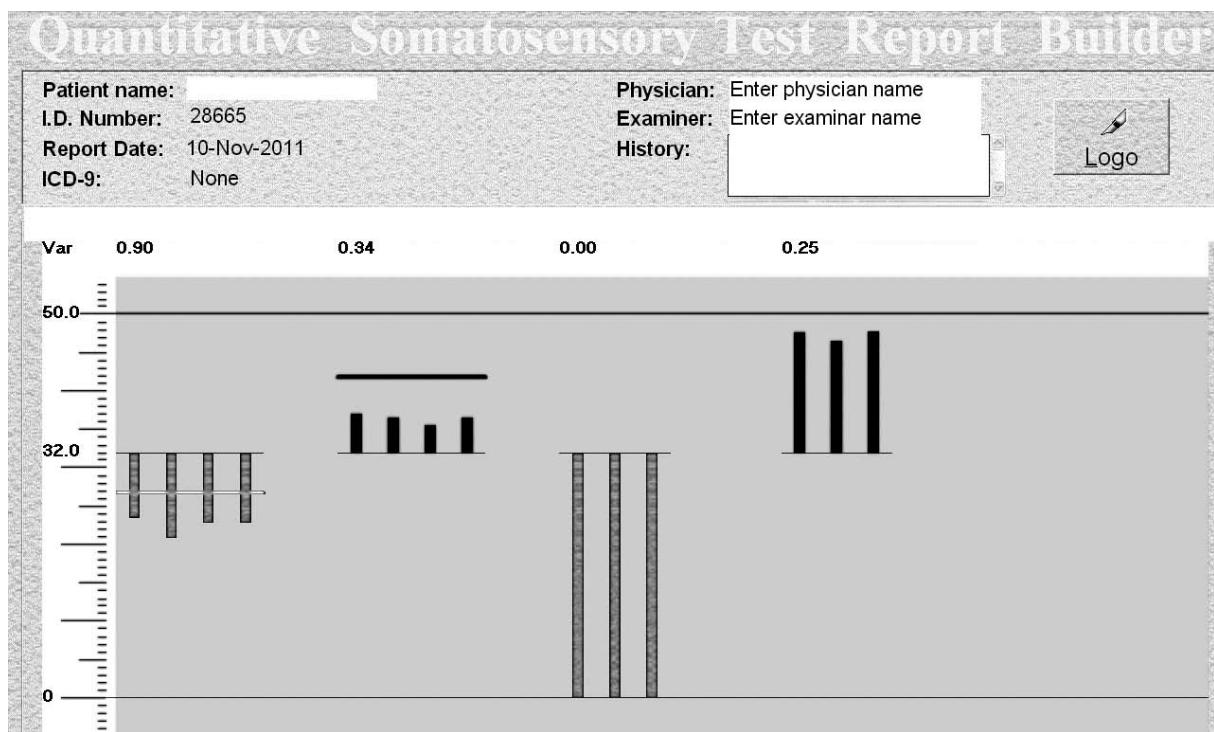
cantly from the results obtained in the  $B_0$  group. These postoperative thresholds were significantly increased when compared to the controls (for all modalities  $p < 0.0001$ ). The graphically presented preoperative and postoperative thermal thresholds in patient with complete recovery are presented in Fig. 1 and Fig. 2, respectively. The graphically presented preoperative and postoperative thermal thresholds in patients with incomplete recovery are presented in Fig. 3 and Fig. 4, respectively.

Next, the comparison of preoperative thresholds between the group with complete postoperative recovery ( $A_0$ ) and the group with incomplete recovery ( $B_0$ ) was performed. The preoperative thermal thresholds for CS, WS, CP in the  $B_0$  group were significantly increased compared to the corresponding thresholds in the  $A_0$  group ( $p = 0.01$ ,  $p = 0.0006$  and  $p = 0.02$ , respectively). There was no difference in HP threshold between the  $A_0$  and  $B_0$  groups.

## Discussion

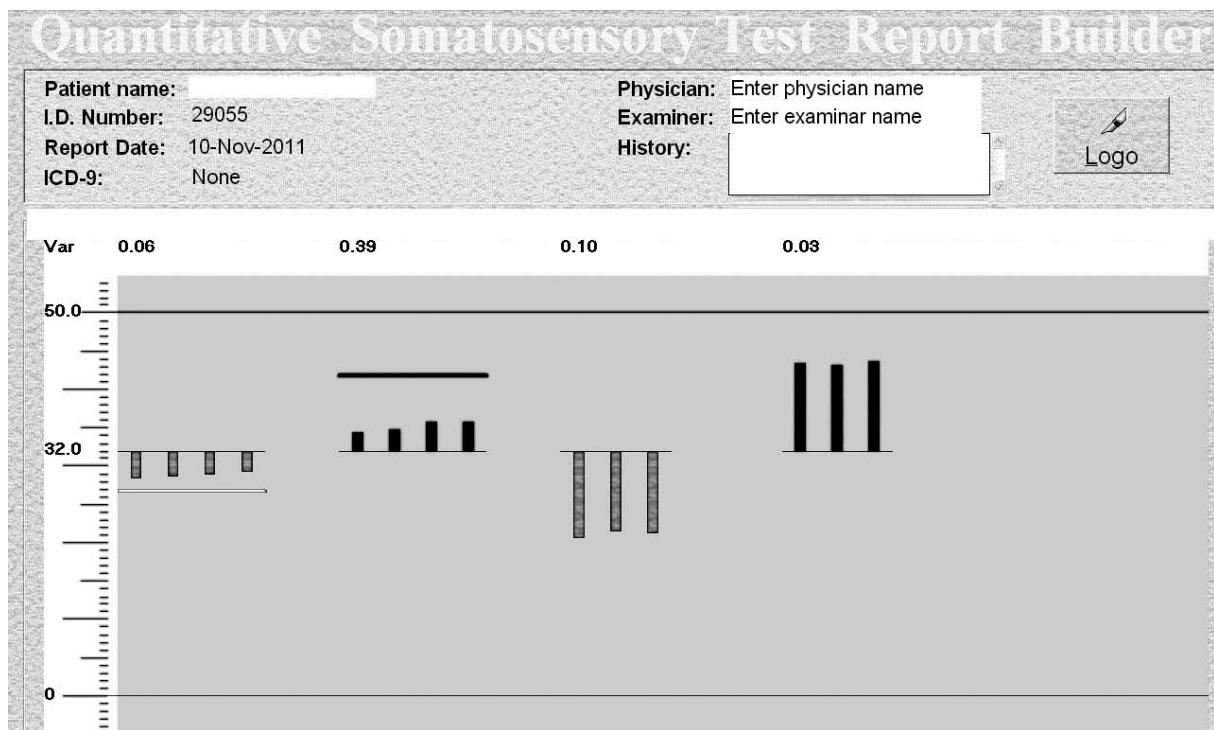
Disabling pain with highly restricted self-service together with one-level evident root compression by a herniated disc on the MRI were essentials for the decision to perform surgical root decompression. In each case, root compression

was confirmed intraoperatively. The approach to the treatment of acute radicular pain depends on clinical findings [2]. In cases of pain which accompany cauda equina syndrome or in cases with severe muscle paresis, surgical treatment should be introduced. Management of cases with monoradicular pain caused by a herniated disc, which means conservative vs. surgical decompression, is mainly based on an individual assessment of each case by a neurosurgeon and on the results of the remote effects of each type of treatment [15]. The efficacy of surgical decompression was demonstrated by Weber [16]. The cited author in the prospective study has estimated the remote results of conservative vs. surgical management in patients with lumbo-sacral radiculopathies. After one year of observation, 66% of operated patients were free of symptoms while in the conservative treatment group, full recovery was achieved only in 33%. After a four-year observation, there was still a prevalence of good results of surgical management vs. conservative (70% vs. 51%). Atlas et al. [17, 18] compared the long-term outcomes (five-year and ten-year observation) of surgical and non-surgical management of sciatica secondary to a lumbar disc herniation. Similarly to Weber [16], after both periods of time they found better functional status in operated patients compared with those treated with non-surgical management. A routine examination



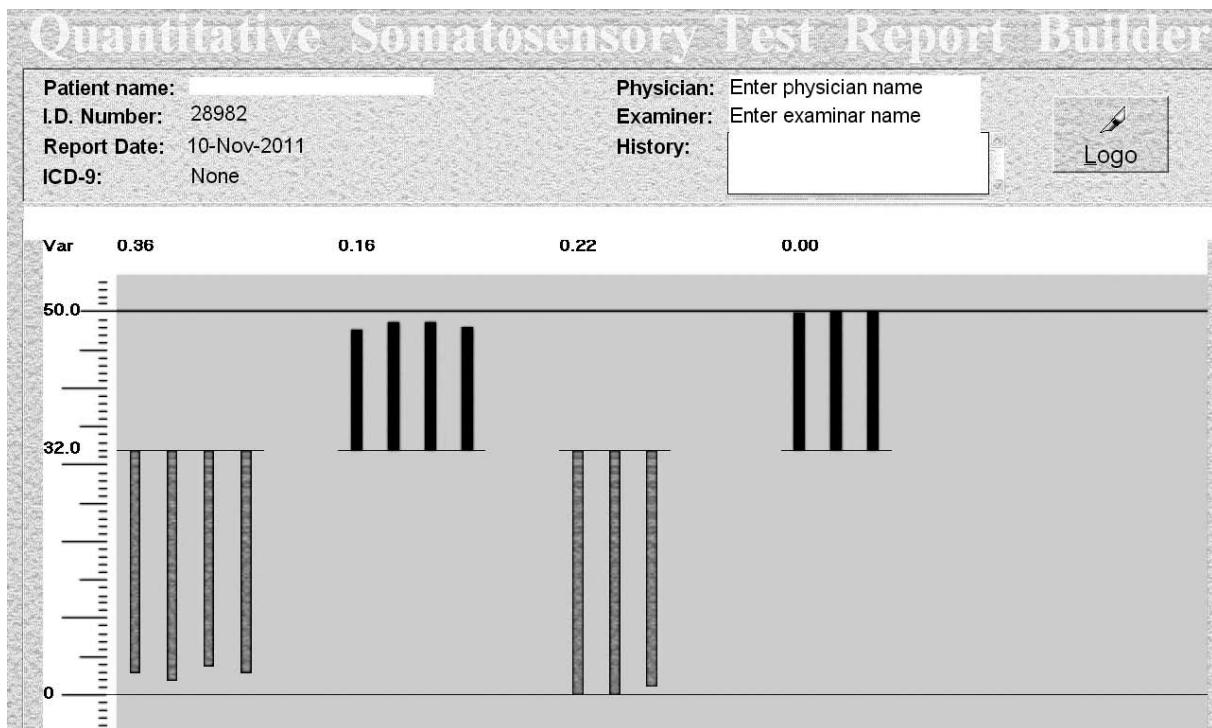
**Fig. 1.** Graphical presentation of preoperative thermal thresholds in S1 sciatica patient with complete recovery after disc surgery (examination no. 28665). Mean values of examined thresholds: CS – 23.4°C, WS – 37.2°C, CP – 0°C, HP – 47.7°C. CS – cold sensation, WS – warm sensation, CP – pain induced by cold, HP – pain induced by hot

**Ryc. 1.** Graficzne przedstawienie przedoperacyjnych wartości termicznych progów u chorego z jednopoziomowym zespołem bólowym S1 z całkowitą poprawą po zabiegu (badanie nr 28665). Średnie wartości badanych progów: CS – 23.4°C, WS – 37.2°C, CP – 0°C, HP – 47.7°C. CS – zimno, WS – ciepło, CP – ból wywołany zimnem, HP – ból wywołany wysoką temperaturą



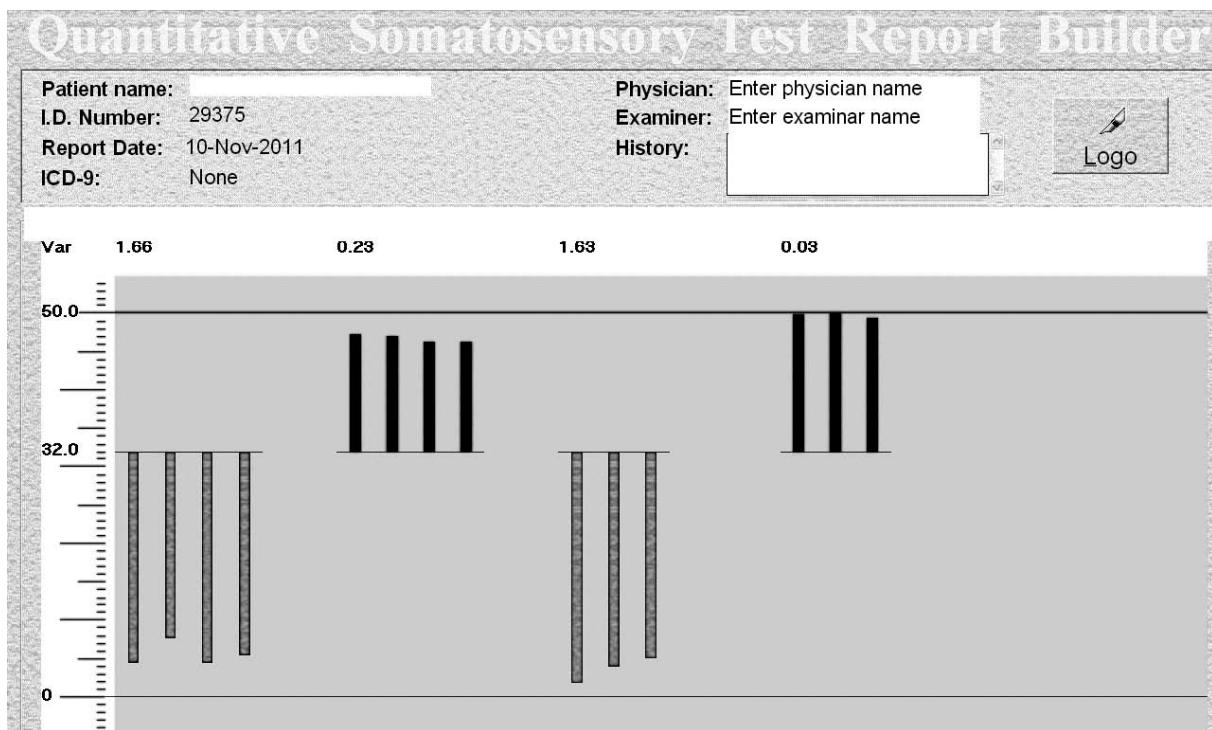
**Fig. 2.** Graphical presentation of postoperative thermal thresholds in the same patient as in Fig. 1 (examination no. 29055). Mean values of examined thresholds: CS – 28.6°C, WS – 34.5°C, CP – 20.7°C, HP – 43.5°C. CS – cold sensation, WS – warm sensation, CP – pain induced by cold, HP – pain induced by hot

**Ryc. 2.** Graficzne przedstawienie pooperacyjnych wartości termicznych progów u chorego z ryc. 1 (badanie nr 29055). Średnie wartości badanych progów: CS – 28.6°C, WS – 34.5°C, CP – 20.7°C, HP – 43.5°C. CS – zimno, WS – ciepło, CP – ból wywołany zimnem, HP – ból wywołany wysoką temperaturą



**Fig. 3.** Graphical presentation of preoperative thermal thresholds in S1 sciatica patient with incomplete recovery after disc surgery (examination no. 28982). Mean values of examined thresholds: CS – 2.9°C, WS – 44.1°C, CP – 0°C, HP – 50.0°C. CS – cold sensation, WS – warm sensation, CP – pain induced by cold, HP – pain induced by hot

**Ryc. 3.** Graficzne przedstawienie przedoperacyjnych wartości termicznych progów u chorego z jednopoziomowym zespołem bólowym S1 z niecałkowitą poprawą po zabiegu (badanie nr 28982). Średnie wartości badanych progów: CS – 2.9°C, WS – 44.1°C, CP – 0°C, HP – 50.0°C. CS – zimno, WS – ciepło, CP – ból wywołany zimnem, HP – ból wywołany wysoką temperaturą



**Fig. 4.** Graphical presentation of postoperative thermal thresholds in the same patient as in Fig. 3 (examination no. 29375). Mean values of examined thresholds: CS – 5.6°C, WS – 46.8°C, CP – 3.7°C, HP – 49.9°C. CS – cold sensation, WS – warm sensation, CP – pain induced by cold, HP – pain induced by hot

**Ryc. 4.** Graficzne przedstawienie pooperacyjnych wartości termicznych progów u chorego z ryc. 3 (badanie nr 29375). Średnie wartości badanych progów: CS – 5.6°C, WS – 46.8°C, CP – 3.7°C, HP – 49.9°C. CS – zimno, WS – ciepło, CP – ból wywołany zimnem, HP – ból wywołany wysoką temperaturą

of sural n. conduction studies has not revealed any abnormalities on the affected side, which is in accordance with data from literature [19, 20]. The sparing of SNAP probably resulted from a lack of damage of the dorsal root ganglia (DRG) [21, 22]. DRGs are usually unaffected by disc herniation due to their location in the intravertebral foramina. However, Moon et al. [23] found the intravertebral location of DRG at S1 level in 81% of the examined patients.

Preoperative QST studies have revealed an increase in thermal thresholds of all modalities in present S1 sciatica group, pointing to the statement that all types of small nociceptive fibers are affected. The results concerning the involvement of different populations of nociceptive fibers in radicular pain differ. Nygaard et al. [24] confirmed the increase in CS and WS thresholds in the affected dermatome while HP thresholds were the same in sciatica patients and controls. Mosek et al. [25] found selective damage to A delta fibers (increased CS threshold) while not to C ones in root compression. Zwart et al. [26] revealed in the subgroup of sciatica patients with operatively confirmed disc herniation much more severe damage to A delta than C fibers. This is explained by a higher susceptibility of myelinated fibers to compression [22]. In present patients, increased thermal thresholds correlated with pain intensity in the affected leg measured using VAS. Similarly, Quarishi et al. [27] found a correlation between CS and WS thresholds, and VAS intensity. In present group, the Lasegue's sign only correlated with C polymodal fibers conveying heat and cold pain.

Five patients were lost for subsequent evaluation, which took place 6 months after disc surgery. Similarly to the results of Peul et al. [15], the pain levels reported by the remaining 21 patients were much lower compared to the level in the same group in the preoperative period. On the basis of

VAS evaluation, the S1 sciatica patients were subdivided into 2 groups. Patients who did not suffer pain (VAS = 0) made a group with complete recovery while those with residual pain sensation in the affected dermatome comprised a group with incomplete recovery. There was a normalization of all thermal thresholds postoperatively in the group of full recovery. On the other hand, after disc surgery, patients who reported even discrete levels of pain presented on a postoperative QST exam sustained abnormal thresholds indicating a prolonged dysfunction of both A delta and C fibers in the affected dermatome. The normalization of C fiber function in the affected dermatome in fully recovery sciatica patients shortly after decompression was reported by Nygaard et al. [28]. Normalization was obtained within the first six weeks after the operation. In opposition to the improvement of C fiber function, A delta did not reach normalization for up to 12 months. In present patients with incomplete recovery at six months after disc surgery, they did not reach normalization of all thermal thresholds, which is in agreement with data from the literature [25, 28]. The discrepancy between full clinical recovery and QST thresholds was reported by Quarishi et al. [27]. The authors have claimed that, despite the relief of pain, normalization of thermal thresholds could be achieved not earlier than in 12 months after decompression.

The authors have also found that preoperative thermal thresholds have been less abnormal in patients with complete recovery at six months after disc surgery than the preoperative thresholds in sciatica patients who have not fully improved after the same period of time.

The results of this study point to the statement that pain in sciatica syndrome is accompanied by changes in the function of nociceptive fibers in the affected dermatome, which may be recorded by QST.

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