Lumbosacral discopathy: analysis of physical therapy

Dyskopatie w części lędźwiowo-krzyżowej kręgosłupa – analiza postępowania fizykalnego

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Słowa kluczowe: dyskopatie, fizjoterapia.

Abstract

Introduction: Spinal pain syndromes are one of the most common medical conditions of the 21st century. Spinal pain syndromes are usually associated with degenerative disease and discopathy. Their incidence has been growing alarmingly year by year in all countries of the world. Studies show that sacral pain occurs in as many as 80% of adults and 39.5% of teenagers.
Aim of the research: To analyse physical therapy and rehabilitation of patients suffering from lumbosacral discopathy.
Material and methods: The study encompassed a group of 54 patients with lumbar disc disease. The subjects were aged 20–60 years. The research tool consisted of a questionnaire prepared by the authors. This survey included 17 closed questions and five open ones. The results were assessed with two subjective scales of pain intensity: a VAS scale and the Laitinen pain indicator. Moreover, Schober's test was also used to assess lumbosacral mobility.
Results: The research shows that the rehabilitation introduced in the patients contributed to a reduction in pain. The treatment resulted in pain relief, a lower frequency of pain episodes, a lower frequency of taking analgesics, and less physical activity limitations. The rehabilitation also had a significant impact on the improvement of lumbosacral spine mobility.
Conclusions: Physical therapy and rehabilitation constitute the basis for the treatment of patients with spinal pain syndromes.

Streszczenie

Wprowadzenie: Dolegliwości bólowe kręgosłupa stanowią jedno z najczęściej występujących schorzeń XXI wieku. Zazwyczaj powiązane są z chorobą zwyrodnieniową oraz towarzyszą dyskopatii, a częstość ich występowania z roku na rok niepokojąco wzrasta we wszystkich krajach świata. Wyniki badań wykazują, że bólu krzyża doświadcza aż 80% ludzi dorosłych oraz 39,5% młodzieży.
Cel pracy: Analiza postępowania fizykalno-usprawniającego u chorych z dyskopatią kręgosłupa w części lędźwiowo-krzyżowej.
Materiał i metody: Badania przeprowadzono w grupie 54 pacjentów z chorobą dyskową kręgosłupa w części lędźwiowo-krzyżowej. Badani byli w wieku 20–60 lat. Narzędzie badawcze stanowił kwestionariusz w postaci ankiety (17 pytań zamkniętych oraz 5 pytań otwartych). Do oceny wyników użyto dwóch subiektywnych skal stosowanych do oceny natężenia bólu – skali VAS oraz skali Laitinena, a do oceny ruchomości kręgosłupa w części lędźwiowo-krzyżowej testu Schobera.
Wyniki: Zastosowana rehabilitacja korzystnie wpłynęła na zmniejszenie dolegliwości bólowych. Po leczeniu uzyskano redukcję nasilenia bólu, częstości jego występowania, częstości zażywania środków przeciwbólowych oraz ograniczenia aktywności ruchowej. Stwierdzono poprawę ruchomości kręgosłupa w części lędźwiowo-krzyżowej.
Wnioski: Postępowanie fizykalno-usprawniające jest podstawowym elementem leczenia chorych z zespołami bólowymi kręgosłupa.

Introduction

Spinal pain is one of the most common medical conditions of the 21st century [1–7]. Recent studies have shown that sacral pain occurs in as many as 80% of adults and 39.5% of adolescents. Sacral pain usually develops in occupationally active persons aged 35–55 years and constitutes the second most common cause of absence from work of the patients.

Etiopathogenesis

Aging is associated with changes concerning intervertebral disc nutrition and hydration, resulting in disc damage and, consequently, pain. Other factors contributing to the development of this problem include obesity, no/limited physical activity, spending long hours in a sitting position at work, and overload of the lumbosacral section of the spine [8, 9]. The intervertebral disc structures (annulus fibrosus and nucleus pulposus) are well hydrated in young people, but later dehydrate as the patients age.

Some specialists believe that damage to the annulus fibrosus marks the beginning of the process of disc degeneration, leading to disintegration of proteoglycans and collagen degradation in the intervertebral disc. At the same time, the cellular activity in the process of matrix reproduction decreases and the activity of proteolytic enzymes increases. The nucleus pulposus undergoes fragmentation and dehydration while clefts develop in the annulus fibrosus.

The development of this intervertebral disc disorder may be associated with abnormal statics of the spine. Gradual limitation of intervertebral disc function results from spinal diseases, congenital spine deformities, spinal overload and accumulating microtrauma, post-traumatic changes, and the process of aging [2–5].

Clinical presentation

Lumbosacral discopathy results in characteristic clinical symptoms, such as limited spinal mobility and severe pain, gait disturbances, decreased lumbar lordosis, and a positive Lasègue's sign and Patrick's test.

Physiotherapy and rehabilitation

Physical therapy and rehabilitation conducted in lumbosacral disc disease are aimed at eliminating pain and inflammation and lowering the tension in the paraspinal muscles. The most common procedures include electrotherapy, laser therapy, cryotherapy, magnetic field therapy, ultrasound, and rehabilitation [10–20].

Aim of the research

The aim of the research was to analyse physical therapy and rehabilitation of patients suffering from lumbosacral discopathy.

Main research problem and hypotheses: assessment of a change in spinal mobility and pain as a result of rehabilitation in patients with discopathy of the lumbosacral spine.

Research hypotheses:

1. The rehabilitation resulted in decreased pain intensity.
2. The rehabilitation resulted in a lower frequency of pain episodes.
3. The rehabilitation resulted in a lower frequency of taking analgesics.
4. The rehabilitation resulted in a decreased degree of physical activity limitation.
5. The rehabilitation resulted in an improved lumbosacral spine mobility when bending forwards in Schober's test.
6. The rehabilitation resulted in an improved lumbosacral spine mobility when bending backwards in Schober's test.

Material and methods

The study was conducted in a group of 54 patients aged 20–60 years, who suffered from lumbosacral disc disease involving the L4–L5 and L5–S1 levels. There were 32 (59.3%) women and 22 (40.7%) men. The patients underwent physical therapy and rehabilitation:

– diadynamic currents (CP, LP), time: 15 min, 10 procedures,
– laser therapy (He-IR) at a dose of 4–6 J/cm^2, time: 15 min, 10 procedures,
– ultrasound therapy, 0.6 W/cm^2, 6 min, 10 procedures.

When the pain was eliminated, kinesiotherapy was introduced in the form of exercise aimed at restoring spinal mobility in the sagittal plane, exercise improving deep spinal stabilisation, and then general keep-fit exercise focused on everyday activity of a given patient

The patients were examined before and after a 2-week rehabilitation programme conducted in January-April 2016 in two out-patient rehabilitation clinics in Radom.

Study methods

The research tool consisted of a questionnaire prepared by the authors. This survey included 17 closed questions and five open ones. Part I focused on basic demographics, type of work, physical activity, frequency and type of pain, the time of diagnosis, and the presence of concomitant diseases of the spine.

Part II of the questionnaire assessed pain intensity before and after the rehabilitation programme based on two subjective scales used to evaluate pain severity: a VAS scale and the Laitinen scale. Moreover, Schober's test was used to assess the level of improvement of lumbosacral spine mobility after the rehabilitation. The patients also assessed the efficacy of the rehabilitation and answered whether they would decide to undergo this treatment again.

Statistical analysis

Statistical analysis used the following tests:

– Wilcoxon matched pairs test to check for significant differences between pre- and post-rehabilitation measurement values,
– Mann-Whitney's *U* test for two groups to check for intergroup differences in the selected quantitative parameters (between two groups),
– Kruskal-Wallis test to check for intergroup differences in the selected quantitative parameters (between more than two groups),
– Fisher's exact test to check for statistically significant relationships between qualitative variables.

Table 1. Gender of study patients

Gender	Number	Percentage
Female	32	59.3
Male	22	40.7
Total	54	100.0

Table 2. Age of study patients

Age [years]	Number	Percentage
20–30	2	3.7
31–40	8	14.8
41–50	13	24.1
51–60	31	57.4
Total	54	100.0

Table 3. Body mass index of study patients

BMI – interpretation	Number	Percentage
Normal values	27	50.0
Overweight	23	42.6
Class I obesity	4	7.4
Total	54	100.0

Table 4. Body mass of study participants

Body mass [kg]	Number	Percentage
≤ 60	8	14.8
61–70	16	29.6
71–80	10	18.5
81–90	13	24.1
≥ 91	7	13.0
Total	54	100.0

Table 5. Body mass of study participants

Parameter	*N*	*M*	*Me*	*SD*	*Min.*	*Max.*
Body mass [kg]	54	75.63	73.50	14.171	50.0	115.0

Results

The results were statistically analysed and are presented in Tables 1–30.

The study group was heterogeneous with respect to gender: 59.3% of the patients were female and the other 40.7% were male. The majority of the study patients were aged 51–60 years (57.4%). Half of the respondents had normal body mass index (BMI) values, 42.6% of the patients were overweight, and 7.4% had class I obesity.

Table 6. Height of study participants

Height [cm]	Number	Percentage
< 170	26	48.1
171–180	17	31.5
≥ 181	11	20.4
Total	54	100.0

Table 7. Level of education of study patients

Education	Number	Percentage
Primary	1	1.9
Vocational	14	25.9
Secondary	20	37.0
Higher education	19	35.2
Total	54	100.0

Table 8. Type of work

Type of work	Number	Percentage
Sedentary job	16	29.6
Moderately hard physical work	10	18.5
Hard physical work	10	18.5
Pensioner/drawing a disability pension	18	33.3
Total	54	100.0

Table 9. Physical activity of study patients

How would you describe your physical activity?	Number	Percentage
Very rare	12	22.2
Once a week	11	20.4
Several times a week	19	35.2
Several times a month	4	7.4
Less than once a month	8	14.8
Total	54	100.0

Table 10. Time of diagnosis

When were you diagnosed with lumbar discopathy?	Number	Percentage
Several months ago	11	20.4
Approx. 1–5 years ago	17	31.5
Approx. 5–10 years ago	21	38.9
Approx. 10–15 years ago	2	3.7
15 and more years ago	3	5.6
Total	54	100.0

Table 11. Concomitant diseases

Do you have other spinal diseases apart from discopathy?	Number	Percentage
Yes	26	48.1
No	28	51.9
Total	54	100.0

Table 12. Frequency of pain

How often do you experience pain?	Number	Percentage
Every day	29	53.7
Several times a week	16	29.6
Several times a months	9	16.7
Total	54	100.0

Table 13. Type of pain

What type of pain you experience?	Number	Percentage
Acute	14	25.9
Chronic	18	33.3
Radiating	22	40.7
Total	54	100.0

Table 14. Painful areas of the body

Please specify where you feel pain	Number	Percentage
Whole spine	19	35.2
L-S section of the spine	35	64.8
Lower limb	18	33.3

Table 15. Circumstances of experiencing pain

When do you usually experience pain?	Number	Percentage
At rest	14	25.9
During physical activity	27	50.0
After physical activity	13	24.1
Total	54	100.0

Table 16. Pain assessment on a five-point Laitinen scale before and after rehabilitation

Variable	Examination	Assessment on a 5-point scale					Significance of differences
		M	*Me*	*SD*	*Min.*	*Max.*	Before rehabilitation vs. after rehabilitation
Pain intensity	Before rehabilitation	2.35	2.00	0.649	1.0	4.0	$p < 0.001$
	After rehabilitation	1.52	1.00	0.637	1.0	3.0	
Pain frequency	Before rehabilitation	2.28	2.00	0.811	1.0	4.0	$p < 0.001$
	After rehabilitation	1.61	1.00	0.738	1.0	3.0	
Frequency of taking analgesics	Before rehabilitation	1.07	1.00	0.843	0.0	4.0	$p = 0.001$
	After rehabilitation	0.80	1.00	0.655	0.0	2.0	
Physical activity limitation	Before rehabilitation	1.22	1.00	0.839	0.0	4.0	$p < 0.001$
	After rehabilitation	0.83	1.00	0.795	0.0	4.0	

Mean body mass of the study participants was $M = 75.63$ kg and the median value was $Me = 73.5$ kg, which means that half of the patients weighted no more than 73.5 kg.

The height of the study patients varied from 160 cm to 190 cm. The height of almost half of the patients (48.1%) was below 170 cm. Mean height was $M = 173.04$ cm, while the median value was slightly lower at $Me = 171.50$ cm.

The study patients had secondary (37%) and higher (35.2%) education. One in three study patients was a pensioner or was drawing a disability pension

Table 17. Change in Laitinen scale before and after rehabilitation

Variable	*N*	*M*	*Me*	*SD*	*Min.*	*Max.*
Pain intensity (change: measurement 1 vs. measurement 2)	54	0.83	1.00	0.466	–1.0	2.0
Pain frequency (change: measurement 1 vs. measurement 2)	54	0.67	1.00	0.644	0.0	2.0
Frequency of taking analgesics (change: measurement 1 vs. measurement 2)	54	0.28	0.00	0.529	0.0	2.0
Physical activity limitation (change: measurement 1 vs. measurement 2)	54	0.39	0.00	0.529	0.0	2.0

Table 18. Measurement results in Schober's test before and after rehabilitation

Variable	Examination	Assessment of measurement results in Schober's test					Significance of differences
		M	*Me*	*SD*	*Min.*	*Max.*	Before rehabilitation vs. after rehabilitation
Schober's test – distance when bending forwards	Before rehabilitation	13.44	13.50	0.698	12.0	15.0	$p < 0.001$
	After rehabilitation	13.84	14.00	0.829	12.0	15.0	
Schober's test – distance when bending backwards	Before rehabilitation	8.98	9.00	0.540	8.0	10.0	$p < 0.001$
	After rehabilitation	8.73	9.00	0.649	7.0	10.0	

Table 19. Change in measurement results in Schober's test

Variable	*N*	*M*	*Me*	*SD*	*Min.*	*Max.*
Schober's test – distance when bending forwards (change: measurement 1 vs. measurement 2)	54	–0.40	–0.50	0.428	–2.0	0.5
Schober's test – distance when bending backwards (change: measurement 1 vs. measurement 2)	54	0.25	0.00	0.385	0.0	1.5

Table 20. Type of rehabilitation used in study patients

What forms of rehabilitation did you undergo?	Number	Percentage
Physical therapy (procedures)	46	85.2
Kinesiotherapy (exercises)	37	68.5
Massage	23	42.6
Other	2	3.7

Table 21. Physical therapy procedures used in study patients

What forms of physical therapy were used?	Number	Percentage
Interference current	15	31.3
Laser	34	70.8
TENS current	26	54.2
Ultrasound	30	62.5
Diadynamic current	4	8.3
Sollux	8	16.7
Magnetic field	41	85.4
Cryotherapy	20	41.7

(33.3% of the group). 18.5% of the respondents did hard physical work.

More than a third of the study patients stated they engaged in physical activity several times a week (35.2%) and 20.4% of the respondents said they practised physical activity once a week.

The study patients had usually been diagnosed with discopathy approximately 5 to 10 years before the study. 31.5% of the respondents had been diagnosed with the diseases 1 to 5 years before the study. 48.1% of the study patients with discopathy suffered from other diseases.

More than a half of the study patients experienced pain every day (53.7%), and 29.6% of the patients suffered from pain several times a week.

40.7% of the study patients suffered from radiating pain, 33.3% of the patients experienced chronic pain, and 25.9% reported acute pain. The patients

Table 22. Pain in a VAS scale before and after rehabilitation

Variable	Examination	Assessment on a 10-point scale					Significance of differences
		M	*Me*	*SD*	*Min.*	*Max.*	Before rehabilitation vs. after rehabilitation
Pain (VAS scale)	Before rehabilitation	6.33	7.00	1.801	2.0	9.0	$p < 0.001$
	After rehabilitation	4.54	5.00	1.809	1.0	8.0	

Table 23. Efficacy of rehabilitation

Please rate the efficacy of the rehabilitation	Number	Percentage
Significant improvement and restored function	9	16.7
I felt much better	22	40.7
Slight improvement	18	33.3
No improvement	5	9.3
Total	54	100.0

Table 24. Opinion on undergoing the rehabilitation again

Would you undergo the rehabilitation procedures again if your symptoms worsened?	Number	Percentage
Yes	50	92.6
No	4	7.4
Total	54	100.0

Table 25. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -6.429$
Second measurement	$p < 0.001$

Table 26. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -5.245$
Second measurement	$p < 0.001$

Table 27. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -3.419$
Second measurement	$p = 0.001$

Table 28. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -4.379$
Second measurement	$p < 0.001$

Table 29. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -5.122$
Second measurement	$p < 0.001$

Table 30. Test results – Wilcoxon matched pairs test

Variables	Result
First measurement	$Z = -3.954$
Second measurement	$p < 0.001$

usually felt pain in the lumbosacral (L-S) section of the spine (64.8%). Half of the patients usually experienced pain during physical activity. 25.9% of the patients suffered from pain at rest, and in 24.1% pain occurred usually after physical activity.

Table 17 presents changes in measurements according to the Laitinen scale. Table 18 presents the results of measurements of spinal mobility. Table 19 presents the results of measurements of lumbosacral spine mobility.

The majority of the study patients (85.2%) underwent physical therapy (procedures). Kinesiotherapy was conducted in 68.5% of the study patients, and 42.6% of the patients underwent massage.

The treatment included: magnetic fields (85.4% of the patients), laser therapy (70.8%), ultrasound (62.5%), TENS current (54.2%), cryotherapy (41.7%), and interference current (31.3%).

Before rehabilitation, the medium VAS scale assessment was 6.33 and the median was $Me = 7$. After rehabilitation the mean value was $M = 4.54$ and the median was $Me = 5$.

When asked about the assessment of the rehabilitation, 40.7% of the study patients stated they felt better. A significant improvement and restored function were observed in 16.7%.

A vast majority of the patients (92.6%) declared that they would again undergo the rehabilitation procedures if their symptoms worsened.

Hypothesis: The rehabilitation resulted in decreased pain intensity

The variable of pain intensity was analysed at two measurement points: before rehabilitation and after

rehabilitation (a significance level of 0.05). It can be concluded that there are statistically significant differences in pain intensity between the two measurements, and the hypothesis: "The rehabilitation resulted in decreased pain intensity" was confirmed.

Hypothesis: The rehabilitation resulted in a lower frequency of pain episodes

The variable of pain frequency was analysed at two measurement points: before rehabilitation and after rehabilitation. There are statistically significant differences in pain frequency between the two measurements, and the hypothesis: "The rehabilitation resulted in a decreased frequency of pain" was confirmed.

Hypothesis: The rehabilitation resulted in a lower frequency of taking analgesics

It can be concluded that there are statistically significant differences in the frequency of taking analgesics between the two measurements, and the hypothesis was confirmed.

Hypothesis: The rehabilitation resulted in a decreased degree of physical activity limitation

The variable of physical activity limitation was analysed at two measurement points: before rehabilitation and after rehabilitation. It can be concluded that there are statistically significant differences in the physical activity limitation between the two measurements.

Hypothesis: The rehabilitation resulted in an improved lumbosacral spine mobility when bending forwards in Schober's test

The variable of spinal mobility when bending forwards was analysed at two measurement points: before rehabilitation and after rehabilitation. It can be concluded that there are statistically significant differences in this variable between the two measurements, and the hypothesis was confirmed.

Hypothesis: The rehabilitation resulted in an improved lumbosacral spine mobility when bending backwards in Schober's test

The variable of spinal mobility when bending backwards was analysed at two measurement points: before rehabilitation and after rehabilitation. It can be concluded that there are statistically significant differences in this variable between the two measurements; the hypothesis was confirmed.

Discussion

Spinal pain syndromes constitute a major clinical and social problem. This condition is present in approximately 18% to 30% of all patients admitted to physiotherapy clinics. The chronic and recurrent character of this syndrome causing long-term inability to work is also a major social problem. Physical therapy and rehabilitation constitute the basis of the treatment. The aim of this study was to analyse physical therapy and rehabilitation in a group of 54 patients with disc disease affecting the lumbosacral section of the spine. The majority of the patients were aged 51–60 years (57.4%). Half of the respondents were people with normal body mass while the other patients were overweight or had class I obesity. The study confirmed a positive influence of the treatment on the patients' health status measured in an objective and subjective assessment. The pain intensity in the VAS scale decreased, as did pain intensity and frequency, the frequency of taking analgesics, and limitation of physical activity in the Laitinen scale; mobility of the lumbosacral section of the spine improved. Similar results were obtained by Szulkowska *et al.* They assessed the effects of ultrasound therapy and interference currents in patients with lumbosacral pain syndromes. The patients who were treated with interference currents showed an approximately 50% decrease in pain, while the effects of ultrasound therapy were small. Korabiewska *et al.*, who compared the analgesic effects of diadynamic currents and magnetic field therapy in patients with lumbosacral pain syndromes, found a decreased level of pain and stress.

The statistically significant influence of the rehabilitation on improved lumbosacral spine mobility shown in this study is consistent with the results achieved by Zdrodowska *et al.* [15], who found that both magnetic field therapy and low-energy laser therapy have a beneficial effect on improving spinal mobility and relieving pain in patients with discopathy. A study by Gworys *et al.* [17] revealed that the use of physical therapy and kinesiotherapy helps decrease pain in lumbosacral pain syndromes. Appropriate treatment of low back pain syndromes consists of a comprehensive therapy combining physiotherapeutic procedures and kinesiotherapy. It is very important to educate the patients and their families with respect to the ergonomics of work and rest. To sum up, the results of this study are consistent with the observations made by the above-mentioned authors. The physical therapy procedures used in the patients reduced the pain and improved lumbosacral mobility. Physical therapy and rehabilitation constitute the basis of the treatment in this group of patients.

Conclusions

Lumbosacral pain syndromes constitute a difficult clinical and social problem. The rehabilitation contributed to a reduction in pain as measured in a VAS scale. The treatment resulted in pain relief, a lower frequency of pain episodes, a lower frequency of tak-

ing analgesics, and less physical activity limitations according to the Laitinen scale. The management contributed to a better mobility of the lumbosacral spine.

Conflict of interest

The authors declare no conflict of interest.

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