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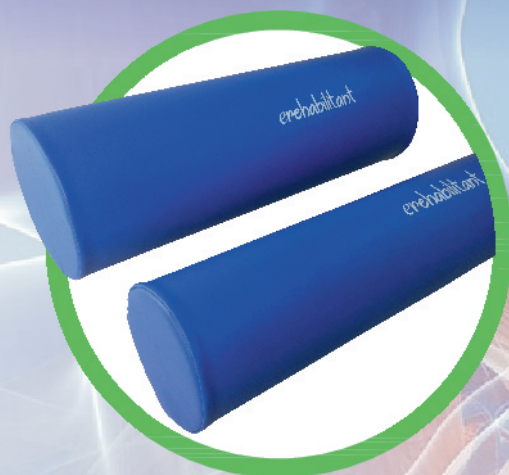
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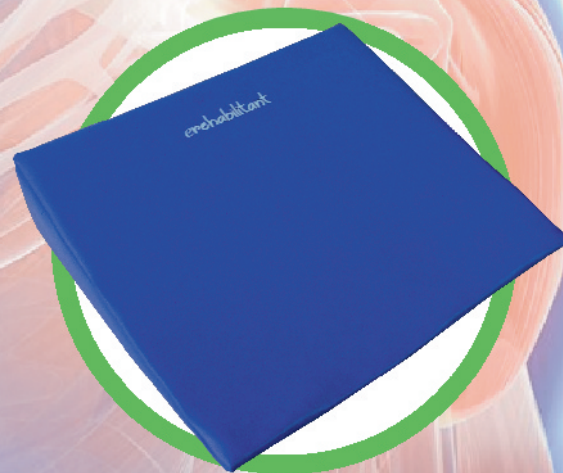
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Efektywność wybranych zabiegów fizjoterapeutycznych w leczeniu dolegliwości bólowych odcinka lędźwiowo-krzyżowego kręgosłupa

Efficacy of selected physiotherapeutic procedures in the treatment of lumbar spine pain

腰椎骶椎间疼痛进行选择性理疗疗程的有效性。

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Streszczenie

Cel pracy. Celem pracy była ocena efektywności wybranych zestawów zabiegów fizjoterapeutycznych na dolegliwości bólowe występujące w odcinku lędźwiowo-krzyżowym spowodowane chorobą zwyrodnieniową.

Materiały i Metody. W badaniu wzięło udział 45 pacjentów z zespołami bólowymi w obrębie odcinka lędźwiowo-krzyżowego kręgosłupa, którzy poddani byli serii zabiegów fizjoterapeutycznych. Badani zostali podzieleni na cztery grupy. Trzy grupy podzielono w zależności od zastosowanych zestawów zabiegów fizjoterapeutycznych, natomiast czwartą grupę (porównawczą) stanowili badani pobierający tylko i wyłącznie niesteroidowe leki przeciwzapalne (NLPZ) przez okres trwania serii zabiegów w pozostałych grupach. Chorzy zostali przebadani za pomocą kwestionariusza ankiety własnego autorstwa, kwestionariusza SF-36 (vol.2) wersji skróconej 11. pytaniowej (wersja Polska), użyto także testu Lovetta, skali Laitinena oraz testów diagnostycznych (Laseque'a, Bragarda, Thomayera). Badania były przeprowadzone bezpośrednio przed podjęciem serii zabiegowej oraz dwa tygodnie po jej zakończeniu.

Wyniki. Badani byli w wieku od 45-65 lat. 71,1% stanowiły kobiety, a 28,9% mężczyźni. 13,3% osób było aktywnych fizycznie. Choroba zwyrodnieniowa kręgosłupa była przyczyną dolegliwości bólowych u wszystkich pacjentów biorących udział w badaniach. W grupie badawczej wykazano istotną statystycznie różnicę pomiędzy wynikami stopnia nasilenia bólu, poziomu siły mięśniowej oraz jakości życia mierzonymi przed fizjoterapią oraz 2 tygodnie po jej zakończeniu. U 90% osób biorących udział w zabiegach uzyskano zwiększenie siły mięśniowej, natomiast w grupie porównawczej jedynie u 6%. Poprawa zakresów ruchomości w omawianym odcinku kręgosłupa dotyczyła 46,6% badanych biorących udział w serii zabiegowej. W grupie porównawczej żaden z pacjentów nie uzyskał poprawy zakresu ruchomości.

Wnioski. Zabiegi fizjoterapeutyczne mają pozytywny wpływ na ograniczenie objawów chorobowych odcinka lędźwiowo-krzyżowego kręgosłupa. Oddziałują one korzystnie na poprawę jakości życia, siły mięśniowej, zakresów ruchomości oraz zmniejszenie, bądź całkowite usunięcie dolegliwości bólowych. Niezależnie od zastosowanego zestawu zabiegów fizjoterapeutycznych działały one lepiej, niż przyjmowanie samych niesteroidowych leków przeciwzapalnych przez pacjentów.

Słowa kluczowe:

fizjoterapia, choroba zwyrodnieniowa, odcinek lędźwiowo-krzyżowy, niesteroidowe leki przeciwzapalne

Abstract

Aim of the study. The aim of the study was to evaluate the effectiveness of selected sets of physiotherapeutic procedures for pain in the lumbosacral segment caused by degenerative disease.

Materials and Methods. The study involved 45 patients with pain syndromes within the lumbosacral spine, who underwent a series of physiotherapy treatments. The subjects were divided into four groups. Three groups were divided depending on the applied sets of physiotherapy treatments, while the fourth group (comparative) were those taking only non-steroidal anti-inflammatory drugs (NSAIDs) for the duration of a series of treatments in the remaining groups. The patients were examined using the questionnaire of their own questionnaire, the SF-36 questionnaire (vol.2) of the short questionnaire version (Poland version), Lovett test, Laitinen scale and diagnostic tests (Laseque, Bragard, Thomayer). The tests were carried out immediately before the treatment series and two weeks after its completion.

Results. The subjects were aged 45-65. 71.1% were women and 28.9% were men. 13.3% of people were physically active. Spinal osteoarthritis was the cause of pain in all patients participating in the study. In the research group, a statistically significant difference was found between the results of the severity of pain, the level of muscle strength and the quality of life measured before physiotherapy and 2 weeks after its completion. In 90% of people participating in the procedures, an increase in muscle strength was obtained, whereas in the control group only in 6%. The improvement of the ranges of mobility in the discussed section of the spine concerned 46.6% of the subjects participating in the treatment series. In the comparison group, none of the patients improved their range of motion.

Conclusions. Physiotherapeutic treatments have a positive effect on the reduction of pathological symptoms of the lumbosacral spine. They have a positive effect on improving the quality of life, muscle strength, ranges of mobility and reducing or completely removing pain. Regardless of the applied set of physiotherapeutic treatments, they worked better than the intake of non-steroidal anti-inflammatory drugs by patients.

Key words:

physiotherapy, degenerative disease, lumbosacral segment, non-steroidal anti-inflammatory drugs

摘要

研究目的：研究目的在评估因骨关节炎所引起的腰椎骶椎间疼痛的选择性理疗疗程的有效性。

材料及方法：共 45 名腰椎骶椎间疼痛的患者参与研究，他们将接受一系列的理疗疗程。受试者将分成四组，其中三组将根据其施用的理疗疗程分组，而第四组（对照组）受试者将只服用非类固醇消炎药，时间为其他组别的疗程延续时间。病患将通过自己的简单版问卷表 SF-36（第二卷）接受研究，共计 11 个问题，此外也使用洛维特测试及莱蒂宁量表及诊断测试（Laseque、Bragard、Thomayer）。研究于系列疗程开始前及疗程结束两星期后进行。

结果：受试者年龄在 45-65 岁之间，其中 71.1% 为女性，28.9% 为男性，13.3% 为体能活跃者。脊柱骨关节炎是所有受试患者产生疼痛的原因，在研究组中，其物理治疗前和结束两周后所测量的疼痛严重程度、肌肉力量水平和生活质量的结果在统计上有着显著差异。90% 参与疗程者的肌肉力量增加，而对照组中只有 6% 的人士增加。46.6% 接受疗程者在所提到的脊柱部分活动范围获得改善，而对照组中无患者在活动范围上获得改善。

结论：理疗疗程对腰椎骶椎的病灶控制具正面作用，在改善生活质量、肌肉力量、活动范围以及减少或完全消除疼痛上能有效作用。无论采用哪一种理疗疗程，其作用都比单单服用非类固醇消炎药要好。

关键词：

理疗、骨关节炎、腰椎骶椎段、非类固醇消炎药

Admission

Pain syndromes of the lumbosacral spine (LS) are one of the basic problems of medicine [1]. The pains in this episode affect about (approx.) 80% of the population [2-3]. Lesions in the lumbosacral spine are related to adults, adolescents and children. In Poland, pains of the lumbosacral segment affect every fourth woman and every fifth man after the age of 15 [4]. The most frequently discussed complaints occur in patients between 30 and 55 years of age [11], that is during the most intense activity and life [1-12].

Before the correct rehabilitation treatment is programmed, it is very important to correctly diagnose the patient, and in particular the causes of the discomfort. Pain symptoms in the lumbosacral region may be due to lesions and lesions of the intervertebral discs, stenosis of the intervertebral holes and spinal canal, congenital malformations, disorders of the spine statics, among others (including) disorders in the physiological spine bends, scoliosis, uneven lower limbs, degenerative changes, inflammatory factors, including rheumatoid, metabolic diseases, consequences of soft, cartilaginous and bony tissue injuries, spinal overloads, as well as its connections and tissues surrounding the lumbar-sacral section and cancers [1-3, 5, 8, 12, 13].

In the pathogenesis of lesions of the lumbo-sacral spine, we distinguish two periods. The first one is characterized by inflammatory-edema reactions and severe pain, called acute and the other characterized by statokinetic dysfunctions with compression symptoms, called chronic. After the resolution of the acute phase, physiotherapeutic treatment can be implemented. In order to support the treatment, orthopedic supplies in the form of orthopedic laces, corsets and belts are also used. It should be remembered to simultaneously use exercises to strengthen particular muscle groups within the back, torso and lower limbs [13-19].

During conservative treatment of lesions of the lumbosacral spine, physiotherapeutic procedures, including kinesitherapy, physiotherapy (electrotherapy, laser therapy, thermotherapy, phototherapy, cryotherapy, magnetotherapy, ultrasounds, hydrotherapy) and healing massage, play a very important role. Physiotherapy treatments affect the internal organs mainly through skin and visceral reflexes (nervous pathway), as well as hormones (humoral pathway), e.g. histamine, acetylcholine, noradrenaline. By shifting ions, they also affect the resting potential and permeability of cell membranes. A large part of the treatments is painkillary through the so-called mechanism. "Control gate", which consists in inhibiting pain stimuli received by the skin receptors and increasing the removal of stimulant compounds from the tissues stimulating the pain receptors. The effect of analgesia is also influenced by the stimulation of the secretion of endorphins and enkephalins (e.g. massage, electrotherapy, phototherapy) [12, 14-19].

The tasks of physiotherapy are to improve blood supply and to achieve relaxation around periarticular soft tissues. Physiotherapeutic factors cause vasomotor reactions. Under the influence of stimuli (e.g. heat, mechanical factors), blood

vessels, especially capillaries, expand. As a result of filling blood vessels, local and generalized congestion occurs. A greater supply of blood to the tissues of the body improves their supply of energy substrates, oxygen and functional substances. At the same time, the outflow of lymph and blood from tissues increases, which causes faster removal of chemical products from inflammatory foci as well as metabolic products. By improving the cardiovascular system, tissue trophics improve within the lumbo-sacral spine, analgesic and anti-inflammatory, which favors faster removal of symptoms and recovery [14-19].

If the pain results from the increased tension of the soft tissues in the lumbar-sacral area of the spine, it is also recommended to order a massage during the programming of the rehabilitation treatment. Its main goal is to relax increased muscular tension, as a consequence of which pain is reduced in the lumbosacral segment. Massage affects the oxygenation of tissues, improve blood flow and faster removal of products of the metabolic process.

One of the most frequently mentioned elements of rehabilitation is also kinesitherapy. Appropriately and individually programmed, as well as properly performed exercises, relax, stretch, mobilize and strengthen the muscular corset in the lumbar-sacral spine [14-19].

In addition to physiotherapeutic procedures, attention should also be paid to adequate patient education as part of preventive activities. Both physiotherapy and proper prophylaxis have the task of total or partial withdrawal of symptoms in order to obtain the best possible functional state of the patient and to stop or slow down the progression of lesions in the lumbosacral spine [14-17, 19].

The long-term observation of the effectiveness of various combinations of physiotherapeutic treatments used during the treatment of pain symptoms in the lumbosacral spine caused by its degenerative changes was the reason for undertaking research in this direction in order to determine their actual significance and present the results in the form of a scientific publication. The paper presents data showing the effectiveness of selected physiotherapy treatments used in patients during outpatient physiotherapy.

Objective of the work

The main objective of the study was to evaluate the effectiveness of selected sets of physiotherapy treatments for pain in the lumbosacral spine due to degenerative disease.

Materials and methods

The research was carried out at the Specialist Clinic RefiMedica in Kościelec, from December 2015 to June 2018. In the conducted research, the influence of selected sets of physiotherapeutic procedures on the examined patients with degenerative changes within the lumbosacral spine was evaluated.

- The average duration of the disease was 4,39 years (max. 10 years, min. 0,06 years [3 weeks])
- The average duration of treatment for the disease was 4,23 years (max. 10 years, at least 0 years)

Table 1. Material characteristics

		Group 1	Group 2	Group 3	Control group	Total
Sex	Women	8	8	8	8	32
	Men	2	2	2	7	13
Age [years]		55.3	60.38	57.4	58	57.87
Additional physical activity	Yes	1	3	0	2	6
	No	9	7	10	13	39
Number of days per week dedicated to physical activity		2	4.67	0	3.5	3.39
The average duration of a single workout [hours]		2	0.8	0	1.25	0.7
Type of work	Physical work	4	4	5	7	20
	Mental work	3	0	5	4	12
	Pensioner	3	6	0	4	13
Duration of illness [years]		3.42	5.5	4.9	3.73	4.39
Time of occurrence of pain before starting the treatment series [years]		0.1	0.1	0.1	0.17	0.11
Time of treatment for the disease [years]		3.42	5.5	4.3	3.73	4.23

■ Physically active patients ■ Patients not undertaking physical activity

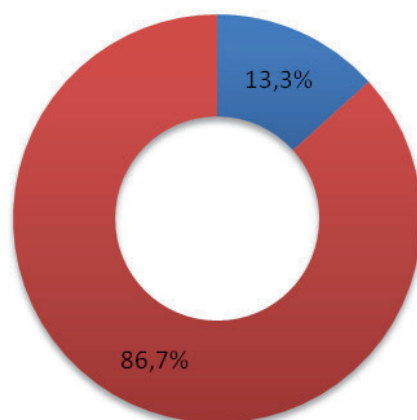


Fig. 1. Physical activity of the respondents

- The average time of experiencing pain related to the lesions before taking the treatment series was 0,11 years (max 0,5 years, minimum 0,08 years).

The study included 45 patients (100%), including 32 women (71,1%) and 13 men (28,9%). The subjects were aged 45 to 65 (mean 56,5 years). Patients participating in the study were informed about the course and purposefulness of the research and the possibility of withdrawing from them at any stage. After examining this information, each of the respondents voluntarily signed the consent to participate in the research. All patients were previously diagnosed by a doctor.

The criteria for inclusion in the group were:

- pain in the lumbosacral spine caused by the presence of degenerative changes,
- age between 45 and 65 years.

Based on the interview and medical documentation, the following exclusion criteria were adopted:

- state after arthroplasty in the hip joints,
- cancer or condition after cancer disease within the lumbosacral spine,
- rheumatoid arthritis,
- ankylosing spondylitis,
- glucocorticosteroid injections over the last 3 months.

Patients were examined twice. The first examination took place immediately before the start of the treatment series (10 treatment days, day after day with a two-day weekend break, 5 days in one week and 5 days in the second treatment week). Taking into account the different metabolism and the body's reaction time to therapeutic stimuli, which are the reason for the creation of adaptive and compensatory reactions, the authors decided that the most optimal would be for the second assessment study effectiveness of the conducted treatment series took place two weeks after its completion. All patients received during the study period only and exclusively oral non-steroidal anti-inflammatory drugs in the form of tablets, in acceptable therapeutic doses. In order to characterize the research material, the questionnaire of own authorship was

used for the study, in which patients administered their gender, age, occupation, or are physically active (recreational sports such as running, cycling, swimming in the pool, gymnastics), number of days in a week devoted to physical activity and the average duration of a single workout. Patients also indicated the location of lesions, the diagnosis made by the doctor (confirmed by the diagnosis placed on the referral by the doctor), the duration of the disease, the time of treatment of the disease, the time of feeling pain associated with the lesions (applies to the acute period), and the type of physiotherapy which they used during rehabilitation.

The subjects were assigned to individual research groups depending on the prescribed sets of physiotherapy treatments. The examined patients had the recommended physiotherapy treatments in the following ranking: Group 1-2,22% (Laser, TENS currents, Sollux Red, Massage, Magnetic Field), Group 2-22,2% (Laser, TENS Currents, Local Cryotherapy, Massage and Kinesitherapy - movement exercises stabilizing and strengthening the lumbar spine, neuromobilization of the sciatic nerve), Group 3-22,2% (Laser, TENS Currents, Local Cryotherapy, Massage, Magnetic Field). Group 4- 33,4% – was a control group (comparative) of patients awaiting physiotherapy, who only received NSAIDs for the period of participation in physiotherapeutic procedures of other groups participating in the study. They were also examined twice (immediately before taking NSAIDs and 2 weeks after discontinuation).

Parameters of physiotherapy treatments

Physiotherapeutic procedures performed in the lumbosacral region of the spine:

Laser – point laser, wavelength 808nm, power 400 mW, 3 J/cm², filling 75%, frequency 10Hz, lying flat on the stomach.

TENS – frequency 200 Hz, pulse duration 100 µs, intensity 30 mA, time 20 minutes, electrodes placed in painful areas in the area of the L-S segment of the spine, lying flat on the abdomen.

Sollux Red (IR) - irradiation included the L-S section from a distance of 30 cm, in the supine position, exposure time of 15 minutes.

Local Cryotherapy - duration of the procedure 3 minutes, lying on the stomach.

Magnetic Field – rectangular pulse shape, applicator with a diameter of 500 mm, frequency 5Hz, magnetic field strength 2,5 mT (25 Gs), field treatment started from the interval of 3 s, in subsequent treatment days the pulse was shortened by 0,5 s, treatment time 15 minutes .

Kinesitherapy – movement exercises stabilizing and strengthening the lumbar spine, neuromobilization of the sciatic nerve, time 30 minutes.

Measurement methods

The Laitinen scale was used to assess the pain experienced by patients²⁰. Measurements of the mobility ranges of the tested section were also carried out in the SFTR system [18] (forward slope, backward slope, sideways slope, torso curvature), functional and diagnostic tests, such as the Lasequea¹⁸ and Bragard [18] test, as well as the Thomayer test [18]. The Lovetta [18] test was also assessed by the strength of the muscles taking part:

- in the forward torso: m. straight abdomen, abdominal oblique muscle, abdominal oblique muscle, ilio-lumbar spine,
- inclined torso back: m. Longest thorax, iliac and rib cage, thoracic lumbar spine, thoracic spine, semicircular chest,
- trunk inclination to the side: abdominal diagonal oblique, oblique abdominis, major lumbar spondylosis, lumbar spine smaller, m. the longest thorax, the ilium-ribs of the loin, thoracic spine, semicirculatory thorax, multifaceted thoracic and lumbar part, mm. twisting chest and loin, mm. intercurrent loins,
- torso twist: external abdominal oblique mate, abdominal oblique m.

To study the quality of life questionnaire SF-36 vol.2 was used (Polish version containing 11 questions) 21, the use of which was obtained by the author. In the questionnaire one could get a maximum of 171 points (which indicated a very poor quality of life), and a minimum of 0 (which determined a very good quality of life).

Statistical analysis of results

The results were statistically calculated by calculating the mean, standard deviation, the difference in mean measurements and the standard deviation of the difference in mean measurements. The statistical significance of the obtained results was assessed by Student's t-test for dependent samples, assessing the improvement in the degree of pain intensity, muscular strength as well as the quality of life level. During the verification of null hypotheses, a critical level of significance of $p = 0,05$ was used. The licensed software Statistica version 12.5 was used for the calculations.

Results

Pain intensity measurements

The mean value of pain severity, measured with the Laitinen scale in the group taking part in physiotherapy treatments before the treatment series, was 8,43 [max.16, min. 5], and two weeks after the treatment series 0,77 [max. 4, min. 0] (Table 2) In the control group, the mean value measured immediately before the initiation of NSAIDs was 9,07 [max. 14, min. 4], and two weeks after their discontinuation 6,87 [max. 10, min. 4]. The obtained results were statistically significant both in the research group and in the control (control) group. A statistically significant difference was found between pain severity scores before physiotherapy and 2 weeks after ending both in the research group (Table 2) and in the control group (Table 2a).



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Table 2. Pain severity in the group of patients participating in physiotherapy (research group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Degree of pain intensity (before the treatment series)	8.43	2.09	30							
Degree of pain severity (2 weeks after the treatment series)	0.77	1.33	30	7.66	1.64	25.24	29	<0.001	6.89	8.45

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

Table 2a. The degree of pain intensity in the group of patients receiving NSAIDs (comparative group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Degree of pain intensity (before the treatment series)	9.07	2.69	15							
Degree of pain severity (2 weeks after the treatment series)	6.87	1.89	15	2.20	1.76	4.70	14	<0.001	1.24	3.16

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

Muscle strength measurements (measured using the Lovett test)

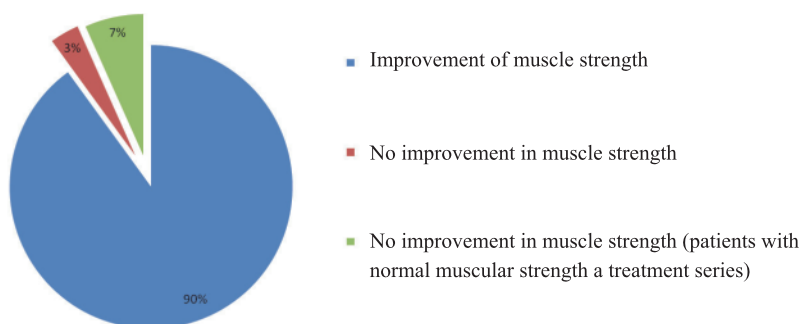


Fig. 2. Measurement of muscle strength (patients taking part in a series of physiotherapy treatments)

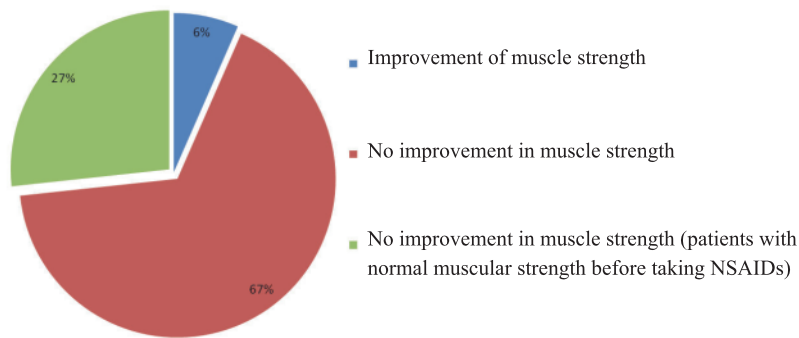


Fig. 3. Measurement of muscle strength (patients receiving NSAID-comparative group only)

Table 3. Muscle strength in a group of patients participating in physiotherapy (research group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Muscle strength (before the treatment series)	3.63	0.87	30							
Muscle strength (2 weeks after the treatment series)	4.70	0.59	30	1.07	0.51	12.88	29	< 0.001	0.91	1.23

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

Tabela 3a. Siła mięśniowa w grupie pacjentów przyjmujących same NLPZ (grupa porównawcza)

Table 3a. Muscle strength in the group of patients receiving NSAIDs alone (control group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Muscle strength (before the treatment series)	4.20	0.54	15							
Muscle strength (2 weeks after the treatment series)	4.27	0.57	15	0.07	0.25	1	14	0.334	-0.06	0.20

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

The mean value of muscle strength in patients participating in the procedures before the treatment series was 3,63, and two weeks after the treatment series 4,70. After the analysis in the Statistica program, a statistically significant difference was shown (Table 3). In the comparison group, the mean value of muscle strength immediately before the start of the NSAID collection was 4,20, and two weeks after the end of NSAID collection, the mean value increased by 0,07. After analysis in the Statistica program, the marked differences were statistically insignificant (Table 3a).

Measuring the level of quality of life

Table 4. Level of quality of life SF-36 in the group of patients participating in physiotherapy (research group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Quality of life level SF-36 (before the treatment series)	138.57	14.17	30							
Quality of life level SF-36 (2 weeks after the treatment series)	46.70	21.87	30	91.87	23.79	21.23	29	< 0.001	86.57	97.17

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

Table 4a. The level of quality of life of SF-36 in the group of patients receiving NSAIDs alone (comparative group)

	Average measurement	Standard deviation	n	Difference in measuring averages	Standard deviation (measurement difference)	t	n-1	p	Trust -95%	Trust +95%
Quality of life level SF-36 (before the treatment series)	135	18.98	15							
Quality of life level SF-36 (2 weeks after the treatment series)	125.73	29.14	15	9.27	20.31	1.71	14	0.109	-1.92	20.46

Where n is the number of respondents and n-1 is the number of degrees of freedom, t is the student's t-test, p is the level of significance

The average value of the examined level of quality of life before the treatment series was 138,57, and two weeks after the end of the treatment series, 46,70. Analyzing the described values in the Statistica program, a statistically significant difference was found between the results of the quality of life before physiotherapy and 2 weeks after its completion (Table 4).

In the comparison group, the average level of quality of life before taking NSAIDs was 135, and two weeks after discontinuation, 125,73. Obtained results in the control group were statistically insignificant (Table 4a).

Measurement of motion ranges in the SFTR system

- Before starting the treatment series (research group)

■ The correct range ■ The limited range

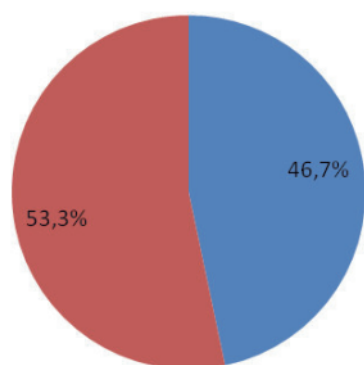


Fig. 4. The range of motion measured in the SFTR system (slope forward, backward slope, slope to the side, trunk twist) before taking a series of treatments

- Two weeks after the treatment series (research group)

■ The correct range ■ The limited range

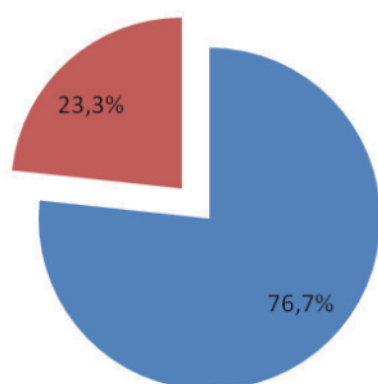


Fig. 5. The range of motion measured in the SFTR system (slope in the forward direction, slope in the back, slope to the side, torsion of the torso) before taking the treatment series

- 76,7% of the respondents two weeks after the treatment series had the correct range of motion (in this case 6,7% of patients who had the correct range of motion before undertaking the treatment series two weeks after the physiotherapy obtained an even better range of movement).
- 23,3% of respondents two weeks after the treatment series had a limited range of movement (16,6% of them got improvement in the scope, however, they did not reach the standard, and in 6,7% of patients no improvement was noted)

Comparative group:

- Measurement of the movement ranges in the SFTR system before starting NSAIDs:

■ The correct range ■ The limited range

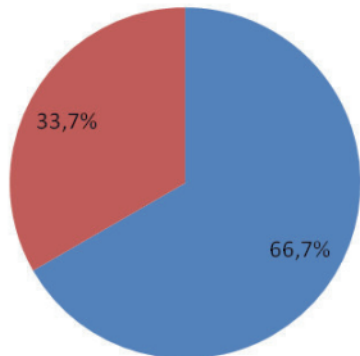


Fig. 6. The range of motion measured in the SFTR system (slope forward, backward slope, slope to the side, torsion of the trunk) before the start of taking NSAIDs.

In the comparison group, none of the patients improved their range of measurement measured two weeks after discontinuation of NSAIDs.

Diagnostic tests (Lasequea, Bragard, Thomayer)

- Before starting the treatment series (research group) (Fig. 7)

■ Positive result (incorrect) ■ Negative result (correct)

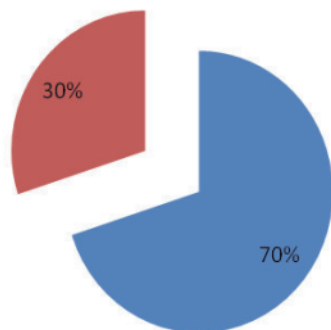


Fig. 7. Diagnostic tests (Lasequea, Bragard, Thomayer) made before taking the treatment series

- Two weeks after the treatment series (research group) (Fig. 8)

■ Positive result (incorrect) ■ Negative result (correct)

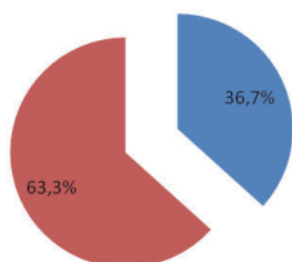


Fig. 8. Diagnostic tests (Lasequea, Bragard, Thomayer) made before taking the treatment series

The improvement was obtained by 33,3% of patients who had a positive result before undertaking the treatment series.

In the control group:

- Before taking NSAIDs (comparative group) (Fig. 9)

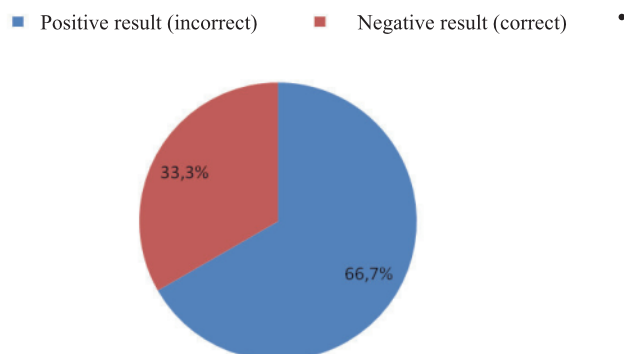


Fig. 9. Diagnostic tests (Lasequea, Bragard, Thomayer) carried out before taking NSAIDs

Two weeks after the end of NSAID uptake, none of the patients with a previous positive result achieved improvement.

The studies also performed separate statistical calculations for each of the individual research groups. All test results (grade of pain, muscle strength, quality of life) obtained in individual study groups (1,2,3) were statistically significant.

Comparing four groups of patients participating in the study, the highest mean difference in the level of pain severity (measured before the treatment series and two weeks after the treatment series) included 8 in group 2 (Laser, TENS Currents, Local Cryotherapy, Massage and Kinesitherapy - stabilizing movement exercises and strengthening the lumbar spine, neuromobilization of the sciatic nerve), and the smallest 2,20 in the group 4 (a comparative group taking NSAIDs only). In group 3 (Laser, TENS Currents, Local Cryotherapy, Massage, Magnetic Field) the result was 7,90 and 7,40 in group 1 ((Laser, TENS Currents, Sollux Red, Massage, Magnetic Field).

In the case of muscle strength, the highest mean difference (measured before the treatment series and two weeks after the treatment series) was also observed in group 2 (1,40). In group 3 there was a value of 1, in group 1 there was 0,80 and the lowest in group 4 (0,07).

However, the highest mean difference (measured before the treatment series and two weeks after the treatment series) of the quality of life level was obtained in group 3 (98), and the smallest in group 4 (9,27). In group 1, the result was 90,70 and in group 2 the result was 86,70.

In 93,3% of respondents participating in physiotherapeutic procedures after the treatment series, the doctor recommended complete discontinuation of non-steroidal anti-inflammatory drugs, and in 6,7% taking non-steroidal anti-inflammatory drugs temporarily.

Discussion

Lesions and their symptoms within the lumbosacral spine are both a social and an economic problem. The economic aspect is associated with the ever-increasing financial outlays related to health care costs, as well as absence from work, as well as

the inability to perform it [22]. The results of our own research indicate very limited physical activity of patients in the form of recreationally practiced sports, for example (running), gym, cycling, swimming in the pool and the like (etc.) Only 13,3% of the subjects studied recreational sports. This situation can be considered as an important cause of pain syndrome within the lumbar-sacral spine. Similar results were obtained by Klimaszevska et al. [23] who pointed out in their work the negative effects of the lack of adequate physical activity in the patients everyday life [23]. The development of civilization has contributed to the loss of the need to engage in physical activity. Lesions in the spine that affect patients result from improper lifestyle and poor work ergonomics. The most common reasons limiting the professional activity of patients are spinal pain syndromes. Movement is a very important and helpful factor in maintaining proper efficiency and fitness of the body. A small amount of it leads to a decrease in the stabilizing properties of the muscle-ligament apparatus [18].

As a consequence, long-term static and dynamic efforts are deteriorating. In our own studies, the average pain intensity among patients participating in physiotherapy decreased by 7,66 units (according to the Laitinen scale), while in the control group it amounted to only 2,20. As a consequence of pain reduction in patients, there was an improvement in the level of muscle strength of the examined spine. In the group taking part in physiotherapeutic procedures, up to 90% of the subjects improved in terms of muscle strength, while in the control group due to the fact that the difference in the severity of pain after treatment was much lower, the correct level of muscle strength was obtained only by 6% more patients compared to the initial condition (before taking NSAIDs). In our own research it was also shown that in the group participating in the procedures, the ranges of motion in the lumbosacral spine were improved. In this group, before the treatment series, 53,3% of patients had a limited range of motion, and two weeks after its completion only 23,3%. This means that among patients with a limited range of motion, as much as 56,7%, there has been an improvement. In the control group, none of the subjects had any improvement in this respect. The same conclusion can be drawn in relation to the diagnostic tests used (Lasequea, Bragard, Thomayer). Positive (negative) results of tests before the start of the treatment series were recorded in 70% of patients, while two weeks after its completion it constituted only 36,7% of the subjects. In this respect, there was an improvement in 52,4% of people who had previously obtained a positive result. In the control group, no improvement was reported in any of the patients. According to our own research, it is also evident that with the reduction in the severity of pain, improvement in muscle strength and range of motion, there is a significant improvement in the quality of life. In the research group, the difference in the quality of life of patients between the state immediately before the start of physiotherapy and two weeks after its completion was statistically significant and amounted to 91,87 units. In the group of patients taking only NSAIDs, the difference was only 9,27 units.

Referring to the research of other authors, Agnieszka Depa et al. [24], who studied the impact of rehabilitation on the change in subjective pain and spine mobility in patients with lumbar pain syndrome, reached similar conclusions. In their studies, they also obtained in the majority of patients (59% of respondents) reduction of pain, improvement of ranges of mobility (57% of subjects), which in consequence influenced the improvement of the functional activity of the subjects [24]. Sławomir Jarząb together with co-authors [25] in their work assessed the effectiveness of selected electrotherapy methods in diseases of the lower spine, in the aspect of reducing the use of analgesics. The authors showed a beneficial long-term effective effect of TENS currents in the treatment of pain symptoms manifesting in the lower part of the spine. In contrast, the interference currents used in the tests gave the best immediate and short-term efficacy, which may favor the use of this type of current immediately before the application of kinesitherapeutic treatments. The authors of the study, according to the results obtained, stated that electrotherapy can and should be used as an alternative agent for analgesics. Positive impact of systemic cryotherapy combined with 30-minute kinesitherapy was also presented by Ewa Demczuk-Włodarczyk [26], who together with co-authors compared the above-mentioned treatment list in relation to the effectiveness of the kinesitherapy alone (respiratory, exercise according to the Maigne program, exercise) strengthening the abdominal muscles, back muscles, gluteal muscles, active upper and lower limbs, exercises on the cycloergometer). The authors thus proved a more beneficial effect of using the treatment set than the use of a single physiotherapeutic treatment. A further example of the use of the treatment set is the work of Żaneta Ciosek and co-authors [27], who assessed the effect of dynamic banding combined with local cryotherapy on the range of mobility and pain in the lumbar region of patients with degenerative changes of the spine. The respondents who received local cryotherapy along with dynamic patterning after surgery experienced a significant reduction in pain and obtained much better ranges of motion in the lumbar region in relation to the group of patients who were treated only with local cryotherapy. Group III in these studies consisted of patients awaiting treatments for whom diagnostic measurements were performed at the same time as in the other groups. In group III, the authors did not notice statistically significant improvement in any of the studied factors. Referring to own research, in the group that was waiting for the treatments, taking only the NSAID recommended by the doctor, in terms of muscle strength and quality of life, there was no statistically significant improvement. Żaneta Ciosek and co-authors [27] came to the conclusion that the examined treatment list gives much better therapeutic effects than the use of local cryotherapy, which is another example showing a better effect of the use of a certain treatment set in relation to a single physiotherapeutic treatment. Referring to the study of the quality of life, Zbigniew Śliwiński [28] in his work entitled "Quality of life of patients with lumbar spine pain"

showed a different degree of reduction in quality of life depending on the degree of impairment in the course of the disease. The conclusions of this work show the need to capture the quality of life in the rehabilitation process, which helps in the assessment of the rehabilitation process, attitude to the disease and provides a lot of information about the patient being treated. In our own work, the level of quality of life assessed both before the treatment series and two weeks after its completion was helpful not only in assessing the therapeutic effectiveness of the treatment combinations applied to the control group, but also in relation to each other. According to the literature and own research, it was found that appropriately compiled conservative treatment in the form of physiotherapy treatments allows to achieve satisfactory results of therapy. It is also a limiting factor in the treatment of NSAIDs and surgical interventions as well as hospitalization of patients [19, 23, 24, 28, 29].

The research was questioned about the superiority of surgical treatment over conservative treatment. Research conducted by Kafchitsas et al. [30], in which the quality of life of patients after conservative and surgical treatment was compared, showed a lack of superiority of surgical treatment over conservative treatment [30]. This was also confirmed by the studies carried out by Svennson et al. [31] in which the kinesitherapy methods were used during the therapy. Both papers showed that surgery was the last resort in most cases [31].

Conclusions

1. Regardless of the applied set of physiotherapy treatments, they worked better than taking only non-steroidal anti-inflammatory drugs by patients. Physiotherapy in ordered sets had a positive effect on the treatment of pain symptoms caused by degenerative changes in the lumbosacral spine. By reducing pain, they also contributed to the improvement of muscle strength, the range of motion in the examined spine, which in turn led to a significant improvement in the quality of life of the subjects.
2. The applied sets of physiotherapeutic procedures have a significant impact on the reduction or total withdrawal of pharmacological anti-inflammatory and analgesic agents.
3. The highest effectiveness in reducing the severity of pain and improvement in muscle strength have been demonstrated by the treatments in group 2 (Laser, TENS Currents, Local Cryotherapy, Massage and Kinesitherapy - movement exercises stabilizing and strengthening the lumbar spine, neuromobilization of the sciatic nerve), and the smallest in group 1 (Laser, TENS Currents, Local Cryotherapy, Massage, Magnetic Field). However, due to the small number of patients examined, this conclusion can be considered as preliminary.
4. A set of physiotherapeutic treatments ordered in group 3 (Laser, TENS Currents, Sollux Red, Massage, Magnetic Field) turned out to be the best to improve the quality of life of the examined patients, and the smallest improvement in quality of life was shown by the group of treatments in Group

2 (Laser, TENS Currents , Local Cryotherapy, Massage, Kinesitherapy - movement exercises stabilizing and strengthening the lumbar spine, neuromobilization of the sciatic nerve).

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