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The Effect of Radiofrequency Ablation on the Quality of Life of Patients with Lower Back Pain

Wpływ zabiegu termolezji na jakość życia pacjentów z bólami dolnego odcinka kręgosłupa

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Abstract

Introduction. Lower back pain is recognised as a leading public health problem that significantly reduces quality of life.
Aim. The aim of this study is to assess the impact of radiofrequency ablation on the quality of life of patients with lower back pain, changes in pain intensity and degree of disability.
Material and Methods. Fifty-seven patients took part in the study, 34 of whom made it to the end (22 women, 12 men), ranging in age from 33 to 81 years. Patients underwent a radiofrequency ablation, which aims to damage a small branch of a spinal nerve, thanks to the heat generated by a radiofrequency electric current flowing through the tissue.
Results. Radiofrequency nerve ablation surgery has been shown to be an effective method in the treatment of lower back pain. Furthermore, it reduces patients' disability and the frequency with which they take pain medication. This effect lasts for at least three months.
Conclusions. Further studies should be carried out to assess the impact of thermotherapy on patients' quality of life. The current study results presented are promising. **(JNNN 2025;14(4):171–177)**
Key Words: disability, LBP, pain, quality of life, thermolesion

Streszczenie

Wstęp. Ból dolnego odcinka kręgosłupa uznawany jest za wiodący problem zdrowia publicznego, który w sposób istotny obniża jakość życia.
Cel. Celem pracy było ocenienie wpływu zabiegu termolezji na jakość życia pacjentów z dolegliwościami bólowymi dolnego odcinka kręgosłupa, zmiany nasilenia bólu oraz stopnia niepełnosprawności.
Materiał i metody. Udział w badaniu wzięło 57 osób, z których 34 dotrwało do samego końca (22 kobiety, 12 mężczyzn) w wieku od 33 do 81 lat. Pacjentów poddano procedurze termolezji, która ma na celu uszkodzenie niewielkiej gałęzi nerwu rdzeniowego, dzięki ciepłu wytworzonemu przez przepływający w tkance prąd elektryczny o częstotliwości fal radiowych.
Wyniki. Wykazano, że zabieg ablacji nerwów prądem o częstotliwości radiowej jest skuteczną metodą w leczeniu dolegliwości bólowych dolnego odcinka kręgosłupa. Co więcej zmniejsza on stopień niepełnosprawności pacjentów oraz częstotliwość przyjmowania przez nich leków przeciwbólowych. Efekt ten utrzymuje się przez okres co najmniej 3 miesięcy.
Wnioski. Należy prowadzić dalsze badania dotyczące oceny wpływu termolezji na jakość życia chorych. Aktualnie przedstawione wyniki badań są obiecujące. **(PNN 2025;14(4):171–177)**
Słowa kluczowe: niepełnosprawność, LBP, ból, jakość życia, termolezja

Introduction

Lower back pain is one of the most prevalent health problems, with an estimated 619 million people affected by the condition in 2020, creating many personal, social and financial burdens worldwide. Despite a slight decrease from 8.1%; (6.7–9.5) to 7.7%; (6.4–8.7), consistently from 1990 to 2020, low back pain (LBP) stands at the infamous first place in the overall global years lived with disability (YLD) ranking with a score of 69 (47.9–88.9) million years survived with disability [1,2].

Polish Statistical Office data shows an upward trend in the number of Poles reporting lower back pain, which in 2019 was the second most frequently reported ailment right after high blood pressure. It is noteworthy that the third and fourth places in the ranking of the statistical office are occupied by neck pain and mid-back pain, respectively, which should further motivate society and the medical community to take steps to limit the spread of this problem [3]. In 2022. The Social Insurance Institution (ZUS) in Poland issued a sickness absence report which, in the male group, clearly indicated that the longest absences from work were caused by spinal root and nerve plexus disorders (G54) — 5.6% of the total number of days absent from work, low back pain (M54) — 4.9%, other intervertebral disc diseases (M51) — 3%. The situation is different in the women's group, where the only entity involving spinal disorders mentioned in the report is spinal root and nerve plexus disorders (G54) — 3.2% of the total number of absences from work [4].

The above statistics indicate a highly significant problem, the solution to which should be as quick to apply, cheap, safe and effective as possible. One procedure that may be applicable to the treatment of chronic LBP is the minimally invasive radiofrequency ablation.

The indication for this procedure is complex factors such as chronic LBP lasting at least 6 months, which cannot be relieved by conventional treatments including pharmacotherapy and physiotherapy. A few contraindications include heart failure, systemic infections, pregnancy, inflammatory skin lesions in the treatment area, certain mental illnesses, especially secondary depression to chronic pain. Additionally, stroke and myocardial infarction are temporary contraindications, after which one must wait three months to safely perform radiofrequency ablation (RFA) [5,6].

Radiofrequency nerve ablation is a minimally invasive procedure carried out under local anaesthesia (2% lidocaine solution), involving the insertion of an electrode needle into the area of the nerve to be treated. The entire procedure is carried out under fluoroscopic control. To ensure that the electrode is in the right place, additional motor stimulation (with a current of 2–5 Hz) and sensory stimulation (with a current of 50–100 Hz) are used. If muscle contraction occurs during stimulation with lower frequency current, e.g. in the calf muscles, or if palsy occurs during stimulation with stimulation with a higher frequency causes paresthesias and increased pain in the dermatome supplied by the root in question, this means that the needle is too close to the root and should be corrected. Once you have ensured that the electrode is in the right place, you can proceed to the main part of the radiofrequency ablation procedure. A current of 300 kHz to 500 kHz is passed through the needle, generating heat. The temperature rises to 80–90°C and is maintained for a period of 60 seconds, damaging the target nerve tissue (medial branch of the dorsal branch of the spinal nerve). This procedure is a one–day procedure, thanks to minimal interference with the human body and local anaesthesia, the patient remains under observation for a short period of time after appropriate protection of the operated area and can then go home safely [7,8].

The aim of this study was to assess the impact of thermocele surgery on the quality of life of patients with lower back pain, changes in pain intensity and degree of disability.

Material and Methods

The study was carried out on patients with lower back pain problems, qualified for thermotherapy, by a neurosurgery specialist, at the Department of Neurosurgery of the Jan Biziel University Hospital No. 2 in Bydgoszcz. Patients who, during the study: suffered a serious injury, underwent another procedure that could affect the results of the study, did not answer all the required questions, or did not answer all the survey dates — were not included in the statistical analysis. After excluding some patients, data collected from 34 patients were used for statistical analysis.

The methods and tools used in the study include: the Oswestry questionnaire (ODI) and the Quebec Back Pain Disability Scale (QBPDS) — investigating the level of disability; the Numeric Rating Scale (NRS) — a subjective pain rating scale; the author's questionnaire — containing sociodemographic questions, as well as indirect questions about body mass index (BMI) and frequency of pain medication use important for the work, created for the purpose of this study.

Respondents completed the above questionnaires on 3 occasions:

a. a few hours before the procedure,
b. one month after the procedure,
c. 3 months after the procedure.

In order to answer the formulated research questions and test the hypotheses, statistical analyses were performed using the IBM SPSS Statistics package version 29. With its help, analysis of basic descriptive statistics, ANOVA with repeated measures, Friedman's test, Pearson's r and Spearman's rho correlation analysis and Student's t tests for independent samples were performed. The classical threshold of α=0.05 was used as the level of statistical significance.

Results

Differences in the Extent of Perceived Pain (NRS)

The study shows that the pre-treatment measurement was significantly different from the second and third measurements, but no differences were obtained between the second and third measurements. This indicates that there was a significant reduction in pain after surgery, and that the analgesic effect was sustained for at least three months after surgery (Figure 1). There was a direct reduction from 5.5 to 3.29 in pain experienced after Radiofrequency Ablation in the study group (Table 1).

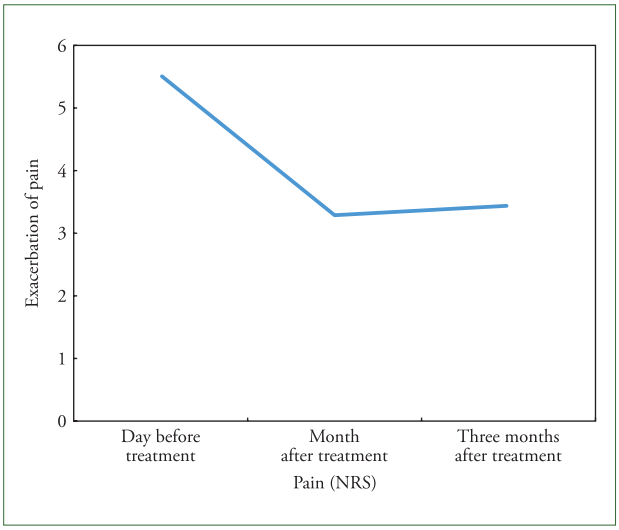

Figure 1. NRS mean value with a 95% confidence interval for pain over three measurements

Differences in ODI and QBPDS Disability

As with pain, there was a significantly statistical improvement in functional status, which was tested using the ODI (Table 2/Figure 2) and QBPDS (Table 3 /Figure 3), When analysed, improvements were observed to persist for at least three months after surgery.

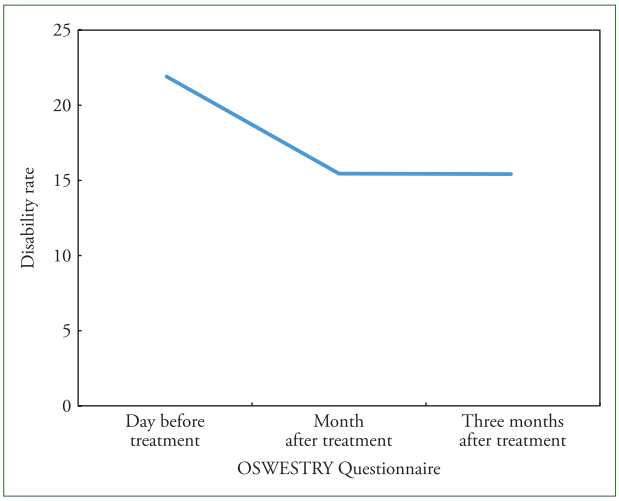

Figure 2. Mean values of the OSWESTRY Questionnaire with a 95% confidence interval for disability rate over three measurements

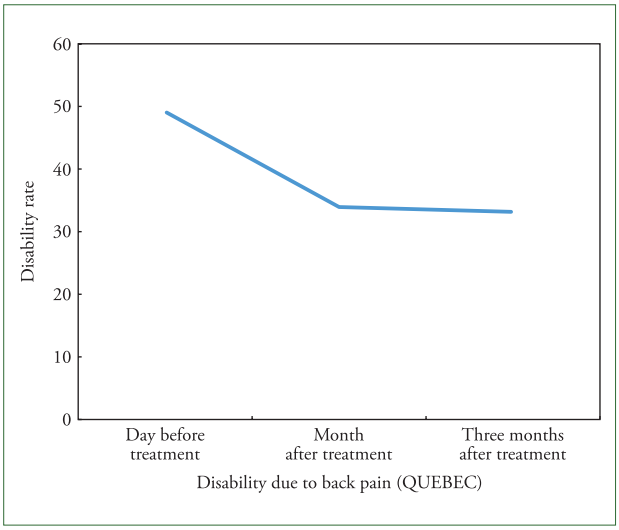

Figure 3. QUEBEC mean values with 95% confidence interval for failure rates over thethree measurements

Table 1. ANOVA Results with Repeated Measurement for Pain After Radiofrequency Ablation

Descriptive statistics					p-level of post hoc[a] testing		ANOVA Results		
Pain	M	SE	95% CI		Measurement 1	Measurement 2	F(1.54; 50.87)[b]	p	η^2_p
			LL	UL					
Measurement 1	5.50	0.31	4.86	6.14	–				
Measurement 2	3.29	0.42	2.43	4.16	<0.001	–	31.83	<0.001	0.49
Measurement 3	3.44	0.40	2.63	4.25	<0.001	0.887			

M — average; SE — standard error; 95% CI from LL & UL — 95% Confidence interval with lower and upper limits; F — Test statistics; p — Statistical significance level; η^2_p — Strength of effect; [a] — Sidak's amendment was applied; [b] — due to the violation of the assumption of spherical variance: $\chi^2(2)$=11.30, p=0.004, Greenhouse-Geisser correction applied (ε=0.77)

Table 2. Results of ANOVA with repeated measures for failure to thrive after Radiofrequency Ablation

Descriptive statistics					p-level of post hoc[a] testing		ANOVA Results		
Malfunction Indicator	M	SE	95% CI		Measurement 1	Measurement 2	F(1.38; 45.40)[b]	p	η^2_p
			LL	UL					
Measurement 1	21.91	1.43	19.01	24.81	–				
Measurement 2	15.44	1.72	11.94	18.95	<0.001	–	21.65	<0.001	0.40
Measurement 3	15.41	1.83	11.69	19.14	<0.001	1.000			

M — average; SE — standard error; 95% CI from LL & UL — 95% confidence interval with lower and upper limits; F — test statistics; p — statistical significance level; η^2_p — strength of effect; [a] — Sidak's amendment was applied, [b] — due to the violation of the assumption of spherical variance: $\chi^2(2) = 19.35$, p=<0.001, Greenhouse-Geisser correction applied (ε=0.69)

Table 3. Results of ANOVA with repeated measures for disability after Radiofrequency Ablation

Descriptive statistics					p-level of post hoc[a] testing		ANOVA Results		
Disability due to pain spine	M	SE	95% CI		Measurement 1	Measurement 2	F(1.31; 43.24)[b]	p	η^2_p
			LL	UL					
Measurement 1	49.03	3.00	42.92	55.14	–				
Measurement2	33.91	3.67	26.44	41.39	<0.001	–	30.18	<0.001	0.48
Measurement 3	33.15	3.89	25.23	41.07	<0.001	0.902			

M — average; SE — standard error; 95% CI from LL & UL — 95% confidence interval with lower and upper limits; F — test statistics; p — statistical significance level; η^2_p — strength of effect; [a] — Sidak's amendment was applied, [b] — due to the violation of the assumption of spherical variance: $\chi^2(2) = 23.92$, p=<0.001, Greenhouse-Geisser correction applied (ε=0.66)

Differences in the Frequency of use of Analgesics

In the next step, it was checked whether there was a reduction in the frequency of analgesics. Due to the ordinal nature of the variable, a nonparametric version of the ANOVA — the Friedman test — was performed.

The test results showed a statistically significant main effect, although the W value indicated a relatively weak effect. Further post hoc comparisons with Dunn-Bonferroni correction showed significant differences only between measurement one and two. However, note the p-value close to 0.05 for differences between the initial and final measurements (Table 4). This shows that there was a reduction in the frequency of pain medication one month after surgery, but this effect did not persist until the measurement three months after surgery, although a decreasing trend was noted compared to the initial measurement (Figure 4).

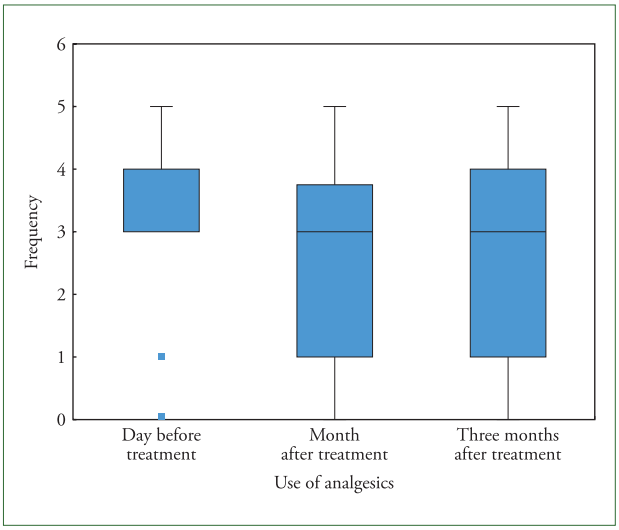

Figure 4. Box plots for the frequency of analgesic intake over the three measurements

Table 4. Friedman test results for comparisons of the frequency of analgesic use on of the three-measurement space

Descriptive statistics			p-level of post hoc[a] testing		Friedman test results		
Frequency use of medicines	Average Rank	Me	Measurement 1	Measurement 2	$\chi^2(2)$	p	W
Measurement 1	2.40	4.00	–				
Measurement 2	1.78	3.00	0.033	–	16.15	<0.001	0.24
Measurement 3	1.82	3.00	0.054	1.000			

χ^2 — Test Statistics, W — Strength of effect, Me — median, [a] — significance corrected for the Dunn-Bonferroni amendment

Relationship between BMI and Time of Onset of First Symptoms, and Improvement in Quality of Life after Radiofrequency Ablation

Correlation analysis with Pearson's r and Spearman's rho coefficient was performed, and only values >0 for pain and performance were included in the analyses for quality-of-life improvement, indicating improvement. However, no statistically significant effect was recorded. Thus, it should be assumed that the time of onset of first symptoms and BMI are not associated with quality of life before surgery and improvement in quality of life after Radiofrequency Ablation (Table 5).

Table 5. Results of Pearson's r and Spearman's rho correlation analyses between BMI and time of onset of first symptoms with quality of life in the initial measurement of quality of life and its improvement

Variable	Time of occurrence first symptoms		BMI	
	rho Spearmana	p	r Pearsona	p
First measurement				
Pain	0.18	0.298	–0.06	0.745
Disability rate	0.20	0.265	0.16	0.379
Disability assessment due to back pain	0.18	0.312	0.14	0.426
Improvement				
ΔPain (N=29)	–0.11	0.569	0.00	1.000
ΔDisability rate (N=30)	–0.24	0.199	0.15	0.418
ΔDisability rate assessment due to back pain (N=26)	–0.04	0.829	0.22	0.274

Values indicating an improvement in quality-of-life indicators were included in the analysis (>0).

Relationship between Sociodemographic Variables and Improvement in Quality of Life after Surgery

As a further step, the association between sociodemographic variables (age and education) and improvement in pain and function after thermotherapy was tested. These associations were tested by correlation analysis with Pearson's r coefficient (age) and Spearman's rho (education). Only those observations with improvement were included in the analyses. However, no statistically significant result was shown. This means that socio-demographic variables are not correlated with improvement in quality of life after radiofrequency ablation (Table 6).

Table 6. Results of Pearson's r correlation analyses between sociodemographic variables and improvement in quality of life after radiofrequency ablation

Variable	Age		Education	
	r Pearsona	p	rho Spearmana	p
ΔPain (N=29)	0.05	0.787	0.05	0.786
ΔDisability rate (N=30)	–0.02	0.916	–0.07	0.716
ΔDisability rate assessment due to back pain (N=26)	0.15	0.462	0.19	0.343

Values indicating an improvement in quality of life indicators were included in the analysis (>0)

Discussion

Analysis of the results showed a highly statistically significant difference in pain, moreover, this effect was maintained at a similar level for a further three months after treatment. In the present study, an average improvement of more than two points on the NRS scale was recorded, like C.W.J. van Tilburg and co-workers, who in their study on the efficacy of RFA in the treatment of LBP reported a score of >2 NRS improvement in almost 50% of the subjects, i.e. 29 patients. A similar result was obtained by Johan N.S. Juch and co-workers [9,10]. Additionally, a systematic review by Arthur W. Poetscher and co-workers, which considered more than 329 articles, showed a definite reduction in pain among patients treated with RFA [11].

In the above-mentioned review, it is also worth noting the overlapping improvement in patients' functioning with the results of the present study. Possible differences in the conclusions regarding the lack of improvement in patients' overall quality of life after RFA may be due to the different timing of the assessment — the maximum time period in the present study was 3 months, the review considered data up to 12 months after the procedure.

A prospective analysis by Álvaro Los Santos Aransay and colleagues showed a highly significant decrease in analgesic consumption after RFA with a 25% increase in the number of people who stopped using any analgesics and a 26% decrease in the consumption of weak opioids. A highly statistically significant decrease in pain was also reported, as in the present study [12].

A study assessing the quality of life of patients afterlumbar thermolysis, conducted by Anna Raszka and colleagues at the Department of Neurosurgery at the 10th Military Clinical Hospital with Polyclinic in Bydgoszcz, evaluated the subjects using the ODI scale and the VAS scale, and the patients' condition was assessed over a period of 6 months after the procedure. The lowest mean

VAS scale score was recorded by the authors the day after the procedure was performed, and subsequent readings were also significantly better than baseline, but with a slight tendency to deteriorate with time. The situation was similar with the degree of disability tested with the ODI questionnaire. The decrease in perceived pain, dexterity, as well as the duration of therapeutic effects overlap with the present study. Conclusions drawn from the study indicate the high efficacy of lumbar thermotherapy in the treatment of LBP and its important role in reducing disability in the early as well as the late period [8].

The use of radiofrequency ablation is not limited to its application in LBP of either plank or joint origin, this treatment also plays an important role in pain originating from the sacroiliac joints (SIJ). In a comprehensive 2021 review, author Aaron J. Yang and colleagues compiled and summarised highlights from 39 studies on RFA for the treatment of LBP caused by SIJ dysfunction. The authors believe that there is a therapeutic effect with positive response rates ranging from 32% to 89% [13].

Conclusions

In this study, RFA was shown to be an effective treatment for lower back pain, moreover, it reduced patients' disability and the frequency with which they took painkillers. This effect persists for at least three months, and it is expected that in most of the patients, the improvement in the parameters studied will continue at a similar level for several more weeks. In addition, the relationship of BMI, time of onset of first LBP symptoms and socio-demographic data with treatment efficacy and improvement in quality of life was investigated — no correlation was shown.

Implications for Nursing Practice

Lower back pain is one of the most common health problems among neurosurgical patients. The treatment procedure is a radiofrequency ablation procedure. Staff are required to take multidirectional measures to assess and monitor patients suffering from LBP and to participate in activities and treatments to alleviate it, regardless of the phase of treatment. The effectiveness of nursing interventions to minimise, reduce or even eliminate accompanying pain symptoms, which will result in an improved quality of life for patients suffering from chronic low back pain. There is a need for further observation and research of the ever-growing group of patients requiring pain management also with effective proven pain management methods, which include radiofrequency ablation, which improves the quality of life of patients reporting LBP.

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