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Ocena skuteczności wybranych metod elektroterapii w schorzeniach dolnego odcinka kręgosłupa w aspekcie ograniczenia przyjmowania leków przeciwbólowych

Evaluation of chosen electrotherapy methods efficiency in lower spine diseases in aspect of lowering usage of painkillers

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Streszczenie:

Wstęp. Pogłębiającym się wraz z wiekiem stanom zwyrodnieniowym kręgosłupa i stawów obwodowych oraz pourazowym zaburzeniom układu ruchu nieodwołalnie towarzyszy ból. Alternatywnie do leków przeciwbólowych z powodzeniem można stosować takie metody, jak elektroterapia. Celem badań była weryfikacja skuteczności wybranych metod elektroterapii w zakresie działania przeciwbólowego w schorzeniach dolnego odcinka kręgosłupa oraz w kontekście redukcji ilości przyjmowanych farmakologicznych środków przeciwbólowych.

Materiał i metody. Grupę badaną stanowiło 74 pacjentów (46 kobiet, 28 mężczyzn) cierpiących na schorzenia dolnego odcinka kręgosłupa. Każda z osób poddawana była jednemu z 3 zabiegów elektroterapii: TENS, prądy Nemeca oraz prądy Bernarda. Przeprowadzono autorski wywiad kwestionariuszowy zawierający m.in. podstawowe informacje o pacjencie, rozpoznanie, informacje o przyjmowanych lekach przeciwbólowych oraz ocenę dolegliwości bólowych, której dokonywano czterokrotnie. Indywidualnie dla każdego badanego wyznaczono parametry pozwalające ocenić skuteczność terapii w perspektywie czasu.

Wyniki. Największą ilość osób deklarujących pozytywny długotrwały efekt przeciwbólowy (60,9%) odnotowano w grupie TENS. Największą ilość osób deklarujących pozytywny doraźny oraz krótkotrwały efekt przeciwbólowy (56%) odnotowano w grupie IF, podobnie jak najczęstszą pozytywną ocenę subiektywną skuteczności terapii (84%). Zmniejszenie ilości leków przeciwbólowych odnotowano na podobnym poziomie (50-60%) dla terapii prądami interferencyjnymi oraz TENS.

Wnioski. Najbardziej długoterminowo skuteczną metodą terapii w leczeniu dolegliwości bólowych dolnego odcinka kręgosłupa jest TENS. Największą skuteczność doraźną i krótkoterminową w uśmierzaniu bólu kręgosłupa lędźwiowo-krzyżowego wykazuje terapia prądem interferencyjnym, co stanowić może podstawę do jej aplikowania bezpośrednio przed zabiegami kinezyterapii. Elektroterapia może, i powinna być stosowana jako alternatywa dla farmakologicznych środków przeciwbólowych.

Słowa kluczowe:
ból, kręgosłup, elektroterapia

Abstract

Background. *While aging, degenerative phase of spine and circular joints deepen, also traumatic diseases in movement system – it is all inseparably combined with pain. Alternatively to painkillers we can use methods such as electrotherapy. The purpose of the researches was to verify the efficiency of chosen methods in electrotherapy in field of fighting with pain in lower part of spine as well as to lower the amount of pharmacological painkillers that are taken.*

Material and methods. *The group that was researched was 74 patients (46 women and 28 men) suffering from lower part of spine disease. Each of these people had of three procedures of electrotherapy: TENS, Nemec currents, Bernard currents. There was an individual interview (questionnaire) contained basic information about the patient, diagnosis, information about painkillers taken and evaluation of pain ailment that was conducted 4 times. Individually for each patient there were chosen parameters allowing to evaluate the efficiency of the therapy in time period.*

Results. *The biggest group that stated long-term positive influence in overcoming pain (60.9%) was noticed in TENS group. The biggest group that stated positive temporary and immediate effect in overcoming pain (56%) was noticed in IF group, similarly like the most frequent positive subjective evaluation of the therapy (84%). Lowering the amount of medicines (painkillers) was noticed on similar level (50-60%) for therapy with interference current and TENS.*

Conclusions. *The most effective long-term method in therapy of treatment pain in the lower part of spine is TENS. The biggest effectiveness in immediate action and short-term in overcoming pain in spine lumber vertebra shows therapy with interference stream – that can be a reason to use it directly before kinesitherapy. Electrotherapy can and should be used as an alternative way for pharmacological painkillers.*

Key words:
pain, spain, electrotherapy

Background

Dysfunctions of movement system are one of the most common diseases in societies of high degree of civilization development. While aging, degenerative phase of spine and circular joints deepen and it is inseparably connected with pain that limits moving activity of the sick person and also lowers the quality of life. To overcome the pain people use pharmacological painkillers and the doses continuously gets bigger which sometimes leads to addictions and causes many side effects. Also, patient without consulting it with a doctor, can easily buy widely promoted painkillers from OTC group (over the counter) which are also toxic and used with no control. Alternatively to painkillers there can be used (with success) methods such as electrotherapy which is both easy to apply and non-invasive. What's most important the rule of electrotherapy influence (and the whole psychotherapy) is about natural mechanisms auto-regular, stimulating organism through different stimulus to use its own supply and possibilities.

The issue taken is very important and worth its time because the medicines (painkillers) accessibility is unlimited and when taking permanently they lead to damaging internal organs and addictions.

Material and methods

The researches included 74 patients (46 women, 28 men) with diagnosed diseases of lower part of spine. People were put into one of two groups depending on whether they declared taking painkillers (group A, n=56) or not (group B, n=18).

Each one had one out of three electrotherapy procedures according to the methodology of conducting them: TENS (Transcutaneous Electrical Nerve Stimulation), stimulation with Nemec current and Bernard current. All 3 kinds of current are current with low or medium frequency.

In general, TENS procedure was conducted on 23 patients (which is 31.1% of the whole group), procedures with Nemec current (group IF) – 25 people (33.8%) and procedures with Bernard current (group DD) – 26 people (35.1%).

The characteristic of each of the group when it comes to age shows Table 1 and Table 2.

The researched group was defined at an angle of physical activity and type of work they do. Patients from group A mostly stated minimum (53.6% people) or just occasional (37.5% people) physical activity and had jobs physically passive - sitting or standing positions (87.5%). Patients from group B mostly declared minimal (22.2%), occasional (22.2%) or regular (50% of people) physical activity and had jobs physically passive – sitting or standing positions (100% of people). There was no big differences in characteristics of physical activity between

groups TENS, IF or DD. The difference was noticed between group A and B what could indicate that average people from the group that take medicines (painkillers) are less fit than the people that don't take medicines.
The researched group was also analysed at angle on frequency of appearing diseases that was diagnosed (Table 3).

Table 1. Characteristic of TENS, IF and DD group an angle of age

	Group TENS			Group IF			Group DD		
	Women	Men	Total	Women	Men	Total	Women	Men	Total
$W_{śr}$ [years]	45.7	53.5	50.1	55.6	50.8	54.5	50.1	55.4	51.9
SD [years]	8.0	11.2	10.5	11.5	16.5	12.7	9.1	10.3	9.7
$SDW_{śr}$ [years]	2.5	3.1	2.2	2.6	6.8	2.5	2.2	3.4	3.2
min [years]	33	29	29	29	28	28	29	41	29
max [years]	59	69	69	79	73	79	60	68	68
median [years]	45	55	50	58	48	54	52	58	55

$W_{śr}$ – average age, SD – standard deviation, $SDW_{śr}$ – standard deviation of average age

Table 2. Characteristic of A and B group at an angle of age

	Group A				Group B			
	Group TENS	Group IF	Group DD	Total	Group TENS	Group IF	Group DD	Total
$W_{śr}$ [years]	51.5	56.4	51.9	53.2	46.2	49.4	52.2	49.1
SD [years]	10.4	9.5	10.5	10.2	10.8	18.6	6.0	13.1
$SDW_{śr}$ [years]	2.5	2.2	2.3	1.4	4.4	7.0	2.7	3.1
min [years]	29	42	29	29	33	28	42	28
max [years]	69	75	68	75	59	79	57	79
median [years]	50	56	54	54	46	54	55	53

$W_{śr}$ – average age, SD – standard deviation, $SDW_{śr}$ – standard deviation of average age

Table 3. Quantitative characteristic of group A and B at angle of diagnosed disease

Recognized disease	Group A n=56		Group B n=18		Total	
	n	%	n	%	n	%
osteoarthritis of lumbar spine	18	32.1	6	33.3	24	32.4
discopathy of lumbar spine	17	30.4	4	22.2	21	28.4
generalized osteoarthritis of the spine and peripheral joints	9	16.1	3	16.7	12	16.2
generalized pain syndrome of the spine and peripheral joints	5	8.9	3	16.7	8	10.8
intervertebral disc hernia of lumbar spine	6	10.7	1	5.6	7	9.5
lumbar spine pain syndrome	5	8.9	2	11.1	7	9.5
sciatica	4	7.1	1	5.6	5	6.8
rheumatoid arthritis	3	5.4	1	5.6	4	5.4
scoliosis	3	5.4	1	5.6	4	5.4
osteoporosis	3	5.4	0	0.0	3	4.1

The researches included making and conducting a personal interview and evaluation of intensity of pain and effectiveness in overcoming pain in chosen method of electrotherapy. The interview had 4 parts consisted of closed questions and opened concerning basic information about the patient, his lifestyle, previous treatment or parameters of the procedure. Part A included information like patient's initials, sex, date of birth, diagnose and other existing diseases. Part B included basic information about social life (job, type of work, degree of job activity), previous treatment (emphasised: taking painkillers) and also pain existing. Part C is an evaluation of influence of electrotherapy treatment on intensity perceptible pain. Evaluation of perceptible intensity of pain was measured (using modified numeric scale) before a series of treatments, directly before the procedure and directly after it and also after 5 hours. Moreover, there was a question asked about subjective feeling of effectiveness of the electro treatment. In part D there were parameters of the procedure (which procedure, dose, time, place, environment, type of stream) and also general comments concerning treatment.

In the first place there was a characteristic of pain quality using matched (based on literature) set of the most popular words describing pain: site, radiating, dull, sharp, continuous, pulsing, burning, tearing, stinging, ripping [3, 4, 5].

Next, there was a quantity characteristic of pain experiences by evaluating feeling of intensity of the pain in four different moments of therapy (before the series of treatments, directly before the treatment, just after the treatment and 5 hours after the treatment) – there was used a modified numeric scale [5, 6]. For more clear results showing - the results gained in the tests in scale 0-10 of pain intensity was multiplied by ten and thanks to that each result for everyone is between 0 and 100.

Individually for each patient there were chosen 4 parameters which let to evaluating effectiveness of the therapy in time perspective:

x_0 – the difference between level of feeling pain before starting the current series of treatments and directly before the treatment (parameters that defines long-term effect of the therapy);

x_1 – the difference between level of feeling pain before the treatment and just after the treatment (parameter defining the immediate effect of the therapy);

x_2 – the difference between feeling pain directly after the treatment and 5 hours after treatment;

x_3 – the difference between feeling pain before the treatment and 5 hours after it (parameter defining short-term of the therapy).

Graphic scheme of choosing certain parameters shows Fig.1. Plus value of the parameter meant fall of the pain intensity (in certain time period), minus value – its gain.

Based on that – it was defined whether the influence of electrotherapy is:
• positive (intensity of pain lowered x>0, E+ group),
• no influence (intensity of pain stayed the same x=0, E0 group),
• negative (intensity of pain increased, x>0, E- group).

Choosing that method of defining pain intensity and evaluating effectiveness of electrotherapy was because the level of feeling pain (pain break) is individual for every single person [4, 5, 6]. Therefore defining value (in certain moment, e.g. just after the treatment) of pain's intensity on a numeric scale and comparing it within the group of patients is wrong an gives no information. That's why it was focused not on defining direct intensity of pain but on differences of levels for each patient individually. That constructed evaluation was showed to the group analyses.

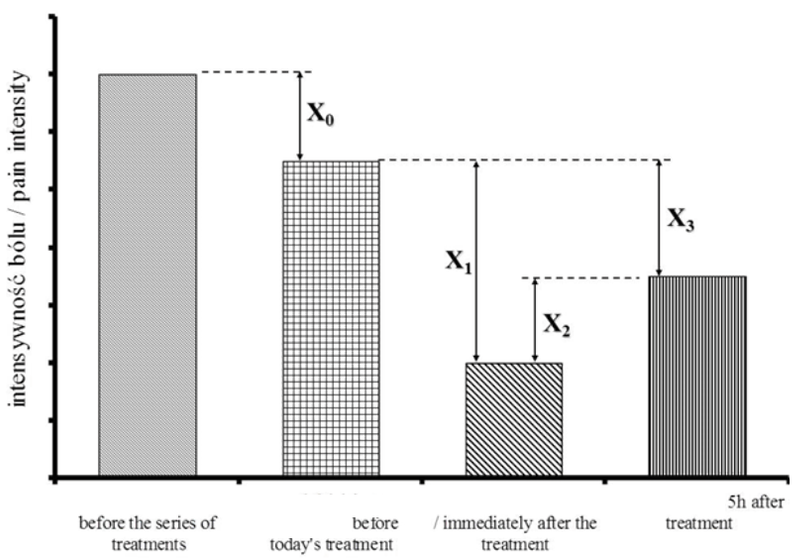

Fig. 1. Scheme showing parameters of quantity intensity pain characteristic

The third step was a subjective evaluation of efficiency electrotherapy treatments made by patients.
The amount of medicines (painkillers) taken is an element of evaluation of pain disease. In the conducted questionnaire interview the patients had to state whether (and what) they take medicine. Easily accessible medicines from OTC were taken by 37.5% of people, medicines that need to be prescribed and controlled by a doctor was taken by 40% of patients, while using both types (at the same time) – 22.5%. People that were researched had to declare whether the amount of medicines taken (painkillers) got higher during treatment (then the people were classified as L+ group), got lower (L- group) or whether stayed the same (L0 group).
All the information gained from researched people via interview was encoded and put in a constructed for this occasion database.
Dependencies between discrete distribution values was described as χ^2 for hypothesises that were made.

Results

People that were researched mostly declared radiating pain (50% of people), constant (36.5%) and tearing (44.6% for all the people).

The most common long-term effect of the therapy (x_0, E+ group) was noticed for TENS group (60.9%) which on average level is $x_{0śr}$=27,9 ±6,6 (SD=24,9) (Tab. 4).

Table 4. Values of statistic amount for parameter x_0 in group E+

	x_0	Group A			GroupB			Total		
		TENS n=8	IF n=5	DD n=10	TENS n=6	IF n=5	DD n=4	TENS n=14	IF n=10	DD n=14
E+	$\bar{x}$	31.3	20.0	16.0	23.3	26.0	27.5	27.9	23.0	19.3
	$SD_{\bar{x}}$	10.9	7.7	4.3	6.1	9.3	8.5	6.6	5.8	4.0
	SD	30.9	17.3	13.5	15.1	20.7	17.1	24.9	18.3	14.9
	min	10	10	10	10	10	10	10	10	10
	max	100	50	50	50	60	50	100	60	50
	median	20	10	10	20	20	25	20	15	10

It was also observed very important statistically dependence (test χ^2, level of importance α>0,10) between long-term effectiveness and the type of electrotherapy. To sum up, positive long-term effect in overcoming pain was most frequently observed in TENS group, just as the lowest average fall of intensity of pain feelings.

The most common positive short-term effect of electrotherapy (x_3, E+ group) was noticed for group IF (56%) which on average was $x_{3śr}$=19.3 ±2.7 (SD=10,0).

It was also observed important statistically dependence (test χ^2, level of importance α>0,25) between short-term effectiveness and a type of procedure.

To sum up, short-term positive effect in overcoming pain was noticed most frequently in group IF but the biggest average fall of intensity of pain was noticed in TENS group ($x_{3śr}$=20,0 ±5,0) (Table. 5).

The most frequent positive immediate effect in electrotherapy (x_1, E+ group) was noticed for IF group (56%) which on average is x1śr=20.7±3.4 (SD=12.7) (Table 6). When it comes to the patients from two other groups the effect appeared almost as frequently as here (34.8% TENS and 34.6% DD).

It was observed a statistically important dependence (test χ^2, level of importance α>0,21) between immediate effectiveness and a type of procedure. To sum up, immediate positive effect in overcoming pain (just after the procedure) was noticed most frequently in TENS group ($x_{1śr}$=25.0 ±7.1).

The patients did subjective evaluation of effectiveness of chosen methods of electrotherapy where A – “treatments

help a lot, definitely lower pain", B - "Treatments help, pain is lowered a little bit", C – "Treatments don't help, pain is still the same", D - "Treatments don't help. Pain is bigger".

Most frequently patients declared partial pain disappearance (highest value for IF group – 81%). Comparable amount of people in all the groups (apart from IF) decla-

Table 5. Values of statistic amount for parameter x_3 in E+ group

	x_3	Group A			GroupB			Total		
		TENS n=8	IF n=12	DD n=11	TENS n=3	IF n=2	DD n=3	TENS n=11	IF n=14	DD n=14
E+	$\bar{x}$	31.3	20.0	16.0	23.3	26.0	27.5	27.9	23.0	19.3
	$SD_{\bar{x}}$	10.9	7.7	4.3	6.1	9.3	8.5	6.6	5.8	4.0
	SD	30.9	17.3	13.5	15.1	20.7	17.1	24.9	18.3	14.9
	min	10	10	10	10	10	10	10	10	10
	max	100	50	50	50	60	50	100	60	50
	median	20	10	10	20	20	25	20	15	10

Table 6. Values of statistic amount for parameter x_1 in E+ group

	x_1	Group A			GroupB			Total		
		TENS n=8	IF n=12	DD n=11	TENS n=3	IF n=2	DD n=3	TENS n=11	IF n=14	DD n=14
E+	$\bar{x}$	28.0	20.0	21.4	21.4	22.5	10.0	25.0	20.7	18.9
	$SD_{\bar{x}}$	24.9	10.5	14.6	14.6	18.9	0.0	20.0	12.7	13.6
	SD	11.1	3.3	5.5	5.5	9.5	0.0	7.1	3.4	4.5
	min	10	10	10	10	10	10	10	10	10
	max	60	40	50	50	50	10	60	50	50
	median	10	20	20	20	15	10	15	20	10

Table 7. Set of results of subjective evaluation of electrotherapy effectiveness

Subjective evaluation of efectiveness		Group A			GroupB			Total		
		TENS n=8	IF n=12	DD n=11	TENS n=3	IF n=2	DD n=3	TENS n=11	IF n=14	DD n=14
A	n	2	2	1	1	1	2	3	3	3
	%	11.8	11.1	4.8	16.7	14.3	40.0	13.1	12.0	11.5
B	n	12	15	16	5	6	3	17	21	19
	%	70.6	83.3	76.2	83.3	85.7	60.0	73.9	84.0	73.1
C	n	3	1	4	0	0	0	3	1	4
	%	17.6	5.6	19.0	0.0	0.0	0.0	13.0	4.0	15.4
D	n	0	0	0	0	0	0	0	0	0
	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

red both real pain disappearance and lack of fall in intensity of pain. There was no statistically important dependence between subjective evaluation of treatment effectiveness and its type (test χ^2, p=0,75). Set of frequency of appearing certain answers among researched people shows Table 7.

The evaluation of change in taken medicines (painkillers) was made just for the patients who were taken these drugs. (A group).

Decreasing the amount of medicines taken most frequently was declared by people from TENS (58.8%), then IF group (50%). The biggest part of patients where the amount of medicines didn't change was 61.9% from DD group.

It was not noticed any statistically important dependence between reduction the amount of medicines taken and the type of electrotherapy (test χ^2, p=0.48). Set of results of evaluation change the amount of medicines taken during the therapy shows Table 8.

Table 8. Set of results of evaluation change amount of medicines taken

Amount of medicines		Grupa A/Group A		
		TENS n=8	IF n=12	DD n=11
L-	n	10	9	8
	%	58.8	50.0	38.1
L0	n	6	8	13
	%	35.3	44.4	61.9
L+	n	1	1	0
	%	5.9	5.6	0.0

Discussion

The beginning of using electrical stream as a treatment factor reach year 1855 [9]. From that moment the technical development and the interest of medical society in this form of therapy led to creating different methods of electrotherapy and also different trials of setting them as a base in psychotherapy. There is a lot of experiments to prove it, conducted in different clinical fields Such as orthopaedics, traumatology, rheumatology, surgery, gynaecology, obstetrics, oncology, stomatology. In this context talking up the issue of evaluating the effectiveness chosen methods (TENS, Nemec's current, Bernard's current) seems to be reasonable.

In researched group the frequency of certain diseases of lower spine was defined where in the first place is degenerative disease of lumbar spine and discopathy which is a confirmation of characteristics made by other authors [14]. The evaluation of pain quality in this group of disorders (most frequent words is pain "constant", "radiating" and "tearing") suggest their chronic character which is a confirmation of previous results.

Because of no objective method of measuring the pain, most frequently used scales are evaluations like VAS or numeric and qu-

estionnaires [15, 16, 17, 18]. In these studies it was decided to use: to quantity intensity of pain a modified numeric scale, as a tried research tool. There was a little change made in analysing the results. The results were not directly analysed on a pain scale but differences in results for certain time periods (for each patient individually). Choosing this method of describing the intensity of pain and evaluation the effectiveness of electrotherapy was because of the fact that the level of pain is individual for each person. So defining a value (in certain period e.g. just after the treatment) on a numeric scale and comparing this value within one group is wrong and gives no information. This fact seems to be rejected by most of the researchers.

The comparing evaluation of 3 methods in electrotherapy (TENS, Nemec, Bernard) at angle of effectiveness in overcoming pain showed that effect of immediate analgesic (appearing directly after the treatment) and short-term (up to 5 hours after the treatment) is most frequent for therapy with interference stream. However the highest level of effectiveness (without regard for the time of working the effect) was noticed for TENS. Those results confirm previous results from other authors, both in case of frequency of immediate effect and short-term [20, 21]. Taking into consideration long-term effectiveness, the best in frequency of appearing positive effect in overcoming pain and fall of intensity of pain is TENS method. This fact says for this method as the most adequate for treating chronicle spine pains which is also said by other authors.

Subjective appraisal of efficiency of the electrotherapy showed that for the vast majority of patients (84%) stimulation of the interference current gives the best effects in pain killing. It's because patients evaluated procedures not in time perspective, but in the time of procedure cycle, it can be concluded that their opinion was based on short term efficiency, then long term.

Evaluation on the change of amount of taken painkillers can may become one of the indicators of efficiency of the chosen therapy method. The results provided in own studies (where patients started to take less painkillers) indicate TENS as a most efficient method of used electrotherapies, confirming studies of other authors [23, 24, 25].

Efficiency of therapy with using diadynamic current was the lower from every five researched methods in compare to therapy using the Nemec currents and TENS. Using this therapy for patients with lower spinal ailments, when more efficient method can be used is inappropriate, what confirmed other authors [26].

Studying the dependence between defined later parameters and type of therapy, despite high group integrity, are not only statistical matter or the level of importance (α) is high (high mistake probability), what may be related to small size of the studied groups.

Conducted researches make starting point for further analyses with taking into consideration studying larger group of patients, different diseases of better control of using painkillers. Subject is important because of big prevalence of lower spine diseases in society and possibility of alternate using as efficient, cheap and non-invasive treatment which is electrotherapy.

Conclusions

Based on provided results ant the analysis of them following conclusions were made:

1. the most efficient method of electrotherapy in treatment in long-standing pain disorders of the lower spine is TENS, because of it long term effect;
2. the most efficiency of immediate method of killing lower spine pain is therapy with usage interference current, what can be the base to applying it directly before the kinesitherapy (increasing the efficiency of exercises);
3. the evaluation of decreasing amount of taken painkillers can be the way to evaluate the efficiency off chosen therapies;
4. TENS as the most efficiently reducing amount of taken painkillers method, can and should be used in prevention from the addictions to pharmacological painkillers;
5. the general efficiency of pain killing with usage Bernard's current for the patients with lower spine diseases is low in compare to other researched methods.

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