The efficacy of mud pack treatment on ailments related to gonarthrosis

Wpływ terapii z zastosowaniem okładów borowinowych na dolegliwości związane z chorobą zwyrodnieniową stawu kolanowego

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Key words

osteoarthrosis, knee, mud-pack, therapy

Abstract

Background: The aim of this study was to evaluate whether mud pack application as a supplementary treatment to physiotherapy and therapy with physical agents allow to achieve better outcome than physiotherapy and therapy with physical agents alone in patients suffering from gonarthrosis.

Methods: Twenty patients aged 49 to 70 at II and III stage of gonarthrosis were divided into experimental and control groups each comprising 10 patients. The experimental group was treated by mud pack, exercises and therapy with physical agents, whereas the control group only by exercises and therapy with physical agents. The following parameters were evaluated in all patients before and two weeks after the therapy: range of motion in the knee, leg circumference, self-assessment of disease severity (using WOMAC questionnaire), and pain level (using VAS scale).

Results: We observed that joint stiffness (assessed using WOMAC questionnaire) decreased significantly only in the experimental group ($p<0.05$). Significant decrease in pain level assessed by means of VAS scale was noticed in both groups ($p<0.05$). After the therapy, a significant improvement in knee flexion ($p<0.05$) was observed only in the control group.

Conclusion: Both treatment modalities had similar effects on pain severity. Reduction of joints stiffness observed 2 weeks following the treatment may suggest that mud pack may be used as a supplementary component in the therapy of osteoarthrosis.

Słowa kluczowe

choroba zwyrodnieniowa, staw kolanowy, borowina, leczenie

Streszczenie

Cel: Celem niniejszej pracy było ustalenie czy zastosowanie okładów borowinowych jako elementu uzupełniającego kinezyterapię i fizykoterapię pozwoli uzyskać lepszy efekt terapeutyczny u pacjentów z chorobą zwyrodnieniową stawów kolanowych niż zastosowanie leczenia opartego tylko na kinezyterapii i fizykoterapii.

Materiał i metoda: Badaniami objęto 20 kobiet w wieku 49-70 lat, u których stwierdzono II° i III° (wg klasyfikacji Seyfrieda) choroby zwyrodnieniowej stawu kolanowego. Wszystkich badanych losowo podzielono na dwie grupy: badaną (n=10) i kontrolną (n=10). W grupie badanej zastosowano: okłady borowinowe, kinezyterapię i fizykoterapię, a w kontrolnej tylko kinezyterapię i fizykoterapię. Pacjentów badano dwukrotnie: bezpośrednio przed rozpoczęciem leczenia i po 2 tygodniach w ostatnim dniu zabiegów. U każdego z badanych przeprowadzono pomiar: zakresu ruchomości w stawie kolanowym i obwodu kończyny, ocenę stopnia dolegliwości wynikających z choroby zwyrodnieniowej przy użyciu kwestionariusza WOMAC, oraz pomiar stopnia intensywności odczuwania bólu za pomocą skali VAS.

Wyniki: Stwierdzono, iż odczuwana przez pacjentów sztywność w stawie (badana przy pomocy kwestionariusza WOMAC) statystycznie istotnie zmniejszyła się tylko w grupie badanej ($p<0.05$). Zauważono, iż w obu grupach po zastosowanej terapii nastąpiło statystycznie istotne zmniejszenie poziomu bólu ($p<0.05$), ocenianego za pomocą skali VAS. Po 2 tygodniach terapii statystycznie istotny przyrost w zakresie zgięcia ($p<0.05$) zaobserwowano tylko w grupie kontrolnej.

Wnioski: Zarówno leczenie oparte tylko na kinezyterapii i fizykoterapii jak i model uzupełniony o okłady borowinowe wykazuje zbliżone działanie przeciwbólowe. Obserwowane po 2 tygodniach zabiegów obniżenie sztywności stawowej pozwala sugerować, że borowina może być włączona jako element uzupełniający terapię choroby zwyrodnieniowej stawów.

INTRODUCTION

Gonarthrosis leads to progressive restriction of joint movements and, as a consequence, to a significant dysfunction of the locomotor system. Osteoarthrosis of the joint cartilage and secondary changes around the affected joint, e.g. muscle weakness, constitute the causes of the reduction in its range of motion and function. The pathological and functional changes are gradually aggravated and lead to a decline in patient's physical fitness, and sometimes even to disability. Unfortunately, complete healing from this disease is impossible, however, we can significantly alleviate the symptoms and slow down the development of gonarthrosis by appropriate physiotherapy.[1,2]

Determining a complex treatment program is very important. It should contain: pharmacotherapy, physiotherapy and therapy with physical agents, prevention (e.g. body mass reduction) as well as patients' and their families' education about this disease. [3,4]

The main goal of physiotherapy is to brake-in *...przerwac bledne kolo… ?* the "vicious circle of immobilisation".[3]

As the joint is less active and its weakness and stiffness are more pronounced, patient's physical fitness deteriorates, physical effort tolerance decreases; hence the risk of body mass enlargement is increased. These factors subsequently influence the progression of the disease. The increase in pain level and intensification of disease symptoms result in subsequent restrictions in patient's physical activity, which consequently increases

the degree of disability. In this way, the „vicious circle" becomes closed. This is the reason, why the appropriate physiotherapeutic treatment should be introduced possibly early.[3,5]

Joint movements are essential for appropriate cartilage nutrition, therefore, greater patients' physical activity improves both their general fitness and accelerate joint recovery process. In the treatment of gonarthrosis, we can use active and passive knee exercises, isometric exercises, weight-bearing exercises as well as exercises strengthening muscles around the knee, especially the quadriceps femoris and vastus medialis muscles. It is also very important to stretch the ischio-cruralis muscles, which are responsible mainly for the protection, stabilization and mobility of the knee. Exercises also help in maintaining proper body mass, which – indirectly, by reduction of articular surfaces compression and loading - influences joint condition and decreases the rate of joint degeneration. Additionally, aerobic, dynamic exercises have a beneficial effect on patients' general agility.[3,5,6]

Biolites, i.e. mud pack called peloid, play an important, emphasised by many researchers, role in the treatment of gonarthrosis.[7,8-10] Mud pack contains salts of formic, acetic and propionic acids, as well as mineral salts (especially ferrous salt) and various organic substances. The advantage of mud pack is its significant hydrous and thermal capacity and small thermal conduction. The mechanisms of action of mud pack include: mechanical effect (the mud pack pressure onto the skin), thermal effect (local tissue hyperthermia leads to increase in cellular metabolism), and biological effect (anti-inflamatory, antiviral and antibacterial effects).[7,9,10]

The aim of this study was to evaluate whether the application of mud pack as a supplementary treatment to physiotherapy and therapy with physical agents allow to achieve better outcome than physiotherapy and therapy with physical agents alone in patients suffering from gonarthrosis.

MATERIAL AND METHODS

Subjects

Twenty female subjects aged 49 to 70 years at stage II and III of gonarthrosis (according to Seyfried scale) were evaluated in this study. They were enrolled based on physician's diagnosis and the X-ray. Prior to the enrollment into the study, written informed consent was obtained from each subject and all of them were informed about the study protocol in detail.

All measurements were performed twice in each subject: immediately before the treatment and after 2 weeks of the therapy (on the last day of the therapy). The study population was randomly divided into experimental and control groups with 10 patients in each group.

In the experimental group, patients received the following interventions:

Exercises – weight-bearing active knee exercise, active exercise (cycling without resistance), postural muscles strengthening exercise (abdominal, back and gluteal), and quadriceps muscle strengthening exercise. During the 2-week period, the exercises were applied daily for one hour.

Therapy with physical agents. The following interventions were applied in the evaluated subjects[11]:

- laserotherapy *LASERTRONIC LT-30 (Laser Instrument, Poland)* – each time, a dose of 6 J/cm^2 was applied
- low frequency magnetic field *Magnoter 26 (MARP-Electronic, Poland)* – each time, the intervention was applied for 15 minutes, the field intensity was 7 mT, and its frequency was 30 Hz.

The therapeutic interventions were provided daily (alternatively every other day) during the period of 2 weeks.

- **Mud pack** – the mud shaped into a compress was used in the treatment (*Biochem, Bochnia*). Mud pack at a temperature of 42°C was applied at the knee area. The intervention was provided daily for 20 minutes, during the period of 2 weeks.[11,12]

Subjects in the control group received the exercises and the therapy with physical agents that were identical in the form, frequency and duration as those in the experimental group.

Study Protocol

- **Measurement of the knee range of motion**

The range of flexion was measured using a goniometer.[13] The examination was repeated twice and the higher value was recorded.

- **Measurement of the leg circumference**

The assessment was performed in the standing position, using centimeter tape-measure. The circumference was measured above the knee, 5 centimeters from the upper rim of the patella.[13]

- **Self-assessment of disease severity**

It was assessed using *The Western Ontario McMaster questionnaire (WOMAC).*[14]

The questionnaire was designed to measure dysfunction and pain by assessing 17 functional activities, 5 pain-related activities and 2 stiffness categories. Each of these categories contributed 0 – 10 points, where 0 indicates the lack of ailments and 10 – their maximal intensity. The total score in each category was:

- Functional activities (0-170 points)
- Pain (0-50 points)
- Stiffness (0-20 points)

- **Pain level measurement**

It was assessed by *Visual Analogue Scale (VAS).* This descriptive scale contributed 0 to 10 points, where 0 indicates the lack of pain, and 10 – its maximal intensity.[15]

STATISTICAL ANALYSIS

All data were analysed using *STATISTICA PL*. Differences in the evaluated variables obtained before and after the treatment within the groups were determined with *ANOVA T-test* for dependent samples. If data were not normally distributed, the differences were determined with the non-parametric *Wilcoxon* test. The differences of

the evaluated variables between the experimental and the control group were determined with the *Student* t-test for independent samples. If data were not normally distributed, the non-parametric *Mann-Whitney* test was used. Statistical significance was tested and accepted at the $\alpha = 0.05$ level of probability.

RESULTS

There were no significant differences between the experimental and control groups at baseline ($p>0.05$).

When data were analysed separately in the experimental and control groups, statistically significant changes in some of the variables evaluated after the treatment were observed as compared to the baseline values.

Significant difference in the knee flexion was noted only in the control group (Table 1). The mean increase in the range of knee flexion was 13° ($p<0.05$).

There were no significant differences in leg circumference after the treatment in comparison to baseline values within both groups ($p>0.05$) (Table 1).

Table 1

Changes in the functional parameters after treatment in the experimental and control groups

	Experimental group n=10			Control group n=10		
	baseline	after treatment	p	baseline	after treatment	p
Flexion (°)	101,5 ± 25,17	112,5±15,5	n.s.	99± 17,28	112± 12,30	<0.05
Circumference (cm)	42,6± 6,59	42,4± 6,52	n.s.	43,1± 4,65	47,9±18,65	n.s.

Values are expressed as mean ± SD; n.s. = non significant

When pain level assessed with VAS scale was analysed, significant decrease in both groups was noted ($p<0.05$) (Table 2). However, there were no significant differences in the pain level assessed with the WOMAC questionnaire within any of the groups ($p>0.05$) (Table 2).

Table 2

Changes in self-assessment parameters (pain, physical agility, joint stiffness) after treatment in the experimental and control groups

	Experimental group n=10			Control group n=10		
	baseline	after treatment	p	baseline	after treatment	p
Pain (*VAS*) (pionts)	6± 2	5± 2	<0,05	6± 3	3,5± 4	<0,05
Pain (*WOMAC*) (points)	17±23	13,5± 18	n.s.	20,5± 20	14± 17	n.s.
Stiffness (*WOMAC*) (points)	6,5± 9	4,5± 5	<0,05	9,5± 9	4,5± 12	n.s.
Functional activities (*WOMAC*) (points)	70,5± 59	70,5± 59	n.s.	71± 65	74,5± 67	n.s.

Values are expressed as median ± quartile range; n.s. = non significant

There were no significant differences in functional activities (assessed with WOMAC questionnaire) in the experimental and control groups ($p>0.05$) (Table 2).

It was observed that knee stiffness (assessed with WOMAC questionnaire) was significantly reduced only in the experimental group ($p<0.05$), whereas it remained unchanged in the control group ($p>0.05$) (Table2).

Evaluating the changes in individual subjects within both groups, it was observed that in the experimental group, more subjects reported an improvement in the pain level and WOMAC scale categories than in the control group (Table 3).

Table 3

The number of subjects in the experimental and control groups who noted an improvement in self-assessment parameters after the treatment (pain, physical agility, joint stiffness), no changes or deterioration.

	Experimental group n=10			Control group n=10		
	improvement (n)	no changes (n)	deterioration (n)	improvement (n)	no changes (n)	deterioration (n)
Pain (*VAS*)	8	1	1	7	2	1
Pain (*WOMAC*)	7	0	3	4	2	4
Stiffness (*WOMAC*)	8	1	1	5	3	2
Functional activities (*WOMAC*)	8	0	2	6	0	4

n = number of subjects

DISCUSSION

It was observed that mud pack applied daily during a period of 2 weeks resulted in a decrease in joint stiffness in the knee, and this effect was noticed immediately after treatment completion. The reduction in joint stiffness was observed by Sukenik[16] even during treatment and he considered it as an immediate effect of mud pack therapy. As other authors emphasise[15-17], mud pack treatment may not only decrease stiffness at the knee, but also diminish the joint inflammation or oedema.

According to many publications [8,10,17,18], we observe, that mud pack may be effective in the treatment of osteoarthrosis. The improvement was noted sometimes as early as after one week of treatment, and beneficial effect was maintained even by 3 months.[12,15-17] Therefore, mud pack therapy has recently become very popular and has been applied not only in the treatment of the locomotor system, but also in other diseases.[10,19,20]

The mud pack efficacy was described by Wigler et al.[15] In a study of 33 patients suffering from gonarthrosis, mud pack therapy resulted in a decrease of night pain and in an improvement in self-assessment of osteoarthrosis severity.[15] Sukenik et al.[21] evaluated the influence of mud pack on joints stiffness and range of motion and observed 2 groups of patients: one treated with mud pack and other without this form of intervention. After 2 weeks of treatment, there was an improvement in the evaluated parameters in both groups. However, repeated assessment of those subjects performed 1 month after therapy completion demonstrated that the improvement was greater in the group treated with mud pack. According to Sukenik, mud pack efficacy is not immediate and maximum improvement may be observed not earlier than after a longer period of time following completion of the therapy. The beneficial effect of mud pack was also reported by Sukenik et al.[12] in another study, where 4 groups of subjects were evaluated. Group I was treated with mud pack, group II with hot sulphur

baths, group III with a combination of mud pack and hot sulphur baths, and group IV served as a control. The treatment was conducted over a period of 2 weeks. A decrease in the intensity of gonarthrosis symptoms was observed in the 3 treatment groups, whereas there were no changes in the control group. Additionally the authors emphasise the fact, that the improvement persisted in those patients for a period of up to 3 months.[12] Similar conclusion was reported by Happach.[22] She noted that in subjects treated with mud pack, apparent ailments attenuation was observed after a few weeks from the end of the spa treatment, and, moreover, in this group of patients, the improvement persisted much longer than in the control group.[22] However, in our study, the two-week period of evalluation did not allow us to observe the late effects of mud pack treatment.

In our study, we did not observe significant differences in most of the evaluated parameters between the experimental and the control group, nor did we demonstrate any significant effect of both treatment protocols on the improvement in subjects' functional activities.

Assessing the pain by VAS scale we noted a decrease in pain level in both groups. Nonetheless, it should be stated, that this scale was designed for the assessment of resting, general pain feelings. Using the VAS scale, it is not possible to evaluate the pain ailments, which appear during movement or activity. The WOMAC questionnaire does enable it, so evaluating the pain occurring during movement using this questionnaire, the beneficial effects of the treatment were not observed.

The authors[5,10,23], who used different treatment methods, either with mud pack or without it, have noted various, often conflicting results regarding pain level assessment. Some[17] did not observe any decrease in pain level after mud pack treatment, however, others stressed out a positive analgesic effect (both immediate and long term) of this intervention. The beneficial influence of exercise on pain reduction in patients with gonarthrosis was observed by Straburzyńska-Lupa[23] based on an authorial 2-weeks exercise program that included active exercise increasing range of motion and exercise strengthening leg muscles . Others authors reported a decrease in pain level after walking exercise (pain level reduction by 12% as compared to baseline), and after isometric exercise (pain level reduction by 8% as compared to baseline)[24]. Despite the fact that most of the studies support the view of a beneficial effect of exercise or physical activity on pain reduction in affected joints, we should remember, that many factors influence the intensity of pain feeling, e.g. individual patient's sensibility or susceptibility to the applied treatment method. Van Baar[25] particularly emphasised this issue in a meta-analysis of research evaluating the efficacy of various treatment methods on osteoarthrosis. He concluded that the effect of exercise on pain intensity and subject’s mood is small or, at most, moderate. Therefore, pain assessment is very subjective and should be taken into account with caution as a criterion of substantial therapy effectiveness.

As it is emphasized in the literature, balneotherapy should constitute the integral part of the treatment. It is very important that balneotherapy is based only on natural substances; if they are properly used in the therapy, it does not have disadvantageous effects.[7,10] It is an essential factor in patients suffering from chronic diseases, such as gonarthrosis, because they are often exposed to negative influence of prolonged drug application.

Because gonarthrosis is a chronic disease considerably restricting patient’s normal daily activity, the treatment should be complex.[22,26,27] In patients suffering from osteoarthrosis, proper cartilage nutrition by moderate joint loading and appropriate exercise ought to be considered. Contractures prevention, pain attenuation, and the care of patients mood are extremely important. It is emphasized that the most important factors include: disease prevention, early diagnosis and delaying progression of changes, even before joint destruction is present.[5,26,27]

In our study, an increase in average range of knee motion was noted in the experimental group, but those changes were not statistically significant. However, in the control group, the mean increase in the range of motion was similar to the value in the experimental group, but at the border of statistical significance. Therefore this result should be considered with caution. The reason for such small changes in this parameter may be ascribed to a too short, scarcely 2-week period of the treatment. Conversely, the observed tendency to increased range of motion, similar in both groups, allow us to suggest that the treatment protocol used in both groups was effective. Yet, based on these observations, we cannot determine, which treatment program applied in this study was better. The changes in the knee range of motion observed in our study are in agreement with other authors' observations, who achieved small increases in this parameter both using the exercise therapy[28-30] and mud pack treatment.[15,17,21]

Despite the principal role of the exercise [2,3,6], the therapy with physical agents is also recommended as a supplementary treatment to the main therapy. The physical intervention may facilitate exercise and reduce joint ailments. It was reported that programs, which include therapy with physical agents performed at the beginning of each treatment session, may reduce the pain and joint stiffness in osteoarthrosis, which allows faster initiation of exercises and makes them easier to perform.[2,3,6]

There is a need for future investigations evaluating the efficacy of this kind of treatment, but based on objective measurements, like joint range of motion or muscle strength assessment. Studies performed so far, describing the results of mud pack treatment are based on subjective methods, like pain level measurement or self-assessment of the treatment progress performed by a questionnaire. In patients' subjective opinion, mud pack treatment is effective, which was also observed in our study, however, objective indicators of the improvement were not unambiguous. It creates the necessity to revise the determinants of mud pack therapy based on objective measurements and to compare this method with other commonly used in the treatment of osteoarthrosis.

The influence of mud pack on the decrease of joint stiffness demonstrated in our study and the long lasting positive effect of this kind of treatment emphasised by many authors[15,17,18,22] suggest that mud pack may be used as a supplementary component in the therapy of osteoarthrosis.

CONCLUSION

1. The use of mud pack as a supplementary component in the therapy of osteoarthrosis results in a reduction in stiffness at the knee joint, and this effect is noted as early as after 2 weeks of the treatment. This observation may constitute the rationale for the use of mud pack as supplementary therapy of osteoarthrosis.
2. The treatment applied in this study in both groups resulted in a significant decrease in resting pain level; however, the pain occurring during movement, assessed with WOMAC, was not reduced. Based on these observations, we suggest that both treatment methods, i.e. exercise and therapy with physical agents only and exercise and therapy physical agents with mud pack as a supplementary therapeutic component have a similar analgetic effect.
3. Similar tendency to an increased range of motion,at the knee, observed in this study in both groups, allows us to suggest that the treatment protocol used in both groups was effective. However, based on

these results we cannot state if the use of mud pack as a treatment complementary to therapy with physical agents and exercise has a positive influence on changes in the knee range of motion.

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