

The efficiency of electrophoresis of the phytocomplex by diadynamic currents in  
rehabilitation of patients with osteoarthritis

D.V. Babaskin

(GBOU VPO First Moscow State Medical University named after I.M.Sechenov, Moscow)

The efficiency of electrophoresis with phytocomplex by  
diadynamic currents in the rehabilitation of patients  
with osteoarthritis

DV Babaskin

IM Sechenov First MSMU (Moscow, Russia)

SUMMARY

A comparative study of the effectiveness of rehabilitation of patients with osteoarthritis using electrophoresis of the phytocomplex by diadynamic currents was carried out. It was found that the complex use of phyto- and electrotherapy in conjunction with drug treatment of patients has a more pronounced positive effect on pain syndrome, knee function and quality of life of patients compared to treatment with drugs alone or the combined use of drug treatment and diadynamic therapy. No side effects have been reported with complex treatment

Key words: osteoarthritis, electrophoresis, phytocomplex.

RESUME

A research of the effectiveness of rehabilitation of comparative patients with osteoarthrosis using electrophoresis with phytocomplex by diadynamic currents was conducted. It was established that complex use of phytoand electrotherapies together with medicamentous treatment of patients makes more expressed positive impact on a painful syndrome, functions of a knee joint and quality of life of patients in comparison to medicamentous treatment or joint use of medicamentous treatment and diadynamic therapy ... No side-effects were observed during the period of complex therapy.

Keywords: osteoarthrosis, electrophoresis, phytocomplex.

Introduction

Osteoarthritis (OA) is a heterogeneous group of diseases of various etiologies, which are based on the defeat of all components of the joint, primarily cartilage, as well as the subchondral bone, synovial membrane, ligaments, capsule of the periarticular muscles [1]. OA has a significant and ubiquitous prevalence, arises as a result of the interaction of many genetic and environmental factors, affects mainly people of the older age group, is characterized by a long and persistent course with a tendency to exacerbation and progression, a decrease in the quality of life of patients,

disability, which determines the social significance of the disease [1, 2, 3].

The main clinical symptoms of OA are pain and limitation of joint function. Therefore, the treatment of OA is aimed mainly at reducing pain, correcting the functional insufficiency of the joint, limiting the progression of the disease and, ultimately, improving the quality of life of patients.

Traditionally, the treatment of OA is complex, including medication and non-medication methods, including physiotherapy. Electrotherapy with diadynamic currents in OA has analgesic, myoneurostimulating, vasodilating, troprostomulating effects. To enhance the therapeutic effect, diadynamic therapy is combined with the administration of drugs (drug electrophoresis by diadynamic currents, or diadynamophoresis) [4]. However, the use of physical and pharmacological methods sometimes causes side reactions, up to the development of anaphylactic shock [5]. In addition, the majority of patients with OA often have polymorbidity, which significantly complicates the choice of treatment method. In this regard, in recent years, attention has begun to be paid to such methods of treating OA, in which natural medicines are used, including vegetable [6, 7]. For electrophoresis, a domestic phytocomplex is proposed for electrophoresis, containing dry extracts of rhizomes with roots of marsh cinquefoil, alfalfa herb and common hop cones (2: 2: 1) [8]. Dry extracts are standardized, contain biologically active substances: flavonoids, polysaccharides, coumestans, tannins, phenol carboxylic acids, essential oils, macro- and microelements, vitamins, due to which analgesic, anti-inflammatory, immunomodulating and other effects are realized, allowing them to be used in medicine for inflammatory-degenerative diseases of the musculoskeletal system [9]. The multicomponent balanced composition of the phytocomplex, a diverse mechanism of action served as the basis for the development of a comprehensive method of phyto and physiotherapy. Clinical studies of the phytocomplex during electrophoresis by diadynamic currents in the rehabilitation of patients with OA were authorized by the Interuniversity Ethics Committee at the Association of Medical Universities of Russia. The aim of the study is to comparatively study the effectiveness of rehabilitation of patients with osteoarthritis using electrophoresis of the phytocomplex by diadynamic currents.

#### Materials and methods

The sample of patients for the study was carried out by the probabilistic method from a set of patients with significant OA of the knee joint according to the criteria of the American College of Rheumatology, with I-III radiological stages of gonarthrosis (according to Kellgren-Lawrence). A prerequisite for the inclusion of patients in the study was the presence of severe pain syndrome (pain intensity according to VAS is not less than 40 mm). Patients with contraindications to the use of electrotherapy with diadynamic currents, individual intolerance were excluded from the study population.

biologically active substances of the phytocomplex, secondary OA, intra-articular administration of any drugs within 6 weeks before the start of the study, a history of operations on the "target joint", bone fractures with unfixed bone fragments, severe concomitant diseases, metal implants in the affected area or artificial pacemakers. Anthropometric indicators were studied in all patients: height, weight, body mass index (BMI).

The study included 106 patients. The ratio of men and women in the sample was 1: 4. The average age of patients is  $54.8 \pm 5.7$  years; the average duration of the disease is  $5.4 \pm 0.5$  years; average BMI -  $30.2 \pm 0.6$  kg / m<sup>2</sup>... Early signs of OA (stages I and II according to Kellgren-Lawrence) were observed in 91 patients (85.8%).

By the time of inclusion in the study, all patients were prescribed drug therapy with oral chondroprotectors according to standard schemes. Some patients (23 people) additionally took non-steroidal anti-inflammatory drugs (NSAIDs) in standard average daily doses. A number of patients included in the study were diagnosed with concomitant diseases, including hypertension - 48 people, diabetes mellitus - 15 people, metabolic syndrome - 18 people, generative osteoporosis - 13 people. In some patients, these diseases were combined. All patients were randomly divided into three groups, comparable in terms of main characteristics. Patients of the first group (36 people) were on a rehabilitation program, including electrophoresis of the phytocomplex by diadynamic currents. Patients of the second group (34 people) were prescribed diadynamic therapy with current parameters similar to those in the first group. The observed patients of the first two groups continued to take drug therapy, which did not change during the course of physiotherapeutic procedures. Patients of the third group (36 people) received only drug treatment: oral chondroprotectors - 36 people (100%), NSAIDs - 8 people (22%). Drug therapy for patients in the third group was comparable to drug treatment for patients in the first two groups. The studies were carried out in a blind manner. All observed patients with OA of the three study groups were assigned therapeutic exercises and massage. The observed patients of the first two groups continued to take drug therapy, which did not change during the course of physiotherapeutic procedures. Patients of the third group (36 people) received only drug treatment: oral chondroprotectors - 36 people (100%), NSAIDs - 8 people (22%). Drug therapy for patients in the third group was comparable to drug treatment for patients in the first two groups. The studies were carried out in a blind manner. All observed patients with OA of the three study groups were assigned therapeutic exercises and massage. The observed patients of the first two groups continued to take drug therapy, which did not change during the course of physiotherapeutic procedures. Patients of the third group (36 people) received only drug treatment: oral chondroprotectors - 36 people (100%), NSAIDs - 8 people (22%). Drug therapy for patients in the third group was comparable to drug treatment for patients in the first two groups. The studies were carried out in a blind manner. All observed patients with OA of the three study groups were assigned therapeutic exercises and massage. Drug therapy for patients in the third group was comparable to drug treatment for patients in the first two groups. The studies were carried out in a blind manner. All observed patients with OA of the three study groups were assigned therapeutic exercises and massage. Drug therapy for patients in the third group was comparable to drug treatment for patients in the first two groups. The studies were carried out in a blind manner. All observed patients with OA of the three study groups were assigned therapeutic exercises and massage.

Electrotherapy was performed on the knee joint area using a transverse technique. If both joints were affected, then two electrodes (from the inner or outer side) were attached to one pole, and the other two - to the other pole of the apparatus. Electrophoresis was carried out according to the following scheme: full-wave continuous current with a frequency of 100 Hz - 1 min., Short-period modulated current with a modulation frequency of 1.5 s - 3 min., With a constant component of the apparatus; then the polarity of the current was reversed and the action was repeated with a full-wave continuous current - 1 min., with a short-period modulated current - 3 min. at current strength - up to pronounced vibration, per course - 10-12 procedures daily or every other day. The working solution of the phytocomplex for electrophoresis was prepared by dissolving a mixture of dry extracts (10 h) in dimethyl sulfoxide (15 h) and then adding warm (40-C) distilled water (up to 100 h). The concentration of the phytocomplex in the working

solution for electrophoresis was selected experimentally as a result of studies of the release of biologically active substances from the phytocomplex under the action of diadynamic currents in model experiments in vitro and in vivo, the use of experimental models of analgesic and anti-inflammatory action, data on bioavailability. Preliminary, the stability of the main active substances of the phytocomplex to the action of diadynamic currents was established. Biologically active substances of the phytocomplex were introduced from two poles. The procedures were carried out on the apparatus "Refton-01-FLS".

A comparative assessment of the effectiveness of restorative methods of treating patients with OA was carried out according to generally accepted criteria: the level of pain according to the VAS (visual analogue scale), the WOMAC index (Western Ontario and McMaster Universities osteoarthritic index), the Lequesne index, the HAQ (Health Assessment Questionnaire) health assessment questionnaire. The dynamics of clinical indicators of inflammation was assessed by changes in ESR and the number of leukocytes in the peripheral blood, the concentration of C-reactive protein (CRP) in the blood serum. All indicators were recorded before the start of the study (indicators with index 1, for example, VAS1), at the end of the course of physiotherapy (indicators with index 2), 1, 3, 6 months after the course of physiotherapy (indicators with indices 3, 4, 5, respectively) (Table 1).

Table 1

Results of a comparative study of the effectiveness of various methods  
rehabilitation of patients with osteoarthritis

Показатель	Группа обследованных		
	1-я (n = 36)	2-я (n = 34)	3-я (n = 36)
ВАШ1, мм (%)	68,3 ± 1,7 (100)	66,2 ± 1,5 (100)	63,8 ± 1,8 (100)
ВАШ2, мм (%)	24,5 ± 2,1*1-3** (35,9 ± 2,4)	28,6 ± 1,7*2-3** (43,4 ± 2,4)	59,2 ± 1,2 (92,9 ± 1,9)
ВАШ3, мм (из них ≤ 40 мм, % к n)	32,4 ± 2,4*1-2, 1-3** (58,6)	42,8 ± 2,6** (45,4)	49,0 ± 1,7** (33,7)
ВАШ4, мм (из них ≤ 40 мм, % к n)	38,0 ± 2,6** (56,8)	42,4 ± 2,6** (46,7)	41,1 ± 1,4** (48,4)
ВАШ5, мм (из них ≤ 40 мм, % к n)	42,2 ± 2,8** (50,3)	40,8 ± 2,4** (49,0)	37,9 ± 2,2** (54,7)
WOMAC1, балл (%)	94,4 ± 1,8 (100)	92,8 ± 1,6 (100)	91,7 ± 1,5 (100)
WOMAC2, балл (%)	56,8 ± 2,0*1-2, 1-3** (60,2 ± 2,3)	68,5 ± 2,2*2-3** (73,9 ± 2,2)	87,7 ± 2,3 (95,8 ± 2,3)
WOMAC3, балл (из них ≤ 85 баллов, % к n)	63,9 ± 2,5*1-2, 1-3** (81,3)	75,7 ± 2,4** (64,2)	79,6 ± 1,8** (56,7)
WOMAC4, балл (из них ≤ 85 баллов, % к n)	65,2 ± 2,6*1-3** (77,8)	73,8 ± 2,5** (68,8)	75,6 ± 1,8** (62,7)
WOMAC5, балл (из них ≤ 85 баллов, % к n)	71,4 ± 2,9** (70,4)	74,2 ± 3,0** (66,1)	74,0 ± 2,4** (65,0)
Лек1, балл (%)	11,4 ± 0,3 (100)	11,0 ± 0,4 (100)	10,8 ± 0,5 (100)
Лек2, балл (%)	5,9 ± 0,2*1-2, 1-3** (51,8 ± 1,1)	7,4 ± 0,3*2-3** (67,5 ± 2,3)	9,7 ± 0,4 (89,8 ± 3,2)
Лек3, балл (%)	6,6 ± 0,2*1-2, 1-3** (57,7 ± 1,8)	7,7 ± 0,3** (70,2 ± 1,6)	8,6 ± 0,3** (79,8 ± 1,4)
Лек4, балл (%)	6,9 ± 0,3*1-2, 1-3** (60,4 ± 1,0)	7,9 ± 0,3** (72,2 ± 2,3)	8,1 ± 0,2** (75,0 ± 0,6)
Лек5, балл (%)	7,5 ± 0,3** (65,5 ± 2,2)	8,1 ± 0,3** (73,6 ± 2,4)	7,9 ± 0,3** (73,3 ± 2,0)
HAQ1, балл (%)	18,3 ± 0,7 (100)	17,9 ± 0,5 (100)	17,9 ± 0,7 (100)
HAQ2, балл (%)	11,9 ± 0,8*1-3** (65,1 ± 1,4)	13,1 ± 0,7*2-3** (73,2 ± 0,8)	16,5 ± 1,2 (92,4 ± 1,4)
HAQ3, балл (из них ≤ 20 баллов, % к n)	12,2 ± 0,6*1-2, 1-3** (86,5)	13,5 ± 0,7** (81,9)	14,8 ± 0,7** (77,4)
HAQ4, балл (из них ≤ 20 баллов, % к n)	12,7 ± 0,7*1-3** (85,9)	13,4 ± 1,2** (82,6)	13,8 ± 0,6** (80,8)
HAQ5, балл (из них ≤ 20 баллов, % к n)	13,2 ± 0,7** (83,3)	13,6 ± 0,6** (78,8)	13,3 ± 0,8** (82,5)

Note.

\* - significant differences between the groups at  $p < 0.05$  (figures indicate group numbers).

\*\* - significant differences in the group before and after treatment at  $p < 0.05$ .

Statistical processing of the results was carried out using the SPSS 10.0 software. To assess the significance of differences between the independent variables, analysis of variance was used, between groups before and after treatment - Student's test, analysis of variance of repeated measurements.

### Results and its discussion

One of the most significant indicators for assessing the effectiveness of treatment of patients with OA in accordance with the recommendations of OARSI (Osteoarthritis Research Society

International) is the pain level according to VAS. Studies have shown that the analyzed methods of treatment significantly reduced the VAS by the end of the course of physiotherapy by 56.6% (diadynamic therapy) and 64.1% (phyto-complex electrophoresis) (Table 1). The method of combined phyto- and electrotherapy (group 1) immediately after the course of physiotherapy was not significantly better than the method of only electrotherapy (group 2) ( $p > 0.05$ ). When assessing the stability of the analgesic action after 1–6 months, it was assumed that the effect is stable at a pain level of no more than 40 mm according to the VAS. From table. 1 shows that one month after the course of physiotherapy, the VAS values in the first group of patients were at a level less than 40 mm and were significantly better than the pain levels in patients of groups 2 and 3 ( $p < 0.05$ ). With diadynamic therapy (group 2), the analgesic effect persisted for less than one month after the course of physiotherapy; in the subsequent periods of observation, the VAS values did not significantly differ from the data on the pain level of patients in group 3 receiving only drug treatment ( $p > 0.05$ ). The proportion of patients with  $VAS \leq 40$  mm during rehabilitation with combined phyto- and physiotherapy (group 1) after 1–6 months was 50–58%. When using diadynamic therapy (group 2), the proportion of patients with  $VAS \leq 40$  mm 1 month after the course of physiotherapy decreased to 45%, and in subsequent periods increased again to 49%, probably due to the effect of chondroprotectors. With drug treatment (group 3), the proportion of patients with  $VAS \leq 40$  mm approached 50% only after 3 months of observation. Thus,

In accordance with the OARSI recommendations, the WOMAC index can also be used for a comparative assessment of the effectiveness of various methods of rehabilitation of patients with OA. We have chosen the total indicator of the WOMAC index, reflecting both the pain syndrome and the functional capabilities of the patients. There was a significant decrease in this indicator by the end of the course of physiotherapy using drug electrophoresis with diadynamic currents (group 1) by 39.8%, diadynamic therapy (group 2) - by 26.1% (Table 1). Comparative evaluation of various methods of treatment of knee OA showed that with the combined use of phyto-physiotherapy (group 1) immediately after the course of physiotherapy, the WOMAC indicator was significantly better than with diadynamic therapy (group 2) ( $p < 0.05$ ) and with drug treatment (group 3) ( $p < 0.05$ ). This picture persisted even a month after the course of physiotherapy. In the long-term follow-up (after 6 months), the WOMAC indices in all research groups did not differ significantly ( $p > 0.05$ ). The stability of the WOMAC index was accepted as satisfactory with its value  $\leq 85$  points. It should be noted that patients in groups 1 and 2 had a stable position of the WOMAC index at a level of less than 85 points in all periods of observation after a course of physiotherapy. In patients of group 3 who have only medication that patients in groups 1 and 2 had a stable position of the WOMAC index at the level of less than 85 points in all periods of observation after a course of physiotherapy. In patients of group 3 who have only medication that patients in groups 1 and 2 had a stable position of the WOMAC index at the level of less than 85 points in all periods of observation after a course of physiotherapy. In patients of group 3 who have only medication

therapy, this index reached the level of 85 points only a month after the completion of the course of complex rehabilitation. The highest proportion of patients with WOMAC index  $\leq 85$  points was noted in group 1 immediately after the course of electrophoresis of the phytocomplex by diadynamic currents and after one month.

The study of the dynamics of the Leken index in three research groups showed that its greatest decrease is observed in group 1 after the complex use of phytoelectrotherapy (by 48.2%) (Table 1). This method of rehabilitation of patients with OA of the knee was significantly better in terms of the Leken index compared to diadynamic therapy (group 2; Lek2, Lek3, Lek4;  $p < 0.05$ ) and only drug treatment (group 3; Lek2, Lek3, Lek4;  $p < 0, 05$ ). The values of the arithmetic mean values of the Lequesne index 6 months after the course of physiotherapy were in the range of 7–8 points and did not differ significantly in all research groups ( $p > 0.05$ ). As a result of laboratory blood tests of patients before the course of rehabilitation and after 1, 3, 6 months after physiotherapy, statistically significant changes in the level of leukocytes were not found ( $p > 0.05$ ). Patients in group 1 showed a significant decrease in ESR and CRP as compared with groups 2 and 3 immediately after the course of physiotherapy ( $p < 0.05$ ).

Health assessment, as well as assessment of the quality of life of patients with OA of the knee joint was carried out using the HAQ index. A significant decrease in HAQ indices was observed immediately after treatment with electrophoresis (group 1 - by 34.9%,  $p < 0.05$ ) and diadynamic therapy (group 2 - by 26.8%,  $p < 0.05$ ) (Table 1). These HAQ indices were and were significantly better compared with the use of medication alone (group 3). The parameters HAQ3,4,5  $\leq 20$  points were accepted as satisfactory (the functional state of the joint was not impaired). In the studied groups, a significant proportion of HAQ1 indicators were below 20, therefore the HAQ3,4,5 values were also satisfactory. The most pronounced steady decrease in HAQ2 parameters was observed with the combined use of phyto and electrotherapy (group 1) compared with other rehabilitation methods (groups 2 and 3) ( $p < 0.05$ ). After 6 months of observation, the HAQ values were at the level of 13.2-13.6 points and did not differ significantly in groups 1-3 ( $p > 0.05$ ).

#### conclusions

A comparative study of the effectiveness of complex methods of rehabilitation of patients with OA showed that the use of electrophoresis of the phytocomplex by diadynamic currents in conjunction with drug treatment has a more pronounced positive effect on pain syndrome, knee function and the quality of life of patients in comparison with drug therapy alone or the combined use of drug treatment and diadynamic therapy. ... This was especially pronounced immediately after the course of physiotherapy and persisted steadily for a month. In the next 3–6 months, the indicators leveled off in all research groups and by the end of the observation did not differ significantly from each other. Similar dynamics of indicators for assessing the arthrological status of patients with OA in complex rehabilitation methods

may be associated with a known distinctive feature of symptomatic slow-acting drugs (chondroprotectors): a delayed onset of clinical effect (usually 2–8 weeks after the start of treatment). It should be noted that no side effects were recorded when using phytocomplex electrophoresis.

#### Literature

1. Rheumatology: national guidelines / Ed. E.L. Nasonova, V.A. Nasonova. - M.: GEOTAR-Media, 2008.-- 720 p.
2. Zorya V.I., Lazishvili G.D., Shpakovsky D.Ye. Deforming arthrosis knee joint: a guide. - M.: Litterra, 2010.-- 320 p.
3. Kotelnikov G.P., Lartsev Yu.V. Osteoarthritis: A Guide. - M.: GEOTAR-Media, 2009.-- 208 p.
4. Ulashchik V.S. Electrophoresis of medicinal substances: a guide for specialists. Minsk. - Belarus: Navuka, 2010.-- 404 p.
5. Physiotherapy: national guidelines / Ed. G.N. Ponomarenko. - M.: GEOTAR-Media, 2009.-- 864 p.
6. Zabolotnykh I.I. Diseases of the joints: a guide for doctors. - SPb.: SpetsLit, 2009.-- 255 p.
7. Korsun V.F. Phytotherapy: Traditions of Russian Herbalism. - M.: EKSMO, 2010.-- 880 p.
8. Babaskin V.S., Babaskin D.V. Development of a phytopreparation for electrophoresis in the rehabilitation of patients with osteoarthritis // Man and medicine: Abstracts. report XVIII Russian nat. Congr. 11-15 Apr 2011 - M., 2011.-- P. 500.
9. Babaskin D.V. Phytophysiotherapy in the rehabilitation of patients with osteoarthritis // Mater. XVI Int. congress on rehabilitation in medicine. Paris, France, Apr 30. - May 3, 2011 / Allergology and Immunology. - 2011. - T. 12. - No. 1. - P. 60–61.

#### Author's address

Ph.D. Babaskin D.V., Associate Professor of the Department of Marketing and Commodity Science in Healthcare, SBEI HPE First Moscow State Medical University named after M.V. I.M.Sechenov.

[babaskind@yandex.ru](mailto:babaskind@yandex.ru)

---

Babaskin, D.V. The effectiveness of electrophoresis of the phytocomplex with diadynamic currents in the rehabilitation of patients with osteoarthritis / D.V. Babaskin // Traditional medicine. - 2012. - No. 4 (31). - S.31-35.

[To favorites](#)