Acta Biomed 2023; Vol. 94, N. 3: e2023734 DOI: 10.23750/abm.v94i3.13459

Physiotherapeutic Complex for the Treatment of Patients with Psoriatic Onychodystrophy

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Abstract. There is a high relevance of improving the rehabilitation of patients with psoriatic onychodystrophy (PsO) due to the high prevalence rate. Target. to optimize the treatment of patients with psoriatic onychodystrophy by including a combination of physical factors in the form of a spark method of high-frequency pulsed D'arsoval current on the nail bed zones and the optical factor of visible electromagnetic radiation in the form of PUVA therapy. Material and methods. The study included 92 patients (46 women and 46 men) with psoriatic onychodystrophy (PsO), which were divided into comparison groups: the first group (Control; n=30 people) received a pharmacological method in accordance with clinical guidelines for this pathology; the second group (Comparison I; n=30 people) received PUVA therapy (systemic against the background of ammifurin); the third group (Main; n=30 people) received combined physiotherapy, including sequential exposure to D'arsoval pulsed current in the spark technique and PUVA therapy (systemic against the background of ammifurin), which made it possible to increase the high clinical effectiveness of treatment. The indicators were monitored immediately after the course of treatment and after 6 months with the evaluation of the results by clinical, visual symptoms, the NAPSI index. The analysis of the obtained data was carried out in Microsoft Office Excel (2018). Differences were considered significant at $p < 0.05$.Conclusions. a spark discharge causes rhythmic fibrillation of myofibrils and vibration of the tissues of the nail plate with the formation of microshock waves in them, which improve metabolic, reparative processes, trophic supply, antipruritic and bactericidal effects [2]. In patients who received course treatment of a combined technique in the form of PUVA therapy and D'arsonval currents on the nail plates, a decrease in the NAPSI index was noted by 73% ($p < 0.01$), against PUVA therapy - by 54.5% ($p < 0.05$) and, against standard drug therapy, by 9% ($p<0.01$).

Keywords: psoriasis, psoriatic onychodystrophy, NAPSI index, PUVA therapy, D'arsonval currents, spark technique.

Introduction

The relevance of research. Damage to the nail plates in psoriasis is much more common than in other pathologies [3, 4, 5, 8, 11]. Currently, Federal Clinical Guidelines have been developed that include all the criteria for evaluating patients, according to the International Classification of the ICF, where it is recommended to use the NAPSI integral index and the dermatological quality of life index (DLQI) to determine the severity of onychodystrophy [7].

It has been established that immunopathological processes in psoriasis are characterized by the production of interleukins (IL)-12 and 23 by dendritic cells, the activation of T-lymphocytes with their subsequent differentiation into T-helpers of types 1 and 17 (Th1 and Th17) and the secretion of the corresponding cytokines [10], which , in turn, leads to inflammation, hyper proliferation of keratinocytes, neovascularization, influx of T cells and neutrophils, and formation of psoriatic plaque and/or psoriatic arthritis [9].
The direct involvement of T cells in the formation of nail lesions in psoriasis has been shown by many researchers. According to a number of authors, it has been established that most of the lymphocytes in perivascular infiltrates in places of psoriatic onychodystrophy are represented by activated T-lymphocytes, some of which have an increased affinity for the epidermis and express various mediators of the immune response and inflammation [10].The influx of activated T-helpers, accompanied by an increase in the number of antigen-presenting Langerhans cells and dendritic cells, indicates a cell-mediated immune mechanism of onychodystrophy in psoriasis.
Due to the fact that recently the special promise of combined pharmaco-physiotherapeutic methods in the treatment of psoriasis has been proven, methods for the treatment of psoriatic complications have been developed, among which onychodystrophy the most is frequently

presented [11]. This raises the question of the importance of assessing the clinical efficacy of new methods of non-drug therapy [2]. The emergence of new scientific data on functional and physiological reserves in patients with PsO, which can be generated by the physical features of the bio potentials of preformed factors, is an extremely promising direction in practical medicine [2].
PUVA therapy on the affected areas of the nail plate has long been used to treat psoriatic onychodystrophy [2]. It is believed that the mechanism of action of PUVA therapy on structurally altered areas of the nail plates due to psoriatic lesions is based on the elimination of excessive growth of Langengars cells and the suppression of immunosuppressive reactions that contribute to the restoration of the cellular matrix of the nail plates [2, 10]. Some authors note that a more effective exfoliation of the nail zones of the lesion can be achieved by the spark technique of D'arsonval currents when they are applied in the form of a high-frequency pulse action (100-110 kHz) of low power (0.02 mA) and high voltage (20-30 kW) and a frequency of 50 Hz on the affected areas of the nail plate [2].

At the same time, attention is focused on the fact that the use of darsonvalization in the area of the nail lesion provides faster separation and exfoliation of the damaged nail, which is extremely thickened and changed in all planes in psoriasis [2, 8]. The mechanism of action of darsonvalization in the spark technique is determined by the generation of reactive oxygen species and the formation of cavitation zones, which not only stimulate increased splitting of dendritic cells and keratinocytes in the nail plates, but also potentiate the sanogenetic-reparative, bactericidal and anti-inflammatory effects due to the effect on bone elements [2].
However, the question arises about the prospects for combining PUVA therapy and spark darsonvalization, since there is reason to talk about the summation of the bio potentials of these physical factors for selective anti-inflammatory, bactericidal, and immunosuppressive effects, since the effect of perverse immune reactivity in psoriasis on distal protein structures has been established [9]. At the moment, such studies in Russia and in the world have not been conducted. At present, the combined effect of PUVA therapy with furocoumarin photosensitizers against the background of spark darsonvalization in psoriatic onychodystrophy has been little studied. The gender aspects of the problem and, accordingly, the features of its effectiveness in combined physiotherapy have not been studied.
The purpose of the study was to optimize the treatment of patients with psoriatic onychodystrophy by including a combination of physical factors in the form of a spark method of high-frequency D'arsoval pulsed current on the nail bed zones and an optical factor visible from electromagnetic radiation in the form of PUVA therapy.
Materials and methods of research: the data of catamnesis according to the medical history of patients with psoriasis treated in the hospital of the Ministry of Defense of the Russian Federation named after A.I. N.N. Burdenko and at the Nika Medica Podology Center (Moscow). To assess the severity and form of the pathological lesion of onychodystrophy, a standardized method for assessing the severity index of psoriasis PASI (Psoriasis area and severity index) and the severity index of damage to the nail plates (NAPSI), the Dermatological Life Quality Index (DLQI Index - DLQI Index - Dermatology Life Quality Index) was used . All patients underwent clinical, laboratory and instrumental examination (laser Doppler flowmetry - LDF, ultrasound examination of the structure of the nail - UST), and dermatoscopy (dermatoscope - Eurolight D30).
Ultrasound examination was carried out in two projections: longitudinal and transverse, using a compact high-resolution linear transducer with a frequency of 15 MHz, which made it possible to identify the most altered nail structures, both with a cross section of at least 5 mm in depth, and with parameters of at least 10 mm in width. , which is important for assessing the predictive value in the effectiveness of treatment
The method of PUVA therapy with psoralent (Ammifurin) was carried out using the PUVA-54 device, the Sibest company, according to the scheme developed for patients with psoriasis [2].

The technique of spark action of D'arsonval currents of high voltage and low force on structurally altered tissues of nail plastics was carried out from the device, "Gezatone" (biolift -4118) generating pulses of 110 kHz, following at a frequency of 50 Hz, of low power (0.02 mA) and high voltage (20-30 kV). The technique is spark, labile-contact, 1 minute for each nail (total no more than 10 minutes per procedure). The course of treatment is 10 procedures every other day (3 times a week). If necessary, repeated courses were prescribed after 1-1.5 months.
Evaluation of NAPSI index indicators, which provide analytical verification of the degree of damage to the nail structures in connection with psoriatic onychodystrophy, was carried out using the NAPSI index (Nail Psoriasis Severity Index) [11], which made it possible to achieve consistency in studying the effectiveness of the therapy.

When evaluating the effectiveness of non-drug treatment of patients with psoriatic onychodystrophy, a study of the integral indicator NAPSI was conducted, which assessed the degree of spread of onychodystrophy

in the nail structures, giving a verdict on the effectiveness of non-drug therapy in parallel. The critical level of significance when testing statistical hypotheses in this study was taken - p = 0.05. When calculating the parametric methods, the Student's t-test was used; to characterize the abnormal distribution of the values of a quantitative and qualitative trait in a particular group, the quartile (Q1; Q3) was used. Data analysis was carried out using the statistical software package Microsoft Office Excel (2018) (USA).

During the study, patients of the first group (Control; n=30 people) received a pharmacological method in accordance with clinical recommendations for this pathology without the use of physiotherapy methods; the second group (Comparison I; n=30 people) received PUVA therapy (systemic against the background of ammifurin); the third group (Main; n=30 people) received combined physiotherapy, including sequential exposure to D'arsoval pulsed current in the spark technique and PUVA therapy (systemic against the background of ammifurin. All patients were examined before and after treatment according to WHO requirements [1, 7].Results the study demonstrates that the severity of onychodystrophy does not correlate with the spread of psoriatic lesions in the skin tissues, since 5.8% of patients with onychodystrophy do not have psoriatic skin lesions (Table 1).

Table 1. Evaluation of the effectiveness of combined physiotherapy in patients with psoriatic onychodystrophy according to the NAPSI index according to immediate and long-term results

Methods physiotherapy	Methods physiotherapy	NAPSI	Veracity
PUVA therapy	1Initial	24,8±3,4	P 1,2>0,05
	2After treatment	24,3±3,4	P2,3<0,01
	3After 6 months	11,3±3,4	P1,3<0,01
PUVA therapy + D'arsonval	1Initial	24,8±3,4	P1,2 >0,05
	2After treatment	24,0±3,4	P2,3<0,01
	3Через 6 месяцев	6,6±3,4	P1,3<0,001
Control	3After 6 months	24,8±3,4	P1,2 >0,05

Note: intragroup difference between indicators before/after treatment - *-p<0.05; **p<0.01, ***p<0.001

In this regard, the severity of the pathology can be assessed by the degree of distal lesions - on the fingers and toes. According to the study, 67.5% of patients with psoriatic onychodystrophy have a generalized lesion of the skin, trunk, hands and feet (p<0.001). At the same time, the generalization of the process of psoriatic onychodystrophy is more significantly (34.5%) presented in the form of dotted depressions, which is consistent with world statistics [9, 10]. The second place in the structure of onychodystrophies is hyperkeratosis (21.5%), which can be the result, along with the NAPSI index in assessing the clinical effectiveness of treatment. When analyzing the index values of NAPSI in patients with varying degrees of severity of psoriatic onychodystrophy, the following results were established: with a mild degree, the average values of the NAPSI index were 7.8 points (p <0.05); with moderate severity - 16.7 points (p<0.01); with severe severity - 40 points (p <0.01).

In our study, a large proportion of patients (82%) had moderate to mild severity. After the use of various methods of physiotherapy, the NAPSI index changed significantly, which may underlie the evaluation of the effectiveness of treatment and the correction of therapy tactics with the choice of methods of physiotherapy and in the preparation of a personalized rehabilitation program for psoriatic onychodystrophy.
The developed combined method for the treatment of patients with psoriatic onychodystrophy is based on high clinical results of effectiveness and statistically significant

criteria for NAPSI index dynamics, confirming the regression of psoriatic lesions.

The most significant contribution to clinical efficacy according to the NAPSI index value is made by a combined method, including PUVA exposure and a spark technique of D'arsonval high-frequency pulsed current (100-110 kHz) of low power (0.02 mA) and high voltage (20-30 kV) following with a frequency of 50 Hz - ($p<0.001$). After applying the combined technique, a statistically significant decrease in the areas of structural damage to the nail plates was noted by an average of 73% ($p <0.01$), which was confirmed by long-term results on NAPSI index values in PsO patients. New scientific data have been obtained on the selective effect of the D'arsonvalization spark technique on structurally altered zones of the nail plates, which confirms the fact that with the spark technique of applying a cavity electrode, spatial streamers (thin branched channels of ionized air) appear between it and the nail, which provoke the formation in the skin of foci of micronecrosis, stimulating reparative, defibrosing and antioxidant processes with the activation of biologically active substances (prostaglandins, cytokines, histamine) of anti-inflammatory and sanitizing orientation. The spark technique stimulates phagocytosis and ensures the destruction of the shells of microorganisms, forming bactericidal, trophic and anti-inflammatory effects. Conclusions: a spark discharge causes rhythmic fibrillation of myofibrils and vibration of the tissues of the nail plate with the formation of microshock waves in them, which improve metabolic, reparative processes, trophic supply, antipruritic and bactericidal effects [2]. In patients who received course treatment of a combined technique in the form of PUVA therapy and D'arsonval currents on the nail plates, a decrease in the NAPSI index was noted by 73% ($p <0.01$), against PUVA therapy - by 54.5% ($p <0.05$) and, against standard drug therapy, by 9% ($p<0.01$).

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