EFFICIENCY OF ELECTRO STIMULATION BY DIADENS-T DEVICE IN THE PATIENTS WITH RETINAL DISEASES

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Alternative medicine in the ophthalmology field is widely adopted in treatment of different pathological conditions: from dry eyes syndrome to pathology of retina, and especially, pigmentary retinopathy, gerontal central degeneration, degenerative myopia, glaucoma,and optic nerve atrophy.

Purpose of our research is to evaluate an efficiency of electrostimulation with the help of the DiaDENS-T apparatus in patients suffering from diseases of the retina.

Materials and methods -

The research was carried out in the period from May to September in 2006; 10 patients were included into it: 8 women and 2 men; average age was 58.2 ±17 years (27-76 years old). All the patients suffer from retinal pathology of degenerative type, particularly: pigmentary retinopathy (RP), senile direct degeneration (DMS), atrophic and vascular, glaucomal neuropathy (NOG) (table 1).

Table 1.

Name	Age (in years)	Sex	Pathology
N.K.	27	F	Optical preatrophy
D.K.	35	F	Pigmentary retinopathy RP
C.R.	46	F	Pigmentary retinopathy RP
D.R.	57	F	Glaucomal opticopatia NOG
A.L.	62	F	Pigmentary retinopathy RP
L.G.	65	M	Pigmentary retinopathy RP
N.D.	65	F	Pigmentary retinopathy RP
G.F.	72	M	Vascular DMS
A.T.	77	F	Atrophic DMS
R.S.	76	F	Atrophic DMS

All the patients had either severely impaired vision or average impaired vision.

Criteria of the inclusion to the research: visually impaired patients with AV < 3/10 (logMAR 0.54) with the fields of view <30%; with the stable retinal pathology which existed for not less than 9 months; absence of inflammatory eye diseases in an acute condition.

Elimination criteria: presence of the heart pacemaker, metal clamps or other material sensitive to electromagnetic stimulation, including the ones that are the result of surgical interventions; surgical interventions in the eyes for the last 6 month.

The following examinations were done to all the patients in the beginning and in the end of treatment: acuity of vision determination (AV) into the distance and close to the object, biomicroscopy of the posterior segment, intraocular pressure measuring with the help of Goldmann device, and fundus of the eye examination.

Parameters that are being estimated: AV p.1 and p.v., microperimetry (microperimeter MP-1 Nidek Technologies, Italy), fields of vision H:30 (HFA II) and optic coherence tomography (OCT II ZEISS) - in case of microperimetry implementation impossibility (single patient).

Microperimetry data , compliancy of the patients and quality of life improvement were evaluated not only in terms of visual acuity, but first of all in respect of personal everyday habit preservation and fulfilment of ordinary obligations.

All the patient were informed of the experimental character of the treatment and gave written consent.

Patients were evaluated at the beginning of treatment ; 1 week later, 3 weeks later and then 6 weeks after the treatment was started.

Patients received dynamic electroneurostimulation (DENS) with the help of DiaDENS-DT electrostimulator and the remote paraorbital electrode DENS-glasses in accordance with the methods presented:

- Patient sat comfortably, on the paraorbital area where the remote electrode DENS-glasses was applied, which was connected with the DiaDENS-T device;
- DiaDENS-T was set up in a "therapy" mode at 20 or 60 Hz stimulation frequency at a comfortable application intensity;
- The treatment continued 10-15 minutes during 3 to 5 days a week.

During the treatment it is necessary to make sure that all the electrodes of the DENS-glasses tightly abut on the skin.

Average duration of the treatment made up 8±2 weeks.

The results of the research

9 people out of 10 patients finished the treatment, only one patient left the research after the third week of treatment because of personal reasons. We carried out a classical perimetry instead of microperimetry for one of the patients.

No unfavorable results were determined during the control process. Perceptiveness of treatment with the help of DiaDENS-T apparatuses was astonishing.

At the end of every week of treatment patients made a report where they had to include some data about their degree of satisfaction of treatment, any unpleasant sensations or complications,

None of the 10 patients found the treatment burdensome or painful; 8 people stated that they were very pleased with 2 people who were merely satisfied.

By the end of the treatment 7 patients described the state of eye comfort, reduction of edema in a paraorbital zone among the sensations they experienced.

Patients that suffered from pigmentary retinopathy (C.R., N.D.) had acute eyesight deficiency and tubular field of vision, noted that they started to see more light and distinguished objects and peoples features better after the treatment.

Patient N.K., that suffered from optical subatrophy as a result of postalcoholic neuropathy noticed that owing to the treatment he managed to read easier. We also registered an ncrease in reading speed of this patient.

AV of 4 patients was steady during long periods of time without signs of deterioration when evaluating vision parameters; no statistically significant changes were registered. 4 patients among the rest noticed a visual acuity improvement; they managed to read 3 letters out of 5 of the same Snellen line, and 2 patients noticed AV improvement of one Snellen line.

Microperimetry allowed us to evaluate DENS treatment efficiency taking time into consideration, with qualitative and quantitative fixation evolution on the basis of retinal sensitivity.

All the patients who suffered from atrophic and vascular DMS (A.T., R.S., G.F.) demonstrated the presence of absolute scotoma in the atrophied retina area or subretinal blood supply at t-0 with unstable peripheral fixation when having micrioperimetry done. Microperimetry evaluation of these patients on the 1-st, 3-d and 6-th week of treatment demonstrated stabilization of the retinal point of fixation (PRL). Differences between stability of fixation at t-0 and after 6 weeks gave a statistically significant result ($p=0.004$). Density of points of fixation in 2 g. decreased in some cases and stayed permanent in others.

Peripheral fixation of patients who suffered from pigmentary retinopathy with acute eyesight deficiency (<1,30 logMAR) appeared to be unstable during all the time without significant changes before and after 6 weeks of treatment.

One patient who suffered from pigmentary retinopathy (L.G.) did not have a chance to have a microperimetry because a nystagmus was detected, and that hampered the eye movements. In spite of the difficulties caused by nystagmus, an automatic perimetry was carried out for this patient, field of vision was H:30 (Heidelberg) and OCT (Zeiss II) before the treatment on the 6-th week.

Reduction of depth of scotomas was registered in 2 patients because they perceived the stimulus in stated zones with the reduced intensity. Retinal sensitivity of the rest of the 8 patients stayed unchanged with the stimulus at the same intensity.

Retinal sensitivity analyses demonstrated that some zones with the atrophy of eye grounds could have certain functionality, and this functionality could grow due to DiaDENS-T apparatus stimulation. Improvement of retinal sensitivity was registered in 2 patients, though this is not a statistically significant result.

Time, that was necessary for examination implementation, was one more parameter that we evaluated when having microperimetry done. All the patients (100 %) showed progressive reduction of time that was necessary for microperimetrical research accomplishment, in average from 15.19±2.25 min at t-0 to 14.25±2.63 min, 13±2.60min, 11±2.73 min correspondingly after 1, 3 and 6 weeks of treatment.
The different average time of examination implementation at t-0 and 6 weeks of treatment is statistically reliable ($p < 0.001$).

Discussion of the research results.

It is important to remember that we involved patients with severe and average degree of a disease, and their eyesight deficiency was at the severe stage. All the patients that were chosen for our research suffered from retinal pathologies.

It becomes apparent from our research that electrostimulation of the area around the eyes is able to improve PRL stabilization, but does not reliably improve a visual acuity. A significant PRL stabilization is achieved after timely rehabilitation which follows from the purpose of our research.

We can affirm that DENS treatment is able to impact very different pathogenetic mechanisms that underlie degenerative retinopathy and could positively influence them.

The results that were achieved, could possibly be explained through metabolic process increase and retinal sensitivity improvement, as it is seen from the results of microperimetry of 2 patients.
Transcutaneous electrostimulation apparently impacts an optic blood supply and cellular metabolism. Such treatment could slow down progression of degenerative diseases that are characterized by metabolic cellular disfunction.

DENS apparatus could also be very important for glaucomal neuropathy and for EPR-photoreceptors defense when having pigmented retinitis and senile direct degeneration.

DENS effect is high in treatment and prevention of degenerative retinal disorders. Some mechanisms of action could affect the reasons of physiopathology of degenerative retinal disorders that we researched.

Electrostimulation of areas around the eyes should be considered an efficient therapy not only for rehabilitation of visually impaired people, but also as an auxiliary therapy for prevention and treatment of degenerative retinal pathology.

The practicality of DiaDENS-T apparatus and convenient application of special remote electrodes in the form of glasses make the treatment extremely simple and original in comparison with other TENS devices.

As a wish. It is necessary to extend our research and increase the number of patients in order to evaluate an efficiency of the therapy also in the environment of visual acuity improvement with all the variants of retinal pathology.