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Magnetostymulacja wspomagająca leczenie zapalenia błony naczyniowej u dzieci – prezentacja przypadku

Extremely Low Frequency Magnetic Field (ELF-MF) Stimulation as a Supporting Treatment of Uveitis in Children – Case Report

Puchalska-Niedbał Lidia, Kulik Urszula

Department of Ophthalmology, Pomeranian Medical University, Szczecin, Poland
Head: Professor Lubiński Wojciech, FEBO, MD, PhD

Summary Purpose: Uveitis requires a more prolonged treatment period in children than in adults. Despite management it continues to reoccur when steroids are tapered or discontinued, and then advancing to steroid-sparing immunomodulatory therapy is required. The role of extremely low frequency magnetic field (ELF – MF) as a support to steroid therapy is reviewed. Firstly, the ELF – MF affects the structure of biological membranes and processes of the membrane ion transport. Secondly, it activates cellular respiration by increasing oxygen uptake by the cell itself. It also affects the blood cell which changes in the magnetic field and reaches the narrowest capillaries. Lastly, it contributes directly or indirectly to increase the resistance of local and systemic tissue as well as it has the antioedematous and analgesics effects.

Material and Methods: Our patient had onset of asymptomatic, unilateral (VOD=0.3, not correctable), intermediate uveitis at the age of 8 years. An idiopathic diagnosis was made due to tailored and individualized diagnostic approach. Basic therapeutic principles involved steroids, adding nonsteroidal anti-inflammatory agents and iontophoresis with KI, however a certain aggressiveness to therapy, advocated approach with oral steroids had to be implemented in a while. In patient in whom uveitis continued to reoccur when steroids were discontinued, therapeutic strategies did not induce durable remission, as a supporting treatment we decided to apply in the 5th year of therapy extremely low frequency magnetic field using Viofor JPS device. Once a day a large applicator was applied to the whole body, while an elliptical applicator (a device producing ELF – MF with the maximum induction = 45 μ T and impulses frequency = 180–195 Hz) on the eye. Period of application was 10 months.

Results: After 3 months of magnetostimulation the use of steroids was abandoned. The visual acuity changes from 0.3 to 1.0 in the right eye were documented. Additionally, after 10 months of ELF – MF application, there was no recurrence of uveitis in the 4 year follow-up.

Conclusions: Frequent use of ELF – MF may shorten considerably treatment, and strengthen the immune system. The analgesic, anti-inflammatory, regenerative, Viofor JPS magnetic stimulation can reduce the amount of anti-inflammatories agents.

Słowa kluczowe: magnetostymulacja, zapalenie błony naczyniowej, dzieci.

Keywords: magnetostimulation, uveitis, children.

Introduction

The course of pediatric uveitis deserves special attention due to the encountered therapeutic challenges. Regardless of the cause, there is only limited number of randomized controlled clinical trials that can guide therapy in pediatric uveitis based on evidence-based practice. The treatment begins with corticosteroids, topical initially for the anterior forms and subsequently oral, when that fails, or in the presence of posterior disease. The approach to persistent ongoing uveitis usually is aggressive therapy with steroids (oral/parenteral route). Nevertheless systemic steroids are seldom a long-term therapeutic option for children due to medication-related side-effects, such as the tendency to induce ocular hypertension and cataracts, suppression of the hypothalamic-pituitary-adrenal cortex, osteoporosis, aseptic necrosis of bone growth disorder, secondary infections and behavioral disorders (1, 2).

Furthermore there are a few well documented pediatric reports, which state that methotrexate (a folate analogue that inhibits dihydrofolate reductase, inhibiting the production of tetrahydrofolate, which is necessary for DNA synthesis) might become therapeutic agent of choice for children who fail to adequately respond to basic treatment (3, 4). Although those agents may offer temporary favorable effect, as follow up is extended it is shown that patients sometimes have active disease beyond childhood, relapses years after discontinuing the drug, leading to serious complications (5).

This paper explores new therapeutic options and will therefore concentrate on extremely low frequency magnetic field (ELF – MF) as a complementary therapy in pediatric uveitis. Several authors have reported a favorable response to ELF – MF in e.g. chronic diseases, injuries, fractures, pain, inflammation and insomnia. High efficiency (due to its actions namely vasodilation, analgesia, anti-inflammatory, diastolic, acceleration of healing, antioedematous), safety and innovative design

The analgesic effect of ELF – MF application takes place mainly through increased secretion of endogenous opioids from the group of β -endorphin, a substance responsible for the increase in the threshold of pain sensation. During exposure to ELF – MF feel less pain, but also after exposure. Such a mechanism for internal analgesic opioid system confirms the effect of blocking the opiate antagonist (Naloxone). Woldańska-Okońska et al. described the use of Viofor JPS in the treatment of spinal pain (11). Similarly, Ciejka et al. (12) reported the augmented mobility of peripheral joints and spine, reduced administration of pain medication and increased daily activity of participants after Viofor JPS treatment. Furthermore, its' analgesic action in patients with acute or chronic musculoskeletal pain syndromes of different etiology (degenerative changes of the spine, migraines, arthritis overload, injuries of the bone-joint) was assessed by Jankowska et al. (13). Moreover ELF – MF as a supporting treatment of pain associated with facial neuralgia and arthritis of the temporo-mandibular joint was evaluated by Jedrzejewski et al. (14). Staś-Rzendkowska et al. (15) reduced patient's pain in different disorders namely arthritis, Sudeck syndrome, polyneuropathy in the course of blood circulation disorders, post-traumatic neuropathic pain and osteoporosis.

The basis of the effects of regeneration is primarily intensification of oxygen utilization and tissue respiration due to increased diffusion and uptake of iron by hemoglobin and cytokines. Increased oxygen uptake is associated with stimulation of the processes of tissue respiration, DNA synthesis and accelerated mitotic cycle. Jedrzejewski et al. (16) described the impact of regenerative and anti-inflammatory properties of ELF – MF to the skin, vascular and nervous tissue. Sieroń (17) recommended use of ELF – MF in changes in muscles and joints. Aziz et al. (18) created a systematic review of randomized trials of adjuvant therapy, the healing of chronic wounds (leg ulcers) using electromagnetic field. The authors emphasized the ambiguity of

solutions allowed us to implement this approach in a child with persistent, recurrent idiopathic uveitis with good clinical outcome.

Case study

An 8-year-old boy presented to our Department of Ophthalmology complaining of 10 days of blurred (decreased) vision in the right eye. History of possible systemic disease and ocular manifestation was negative. The patient denied having eye pain, redness, photophobia, or irritation. At the initial examination, the visual acuity was 0.3 (right eye) which was not correctable and 1.0 (left eye). Biomicroscopic examination of the affected eye showed no significant positive findings of anterior segment, namely the bulbar conjunctiva was white and transparent, anterior chamber clear and cornea transparent. Furthermore, pupil was normal in size or shape and reactive to light, and no lens opacification was seen. However dilated fundoscopic examination demonstrated trace vitreous cells and haze. Diagnostic B-scan ultrasound revealed changes in the vitreous and attached retina. No abnormalities were seen in the left eye.

Initial laboratory investigations were unremarkable (complete blood count (CBC), erythrocyte sedimentation rate (ESR), c-reactive protein (CRP), angiotensin converting enzyme (ACE), anti-neutrophil cytoplasmic antibody (ANCA), leukocytes, liver function test, rheumatoid factor, purified protein derivative of tuberculin (with anergy panel), Toxoplasma IgG and IgM and Toxocara enzyme-linked immunosorbent assay (ELISA) with Toxocara excretory-secretory antigen (TES-Ag) showed no abnormalities. Moreover, there was no evidence for an active infection with cytomegalovirus (CMV), HSV, VZV and Rubella. Radiological chest examination was normal. Uveitis was classified as "idiopathic" because no specific cause was found.

The pharmacological treatment consisted initially of corticosteroids eye drops, non-steroidal anti-inflammatory agents, and iontophoresis with KI. Despite frequent administration of steroids the patient failed to respond adequately to the therapy. The uveitis was refractory to treatment therefore the therapy was escalated with oral steroids. The response was good, it decreased the severity of uveitis and improved visual acuity caused by the reduction of exudate in the vitreous. Following corticosteroids withdrawal ocular inflammation rebound occurred (exudate in the right vitreous). The patient had recurrent, inadequately suppressed uveitis with major drop of vision requiring systemic corticosteroids uptake for 5 years.

In the 5th year of therapy in spite of oral steroids the ELF – MF was added to treatment, due to poor inflammation control, namely relapses of uveitis at the time of steroid withdrawal. Once a day a large applicator was applied to the whole body, simultaneously an elliptical applicator on the eye [VIOFOR JPS (a device producing ELF – MF with the maximum induction = 45 μ T and impulses frequency = 180–195 Hz)]. A gradual improvement in visual acuity (Snellen chart OD=0.5), reduction of exudate in the vitreous were observed already after 3 weeks of the treatment. One month after magnetic field therapy introduction, the dose of steroids began to be gradually lowered and withdrawn after 4 months. After 3 months of ELF – MF administration the use of steroids was abandoned, simultaneously we began to gradually reduce the frequency of the magnetic field application to 2–3 times a week and starting with 6 month till once a week. Additionally, after 10 months of ELF – MF application the changes in VA from 0.3 to 1.0 in the right eye were documented. During the entire follow-up period, 4 years after ELF – MF application, intraocular inflammation remained suppressed.

Discussion

The clinical presentation of uveitis in adults and children varies. The diagnosis of potentially sight-threatening uveitis is often delayed in youngsters, due to the "silent" nature of the disease, and amblyopia, which may occur in children under 10 years of age. Moreover chronic, undetected or chronic, undertreated uveitis merits special considerations because it frequently results in glaucoma and in retinal complications. Additionally, 2 of the most common causes of pediatric uveitis, namely juvenile idiopathic arthritis and sarcoidosis, are also 2 of the most devastating, with some of the poorest outcomes resulting from undertreatment.

The inventors of Viofor JPS are Jaroszyk (6) who developed the basic characteristics of the temporary electrical signals and their combinations based on biophysical phenomena occurring during the interaction of ELF – MF on living matter, Paluszak (7) who was responsible for biochemical analysis – physical interaction of signals designed to living organisms and Sieroń (8) who developed methods of application and analyzed the signals

the results involving the inference about the effectiveness of therapy in the absence of significant differences between the study group and the placebo or the demonstration of statistical significance in the study of low reliability (due to the large loss of patients with follow-up, small populations). The beneficial effects of the impact of ELF – MF patients treated for chronic wounds and ulcers of various etiologies confirmed Cieřlar et al. (19) and Sieroń et al. (20).

It should be emphasized that improving the outcomes for children with uveitis is going to require early and aggressive anti-inflammatory therapy, earlier case detection, and better coordination of care among ophthalmologists, pediatricians, and rheumatologists experienced in immunomodulatory agents use. In severe cases of uveitis magnetic stimulation should be considered as a method of supporting and facilitating (speeding) treatment is essential. Used briefly it gives a momentary improvement, furthermore long term administration can give a long remission of the inflammatory processes. Viofor is best suited for those who prefer non-invasive methods, or they simply need it.

Conclusions:

1. In severe and chronic cases of uveitis in children, the Extremely Low Frequency Magnetic Field (ELF-MF) stimulation should be considered as a supporting and accelerating method of treatment.
2. The Extremely Low Frequency Magnetic Field (ELF-MF) properly applied in patients with uveitis may substantially reduce the steroids application period and ensure long remission.

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and clinical aspects of their effects on humans.

ELF – MF is used in the treatment of a number of conditions including eye diseases. It causes several different effects in the body such as mainly the reduction of inflammation, analgesia (relief of pain), the prevention of clotting, and the reduction of edema. Sieroń et al. (9) described use of magnetic stimulation in diabetic retinopathy. Magnetic field changes structure of the liquid crystal components of cell membranes and the enzymatic activity of membrane pumps, which significantly reduces the permeability of the membrane and increases the anti-inflammatory and antiedematous effect. They also describe vasodilatation and antycoagulation properties whereas they help to improve blood circulation in the retina and reduce the occurrence of thrombosis.

Hadław-Durska et al. (10) reported significantly decreased intraocular pressure after ELF – MF application in patients with glaucoma. Pressure-lowering effect of magnetic stimulation is multidirectional and complex, they assumed it may be due to the impact of the field on the intercellular membrane transport. They hypothesized that the magnetic field reduces the activity of the ATP-dependent sodium-potassium pump, which leads to inhibition of the active transition of sodium and potassium ions, the effect decreases the production of aqueous humor. Also they mentioned that activation of acetylcholine synthesis and stimulation the parasympathetic nervous system activity in the magnetic field can reduce intraocular pressure.

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Adres do korespondencji/ Reprint requests to:
dr hab. n. med. Lidia Puchalska-Niedbał (e-mail: lidianiedbal@tlen.pl)

Katedra i Klinika Okulistyki PUM
al. Powstańców Wielkopolskich 72, 70-111 Szczecin, Poland

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