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New Methods of Diagnosis and Therapy of Cerebral Palsy Patients

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Abstract

Despite the development of medicine,the cerebral palsy remains one of the most frequent neurological disorders. Long-term care focused on achieving the patient's maximum independence is still a challenge for the entire therapeutic team. Therefore, it is understandable thatnew support opportunities are searched for, which previously made it possible to achieve positive effects in patients with other disorders or were successfully used in training of healthy people.

The selected, new forms of diagnosis and therapy proposed for patients with cerebral palsy reported in literature in the last 5 years are briefly presented.

These include transcranial brain stimulation previously used in patients with mental disorders, vibratory training and video games, which were initially a part of training or stimulation of healthy people as well asfascial and visceral therapy, gaining popularity and suggested also for neurological patients. Moreover, the Medek method is described as a new form of work developed for patients with cerebral palsy.

Analysis of the literature has indicated the pre-positive effects ofthe proposed forms of therapy. The study carried out using the above-mentioned methodsalso included functional assessment of patients. However, the work was preliminary and involved only a few groups of patients, hence the need to conduct a broader study evaluating possible events and adverse effects.

Key words: infantile cerebral palsy, physiotherapy

Introduction

Cerebral palsy (CP) is a group of permanent disorders of movement and posture development limiting the functions, ascribed to non-progressive disruptions to the development of the brain of a foetus or an infant.Motor disorders in cerebral palsy can be accompanied by dysfunctions in sensation, perception, cognition, communication and behaviour, as well as by epilepsy and secondary musculoskeletal problems [1].

The incidence of cerebral palsy in Europe is close to 1.77 per 1000 live births (compared to 1.9 in the 1980s) [2]. Despite a general slight downward trend, the available data indicate that currently a special group of patients at risk of CP are premature babies. In this group, cerebral palsy is the most frequently diagnosed neurological disorder in newborns born before the 32nd week of pregnancy [3].

The incidence of CP is inversely proportional to the gestational age. During the last 10 years it fluctuated between 8-12% in the population of babies born before the 32nd week of gestational age and 17-18% in those born before the 28th week of gestational age (however, the incidence of CP has recently decreased) [4].

The databases of PubMed, PEDro, Cochrane Library and Google Scholar. Articles were searched

for papers describing patients with cerebral palsy both, adults and children. The methods of diagnosis and therapy that are not currently part of standard practice were presented. The literature review includedarticles published within the last 5 years.

The development of medicine, greater availability of new methods, as well as the use of new technologies in physiotherapy of patients with infantile cerebral palsyextend the scope of support for these patients with new forms of therapy, e.g.: transcranial magnetic stimulation (TMS), vibration training, video games, fascial therapy, visceral therapy, and MEDEK therapy.

Transcranial magnetic stimulation (TMS)

Transcranial magnetic stimulation (TMS) is a tool used to examine neuronal activity and to treat mental disorders.Repetitive TMS (rTMS) is a non-invasive technique of brain stimulation using magnetic impulses. Preliminary research has demonstrated the effectivenessof rTMSin facilitating motor functions, therefore, the effectiveness of rTMS in improving motor activity in spastic cerebral palsy has been studied.

In one of the studies, TMS supplemented physiotherapy in the examined group (the control group underwent physiotherapy only). The findings have demonstrated a significant improvement in motor function in the examined group; the assessment was carried out according to the GMFM scale [5].

Some other studies(on a limited number of subjects) were focused on the use of TMS diagnostically in children at risk of cerebral palsy[6]. It has been stressed thatpaediatric patients require special attention in the use of brain stimulation techniques due to developmental variability, diagnostic difficulties, as well as not fully estimated risk of adverse events [7].

Vibration training

The application of local vibration techniques has been an element of physiotherapy of CP patients for years. However, it is emphasized that evena local vibration application can cause side effects - an increase in the occurrence of abnormal symptoms [8].

Vibration training was initially introduced as a training for people without neurological disorders. In cerebral palsy patients, the training is conducted for a short span of time (several minutes) and depends on the patient's ability and condition.The use of vibration training improves bone density, gait speed and standing balance. The results of the assessment on the functional improvement of mobility are ambiguous, both significant changes and irrelevant changes were recorded, as compared to the control group [9,10,11].

Video games

Tanks to new technologies, the therapy administered can be more attractive to patients, also at home settings. Moreover, games using virtual reality are an interesting therapeutic tool due to lower costs.

The findings of research carried out among cerebral palsy children aged 5-18using games as a supplement to physiotherapy, havedemonstrated some improvement in postural balance and functioning of patients. Interestingly, functional improvements in both small and large motor skillsareobserved, although large motor skillsimprove to a lesser extent.A low riskof adverse events during therapies or a great joy when the form of play can be selected to suit the patient's preferences are emphasized. Nevertheless, the use of video games is a complement to and not a substitute forphysiotherapy [12,13].

Fascial therapy

Fascial therapy is intensively and widely used and is also recommended for to neurological

patients, including patients with cerebral palsy. Research in this area is limited, but its results suggest positive effects.

There are data showing positive results of fascial therapy in pre-school children with cerebral palsy. The improvements concern the walking pattern - an increase in stride was observed, which is very important in this group of patients, and foot loading. Interestingly, positive changes were also observed 3 months after the end of therapy[14].

Studies aimed at assessing the effect of fascial therapy on upper limb mobility in school-aged patients with cerebral palsydemonstrate improvement in mobility of the upper limb and reduction of hypertension. However, no significant functional improvement is observed[15].

Urological and anorectal problems

According to the data available, 50-80% of CP patients suffer from urinary system dysfunctions. Furthermore, CP patients are afflicted by defecation disorders – troublesome constipation and faecal incontinence. Urological and anorectal problems, often undiagnosed, are of great importance for the quality of life of patients[16,17].

Selected visceral techniques used in patients with cerebral palsy have been found to relieve chronic constipation and provide support or an alternative to pharmacological treatment. Due to the limited number of patients, further research is needed[18].

The importance of correlation between postural control, abdominal surgery and urinary output control is alsounderlined. Moreover, it is emphasized that the pelvic floor muscles function properly and that normal urinating habits develop in childhood [19].

The MEDEK method

MEDEK is a dynamic method of kinetic stimulation, the guidelines of which were formulated by Ramon Cuevas in Chile.The method is based on stabilization of the body in space in response to strong vestibular stimulation, and does not demand concentration or cooperation of the patient with the therapist.The therapy is focused on reaching of the independent sitting and standing positions.The method differs from the classical approach. A therapist introduces a patient into a very dynamic movement which is supposed to induce the head and body control. It is assumed that hypertonia which may occur is not a negative symptom.A limitation is height and age of a child whom the therapist is able to guide (to hold and move the child for a long time without using equipment) [20].

Studiesfocused on this method are scarce; mainly case reports or assessment of few groups of patients are available.However, there are findings demonstrating positive and quick effects of this form of therapy in pre-school patients diagnosed with spastic cerebral palsy. Nevertheless, there is no long-term research or identification of possible threats connected with such a dynamic therapy [21].

New options of therapy enable functional improvement of the patient's condition and their forms areoften more interesting or easier to accept for patients. Nevertheless, evidence of the effectiveness of the presented forms of therapy is quite limited. Further studies are required to determine the effectiveness and safety of new therapy techniques [22].

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