

EFFECTS OF PHYSICAL AND VIBROACOUSTIC THERAPY IN CHRONIC PAIN IN JUVENILE ARTHRITIS

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Abstract

Objectives. The study aimed to evaluate the response to physical and vibroacoustic therapy by studying the Simplified Disease Activity Index (SDAI), together with the psychobehavioral manifestations in moderate and severe forms of juvenile idiopathic arthritis (JIA).

Material and method. 68 children with JIA were randomly divided into two groups. Group I (34 patients) received physical and vibroacoustic therapy with type BRS-2 Bodysonic System. The protocol consisted in vibroacoustic therapy, administrated for 20 minutes per day, 10 days consecutively, and then, one session of 20 minutes per week, up to 12 weeks, together with individualized physical therapy and conventional drugs. Group II (34 patients, witness group) received only conventional therapy (individualized physical and pharmacological therapy), as the vibroacoustic therapy was performed in placebo mode.

Results. In Group I, changes in SDAI score resulted in the reduction of the disease activity from severe to moderate, and the decrease in anxiety, chronic fatigability and depressive tendency, with statistically significant differences compared to the witness group.

Conclusions. Vibroacoustic therapy is a revolutionary tool in the field of multidisciplinary management of chronic pain in JIA and triggered a noticeable diminution of the SDAI score, decreasing the disease activity from severe to moderate and the psycho-behavioral manifestations, with great statistically significant difference to the witness group ($p < 0.0001$).

Key words: pain, vibroacoustic therapy, juvenile, arthritis

Rezumat

Obiective. Scopul studiului a fost evaluarea răspunsului la terapia fizică și vibroacustică prin utilizarea Indexului Simplificat de Activitate a Bolii (ISAB) și a manifestărilor psihocomportamentale în forme moderate și severe de artrită juvenilă idiopatică (AJI).

Material și metodă. 68 de copii cu AJI au fost împărțiți randomizat în două grupuri: Grupul I (34 de pacienți) a primit terapie vibroacustică cu sistemul BRS-2 Bodysonic, administrată 20 de minute pe zi, 10 zile consecutiv, iar apoi, o ședință pe săptămână, timp de 12 săptămâni, împreună cu kinetoterapie individualizată și mijloace farmacologice convenționale. Grupul II (34 de pacienți, martor) a fost tratat convențional (kinetoterapie individualizată și medicație), împreună cu terapie vibroacustică placebo.

Rezultate. În grupul I, indexul simplificat de activitate a bolii a demonstrat reducerea activității de la severă la moderată și descreșterea anxietății, oboselii cronice și a manifestărilor depresive, cu diferențe statistice semnificative față de lotul martor.

Concluzii. Terapia vibroacustică constituie o metodă revoluționară în managementul multidisciplinar al durerii cronice din AJI și a determinat reducerea semnificativă a indexului simplificat de activitate a bolii și a tulburărilor psiho-comportamentale, comparativ cu grupul martor ($p < 0,0001$).

Cuvinte cheie: durere, terapie vibroacustică, artrită, juvenilă

INTRODUCTION

Juvenile idiopathic arthritis (JIA) is a chronic autoimmune disease of unknown etiology. It is estimated that JIA affects up to 1 in 1,000 children

worldwide and is the most common cause of autoimmune musculoskeletal diseases in children (1).

By definition, children with JIA have disease onset prior to age 16 years, and present with joint pain,

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stiffness and swelling that persists for longer than 6 weeks (2).

At the moment, the multifactorial etiopathogenic theory accepted by most authors indicates a subject with certain genetic predisposition, associated with the intervention of an environmental factor, which is then self-sustained by immune mechanisms (3, 4).

Arthritis is characterized by synovial proliferation and the formation of granular tissue, which leads to progressive destruction of the joint structures (5).

JIA is triggered by a multitude of pathogenic events, which lead to the clinical symptoms of arthritis, such as chronic pain and swelling, joint damage and disability (6).

The treatment goal for JIA is to achieve disease remission and facilitate normal childhood activities, growth, and development (7).

The treatment should be performed by a multidisciplinary team, together with the active participation of the affected children and their families, from the very beginning. The fundamental measures must consist of diet, hygienic measures, pharmacologic therapy, physical therapy, psycho-social integration and somatic growth problems prevention (5, 7).

In order to control the chronic pain, it is essential besides allopath medicine, to take advantage of some complementary methods, like: vibroacoustic music therapy, aromatherapy, reflexology, psycho-behavioral therapy, in a holistic approach (8, 9).

In vibroacoustic (VA) therapy, the relaxing effect music has on the soul and mind is amplified by the relaxing effect acoustic vibromassage has on the body, producing a deep state of relaxation very quickly. The principle of vibroacoustic therapy is the conversion of musical melodies and rhythms into waves that can be felt within the patient's body. Deeply soothing low frequency sounds (less than 120 Hz) are conducted to the body as vibrations, while the same sounds are experienced by the patient's auditory system (10, 11).

We aimed to evaluate the response to physical and vibroacoustic therapy by studying the Simplified Disease Activity Index (SDAI) (12), together with the psychobehavioral manifestations in moderate and severe forms of JIA.

MATERIAL AND METHOD

Between 10.04.2009 – 11.10.2010, 68 children were included in the study. The subjects were between 9 and 16 years of age, and were diagnosed

with JIA – extensive oligoarthritis and polyarthritis types, moderate and severe forms. The diagnostic criteria took into account the precise definitions for the different types of JIA (13).

The patients were randomly divided into two groups. Group I (34 patients) received physical and vibroacoustic therapy with type BRS-2 Bodysonic System (14). The protocol consisted in vibroacoustic therapy, administered for 20 minutes per day, 10 days consecutively, and then, one session of 20 minutes per week, up to 12 weeks, together with individualized physical therapy and conventional drugs. The vibrating probe was placed on the body, along the spinal cord and on the painful areas of the affected joints. The vibrations stimulated the cochlea, respectively the cortex, by the use of headphones.

Group II (34 patients, witness group) received only conventional therapy (individualized physical and pharmacological therapy), as the vibroacoustic therapy was performed in placebo mode.

As a disease activity quantification (Table I), we used the Simplified Disease Activity Index (SDAI), which is the numerical sum of five outcome parameters: Tender Joint Count (TJC) and Swollen Joint Count (SJC) – (based on a 28-joint assessment), Patient's and Family's Global Assessment (PGA) [visual analogue scale (VAS) 0–10 (0 = best health status and 10 = worst possible health status)] and Physician's Global Assessment (MDGA) [visual analogue scale (VAS) 0–10 (0 cm = absence of the disease and 10 = most severe disease)] and level of C-reactive protein (CRP) [mg/dl, normal <1 mg/dl]. Formula of the SDAI is as follows: $SDAI = TJC + SJC + PGA + MDGA + CRP$. An absolute SDAI value of 5–20 relates to mild disease activity, while an SDAI of 21 to 40 corresponds to moderate disease activity, and finally, an SDAI of >40 is associated with severe disease activity.

An important emphasis was put on how the patients reacted to the therapeutic trial, regarding psychosocial integration and psychobehavioral manifestations (anxiety, introversion, chronic fatigability, less sleep, depressive tendency). At the beginning and at the end of the study all the patients from both groups were asked to draw in pencils on a piece of paper something of their own choice. The subjects were evaluated by a professional psychologist at the beginning of the study and in the end. The data were analyzed at the initiation of the study and after the 12 weeks of treatment. The statistical analysis followed

the comparison of the two groups, performing t-student test and Fisher's exact test for a trust interval of 95%.

RESULTS

At the beginning of the treatment the clinical and biological parameters displayed no significant statistical difference in the two groups taken into study (Table 1).

At the end of 12 weeks of treatment, the vibroacoustic therapy performed with Bodysonic System, proved to be an efficient non-pharmacological method for pain control, reduction of tender and swollen joints, movement range improvement, in direct correlation with the evolution of the biological parameters. One should also notice the decrease in anxiety, introversion, chronic fatigability, less sleep, depressive tendency in group I, compared to the witness group. Data are recorded in Table 2.

TABLE 1. Initial clinical and biological parameters of patients in the two groups

Data	Group I	Group II
Patients (n)	34	34
Age (years; mean \pm SD)	12.5 \pm 3.4	12.7 \pm 3.2(NS)
Sex (% female)	58.8	61.7(NS)
Polyarthritis Rheumatoid Factor (% positive)	44.1	41.1(NS)
Oligoarthritis extensive (%)	23.5	17.6(NS)
Disease duration at baseline (mo mean \pm SD)	9.1 \pm 2.2	9.0 \pm 2.6 (p=0.8559)
Disease activity characteristics		
Tender joint count (0–28)	25.0 \pm 7.4	25.9 \pm 8.2 (p=0.3289)
Swollen joint count (0–28)	13.3 \pm 4.6	13.8 \pm 2.0 (p=0.3040)
Patient's/family's global assessment	6.3 \pm 1.2	6.2 \pm 1.5 (p=0.8418)
Physician's global assessment of activity	6.2 \pm 1.4	5.9 \pm 1.7 (p=0.3441)
CRP (mg/dl; normal <1.0)	4.5 \pm 0.9	4.2 \pm 1.2 (p=0.3036)
SDAI	55.5 \pm 4.7	56.3 \pm 3.2 (p= 0.275)
Behavioral/psychosocial/emotional characteristics		
Anxiety	82.3%(28)	79.4% (27) (NS)
Introversion	76.4%(26)	85.2% (29) (NS)
Fatigue	58.8%(20)	58.8% (20) (NS)
Less sleep	55.8%(19)	52.9% (18) (NS)
Depression	44.1% (15)	41.1% (14) (NS)

SDAI – Simplified Disease Activity Index; CRP, C-reactive protein; SD – standard deviation. NS – no statistically significant differences (p>0.05).

TABLE 2. The parameters of patients in the two groups after 12 weeks of treatment

Data	Group I	Group II
Patients (n)	34	34
Tender joint count (0–28)	10.3 \pm 0.6	19.7 \pm 1.1 (p=0.0001)
Swollen joint count (0–28)	2.5 \pm 0.5	6.7 \pm 2.8 (p=0.0001)
Patient's/family's global assessment of activity	3.7 \pm 1.5	6.3 \pm 1.8 (p=0.0001)
Physician's global assessment of activity	3.0 \pm 1.1	6.4 \pm 0.8=0.0001)
CRP (mg/dl; normal <1.0)	1.2 \pm 1.7	3.3 \pm 2.1 (p=0.0001)
SDAI	21.0 \pm 3.1	42.5 \pm 4.6 (p=0.0001)
Behavioral/psychosocial/emotional characteristics*		
Anxiety	32.3% (11)	58.8%(20) (p=0.0177)
Introversion	20% (6)	56.0%(19) (p=0.0028)
Fatigue	20.6% (7)	44.1%(15) (p=0.0289)
Less sleep	14.7% (5)	38.2%(13) (p=0.0042)
Depression	8.8% (3)	29.4% (10) (p=0.0054)

SDAI – Simplified Disease Activity Index; CRP, C-reactive protein; SD – standard deviation.

Statistically significant differences: p < 0.05. Significant: 0.01 < p < 0.05;

Very significant: 0.001 < p < 0.01; Extremely significant: p<0.001.

In Group I, changes in SDAI score resulted in the decreasing of the classification level of the disease activity from severe to moderate, with statistically significant differences compared to the witness group ($p < 0.01$).

DISCUSSIONS

Music is a combination of rhythmical, harmonic and melodic sounds, and many peoples, throughout history, have believed in its curative effects (15). Music with therapeutic effects is as ancient as the writings of Aristotle and Plato (16); but, only recently, has objective research been developed in order to validate the healing effects of combined music and vibrations (17, 18, 19).

Vibroacoustic (VA) therapy is a recently recognized method, a more complex intervention than music alone, which uses a physical stimulus in the form of a pulsed sinusoidal low frequency wave to produce mechanical vibrations that are applied directly to the body (20, 21, 22, 23, 24).

With Bodysonic System, the musical sound waves enter the body and stimulate the A10 nervous system of the cerebral cortex (14). This stimulation activates the body's natural self-healing abilities and the capacity to recover, and brings the body and mind in balance, which can lead to a state of homeostasis, the reduction of inflammation and of the chronic pain (19, 22, 23, 24, 25).

Many patients with arthritis are seeking help with disease management from alternative therapies. When used along with allopathic medicine, these therapies may, in fact, increase the quality of life for patients with arthritis (26). The musical vibrations harmoniously combine in order to produce a new type of relaxation for the ill child.

Our study supports and validates the efficacy of physical and VA therapy, giving additional evidence of the value of these therapies for JIA patients.

Music and pain are processed along the same neuronal pathways. Stronger stimuli diminish the perception of the weaker ones. This technique helped the patient with arthritis to acquire a pain-free positive experience, modifying the threshold for nociceptive stimuli, and as a consequence, the participation in the physical therapy program was improved.

In Group I, the physical and VA therapy reduced the number of tender and swollen joints and offered the patients a feeling of consciousness for their personal experience towards pain and its control. It also decreased anxiety, introversion, chronic fatigability, adapting difficulties, depressive tendency, with statistically significant difference ($p < 0.05$), compared to Group II.

Not only was the VA therapy highly motivational for the patients in group I, but it also had calming and relaxing effects and helped the children to overcome more easily the stress generated by the disease. Independence, creativity development and the self-identity feeling were other effects of this therapeutic method. These aspects were revealed by the changed perspective displayed in the drawings the patients in Group I, in the end of treatment. The vibroacoustic therapy encouraged self-confidence, socialization, communication and physical activity. Group I displayed an increased cohesion to family and friends, together with a favorable social behavior and a general positive attitude.

VA therapy in JIA patients was an effective treatment for relaxation, anxiety reduction, muscle-tension reduction and pain management. The non-pharmacologic nature of vibroacoustic waves makes this treatment an important pain-management tool. It is a promising complementary method that may reduce the need for pain killers and provide a pleasant alternative to medication.

CONCLUSIONS

Vibroacoustic therapy is a revolutionary tool in the field of holistic pediatrics, for the multidisciplinary management of chronic pain in juvenile arthritis; it triggered in Group I a noticeable diminution of the SDAI score, so reducing the disease activity from severe to moderate and the psycho-behavioral manifestations, with great statistically significant difference to the witness group ($p < 0.0001$).

New research gives hope that early diagnosis, proper medical treatment, and alternative pain management strategies can help optimize function, reduce pain, and improve quality of life in JIA patients.

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