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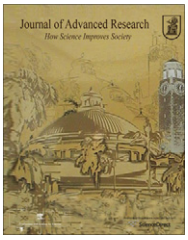

ORIGINAL ARTICLE

Efficacy of cold therapy on spasticity and hand function in children with cerebral palsy

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Abstract Spasticity remains a major cause of disability among children with cerebral palsy (CP). Effective management depends on careful assessment and an interdisciplinary treatment approach. The purpose of this study was to investigate the effect of cold therapy when used in combination with conventional physical and occupational therapy to control upper limbs' spasticity and to improve hand function in children with spastic CP. Thirty children of both sexes (12 girls and 18 boys) with spastic CP with ages ranged from 4 to 6 years (mean age 62.2 ± 7.5 months) participated in this study. They had mild to moderate spasticity in elbow and wrist flexors. Children were randomly divided into two groups of equal number: group I and group II. Children in group I received cold therapy on elbow and wrist flexors immediately before the application of conventional physical and occupational therapy. Those in group II received the same conventional occupational and physical therapy only. In both groups treatment was conducted three times per week for a successive 3 months. Spasticity, range of motion (ROM) and hand function were evaluated before and after the treatment by using the Modified Ashworth Scale, the electronic goniometer and the Peabody Developmental Motor Scale, respectively. Both groups showed a statistically significant reduction in spasticity, increase in ROM and improvement of hand function but group I showed

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a more significant improvement. It can be concluded that cold therapy in conjunction with conventional physical and occupational therapy significantly reduced spasticity, increased ROM and improved hand function in children with spastic CP.

Introduction

Spasticity is a widespread problem in cerebral palsy (CP) as it affects function and can lead to musculoskeletal complications [1]. It occurs as a result of pathologically increased muscle tone and hyperactive reflexes mediated by a loss of upper motor neuron inhibitory control [2].

Children with CP demonstrate poor hand function due to spasticity in the wrist and finger flexors [3]. Thus spasticity in the flexor muscles of the upper limbs poses a great deal of functional limitation in the hands. One common problem associated with poor hand function as a result of spasticity is the inability of the child to grasp objects and difficulty with fine motor tasks such as writing or cutting with hands [2,3].

The management of upper limbs' problems in CP is often complex and challenging. Effective treatment requires a multidisciplinary approach involving paediatricians, occupational therapists, physiotherapists, orthotists and upper extremity surgeons. Interventions are generally aimed at improving function and cosmoses by spasticity management, preventing contractures and correcting established deformities. Treatment objectives vary according to each child and range from static correction of deformities to ease nursing care, to improvement in dynamic muscle balance to augment hand function [4].

Previous studies have reported various treatment approaches and modalities to manage spasticity associated with spastic CP and other upper motor neuron lesion disorders. These include the use of oral neuropharmacological agents, injectable materials such as botulinum – a toxin or surgical treatment. The other treatment approaches are contracture reduction, orthosis, topical anesthesia application using various massage techniques, strengthening the antagonist musculature with electrical stimulation and the application of cryotherapy or ice therapy [5,6].

Ice or cold therapy is a widely used treatment technique in the management of acute and chronic conditions of various types. There are many tissue-based effects which are promoted by the application of cold therapy and these include post-injury reduction of swelling and oedema, an increase in the local circulation, lowering of the acute inflammation that follows tissue damage, muscle spasm reduction, and pain inhibition. Muscle contraction can be facilitated by using cold therapy and this can be used to improve muscle contraction to increase joint ranges of motion after injury. Another effect of cold is a time-related reduction in spasticity once the cold has been applied for some time. Cold can be applied to the body in three different ways: immersing in cold water, rubbing with ice cubes or ice packs or using evaporative sprays such as ethyl chloride [7].

The ability of muscles to function after spasticity reduction varies. Treating spasticity does not always facilitate the acquisition of undeveloped skills. The importance of physical and occupational therapy intervention for achieving functional goals cannot be overemphasized [8].

This study was therefore designed to investigate the effect of cold therapy when used in combination with conventional physical and occupational therapy to reduce upper limbs' spasticity and improve hand function in children with spastic CP.

Subjects and methods

Subjects

Thirty children with spastic CP (18 diplegia and 12 quadriplegia), with ages ranged from 4 to 6 years (mean age 62.2 ± 7.5 months), participated in this study after their parents signed consent forms for their children's participation. They were selected from the outpatient clinic of the Faculty of Physical Therapy, Cairo University.

Children were enrolled in this study if they met the following criteria: a mild to moderate degree of spasticity in the elbow and wrist flexors; ranged from grade 1+ to grade 3 according to the Modified Ashworth Scale (MAS) [9]; ability to sit alone or even with support; sufficient cognition to allow them to follow simple verbal commands and instructions during tests and training; and normal skin sensation of the upper limbs.

Children were excluded from the study if they had fixed contractures or deformities in the upper limb, concurrent therapy with oral antispastic drugs, previous treatment with botulinum toxin injection, alcohol or phenol into upper limbs, previous surgical intervention in the upper limbs, vasospasm or cold urticaria, visual or auditory defects or autistic features. The study was approved by the ethical committee of the Faculty of Physical Therapy, Cairo University.

The participants were randomly divided into two groups (group I and group II) of equal numbers. Group I consisted of 15 children with spastic CP (five girls and ten boys), nine with diplegia and six with quadriplegia. Their mean age was 63.2 ± 7.4 months. They received cold application on the area of upper arm and flexor compartment of the forearm (elbow and wrist flexor muscles) immediately before the application of the conventional physical and occupational therapy programme. Group II consisted of 15 children with spastic CP (seven girls and eight boys), nine with diplegia and six with quadriplegia. Their mean age was 61.2 ± 7.7 months. They received the same physical and occupational therapy programme only.

Procedures

Evaluative procedure

Each child was evaluated for degree of spasticity, ROM and fine motor skills. Spasticity was assessed by using MAS to quantify the degree of spasticity in the elbow and wrist flexors for all children in both groups. The degree of spasticity ranged from grade 1+ to grade 3 according to MAS. To accommodate the "1+" modification for numeric analysis, grade