

RELATO DE CASO

Constraint-induced movement therapy for a child with hemiplegic cerebral palsy: case report

Terapia de restrição para uma criança com paralisia cerebral com hemiparesia: estudo de caso

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RESUMO

A Terapia de Restrição (TR) é uma técnica que tem sido aplicada com grande sucesso para reabilitação de membro superior de pacientes acometidos por um acidente vascular cerebral. O objetivo deste estudo foi relatar os efeitos terapêuticos da TR em uma criança de 11 anos de idade com o diagnóstico de paralisia cerebral hemiparesia espástica com diminuição da função no membro superior direito. A paciente foi submetida ao protocolo modificado de 2 semanas da TR, que consistia em sessões de 3 horas da prática das tarefas adaptadas, associado à prática domiciliar. Houve melhora nos valores dos testes de membro superior “Wolf Motor Function Test”, “Action Research Arm Test” e “Motor Activity Log” imediatamente após o tratamento. Os resultados sugerem que a TR pode ser de grande ajuda no tratamento da função do membro superior na criança hemiparética. Os efeitos da duração e da intensidade da TR precisam ser melhor conhecidos.

PALAVRAS-CHAVE

paralisia cerebral, reabilitação, hemiplegia, criança

ABSTRACT

The constraint-induced movement therapy (CIMT) is a technique that has been applied with increasing success for the rehabilitation of upper extremity disabilities related to stroke. This study aimed at reporting the therapeutic effects of CIMT in an 11-year-old child with spastic hemiplegic cerebral palsy who presented decreased right upper extremity function. The patient was submitted to a 2-week modified CIMT protocol, which consisted of 3-hour sessions of the adapted procedures plus home practice. She presented improvement in upper extremity function as observed at the Wolf Motor Function Test, Action Research Arm Test and Motor Activity Log, immediately after the treatment. The results suggest that CIMT may be useful in the treatment of upper extremity dysfunction in hemiplegic cerebral palsy. The effects of CIMT duration and intensity need further investigation.

KEYWORDS

cerebral palsy, rehabilitation, hemiplegia, child

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INTRODUCTION

Children with a diagnosis of hemiparetic cerebral palsy (CP) can present a decrease in muscular strength, proprioception, and coordination of the affected upper limb¹. One of the treatments used for the recovery of upper limb function is the constraint-induced movement therapy (CIMT), also known as the Restriction Therapy (RT). The RT is an adjunct therapy to the conventional physical therapy and consists in intensive training, practicing functional repetitions and restriction of the non-paretic upper limb for two consecutive weeks, with the technique being applied for 6 hours daily². The efficacy of the RT, which is based on overcoming the learned nonuse theory, has been documented by several studies in adults with hemiparesis due to stroke³⁻⁵. However, there have been few studies on the efficacy of RT in children with CP in the world literature and none in the Brazilian literature. Riberto *et al*⁶ presented the first Brazilian study on this technique in hemiparetic patients after stroke. DeLuca *et al*⁷ studied the effects of RT in a child with tetraparetic CP, who was submitted to therapy at two distinct moments: firstly, at 15 months (stimulating the most affected side) and later at 20 months old (stimulating the other side), showing an improvement in the quality of the movement of the upper limbs. Pierce *et al*⁸, in a study similar to ours, observed that the effects of RT persist after treatment. Willis *et al*⁹ compared the forced use (with a sling) in 12 children aged 1 to 8 years with a control group during a month of rehabilitation and showed improvement in the paretic upper limb function in the children who underwent restriction.

The aim of the present study was to report the therapeutic effects observed in the upper limb of a child with spastic hemiparetic CP treated by RT.

METHODS

Patient's characteristics

BG, female sex, 11 years of age, with a diagnosis of right spastic hemiparetic CP due to perinatal anoxia, with left lateral dominance, presented the selective right upper limb, however, with little functional use. She did not present cognitive deficit and was independent for all daily living activities (DLA). She underwent treatment at Lar Escola Sao Francisco (LESF) Rehabilitation Center for 8 years and her main complaints were: she could not grasp and release a pen or small objects and throw a ball with her right upper limb.

Intervention

The patient was submitted to treatment with RT with an adapted protocol, which has a duration of two weeks with 3 hours of daily exercises supervised by a physical therapist, involving the paretic upper limb and restriction therapy (in this case, with a sling) in the non-paretic upper limb after the therapy time. The mother was advised to incentive the use of the restriction at home for around 70% of the afternoon period, and remove the sling only for feeding, resting, shower and situations that involved risk for the child, such as running and going up or downstairs.

The adapted RT protocol consists in performing 3 hours of supervised daily exercises, including task practice and shaping procedures. The general tasks consist in daily living activities, such as opening and closing doors, washing and drying hands, feeding, etc. The adapted tasks consist of exercises with progressive degrees of difficulties, performed in several stages. Twenty activities of adapted tasks were performed.

Assessment tools

The following tests were applied during the start of the treatment:

- “*Wolf Motor Function Test*”: standardized time-dependent test, in which the patient has up to 120 seconds to perform the requested task, with a total of 15 tasks, performed with the help of a chronometer; it is used to measure the functional evolution of the paretic upper limb.
- “*Action Research Arm Test*”: continuous and progressive score test, with four items: “grasp”, “grip”, “pinch” and “gross movement”, being divided in sub-items; the score in each sub-item varies from 0 (absence of movement) to 3 (normal movement without compensation).
- “*Motor Activity Log*”: questionnaire with 30 questions that measures the frequency and quality of the movement of the paretic upper limb in daily living activities, though a subjective assessment of the patient; its score varies from 0 to 5. Regarding the patient of the present study, the questions concerning feeding and writing were excluded, as she performed these activities with the left upper limb (non-paretic).

At the end of the treatment, the tests were re-applied and the results were compared.

RESULTS

It was observed an improvement in movement dexterity, shoulder stabilization, decrease of the associated reactions and improvement in the positioning of the paretic upper limb.

Tables 1 to 3 refer, respectively, to the tests “*Wolf Motor Function Test*”, “*Action Research Arm Test*” and “*Motor Activity Log*” before and after treatment. It is observed, in Table 1, a decrease in time (expressed in seconds and milliseconds) when performing the tests, indicating an increase in dexterity to perform the tasks; in table 2, an increase of the total score and especially of the “*pinch*” item are observed demonstrating the improvement of the fine motor coordination. Table 3 shows an increase in the score of both frequency and quality of movement, showing the efficacy of the RT after the period of supervised practice.

DISCUSSION

The adapted protocol was selected because its efficacy has been demonstrated in a study involving 18 patients with hemiparesis after stroke¹⁰ and also due to the reduction of the number of hours of supervised practice to prevent muscle fatigue and possible irritability of the patient regarding the technique.

Table 1
Values (expressed in seconds) of the pre- and post-treatment activities and their mean values at the "Wolf Motor Function Test".

Activity	Before	After	% gain
1	1,06	0,47	55,66
2	0,96	0,59	38,54
3	1,80	0,44	75,56
4	0,75	0,66	12,00
5	0,75	0,41	45,33
6	0,88	0,66	25,00
7	1,12	0,47	58,04
8	4,29	3,15	26,57
9	2,85	2,03	28,77
10	4,38	1,75	60,05
11	7,29	4,28	41,29
12	6,63	5,47	17,50
13	13,75	8,19	40,44
14	4,03	2,57	36,23
15	4,22	1,90	54,98
Mean	3,65	2,20	

Table 2
Values obtained before and after treatment with the "Action Research Arm Test".

Activities	Value	
	Before	After
Grasp	17	18
Grip	10	12
Pinch	11	18
GM	9	9
Total	47	57

Table 3
Mean of the values obtained before and after treatment with the "Motor Activity Log" questionnaire.

Questions	Values	
	Before	After
Frequency of movement	1,4	1,9
Quality of movement	1,2	1,4

This was the first experience with a CP child referred to the RT Service at LESF and our results confirm the technique efficacy.

The theoretical foundation of the RT is based on overcoming the learned nonuse theory and on the use-dependent cortical re-organization. The nonuse theory is observed in patients with an alteration of the body engram, who transfer the motor activities to

the non-paretic side; its overcoming occurs through an intensive training and forced use of the paretic upper limb, promoting a use-dependent cortical re-organization. The child with a diagnosis of CP has a body engram alteration, but does not is consciously aware of it; this is the main point of disagreement regarding the use of RT in children.

During the treatment, the patient showed the need to use the non-paretic upper limb in activities that caused fatigue or frustration and she wanted to perform the activities, one right after the other without intervals; consequently, on the first days the patient presented irritability regarding the duration of therapy and acquisition of the more complex tasks.

The tests applied to this child are the same that are applied to adults submitted to this same treatment.

Considering that the use of RT in children is still recent and little explored, it is necessary to conduct further studies aiming at clarifying: the duration of the effects; the need for treatment maintenance; age at the start of the treatment; the time-benefit diad relationship for the institution and for the family and help choosing the best protocol to be applied to this population.

CONCLUSION

This case report suggests that RT can be an effective treatment for the functional improvement of the paretic upper limb in children with cerebral palsy.

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