

Acute encephalic vascular accident: rehabilitation

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Conclusion: July 01, 2011

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DESCRIPTION OF THE EVIDENCE COLLECTION

METHOD

This study revised articles from the MEDLINE (PubMed) databases and other research sources, with no time limit. To do so, the search strategy adopted was based on (P.I.C.O.) structured questions (from the initials "Patient"; "Intervention"; "Control" and "Outcome". As keywords were used: (cerebrovascular disorders OR Stroke) AND acute AND (movement OR physical therapy modalities OR exercise movement techniques); (cerebrovascular disorders OR stroke) AND (Postural Balance OR Musculoskel et al. Physiological Phenomena) AND Rehabilitation AND trunk; (cerebrovascular disorders OR Stroke) AND (virtual reality OR user-computer interface OR video games); cerebrovascular disorders AND (home care services, hospital-based); cerebrovascular disorders AND (contractures OR splint OR orthotic devices); cerebrovascular disorders AND acute AND (rehabilitation OR physical therapy disorders or task performance); cerebrovascular disorders AND (physical therapy modalities OR rehabilitation OR exercise therapy) AND (Home Care Services OR self care); (cerebrovascular disorders OR stroke) AND (electric stimulation OR electric stimulation therapy) AND (muscle tonus OR muscle hypotonia OR muscle hypertonia); cerebrovascular disorders AND (restraint physical OR constraint induced movement therapy OR constraint); (cerebrovascular disorders OR stroke) AND (body weight support OR supported treadmill training OR partial weight bearing); (cerebrovascular disorders OR stroke) AND transcranial magnetic stimulation; (cerebrovascular disorders OR stroke) AND bandages. With the above keywords crossings were performed according to the proposed theme in each topic of the (P.I.C.O.) questions. After analyzing this material, articles regarding the questions were selected and, by studying those, the evidences that fundamented the directives of this document were established.

LEVEL OF RECOMMENDATION AND EVIDENCE:

- A:** Strong consistency experimental or observational studies.
- B:** Fair consistency experimental or observational studies.
- C:** Case reports (uncontrolled studies).
- D:** Opinion lacking critical evaluation, based on consensus, physiological studies or animal models.

OBJECTIVES:

Offering information regarding rehabilitation treatment of encephalic vascular accident in the acute phase.

CONFLICTS OF INTERESTS:

There are no declared conflicts of interests.

INTRODUCTION

Worldwide, one of the most common causes for disability in adults is the Encephalic Vascular Accident EVA. It so happens that after the first episode onset 70% to 80% of individuals show hemiplegia sequelae, and part of this population never resume their functional activities in an independent manner¹⁻³ **(D)(A)**.

Such sequelae may be sensorimotor, Musculoskel et al., perceptual and cognitive⁶ **(D)**. EVA victims, normally, require rehabilitation that includes several professionals and care levels, such as: physicians; rehabilitation, nursing, and other health care specialists⁵ **(A)**.

The World Health Organization (WHO) defines EVA as a "quick onset of clinical signs of focal disorders (or global) of the brain function, with symptoms that last over a period longer than 24 hours or lead to death, with no other apparent cause but the vascular origin"⁴ **(D)**. In the pertinent literature, EVA is divided in three distinct phases, according to the time of onset. These are: acute, subacute and chronic phases. By means of these readings we observed that it was considered as acute phase EVA up to three months from the episode onset.

Although there is large incidence of mild EVA causing substantial socioeconomic impact, it is not possible to determine which are the better choices in approaches for its rehabilitation, since there is a lack of theoretical framework studies to justify clinical practices and their successes² **(D)**.

THERAPEUTIC SECTION

1. IS EARLY MOTION EFFECTIVE IN THE FUNCTIONAL RECOVERY OF ACUTE PHASE EVA PATIENTS?

The early motion, hospital-based, in the first twenty-four hours, and over the next fourteen days, at least twice a day, six times a week, has proved safe and reliable, not presenting any risks to patients regarding clinical stability, even in the most severe cases⁷ **(B)**.

Regarding safety, early passive motion physical therapy, started in the first week of EVA pathology, applied in forty-five minute sessions, five times a week for four weeks, proved effective in the gain of basic activities of daily life independence⁸ (A).

RECOMMENDATION

The early passive motion in acute phase EVA patients can be applied safely and reliably. The results of this procedure may reper-
cute, in the future, in the gain of patient's independence in basic activities of daily life⁸ (A).

2. DOES EARLY TRUNK CONTROL TRAINING IN ACUTE PHASE EVA PROVIDE BETTER FUNCTIONAL RECOVERY?

The sum of trunk control specific exercises, in combination with conventional rehabilitation does not provide significant response in the functional rehabilitation of acute phase EVA patients. However, more specific results were found, for example, better control and balance in the sit-to-stand movement⁹ (B).

A specific training of voluntary trunk control in combination with spatial exploring tasks also did not show significant difference in functional tests, but showed significant improvement in heminegligence¹⁰ (B).

RECOMMENDATION

The specific training of trunk control applied to acute phase EVA patients does not provide better results in functional recovery than conventional rehabilitation. However, it provides improvements in specific aspects such as heminegligence and sit to stand balance^{9,10} (B).

3. IS THERE BENEFIT IN THE USE OF VIRTUAL REALITY AS THERAPEUTIC INTERVENTION IN ASSISTING FUNCTIONAL REHABILITATION IN ACUTE PHASE EVA PATIENT?

The use of virtual reality as a therapy for acute phase EVA patients still presents gaps, since it was little studied by the scientific community. In this research only one randomized and controlled article was found. Therefore, and through critical evaluation of this single paper found, it is possible to affirm that the use of video games with remote control games, for rehabilitation of the affected upper limb, is safe and reliable as much as the performing of recreational activities, such as card games and bingo¹¹ (B).

RECOMMENDATION

Although there are no studies to evaluate the effectiveness of the use of video games in the functional recovery of acute phase EVA patients, no literature was found to condemn this practice. On the contrary, it is possible to use this instrument safely and reliably as a conventional rehabilitation adjuvant¹¹ (B).

4. CAN HOME CARE AND EXERCISE ORIENTATIONS GIVEN TO ACUTE PHASE EVA PATIENTS PREVENT SECONDARY COMPLICATIONS TO THE LESION?

Submitting acute phase EVA patients who require physical therapy and/or occupational therapy treatments after discharge to home exercise program, provided they are able to go to the clinical therapy department, and that they live in private homes or retirement homes with in the geographic area served by the hospital, has shown to be as beneficial to physical, neurological, or daily life functions aspects as a clinical therapy program.

In this home program, immediately after discharge, a series of exercises was individually designed for each patient, focusing in

function and activities of their daily lives, and the patients were visited weekly so that the exercises could be modified when needed.

In the clinical program, the elderly patients were referred, at discharge, to a Senior Citizen's Health Care Program, thus receiving a multidisciplinary treatment two to three times a week, in five-hour sessions. The patients' evolution in the program was monitored by the team, weekly, until discharge. The younger patients were referred to the hospital's clinical therapy service, since their physical therapists and occupational therapists base their work, mainly, in the Bobath and Motor Relearning Programme approaches.

Both groups, home and clinical, showed improvement in the gait speed, anxiety and depression, and no approach proved superior to the other¹² (A).

RECOMMENDATION

A home exercise orientation program is as effective in the maintenance and improvement of physical capabilities and activities of daily life as a clinical rehabilitation program¹² (A).

5. IS THE USE OF POSITIONING ORTHOSES EFFECTIVE IN PREVENTING SHORTENINGS IN ACUTE PHASE EVA PATIENTS?

The use of ankle-foot orthosis, used seven times a week during the night, for four weeks, is as effective as the use of the "stand table" for thirty-minutes, five times a week, during four weeks for the maintenance of the ankle amplitude of movement, in study with thirty EVA patients, occurred with in the previous three weeks, with motor scale score lower than three, with no circulatory, cognitive alterations, or previous contractures which could prevent the use of splints or orthoses. In both therapies the ankle was positioned in maximum amplitude of stretching and all patients continued with their rehabilitation program during the study. The evaluation was performed by photographing the ankle in maximum dorsiflexion position, by means of the angles formed by the projection of parallel lines to the fifth metatarsal and the fibula¹³ (A).

The use of a wrist splint during the night for up to twelve hours, over four weeks, both in the neutral position (allowing 0° to 10° wrist extension) and in wrist extension position (extension higher than 45° with extended metacarpophalangeal and interphalangeal joints) by individuals that had suffered EVA within the previous eight weeks, aged over eighteen years, without active wrist extension, with preserved cognitive and auditory functions, does not prevent the loss of wrist amplitude of movement and using orthosis is not better than not using it.

During the study the usual rehabilitation was maintained, with the exception of wrist and long flexor of the fingers muscles stretchings. The assessment was performed by means of side photography with the wrist in extension with extended metacarpophalangeal and interphalangeal joints. The consecutive repetition average was three measurements¹⁴ (B).

RECOMMENDATION

The use lower limbs orthosis prevents muscular shortenings in the post-EVA acute phase¹³ (A). The use of upper limb orthosis does not prevent muscular shortenings¹⁴ (B).

6. DOES THE TASK RELATED TRAINING WITH POST-EVA ACUTE PHASE PATIENTS IMPROVE MOTOR PERFORMANCE?

An additional task-related exercise program, specific during four weeks, in post-EVA individuals, with walking dependence for a ten-meter distance and clinically stable, proved effective in the functional recovery

according to the task focused. Thirty patients divided into two groups were studied, one of the groups received mobility tasks and the other upper limb function ones. The mobility group performed warm-up, cycle ergometer resistance and treadmill activities, functional tasks such as sitting and standing, climbing steps, balance and stretching. The upper limbs group performed warm-up activities, followed by functional tasks for the improvement of reach, prehension and eye-hand coordination. Both groups showed improvement in the six-minute walking test and time up and go, however, the mobility group showed greater improvement in these tests. The upper limbs function exercise group showed improvement in the dexterity tests. Both groups performed physical therapy, one hour a day, five times a week¹⁵ (A).

This directive observed two therapies intended for post-EVA acute phase patients with hemiparesia sequelae; the first with thirty-three patients that received bobath approach physical therapy and the second with twenty-eight individuals with the same condition, but treated with the motor relearning programme approach for five times a week, at least forty minutes, throughout the hospitalisation period and continued after discharge. All of these patients showed improvements in motor function and activities of daily life. However, there was greater improvement in motor function in the group that received the motor relearning programme-based therapy¹⁶ (A).

Weight-transfer complementary exercises twelve session program, i.e., exercises with the repetition of target oriented self initiated activities, sitting and standing reach, performed in seventeen patients aged over eighteen years, after EVA incident, presenting hemiplegia, stable and clinically able to cooperate with the treatment and consent to the participation in the study, independent previous to the EVA, evaluated by the lateral reach test, static stand balance and sit on stand-to, did not show significant difference in the standing weight transfer and reach as well as stand and sit time measurements, when compared to conventional physical therapy applied in eighteen patients. However, there was difference in the oscillation during orthostatism and return to initial position time after reach, evidencing greater postural control¹⁷ (A).

RECOMMENDATION

An immediate physical therapy program, following an EVA incident, has proved effective in patients functional recovery. This recovery tends to be more effective when this program is based in task/function-oriented exercises, and the improvement is specific to the task focused¹⁵⁻¹⁷ (A).

7. CAN FUNCTIONAL ELECTRICAL STIMULATION (FES) BE USED FOR MUSCLE TONE ADJUSTMENT IN POST-EVA ACUTE PHASE PATIENTS?

The functional electrical stimulation applied for nine minutes in the anterior tibialis muscle (cathode on the neuromuscular junction of the muscle and anode over the fibular head, 100 Hz frequency current, pulse duration of $\frac{1}{4}$ 0.1 ms, pulse interval $\frac{1}{4}$ 0.9 ms, time on of $\frac{1}{4}$ four seconds and time off of $\frac{1}{4}$ six seconds, with intensity 25% below the required to produce a maximum muscle contraction), associated with Bobath inhibitory techniques (ankle flexion extension, knee extension, hip external abduction and rotation - reflex inhibitory pattern passive motion) performed in fifteen-minute daily sessions over twenty consecutive days, helps in the gastrocnemius muscle spasticity reduction on acute EVA patients, according to the measurement by Modified Ashworth Scale¹⁸ (A).

However, FES with 30 Hz frequency, pulse duration 0.3 ms, intensity according to the maximum tolerance, with in twenty to thirty mA,

using an activation sequence that simulates normal gait applied once a day for thirty minutes after sixty minutes of conventional therapy based in neuroevolutionary facilitation and activities of daily life-focused occupational therapy, five times a week during three weeks, and electrodes positioned over the quadriceps, ischiotibial, anterior tibialis and medial gastrocnemius muscles with the individual in a standing position with the affected lower limb supported by a sling, has shown an improvement in the spasticity of the plantar flexor muscles according to the Composite spasticity scale (CSS), however, with no statistically significant difference between the groups that did not receive FES¹⁹ (A).

RECOMMENDATION

The use of functional electrical stimulation (FES) reduces plantar flexor muscles spasticity in post - EVA acute patients. Therefore, FES can be used for the muscle tone adjustment in acute EVA patients^{18,19} (A).

8. DOES CONSTRAINT-INDUCED MOVEMENT THERAPY PROVIDE BETTER FUNCTIONAL RESULTS THAN CONVENTIONAL THERAPY IN ACUTE PHASE EVA PATIENTS?

The constraint-induced movement therapy applied in one-hour activities of daily life training and one-hour bimanual activities using the unaffected upper limb constraint, in addition to the maintenance of constraint to the unaffected upper limb for six hours a day, or when applied in three-hour supervised activities of daily life, in addition to exercises with play-dough and other functional activities, and maintenance of constraint of the unaffected upper limb for 90% of waking hours, applied five days a week for two weeks, provides better functional results on post-EVA acute patients. This improvement is as effective as the conventional therapy with the same population, consisting of occupational therapy involving activities of daily life adaptation techniques, amplitude of movement and stretching, where adaptational equipments and positioning devices, and the use of the paretic upper limb can be encouraged; however, activities with play-dough and with constraint are not allowed. The improvement was evidenced through measurements performed with the NIH Stroke Scale (NIHSS), Action Research Arm Test (ARAT), Functional Independence Measurement (FIM) scale, Stroke Impact Scale (hand function subscale), pain measurements and geriatric depression scale²⁰ (A).

The constraint-induced movement therapy applied for three hours a day, six days a week, for two weeks attained functional improvement equal to the patients that received intensive conventional therapy, according to data obtained with the Fugl-Meyer Assessment of Motor Recovery, Grooved Pegboard Test (GPT), Motor Activity Log (MAL) and Transcranial Magnetic Stimulation. With exception of the Fugl-Meyer which showed greater improvement in the constraint-induced therapy group. The intensive conventional therapy consisted of bimanual activities of daily life and therapeutic activities with the affected upper limb, focused in improving stretching, muscular tone and amplitude of movement. The number of daily hours of therapy and the number of therapies in each day were greater than the conventional in order to be closer to the frequency and duration of the constraint-induced therapy.

No constraint could be used and the patients were free to use both hands in their activities of daily life²¹ (A).

According to The Fugl-Meyer Assessment of Motor Recovery (Fugl-Meyer) and Action Research Arm Test (ARA) scales, the

constraint-induced movement therapy consists of activities performed with the most affected upper limb during thirty minutes. The employment of this time is divided in two steps. On the first step, for twenty-five minutes the patient performs three routine activities, e.g., writing, picking up a hair brush and brushing one's hair, typing on the computer keyboard, picking up a glass of water and drinking it, and all these activities being performed with the affected upper limb. On the second step, in the remaining five minutes the patient performs exercises focused on the amplitude of movement of the affected upper limb. Each session was repeated three times a week for ten weeks, and with less affected upper limb constraint for five hours, five times a week, over ten weeks. This therapy attained greater results than the conventional therapy consisting of manual dexterity exercises with the affected upper limb and stretching, in addition to compensatory strategies with the unaffected upper limb, for half an hour, three times a week, over ten weeks. According to the Motor Activity Log (MAL), there was no difference between the therapies²² (A).

The constraint-induced movement therapy performed with a progressive time of use, starting with one hour a day and incrementing to reach six hours daily (average of 2.7 hours daily) during two weeks, in combination with conventional therapy, which involves proximal motor control facilitation progressing to specific manual skills tasks, in addition to stretching, resistance training, functional electrical stimulation, gait and orientations, provide similar results to the conventional therapy isolatedly, according to the ARAT and FIM scales and the prehension strength (measured with Jamar hand dynamometer). However, according to the CMII for postural control, the constraint-induced movement therapy in combination with conventional therapy provides better results than the isolated conventional therapy²³ (A).

When segregated by gender, the men in the constraint-induced therapy group showed better ARAT scores than the ones in the group that had conventional therapy isolatedly²³ (A).

The constraint-induced therapy performed with occupational therapy focused on basic activities of daily life with emphasis on functional activities with the use of the affected upper limb as often as possible, performed for two hours a day, five days a week, over two weeks in addition to six-hour constraint daily for two weeks, showed better results in the total scores of the Action Research Arm Test (ARA) when compared to conventional therapy, which included compensatory techniques for activities of daily life such as stretching, amplitude of movement and traditional positionings, in addition to a program of circuit activities involving bilateral active movements and supervised functional activities. There was no difference in the Barthel Index between the groups and in the Functional Independence Measurement (FIM), there was significant difference solely on the dress item, where constraint-induced therapy showed better results than conventional therapy²⁴ (A).

RECOMMENDATION

Constraint-induced movement therapy provides better functional results in post-EVA acute patients. However, not always, and not in all functional items, this improvement is greater than the attained with conventional therapy, because in most cases both provide functional improvements, and only in a few items the constraint-induced therapy provides better results than conventional therapy²⁰⁻²⁴ (A).

9. DOES BODY-WEIGHT-SUPPORTED TREADMILL GAIT TRAINING PROVIDE BETTER FUNCTIONAL RESULTS TO GAIT WHEN COMPARED TO THE TRADITIONAL PHYSICAL THERAPY PROGRAM IN ACUTE PHASE EVA PATIENTS?

Body-weight-supported treadmill gait training is viable, safe and tends to result in an independent gait in the first, second and sixth months after intervention in post-EVA acute patients with up to four weeks from the lesion, performing one thirty-minute training session daily, five times a week²⁵ (A). Further corroborating these results, body-weight-supported treadmill gait training is considered a viable and promising intervention in trainings performed for three hours daily during three weeks when compared to physical therapy, kinesiotherapy and occupational therapy during the same time in post-EVA acute patient with up to six weeks²⁶ (A).

Thus, as in this study, the body-weight-supported treadmill gait training showed a greater gait ability and high perception of this ability six months after the start of training compared to overground gait training in post-EVA acute patients of up to twenty-eight days aged from fifty to eighty-five years, performing thirty minutes of training a day, five times a week, combining lower limbs strengthening exercises and sit-to-stand training for sixty minutes a day²⁷ (A). The body-weight-supported treadmill gait training also shows it is more effective when compared to overground gait training²⁸⁻²⁹ (B)(A).

In addition to body-weight-supported treadmill gait training being an effective approach that results in better locomotor and postural skills, it also can be used with and benefit from other rehabilitation instruments, such as functional electrical stimulation - FES³⁰ (A), shown in post-EVA acute patients performing overground gait training, body-weight-supported treadmill gait training and body-weight-supported treadmill gait training with the use of FES on the quadriceps in the support phase and knee dorsiflexor and flexor in the swing phase during twenty minutes a day and five times a week over four weeks²⁸ (B). Another improvement shown regards mobility and functional ambulation in six-week post-EVA acute patients when submitted to body-weight-supported treadmill gait training with and without FES compared to patients submitted solely to conventional gait training, in twenty-minute sessions, five times a week over four weeks²⁹ (A).

When comparing hand facilitation by therapist associated with mechanically-suspended gait in up to three-week post-EVA acute patients with three times a week training for six weeks, the hand facilitation by therapist did not add significant results for hand facilitation when compared to the group that performed solely the body-weight-supported treadmill gait training³¹ (A).

However, body-weight-supported treadmill gait training, though viable, was described as being as effective as the conventional gait training on six-week post-EVA patients with body-weight-supported treadmill gait training on sixty-minute sessions for four weeks compared to the group that received physical therapy according to the needs of each patient for the same period³² (A).

Body-weight-supported treadmill gait training was also considered a choice compared to overground walking in post-EVA acute patients submitted to overground gait training when compared to patients submitted to body-weight-supported treadmill gait training for thirty minutes five times a week for two months. In addition to this, all patients received therapy with balance training and weight discharge over the plegic limb³³ (A).

It was also described that the body-weight-supported treadmill gait training does not indicate to be a superior exercise to the home exercise training by physical therapist. This indicated that, in post-EVA patients, when submitted to three ninety-minute sessions a week over twelve to sixteen weeks of body-weight-supported treadmill gait training for two months post-EVA and on the body-weight-supported treadmill gait training six months after EVA and remaining patients under home exercises training, it showed that on six-month post-EVA patients the group that performed body-weight-supported treadmill gait training two months after EVA and the group that performed home exercises, the gains attained, in these patients, were similar in gait speed and these gains were maintained after one year and, also, the group that performed body-weight-supported treadmill gait training six months post-EVA attained a better recovery after one year. Besides that, the author comments that the number of falls in the participants of the two-month post-EVA group suggest that the balance improving therapies should be included in the program to improve gait skill^{34,35} **(A)**.

RECOMMENDATION

Although there is no consensus in the literature regarding partial body-weight-supported treadmill gait training regarding post-EVA patients rehabilitation, it is being used as an additional instrument to therapy and thus described as a viable and safe instrument, in addition to improving gait pattern and locomotion independence on acute post-EVA patients²⁵ **(A)**.

10. DOES TRANSCRANIAL MAGNETIC STIMULATION PROVIDE BETTER RESULTS WITH MOTOR/FUNCTIONAL TRAINING THAN SOLELY ISOLATED CONVENTIONAL THERAPY IN ACUTE PHASE EVA PATIENTS?

Therapeutic application of repetitive transcranial magnetic stimulation (RTMS) of 1-10 Hz with 1000 pulses, five to ten consecutive days over the affected motor cortex can improve and maintain recovery, in addition to being a useful mean of treatment of four to six-week acute EVA patients³⁶⁻³⁸ **(B)(A)**. In addition to this, the use of RTMS of 1 Hz with 1200 pulses over the unaffected hemisphere is viable on acute EVA patients³⁹ **(B)**.

RECOMMENDATION

RTMS of 1-10 Hz with 1000 pulses, five to ten consecutive days over the affected and the unaffected motor cortex showed it is an additional instrument for the starting of neurological rehabilitation on four to six-week post-EVA acute patients³⁹ **(B)**.

11. IS THE USE OF THERAPY TAPPING EFFECTIVE ON THE TREATMENT OF PAINFUL SHOULDER IN ACUTE PHASE EVA PATIENTS?

According to the study the use of strapping on the hemiplegic shoulder for four weeks on acute EVA patients limited the development of pain/painful shoulder when compared to the control group and the group that received placebo strapping⁴⁰ **(A)**.

RECOMMENDATION

The use of strapping on the hemiplegic shoulder for four weeks in post-EVA acute patients limited the development of pain, thus, it is recommended for the use in hemiplegic post-EVA acute patients of up to four weeks⁴⁰ **(A)**.

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