J Acupunct Meridian Stud 2018;11(2):67—73

Available online at www.sciencedirect.com

Journal of Acupuncture and Meridian Studies

journal homepage: www.jams-kpi.com

Research Article

Kinesio Taping Associated with Acupuncture in the Treatment of the Paretic Upper Limb After Stroke

Moisés S. Dall'Agnol [1], Fernanda Cechetti [1,2,*]

[1] *Graduate Program in Rehabilitation Sciences, Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), Brazil*
[2] *Physical Therapy Department, Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), Brazil*
Available online 4 January 2018

Received: Aug 31, 2017
Revised: Dec 21, 2017
Accepted: Dec 26, 2017

KEYWORDS
acupuncture;
athletic tape;
muscle spasticity;
stroke

Abstract
The leading cause of disability in adults, leads to different consequences, such as hemiparesis and loss of function in the upper limb which can impair the performance of activities of daily living. Different techniques, such as like acupuncture and Kinesio Taping (KT), have been used to ameliorate this condition. However, there is no consensus on their concomitant effect on neurological patients. This study aimed to analyze the effects of acupuncture associated with KT on the upper limb of patients with chronic hemiparesis after stroke. In this clinical study, 16 subjects were divided into two intervention groups: acupuncture (ACP)—12 sessions of acupuncture—and acupuncture + Kinesio Taping (ACP-KT)—12 sessions of acupuncture plus KT. The Modified Ashworth Scale (spasticity), active goniometry [range of motion (ROM)], and the Wolf Motor Function Test (speed of movement) were used to assess the function of the affected upper limb. As a main result, both groups reduced spasticity in some studied musculature and increased ROM ($p < 0.05$), without intergroup difference. Moreover, there was no significant improvement concerning speed of movement in either group. Acupuncture was effective in reducing spasticity and increasing ROM of paretic upper limb after stroke, but did not contribute significantly to speed and quality of movement. KT did not show significant benefits concerning the analyzed variables.

* Corresponding author. Departamento de Fisioterapia, Universidade Federal de Ciências da Saúde de Porto Alegre — UFCSPA, Rua Sarmento Leite, 245, 90050-170, Porto Alegre, RS, Brazil. CEP UFCSPA: 935.288.
E-mail: nandacechetti@gmail.com (F. Cechetti).

pISSN 2005-2901 eISSN 2093-8152
https://doi.org/10.1016/j.jams.2017.12.003

1. Introduction

According to the World Health Organization, stroke is the sudden development of clinical signs of focal or global disturbance of cerebral function, with symptoms lasting for more than 24 hours or leading to death, with no apparent cause other than of vascular origin [1]. It is estimated that 50—70% of victims regain their functional independence. Despite the high rate of survival, stroke generates some kind of disability in approximately 90% of cases, being considered the leading cause of disability in adults [2—4].

Motor disorders after stroke occur because of damage to the upper motor neurons, which control distal and proximal muscles [4], leading to hemiplegia or hemiparesis [5]. However, 70% of individuals with paresis of the upper limb will show some residual sequelae, hindering the performance of daily activities [6]. The sequelae can range from sensory to motor disorders to change in muscle tone, like spasticity [7]. In this way, as a determining factor in hemiplegia, spasticity is a motor disorder resulting from hyperexcitability of the stretch reflex, characterized by exaggerated tendon spasms and a speed-dependent increase of such reflex [8].

Currently, however, there are several treatments for stroke [9]. Among them, some more recent techniques and approaches, like acupuncture and Kinesio Taping (KT) [10,11]. As a key component of Traditional Chinese Medicine and an effective remedy for stroke [12], a considerable number of clinical and experimental studies have demonstrated that acupuncture relieves poststroke symptoms and complications such dysphagia, depression, and cognitive dysfunction [13—15].

Another therapeutic possibility is KinesioKT, developed by Kenzo Kase in 1996, which is the application of an elastic bandage to the skin, promoting a mechanism of pressure/force on it while pulling up hard, differing from a common bandage [16]. So, the constant afferent mechanical and somatosensory stimuli are perceived at the cortical level, producing motor unit recruitment and contributing to the neuroplasticity [17,18]. Therefore, muscle function can be facilitated or inhibited by the use of elastic bandages. In this way, the bandages effect joint position [19].

For this, it is important to identify new therapies in stroke sequelae treatment and to provide functionality and a better quality of life for patients. Hence, this research aims to analyze the effects of acupuncture associated with KT on the upper limb of patients with chronic hemiparesis after stroke.

2. Materials and methods

This prospective, randomized trial was registered on ClinicalTrials.gov (NCT02690493). Participants provided informed written consent to a protocol approved by the Universidade Federal de Ciências da Saúde de Porto Alegre Human Research Ethics Committee (protocol #935.288), and all evaluations and treatment sessions were conducted in the Functional and Nutritional Evaluation Laboratory of Universidade Federal de Ciências da Saúde de Porto Alegre.

The inclusion criteria were as follows: (1) diagnosis of stroke for at least 6 months; (2) hemiparesis in upper limb; (3) age over 18 years, no gender specification; and (4) ability to comprehend simple instruction [Mini-Mental State Examination(MMSE)]. It evaluates seven specific cognitive functions and its total score ranges from zero to 30 points. The cut-off for diagnosis of dementia in individuals with no education is 18/19, and in the ones with education, it is 24/25 [20]). Participants were excluded if they (1) presented subluxation or dislocation of shoulder, painful shoulder syndrome or amputations; (2) presented allergy or any reaction to elastic bandage, or (3) had an averse reaction to treatment with needles.

Participants were randomized (simple randomization through black envelopes) into two groups: acupuncture (ACP) group and acupuncture + Kinesio Taping (ACP-KT) group. Group ACP received 12 acupuncture sessions by an acupuncturist, three times a week—every Monday, Wednesday and Friday—at the same time of the day. They were in the sitting position with arms supported by the chair when possible or in the flex-adduction pattern in the case that the affected arm would not be able to stay naturally on the chair-arm. Sterilized needles (Dongbang, 0.25 mm × 40 mm) were used for 30 minutes in Baihui (DU20), Sishencong, and "Wrist 4, 5 and 6" (wrist—ankle acupuncture) bilaterally. Needles were inserted until "TeQi" sensation was achieved, and no further manipulation of needles was performed.

Group ACP-KT received the application of taping to the segments corresponding to triceps-brachial and wrist and finger extensors of the paretic upper limb (fixed points on elbow and lateral epicondyle, respectively, in "I" and "Y" techniques) with 100% tension, right after the acupuncture session, which followed the same procedures as the ACP group (Fig. 1). For the tape application, patients were in the sitting position. Elastic bandages (Dongbang Acu-Tape) were used, and were retained on the patient's arm until the next session.

Spasticity was assessed through the Modified Ashworth Scale (MAS) [21]. It is rated on an ordinal numeric scale, ranging from zero (normal muscle tone) to 4 (extreme spasticity) [21,22]. For mathematical calculation purposes, the 1+ rating was replaced by 1.5 [23].

Evaluations took place before the first and after the last intervention session to verify joint active range of motion (ROM) through goniometry (flexion, extension, and abduction of the shoulder; elbow and wrist extension; and radial deviation and third finger extension). One single measurement was performed for each ROM/movement for each evaluation. The median difference between the preintervention and postintervention values was analyzed. An acrylic goniometer of the brand Profisiomed with a length of 35 cm and a width of 4.5 cm was used, while the patient was sitting on a chair, keeping the spine straight.

The Wolf Motor Function Test (WMFT) was applied to these individuals to evaluate the time spent performing 17 activities of daily living. It is a test currently used for analyzing the agility of upper limb movements, and this result provides the mean completion time of all tasks [24].

Descriptive statistical analysis was used. Intragroup comparisons were made by the Wilcoxon test and the

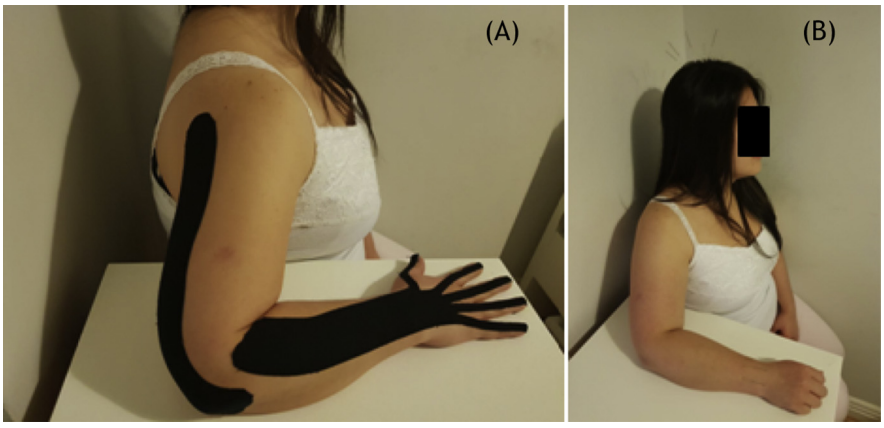

Figure 1 Image of the application. (A) The functional taping. (B) The acupuncture needles.

intergroup differences by the Mann—Whitney test for range of motion, MAS, and FAS. The analysis of time in WMFT was made through parametric tests: paired *t* test in intragroup and *t* test (independent) in intergroup comparison. The sample characterization was given from Fisher's exact test. For all of these, the significance level was set at 5%. The statistical treatment of the data was performed using IBM SPSS® (Statistic Package for the Social Sciences, Chicago, IL, USA), version 20, for Windows®.

3. Results

3.1. Study sample

A total of 25 patients were screened, of whom 16 met the study criteria. These patients were randomly divided into the two experimental groups as follows: 8 to ACP and 8 to ACP-KT. All of the ACP and ACP-KT participants completed the proposed protocol and were recommended for revaluation.

3.2. Participants' characteristics

The participants' characteristics are shown in Table 1. As it can be seen, there was no difference between groups in terms of age, gender, time since onset, type of stroke, paretic side, or MMSE score.

Regarding the evaluation of spasticity, there was no significant intergroup difference in MAS. However, it can be noted that there was an intragroup reduction of spasticity in both groups; the major changes of which can be seen in Table 2. In ACP, there was significant improvement in muscle tone in seven of the 11 muscle groups assessed, whereas in ACP-KT, the tone of eight muscle groups improved.

Goniometry showed significant intragroup difference in flexion, extension, and adduction of the shoulder, flexion of the elbow and wrist, and radial deviation and extension of the third finger, whose values are shown in Table 3. Conversely, no significant intergroup difference was found.

Regarding WMFT, the mean time to perform the tasks at preintervention and postintervention moments were 784.93 (±756.83) and 762.68 (±774.26) seconds, respectively, for ACP (*p* 0.097), and 1172.78 (±576.13) and 1171.22 (±579.64) seconds for ACP-KT (*p* 0.702). The result showed no intergroup or intragroup difference.

Table 1 Characteristics of the participants.

Group	Acupuncture	Acupuncture + KT	*p*[a]
Total *n*	8	8	1.0
Gender, *n* (%)			
Male	4 (50%)	4 (50%)	1.0
Female	4 (50%)	4 (50%)	
Age (years—mean ± SD)	56.0 (±13.1)	59.5 (±10.8)	0.62
Stroke, n (%)			
Ischemia	8 (100%)	6 (83.3%)	1.0
Hemorrhage		2 (16.7%)	
Time since onset (months—mean ± SD)	114.1 (±114.1)	115.0 (±73.1)	0.69
Paretic side, *n* (%) right	4 (50%)	4 (50%)	1.0
MMSE (score—mean ± SD)	28.5 (±1.5)	28.3 (±1.9)	0.87

n = number of participants, MMSE = Mini-Mental State Examination; SD = standard deviation; KT = Kinesio Taping.
[a] Fisher's exact test for proportions; *t* test for continuous variables.

4. Discussion

This study aimed to determine the effects of acupuncture associated with KT on the upper limb of patients with chronic hemiparesis after stroke. Acupuncture was effective in treating stroke sequelae in the paretic upper limb concerned with a decrease in muscle tone and increase in active ROM, despite not having significantly improved speed of movement in WMFT tasks. In turn, the concomitant use of KT did not bring significant benefits to treatment.

Concerning the studied sample, all items evaluated between the two groups were homogeneous. Thus, homogeneous distribution of gender was found, as well as a higher

Table 2 Modified Ashworth Scale outcomes.

Muscle group	Variables	Acupuncture	Acupuncture + Kinesio Taping	*p* intergroup
Shoulder adductor	Variation	−0.7 (−1.5;-0.5)	−1.2 (−1.5;-0.3)	0.73
	Pre	1.5 (1.5;2.13)	2.5 (1.5;3.1)	
	Post	1.0 (0.0;1.5)	1.2 (0.7;2.1)	
	p intragroup	**0.026***	**0.039***	
Shoulder extensor	Variation	−1.0 (−1.25;-0.88)	−1.0 (−1.2;0.0)	0.53
	Pre	1.5 (1.0;2.5)	2.5 (1.7;4.0)	
	Post	0.5 (0.0;1.6)	1.5 (1.0;2.5)	
	p intragroup	**0.024***	0.059	
Shoulder internal rotators	Variation	−1.2 (−1.6;-0.7)	−0.5 (−1,2;0,0)	0.24
	Pre	2.0 (1.3;3.0)	2.5 (1.5;4.0)	
	Post	0.5 (0.0;1.8)	1.7 (1.3;3.0)	
	p intragroup	**0.041***	0.102	
Elbow flexor	Variation	−1.0 (−1.1;0.0)	−1.25 (−2.0;-0.3)	0.32
	Pre	1.7 (0.7;3.0)	3.0 (2.0;3.7)	
	Post	1.2 (0.0;1.6)	1.5 (0.7;2.5)	
	p intragroup	0.059	**0.042***	
Pronator	Variation	−0.2 (−1.1;0.0)	−1.0 (−1.6;-0.7)	0.15
	Pre	2.2 (1.1;3.2)	3.0 (1.8;4.0)	
	Post	1.5 (0.0;3.2)	2.5 (0.0;3.0)	
	p intragroup	0.109	**0.039***	
Wrist flexor	Variation	−1.2 (−1.6;-0.7)	−1.0 (−1.2;0.0)	0.35
	Pre	2.5 (1.1;3.0)	3.0 (2.0;4.0)	
	Post	0.7 (0.0;2.0)	2.5 (1.5;3.0)	
	p intragroup	**0.041***	0.059	
Thumb flexor	Variation	−1.2 (−1.6;-0.5)	−1.5 (−2.2;-1.13)	0.35
	Pre	1.5 (1.3;1.8)	2.5 (1,5;3.0)	
	Post	0.5 (0.0;1.0)	0.5 (0.0;1.6)	
	p intragroup	**0.027***	**0.039***	
2nd finger flexor	Variation	−1.1 (−1.5;-0.7)	−0.7 (−1.6;-0.3)	0.62
	Pre	1.5 (0.7;2.2)	2.0 (1.5;2.2)	
	Post	0.0 (0.0;1.1)	1.0 (0.7;1.6)	
	p intragroup	**0.038***	**0.042***	
3rd finger flexor	Variation	−1.2 (−1.5;-0,7)	−0.7 (−1.8;-0,3)	0.62
	Pre	1.5 (0.7;2.2)	2.0 (1.5;2.2)	
	Post	0.0 (0.0;1.1)	1.0 (0.0;1.6)	
	p intragroup	**0.038***	**0.042***	
4th finger flexor	Variation	−1.2 (−1.5;0.0)	−1.5 (−2.2;-0.7)	0.27
	Pre	1.5 (0.0;2.2)	2.0 (1.5;2.2)	
	Post	0.0 (0.0;1.1)	0.0 (0.0;1.2)	
	p intragroup	0.059	**0.042***	
5th finger flexor	Variation	−1.5 (−2.0;0.0)	−1.75 (−2.2;-0,7)	0.50
	Pre	1.5 (0.0;2.2)	2.0 (1.3;2.2)	
	Post	0.0 (0.0;0.2)	0.0 (0.0;0.5)	
	p intragroup	0.063	**0.042***	

Values are median (min/max). Wilcoxon and Mann−Whitney tests were used for intragroup and intergroup comparisons, respectively.
*$p < 0.05$. Variation means difference between pretreatment and posttreatment.

incidence of ischemic stroke and mean age. Similarly, the study conducted by Kuster et al., in which 341 patients admitted to a Brazilian hospital were evaluated, found that 59.2% had ischemic stroke, 29.6% suffered transient ischemic attack, and only 11.1% had hemorrhagic stroke. Moreover, there was no difference in gender and the mean age [25].

Regarding spasticity, after intervention it was possible to verify that both ACP and ACP-KT groups showed a significant decrease in intragroup muscle tone. Corroborating with this finding, Plavsic et al. conducted a study to evaluate the long-term effects of acupuncture and therapeutic exercises on the frozen shoulder of patients with stroke. They found that the group receiving acupuncture and exercise therapy achieved better results on the reduction of spasticity [26]. Likewise, in a study involving three children with cerebral palsy, it was found that the concomitant use of acupuncture and neurological physical therapy twice a week for 9 months decreased the muscle tone of the lower limbs and trunk in all participants [27].

Table 3 Active goniometry outcomes.

Muscle group	Variables	Acupuncture	Acupuncture + Kinesio Taping	*p* intergroup
Shoulder flexion	Variation	5.5 (3.5;10.5)	9.0 (−2.5;25.5)	0.57
	Pre	93.5 (36.0;116.5)	56.0 (35.5;82.5)	
	Post	97.0 (46.5;122.0)	70.0 (43.0;88.5)	
	p intragroup	**0.027***	0.17	
Shoulder extension	Variation	17 (9.3;21)	9.0 (3.0;19.5)	0.37
	Pre	20 (10.5;31.3)	18.0 (0.0;43)	
	Post	35 (21.5;52)	29.0 (18.0;47.5)	
	p intragroup	**0.028***	**0.043***	
Shoulder abduction	variation	4 (0.0;7.8)	4 (1.5;17)	0.62
	Pre	10.0 (−2.5;14.3)	6 (−1.5;16.5)	
	Post	14.0 (0.0;19.5)	15.0 (8.0;2)	
	p intragroup	0.066	**0.042***	
Elbow extension	Variation	3 (0.0;14.5)	9 (3;16.5)	0.46
	Pre	116 (98.5;138)	102 (94;120)	
	Post	124 (109.5;139)	112 (101;133)	
	p intragroup	0.068	**0.043***	
Wrist extension	variation	1 (−0.5;24)	7 (1.5;17)	0.46
	Pre	43 (28.5;52.5)	43 (29.5;65.5)	
	Post	54 (30;68.5)	58 (39;67.5)	
	p intragroup	0.197	**0.043***	
Radial deviation	variation	5 (1.5;11.5)	3 (0.0;4.0)	0.18
	Pre	5 (0.0;19)	10 (−1;19.5)	
	Post	16 (6;24)	11 (3;20.5)	
	p intragroup	**0.043***	0.059	
3rd finger extension	variation	4 (1.5;14.5)	2 (−3.5;9)	0.46
	Pre	−12 (-66;11)	−35 (-55.5;0.0)	
	Post	−11 (−51.5;14)	−29 (−66;3)	
	p intragroup	**0.042***	0.71	

Values are median (min/max). Wilcoxon and Mann–Whitney tests were used for intragroup and intergroup comparisons, respectively.
*$p < 0.05$. Variation means difference between pretreatment and posttreatment.

In this way, acupuncture is able to create many biological responses, distant or close to the site of application, such as circulatory and biochemical effects, considering the release of peptides and transmitters in both the brain and the spinal cord. Mainly, these responses are mediated by sensory neurons to various structures in the central nervous system [28,29]. The sensory stimulation can modify cortical sensorimotor representation areas which may also be altered by loss of sensory input, like amputation, as well as in response to focal brain lesions, including stroke. At any rate, many types of training, sensory stimulation, and activation may influence plasticity and, hence, rehabilitation [28]. In addition, acupuncture may influence cortical circuits in the damaged area of the brain. The brain tissue, on its turn, attempts to modify itself at cellular level, comprising neuronal and glial cell extensions and synapses. Moreover, this reorganization happens in both cortical and subcortical areas as well as in the spinal cord, justifying, at least partially, the results observed in this study [28,30].

On the other hand, even though Ludwig noted a decrease in spasticity from stroke by KT treatment, it was not statistically significant [31]. Furthermore, it was also found that KT associated with kinesiotherapy had no efficacy in reducing spasticity in patients with chronic hemiplegia [32]. In addition, KT allows afferent sensorimotor stimulation, taking information to cortex and then creating motor responses. However, neuroplasticity becomes slower the more chronic the disorder is. Therefore, stimuli produced by taping on the integumentary system, which can help nervous system plastic response, have diminished action [32]. This may be a reason for the lack of significant additional benefit from KT, as found in this study, since most patients had chronic stroke sequelae.

Regarding active goniometry, there was significant increase in ROM for flexion and extension of shoulder and radial deviation and metacarpophalangeal extension of third finger for ACP group, along with extension and abduction of shoulder and the extension of the elbow and wrist for ACP-KT. Although they are different muscle groups, both ACP and ACP-KT showed improvement in all four of them. Consequently, it can be inferred that KT did not significantly influence the treatment regarding the increase in ROM of the paretic upper limb. So far, there has not been a specific clinical trial on the treatment of the paretic upper limb through acupuncture and evaluation of active ROM. However, Alegre et al. state that spasticity directly influences the range of motion and causes changes in the soft tissues [33]. Accordingly, gains in ROM and the decrease in muscle tone can be correlated. This perspective was confirmed by Silva and Chiumento, who found that three patients with spinal cord injury, undergoing aquatic physical therapy, improved ROM of the knees and hips in that spasticity

decreased [34]. In addition, a study examined the effect of KT in dorsiflexion movement of patients with chronic sequelae of stroke after 4 weeks of treatment. All of them presented an increase in active ROM, although it was not significant [35]. Likewise, improvement in wrist and elbow ROM was reported in four out of five patients with stroke sequelae, with KT treatment, as in our study. Nevertheless, participants underwent 20 sessions of concomitant kinesiotherapy plus taping, with no control group [36].

On the subject of the speed of active movement, assessed by WMFT, there was no significant improvement in the parameters, suggesting that neither acupuncture nor KT was effective in this matter. In another study, 90 patients were divided into two groups, one receiving standard treatment (physical therapy, speech therapy, nursing, and medication) and one receiving acupuncture plus standard treatment. After an average of 35 sessions, it was found that there was no intergroup difference regarding functional independence, mobility, and sensorimotor impairment, suggesting that acupuncture did not contribute to these parameters [37]. The same outcome was observed by Figueiredo et al., who examined the effects of KT associated with kinesiotherapy on gait speed of hemiparetic patients, or, in other words, their agility on the ""walk 10 meters"" test. There was no difference between the intervention and control groups.[31] Equally, Paulino et al found that taping had no significant improvement in performance time on Time up and Go test, which also evaluates mobility during gait [35].

Eventually, although being effective in the modulation of tonus and increase of ROM, acupuncture did not significantly improve agility of movement, and neither did KT. Many aspects may explain such results. First, a long time since the onset, different ages and subtypes of stroke, as well as different damaged areas of the brain, might influence the potential for brain plasticity [30,32]. Second, it must be taken into account that there are several techniques of acupuncture like needle, auricular, and electro acupuncture, for instance. Thus, a reason for the negative results reported in this article may depend on the fact that mainly wrist—ankle acupuncture was used, which does not imply that all techniques can produce the same outcome. Finally, even though KT can provide stimuli on the skin receptors of the sensorimotor system and result in better coordination and voluntary control [38], it should be used in conjunction with other therapies. That is, it is a complementary technique which must be linked to a therapeutic program [31]. Therefore, we believe these stimuli were not sufficient to obtain a significant response by the central nervous system in such a short-duration treatment on chronic stroke patients.

Therefore, acupuncture provided stroke patients excellent results, by reducing the tonus of the major muscles involved as well as increasing the range of motion of several joints important to upper limb functionality. The same did not occur regarding limb agility. In addition, KT did not bring significant benefits concerning the analyzed variables. However, the small number of patients and the lack of a group treated only with taping are important restrictions to a final conclusion, but these issues are being solved by the research group, with an increase of the sample studied.

Financial support

None.

Disclosure statement

None.

References

[1] Correia ACS, Silva JDS, Silva LVC, Oliveira DA, Cabral ED. Crioterapia e Cinesioterapia no Membro Superior Espástico no Acidente Vascular Cerebral. Fisioter Mov 2010;23(4):555—63. Brazil.
[2] Cabral DL, Damascena CG, Teixeira-Salmela LF, Laurentino GEC. Confiabilidade do Perfil de Saúde de Nottingham ApósAcidente Vascular Encefálico. Ciência&Saúde-Coletiva 2012;17(5):1313—22. Brazil.
[3] Sedrez JA, Farias GL, Braida G. Relação Entre Funcionalidade e Sequela emLadoDominanteemPacientes com AVE. Saúde Rev. 2012;12(31):43—51. Brazil.
[4] Marcucci FCI, Cardoso NS, Berteli KS, Maranhani MR, Cardoso JR. AlteraçõesEletromiográficas dos Músculos do Tronco de Pacientes com HemiparesiaApósAcidente Vascular Encefálico. ArqNeuropsiquiatr 2007;65(3-B):900—5. Brazil.
[5] Stokes M. Neurologia para Fisioterapeutas. 1st ed. São Paulo: Premier: Translation Oppido T; 2000.
[6] Harris JE, ENG JJ. Paretic Upper-Limb Strength Best Explains Arm Activity in People with Stroke. PhysTher 2007 Jan;87(1):87—98.
[7] Mota RS, Bitencourt JS, Conceição TMA, Cardoso FB, Silva IL, Beresford H. Avaliação do efeito do exercícioaeróbiconamarcha de indivíduoshemiparéticos. R. bras. Ci. e Mov 2011;19(2):45—51. Brazil.
[8] Belagaje SR, Lindsell C, Moomaw CJ, Alwell K, Flaherty ML, Woo D, et al. The Adverse Effect of Spacity on 3-Month Post-stroke Outcome Using a Population-Based Model. Stroke Res Treat 2014, 696089.
[9] Filippo TRM, Alfieri FM, Cichon FR, Imamura M, Battistella LR. Neuroplasticidade e RecuperaçãoFuncionalnaReabilitaçãoPós-Acidente Vascular Encefálico. ActaFisiatr 2015;22(2):93—6. Brazil.
[10] Nakata CH, Melo PF, Morais PK, Silva GHC. Acupuntura e Hemiplegia: RevisãoSistemática. Rev Med Saude Brasília 2014;3(2):162—72.
[11] Junior AAP, Butzke J, Persuhn JJ. Aplicação do KinesioTapingAssociado à CinesioterapianaCorreção da MarchaPósAcidente Vascular Encefálico. RevistaPesquisaem Fisioterapia 2016;6(1):73—82. Brazil.
[12] Bonafede M, Dick A, Noyes K, Klein JD, Brown T. The effect of acupuncture utilization on healthcare utilization. Med Care 2008;46(1):41—8.
[13] Wong ISY, Ng KF, Tsang HWH. Acupuncture for dysphagia following stroke: A systematic review. Eur J Integrat Med 2012;4(2):141—50.
[14] Menghan L, Bo Z, Zhihong M, Tao S, Chunhong Z. Effect of Tiaoshen Kaiqiao acupuncture in the treatment of ischemic post-stroke depression: a randomized controlled trial. J Trad Chinese Medicine 2017;37(2):171—8.
[15] Yang S, Ye H, Huang J, Tao J, Jiang C, Lin Z, et al. The synergistic effect of acupuncture and computer-based cognitive training on post-stroke cognitive dysfunction: a study protocol for a randomized controlled trial of 2 × 2 factorial design. BMC Complement Altern Med 2014;14(1):290.
[16] FU TC, Wong AMK, Pei YC, Wu KP, Chou SW, Lin YC. Effect of Kinesio Taping on Muscle Strength in Athletes- A pilot Study. J Sci Med Sport 2008;11:198—201.

[17] Santos JCC, Giorgetti MJS, Torello EM, Meneghetti CHZ, Ordenes IEU. A influência da KinesioTaping no tratamento da subluxação de ombro no Acidente Vascular Cerebral. Rev Neurocienc 2010;18(3):335—40. Brazil.
[18] Stupik A, Dwornik M, Bialoszewski D, Zych E. Effect of Kinesio Taping on bioelectrical activity of vastusmedialis muscle: Preliminary report. Ortop Traumatol Rehabil 2007;9(6): 644—51.
[19] Jaraczewska E, Long C. Kinesio Taping in Stroke: Improving Functional Use of the Upper Extremity in Hemiplegia. Top Stroke Rehabil 2006;13(3):31—42.
[20] Lourenço RA, Veras RP. Mini-Exame do Estado Mental: CaracterísticasPsicométricasemIdososAmbulatoriais. Rev Saúde-Pública 2006;40(4). Brazil.
[21] Associação Brasileira de MedicinaFísica e Reabilitação. Espasticidade: AvaliaçãoClínica. Brazil: ProjetoDiretrizes; 2006.
[22] Henriques A. Nível de actividade do tronco vs repercussões-funcionais no movimento de alcanceemindivíduospós AVE [dissertation]. Vila Nova de Gaia (Portugal): Escola Superior de Tecnologia de Saúde do Porto; 2010.
[23] Serrano S, Constantino J, Januário F, Amaral C. Espasticidade do Membro Superior: Avaliação da Eficácia e Segurança da ToxinaBotulínica e Utilidade da Escala GAS — EstudoRetrospectivo. Rev Sociedade Portuguesa de Med Fisica e Reabilit 2014;25(1). Portugal.
[24] Pereira ND, Michaelsen SM, Menezes IS, Ovando AC, Lima RCM, Teixeira-Salmela LF. Confiabilidade da VersãoBrasileira do Wolf Motor Function Test emAdultos com Hemiparesia. Rev Bras Fisioter 2011;15(3):257—65. Brazil.
[25] Kuster GW, Dutra LA, Brasil IP, Pacheco EP, Arruda MA, Volcov C, et al. Outcome Determinants of Stroke in a Brazilian Primary Stroke Center. Stroke Res Treat 2014, 194768.
[26] Plavsic A, Foti C, Bella GD, Brdareski Z, Nikcevic L, Konstantinovic L. Avaliação dos Efeitos a Longo Prazo da Acupuntura e ExercíciosTerapêuticosemOmbroCongelado de Pacientes com Acidente Cerebral Vascular. ActaFisiatr 2009; 16(3):121—5. Brazil.
[27] Junior RJM, Rossetto SC, Matsuo RF, editors. Acupuntura no Auxílio da Diminuição da EspasticidadeemCrianças com Paralisia Cerebral [Internet]. São Paulo: UniversidadeEstácio de Sá; 2015 [cited 2016 Apr 17]. Available from, http://pt.slideshare.net/rubensmontes92/.
[28] Johansson BB, Haker E, Arbin M, Britton M, Långström G, Terént A, et al. Acupuncture and Transcutaneous Nerve Stimulation in Stroke Rehabilitation. Stroke 2001;32:707—13.
[29] Wu H, Tang J, Lin X, Lau J, Leung PC, Woo J, et al. Acupuncture for Stroke Rehabilitation. Stroke 2008;39:517—8.
[30] Gosman-Hedström G, Claesson L, Klingenstierna U, Carlsson J, Olausson B, Frizell M, et al. Effects of Acupuncture Treatment on Daily Life Activities and Quality of Life. Stroke 1998;29: 2100—8.
[31] Ludwig L. Osefeitos da bandagemfuncional no membro superior paréticoporseqüela de acidente vascular encefálico. Novo Hamburgo (RS): UniversidadeFeevale; 2009.
[32] Figueiredo MV, Chaves L, Rodrigues ARS, Silva EB. Eficácia do taping associado à cinesioterapianamelhora da espasticidade e velocidade da marchaemhemiplégicos. Rev Bras CiencEnvelhec Human 2011;8(3):355—62. Brazil.
[33] Monte Alegre DC, Almeida JFS, Oliveira TVC, Candido EAF. Plasticidade Muscular: do MúsculoSadioaoEspástico. ScireSalutis 2012;2(1).
[34] Silva LC, Chiumento LF. Análise da Espasticidade de MembrosInferioresemPacientes com TraumatismoRaquimedular, Submetidos a RelaxamentoAquático. Criciúma (SC): Universidade do ExtremoSulCatarinense; 2007.
[35] Paulino GLC, Vicente E, Chiumento LF, Coelho BLP, editors. KinesioTapingnaDorsiflexão do TornozeloemPacientes com Acidente Vascular Encefálico. Criciúma (SC): Universidade do ExtremoSulCatarinense; 2012.
[36] Mota DVN, Silva LVC. Use of Functional Bandages in Patients with Stroke. Fisioter Mov 2014;27(3):329—36.
[37] Sze FKH, Wong E, Yi X, Woo J. Does Acupuncture Have Additional Value to Standard Poststroke Motor Rehabilitation? Stroke 2002;33:186—94.
[38] Silva HAS, Vasconcelos DA, editors. EfeitoBiomecânico do Uso da BandagemElásticaTerapêuticaemPortadores de Espasticidade no Membro Superior PósAcidente Vascular Cerebral [internet]. Campina Grande (PB): UniversidadeEstadual da Paraíba; 2014 [cited 2016 Jun 4]. Avaliable from.