

Original article:

Can icing is help to reduce Spasticity, improving ankle range of motion and gait velocity in post stroke subjects

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Abstract:

Background: Stroke (CVA) is the leading cause of morbidity in the elderly population that affects movements. Stroke is the third leading cause of mortality in most countries around the globe. The most commonly we found spasticity in strokes patients and Spasticity management is an imperative one in the rehabilitation programme, which can be attained through cryotherapy.

Methodology: Total 30 participant who are hemiplegic patients with plantar flexor spasticity and walk independently were included in this study. The measurement like spasticity ankle range of motion and gait velocity measured with Modified Ashworth Scale, goniometry and velocity formula.

Results : The t tab value for each measure is 2.045 and t cal value for spasticity is 4.67, for PROM for ankle joint 9.07 and for gait velocity it is 13.47. these t tab and t cal value are statistically significant.

Conclusion: It is concluded from our study that icing decreases spasticity, and increases range of motion of ankle there by improving gait velocity.

Key Words: Icing, Spasticity, PROM, Gait Velocity etc.

Introduction

Stroke (CVA) is the leading cause of morbidity in the elderly population that affects movements. Stroke is the third leading cause of mortality in most countries around the globe. In a survey taken, nearly 7,50,000 individuals have stroke and 1,50,000 die from stroke every year, out of which 90,000 are men, and 60,000 are women, throughout the world. The remaining 6,00,000 individuals suffer from movement disorders. Someone has stroke every 45 seconds and someone dies of stroke for every 3.1 minutes, throughout the world.^{1,2}

The main hindrance for the functional recovery of stroke patients is spasticity, which affects their functional tasks. Spasticity management is an imperative one in the rehabilitation programme, which can be attained

through cryotherapy.³ "Cryo" means cold or freezing and cryotherapy refer to the practice of using cold to achieve therapeutic goals. Cooling agents such as cold packs, cold whirlpool and ice massage are commonly used in the management of pain, edema and are also effective in decreasing muscle guarding and spasm. Several studies indicate that spasticity can be reduced by cryotherapy.^{3, 4} Of the many functions that are affected due to spasticity, gait is the one and most important in stroke patients.³ So the purpose of this study to find effectiveness of icing in reducing Spasticity, improving ankle range of motion and gait velocity in post stroke subjects.

Methodology

After obtaining ethical clearance from Siddhakala Institute, Sangamner where 30 hemiplegic patients of

both genders with plantar flexor spasticity, who able to walk without support, psychologically fit, without any sensory deficits & without any orthopaedic problems in lower limb were only included and who were not willing to participate, with severe neurological, cardiac & musculoskeletal impairment were excluded from the study. After fulfilled the selection criteria were selected using convenient sampling technique. They were subjected to pretest assessments for spasticity, passive range of motion of ankle and gait velocity.

Spasticity

Ashworth scale was used to assess the spasticity, which consisted of 5-point ordinal scale in which,

1. Represented no increase in muscle tone.
2. Represented slight increase in tone giving “catch” when affected part is moved in flexion or extension.
3. Represented more marked increase in tone but affected part is easily moved.
4. Represented considerable increase in tone, passive movement difficult.
5. Represented affected part is rigid in flexion or extension.

The subjects were comfortably positioned in prone lying with 90° knee flexion of affected lower limb, and dorsiflexion was performed passively to assess the spasticity of plantar flexors.^{1,3,4,12}

Gait velocity was calculated using the formula:

Distance covered in meters (20m)

Time taken to cover the distance in seconds.

Two attempts were given to each subject with 5 minutes interval between each attempt and best of the two readings was recorded.^{5,6,7}

Passive range of motion of ankle

Goniometry was used to measure the passive range of motion of the ankle. Goniometer is the one, widely used to measure the range of motion of the joints, which consist of one fixed arm and another movable arm with a fulcrum at the centre.

In this study, the patients were comfortably positioned in prone lying with 90° knee flexion of affected lower limb and ankle in extreme plantar flexion. Fulcrum of the goniometer was centered over the lateral malleolus and the fixed arm was aligned parallel to the shaft of fibula. The movable arm was aligned parallel to the lateral aspect of the fifth metatarsal and moved from the extreme plantar flexion towards dorsiflexion up to the available range. The difference between the two positions was recorded as the measurement of passive range of motion of ankle.^{4,5,6}

Gait velocity

Velocity of an object is defined as the distance travelled by an object in unit time, in a specific direction. Similarly gait velocity is measured by dividing the distance covered by the subject by time taken to cover the distance. All the subjects were asked to walk on a regular surface with the maximum speed they could, for a distance of 20 meters and the time taken to cover the distance was recorded using Stopwatch.

Procedure -

A brief introduction about the procedure was explained to the patients and was made to experience the cold before the actual treatment, and their sensitivity to cold were also analysed. The patients were comfortably positioned in prone lying with a pillow under the ankle and turkey towel under the leg. To guard against the skin reaction vegetable oil was applied on the area of skin, which was to be treated.

Ice cube was taken in a turkey towel exposing one surface, and stroked over gastrosoleus slowly from origin to insertion, maintaining a continuous and direct contact for 30 minutes.^{1, 3, 4, 8, 9, 10, 11, 12, 13} After icing, all the subjects were subjected to all the three assessments for spasticity, passive range of motion of ankle and gait velocity, very similar to that of the pretest assessments

Result

At the end of study the data was analysed by using Graphpad Prism 5 Software. Total 30 participants included in which 20 were male and 10 female as shown in table and graph no. 1.

Table no. 1

Sex distribution	
Male	Female
20	10

There was significant change is seen in spasticity, p value was <0.0001 (df = 29) and Correlation coefficient 0.7245. table and Graph no. 2

Table no. 2

Spaticity	
Pre	Post
2.8	2.3

Along with there is improvement seen in PROM of Ankle joint, p value was (p<0.0001) (df = 29) which is statistically significant and Correlation coefficient 0.8765, Table and Graph no. 3

Table no. 3

PROM of Ankle Joint	
Pre	Post
49.3	51.6

And finally Gait velocity also has improved, p value was<0.0001 (df = 29) and and which is statistically signifiacnt and Correlation coefficient is 0.9946, Table and Graph no. 4

Table no. 4

Gait Velocity	
Pre	Post
0.54	0.57

The t tab and t cal value for Spasticity, PROM of Ankle joint and for Gait Velocity and there was reduction in spasticity, improvement in range of motion of ankle and gait velocity was significant at 5% level, Table no. 5,

Table no. 5

Variables	t-tab value	t-cal value
Spasticity	2.045	4.67
PROM of ankle	2.045	9.07
Gait velocity	2.045	13.47

Discussion

Many authorities point to the reduced velocity of nerve conduction or depressed sensitivity of receptors such as muscle spindle, for the reduction of spasticity, after icing. The stimulus produced by cold have an inhibitory effect on the alpha motor neuron pool, which ultimately reduce spasticity. From our study there is significant reduction in spaticity which is statistically proved. According to Dejangbal., et al. he found that in general, nerve conduction drops with decreasing temperature and finally nerve fibers cease conducting.⁹ Also Miglietta.et al., he found an invariable decrease in spasticity after cooling.¹⁴

The results obtained from our study show that there is significant improvement in passive range of motion of ankle after icing. This may be due to the reduction in spasticity of plantar flexors.Spasticity in the plantar flexor restricts the dorsiflexion range of motion of ankle. Once the spasticity is reduced at the plantar flexors, it gives way for dorsiflexion. After icing, the restriction of range of motion due to the spasticity is reduced and passive range of motion is increased.^{4, 12} Dontigy

and Sheldon et al, they stated that cold packs applied to spastic quadriceps and gastronemius muscle produced decrease in clonus and permitted the patient to participate in resistive exercises to the lower extremities in all ranges of motion.¹⁵

Gait velocity is also improved significantly after icing in our study.

Dorsiflexion of ankle is the major component in both stance and swing phases of the gait cycle. Improvement in dorsiflexion adds to the quantity and quality of gait, which obviously improves gait velocity.^{5, 7, 16} Bobath (1978) he said that for the recovery of gait the patient needs release of spasticity at hip, knee and ankle to lift his leg and make a step.

Conclusion

Hence it is concluded from our study there is an icing decreases spasticity, and increases range of motion of ankle there by improving gait velocity.

Limitation of study

1. Small smaple size
2. Less duration for study and
3. No any follow up

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