

## A STUDY TO FIND OUT EFFECT OF CERVICAL TRACTION ON SOLEUS MUSCLE H - REFLEX IN AMBULATORY STROKE PATIENTS - AN EXPERIMENTAL STUDY

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### **ABSTRACT**

**Context:** There are limited studies on effect of cervical traction in inhibition of the soleus H reflex amplitude in ambulatory stroke patients.

**Aim:** To find out effect of cervical traction on soleus H-reflex in ambulatory stroke patients.

**Settings and Design:** The interventional study was carried out in Shree K.K Sheth physiotherapy college, Rajkot.

**Method and Material:** Static Cervical traction (C.T) has been given to total 15 subjects (13 males and 2 females) for 1 min with 4 kg weight. Soleus muscle H reflex amplitude was measured before C.T and after 3 min of C.T.

**Statistical analysis:** Data was analyzed by using SPSS Version 20. Paired t-test was used to find out effect of cervical traction on soleus muscle H reflex in ambulatory stroke patients.

**Results:** Statistically not significant ( $p>0.05$ ) effect of cervical traction on soleus muscle on H reflex in ambulatory stroke patients.

**Conclusion:** This study concludes that there is no significant effect of cervical traction on soleus muscle H reflex in ambulatory stroke patients.

**KEYWORDS:** Cervical traction (C.T); H reflex; ambulatory stroke patients

### **INTRODUCTION**

The term Stroke or brain attack is defined as the sudden loss of neurological function caused by an interruption of the blood flow to the brain<sup>1</sup>. This cut off the supply of oxygen and nutrients, causing damage to the brain tissue<sup>2</sup>. The most common symptom of a stroke is sudden weakness or numbness of the face, arm, or leg, most often on one side of the body, occurring in 90% of the strokes<sup>2</sup>.

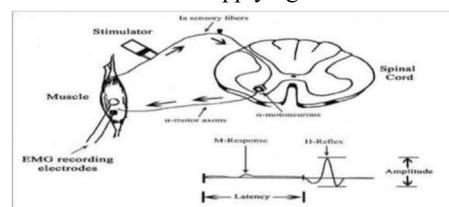
In India, the overall prevalence rate for stroke is lies between 84 – 262 per 100,000 in rural area and between 334 – 424 per 100,000 in urban areas. Mean age for onset of stroke for men in India ranges from 63-65 years and for women 57-68 years. Indian studies have shown that about 10-15% of strokes occur in people below age of 40 years<sup>3</sup>.

Performing late response tests, such as the H-reflex, can provide valuable information helpful in understanding the pathophysiology of various central nervous system abnormalities.

H-reflex was described by Johann Hoffmann in 1918, hence called H-reflex.<sup>4</sup> It is a mono synaptic reflex elicited by submaximal stimulation of the nerve. It is analogous to the mechanically induced spinal stretch reflex. The primary difference between the H-reflex and the spinal stretch reflex is that the H-reflex bypasses

the muscle spindle and therefore, is a valuable tool in assessing modulation of monosynaptic reflex activity in the spinal cord.

The H-wave is a good indicator of the strength and distribution of the stimulus input from muscle spindle to the motor neuron pool, which lies at the site of the anterior horn of the spinal cord and hence is an objective method for the measurement of spasticity<sup>4</sup>. The reflex arc of H-reflex includes, i) large fast conducting group Ia sensory fibers, ii) spinal cord where afferent fibers synapse with alpha motor neurons and iii) efferent motor fibers supplying the muscle.



**Figure 1: The reflex arc for H-reflex**

The H reflex amplitude is a parameter of the excitability of the monosynaptic reflex and increase in excitability of that reflex increases spasticity<sup>5-8</sup>. Through clinical observations, it has been reported that triceps surae is a muscle in which spasticity is predominantly present in patients with central nervous system dysfunctions such as stroke or cerebral palsy<sup>9-10</sup>.

Accordingly, longitudinal cervical traction, which induces mechanical stimulation of the cervical region, is also expected to have an effect on the soleus H reflex. In healthy subjects,

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cervical traction with intensity of 3kg depressed the soleus H reflex amplitude after traction and the degrees of the depression were 6% in the first minute, 7% in the second minute, and 10% in the third minute<sup>11</sup>.

## NEED OF THE STUDY

There are limited studies on effect of cervical traction in inhibition of the soleus H reflex amplitude in ambulatory stroke patients.

If there is any significant effect of C.T on soleus H reflex amplitude and  $\alpha$  motor neuron excitability then C.T can be used as treatment tool in combination with other spasticity reduction methods in stroke patients.

So the need of the study is to find out effect of cervical traction on soleus H reflex in ambulatory stroke patients.

## AIM OF THE STUDY

To find out effect of cervical traction on soleus muscle H- reflex in ambulatory stroke patients.

## OBJECTIVES

- To measure soleus H reflex amplitude prior to cervical traction in ambulatory stroke patients.
- To measure soleus H reflex amplitude after 3 min of cervical traction in ambulatory stroke patients.
- To find out difference between soleus muscle H reflex amplitude prior to cervical traction and after 3 minor cervical traction in ambulatory stroke patients.

## MATERIAL AND METHODS

**STUDY SETTING:** Shri K.K. Sheth Physiotherapy Centers, Rajkot

**STUDY DESIGN:** An experimental study

**METHOD OF COLLECTION OF DATA:**

Source of data collection: Shree K. K. Sheth Physiotherapy center, Rajkot

Study population: Ambulatory stroke patients

Sampling method: Purposive sampling

Sample size: 15 subjects

### MATERIALS TO BE USED

- EMG-NCV Instrument (RMS EMG EP MK-II, Version 1.1)
- Stop Watch
- Gel & cotton
- Cervical Traction apparatus
- Pen – Paper & pencil
- Consent form
- Assessment form



Figure 2: Materials to be used



Figure 3: Patient's Position during cervical traction



Figure 4: EMG-NCV Instrument (RMS Ep Mk-II, Version 1.1)



Figure 4: EMG-NCV Instrument (RMS Ep Mk-II, Version 1.1)

## CRITERIA FOR SELECTION

### Inclusion Criteria

- Gender: both males and females
- Modified Ashworth scale (1-3)
- Subjects with normal cognitive function (MMSE >23 )
- Ischemic and hemorrhagic types of stroke
- A score of 2-4 on Brunnstrom stages of recovery for the lower limb
- Patients with acute, sub acute and chronic stages of stroke

- Independent ambulatory patients with and without assistive device

#### **Exclusion Criteria**

- Patients with history of any recent surgeries in low back and lower limbs
- Patients with history of any recent musculoskeletal injuries like fractures, dislocation, joint instability or any soft tissue injuries
- Patients with other form of neurological impairments
- Patients with severe contractures due to spasticity in lower limbs
- Hemodynamically unstable patients
- Uncooperative patients or patient who is not willing to participate

#### **MEASUREMENT PROCEDURE**

The patients have been selected on the basis of inclusion and exclusion criteria.

Before starting the study, brief assessment has been done by Mini Mental State Examination and written consent was taken from the patients.

Position for soleus H reflex: Patient lied in prone position with leg and thigh firmly supported. The feet hanged freely with dorsum at right angle to tibia. Recording: The active surface electrode was placed at the distal edge of calf muscle, the reference electrode was placed on Achilles tendon and stimulating electrode was placed in the popliteal fossa. A square pulse of 1 ms duration was used for preferential stimulation

of large sensory fibers. The cathode was kept proximal to anode to avoid anodal block. The amplitude was measured from peak to peak. Five H responses were studied for analysis and maximum H wave amplitude was taken<sup>12</sup>.

#### *Instrumentation Parameters for H-reflex measurement:*

- Sweep speed: 10ms/div
- Sensitivity: 200-500  $\mu$ V/div
- Filter setting: 3 KHz

Cervical traction mode was static for 1 minute, with 4 kg weight given to the patient. Then soleus H – reflex was measured before cervical traction and after 3 and 5 minutes of cervical traction.

#### **RESULTS**

Data was analyzed by using SPSS Version 20. Paired t- test was used to find out effect of cervical traction on soleus muscle H reflex in 15 (Male-13 and Female-2) ambulatory stroke patients. In this test t value is 0.478 and level of significance is 0.640 that is more than 0.05.

**Table 1: Age and gender group distribution**

Age group	Male	Female	Total
30-40	2	0	2
41-50	1	1	2
51-60	2	1	3
61-70	8	0	8

**Table 2: Paired t test for pre and 3 min post H reflex amplitude**

	Paired Differences					t	df	Sig. (2-tailed)			
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference							
				Lower	Upper						
Pre and 3 min Post H reflex	0.122	0.989	0.25538	-0.42574	0.669	0.478	14	0.64			

**Table 3: Paired t test for pre and post 5 min H reflex amplitude**

	Paired Differences					T	df	Sig. (2-tailed)			
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference							
				Lower	Upper						
Pre and 5 min Post H reflex	-0.2	1.59227	0.41112	-1.082	0.6811	-0.488	14	0.633			

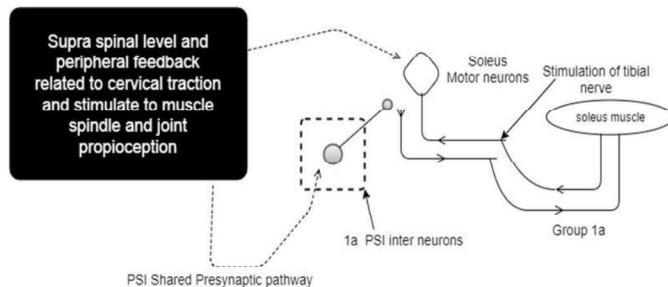
**Table 4: Mean and Standard Deviation for pre and 3 min post H reflex amplitude**

	Pre H reflex amplitude	Post H reflex amplitude
Mean	2.34	2.21
SD	2.82	2.99

#### **DISCUSSION**

Aim of the study was to find out effect of cervical traction on soleus muscle H- reflex in ambulatory stroke patients. This study concludes that there is no significant effect of cervical traction on soleus muscle H reflex in ambulatory stroke patients.

Interpretation: The above table shows the mean value of pre H reflex amplitude 2.34+ or – 2.82 and post H reflex amplitude 2.21 + or – 2.99



**Figure 6: Mechanism for Effect of cervical traction on soleus muscle H reflex**

Koichi Hiraoka et al, (1998) conducted a study to find the effects of cervical traction on the soleus H reflex in stroke patients in Japan. There was inhibition of the soleus H reflex amplitude several minutes after cervical traction. The result implied the possible usefulness of cervical traction for inhibiting excitability of the monosynaptic reflex in stroke patients<sup>21 13</sup>.

Olyaei et al (2017) conducted a study to the effect of cervical traction on soleus H reflex in healthy men and concluded showed that traction with 3 Kg force can increase motor neuron excitability of soleus muscle<sup>22 14</sup>. In 2003, Alain Frigon at al. conducted a study to find out effect of rhythmic arm movement on reflexes in the legs: Modulation of Soleus H Reflexes and Somatosensory Conditioning, concluded that, rhythmic arm swing contributes to the pattern of H-reflex modulation reported during human walking and running<sup>23 15</sup>.

In study noticed that Position of the patients in proper prone are most important for taking soleus H reflex. Two subjects dropped out because of fear of cervical traction.

It was also observed that the effect of cervical traction to reduce α neuro motor excitability or changes in H reflex were continued even after 5 minutes of cervical traction but that changes are not clinical significant so according to result of present study cervical traction cannot be used as treatment tool to reduce spasticity.

#### **Limitation of the study**

Small sample size, specific age criteria and duration after onset of stroke was not taken in to consideration.

#### **FURTHER RECOMMENDATIONS**

The effect of cervical traction on motor neuron excitability needs to be evaluated in other neurological conditions and other C.T parameter can be used.

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#### **CONCLUSION**

There is no significant effect of cervical traction on soleus muscle H reflex in ambulatory stroke patients. Therefore, cervical traction cannot be used as treatment tool to reduce spasticity in stroke patients.

#### **Conflict of Interest:**

Nil.

#### **Source of Fund:**

No fund was needed.

#### **Ethical Clearance:**

From Shree K.K. Sheth Physiotherapy College, Rajkot.

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