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Original Research Article

A Study to Find Out Effect of Equino-Varus Foot Posture on Distal Latency, CMAP Amplitude, Motor NCV Parameters of Nerve Conduction Velocity Study of Common Peroneal Nerve in Post Stroke Patients - An Observational Study

Dafda Renuka H[1]

[1]Assistant Professor, Shri K.K Sheth Physiotherapy College, Prakash Society Main Road, Opp. Nirmala Convent School, Rajkot, Gujarat-360007, India

ABSTRACT

Stroke patients with persistent distal weakness of ankle dorsiflexors and spastic plantar flexors are often unable to actively dorsiflex the foot during swing phase which is referred as foot drop. Common peroneal neuropathies are one of the causes of foot drop a condition which is evaluated using electrodiagnostic method. Primary objective of this study was to find out the distal latency, CMAP amplitude and nerve conduction velocity of common peroneal nerve of the hemiparetic lower extremity in stroke patients. Secondary objective of this study was to compare these NCV parameters of common peroneal nerve with the non-paretic lower extremity in the same patients.

Method: Twenty patients with the clinical diagnosis of stroke included in this study. Nerve conduction velocity of the Common Peroneal Nerve was studied in hemiparetic and non-paretic lower limbs. Outcome measures used in this study was distal latency, CMAP amplitude and Motor NCV.

Result: The Study showed that there was statistically significant difference in all the outcome measures.

Conclusion: Thus this study concluded that continuous equino-varus position in stroke individuals could cause electrophysiological changes in the Common Peroneal Nerve.

Key Words: Stroke, Equino-varus foot, MNCV

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. [1] Stroke patients with persistent distal weakness of ankle dorsiflexors and spastic plantar flexors are often unable to actively dorsiflex the foot during swing phase which is referred to as foot drop. [2] A study stated that people suffering from ankle sprain caused by inversion movement of the foot or ankle instability might have damage to the peroneal nerve. [3] The two tests commonly used are Electromyography (EMG) and Nerve Conduction Velocity (NCV). [4,5] This study aims to investigate whether spasticity of the ankle plantar flexors and/or weakness of ankle dorsiflexors in stroke patients cause electrophysiological changes in the common peroneal nerve.

Need Of The Study

Continuous equino-varus position leads to severe traction may either cause hematoma or ischemia inside the nerve. Thus this study aims to find out effect of equino-varus foot posture on distal latency, CMAP amplitude and MNCV parameters of

nerve conduction velocity study of common peroneal nerve in post stroke patients.

Aims Of The Study

To find out effect of equino-varus foot posture on distal latency, CMAP amplitude and MNCV parameters of nerve conduction velocity study of common peroneal nerve in post stroke patients.

Objectives:

To find out effect of equino-varus foot posture on distal latency, CMAP amplitude and MNCV of common peroneal nerve in normal and hemiparetic limb and to compare distal latency, CMAP amplitude and MNCV of common peroneal nerve in normal and hemiparetic limb.

MATERIALS USED: EMG-NCV instrument; RMS Ep Mk II, version 1.1, Electrodes, Electrode gel, Spirit, Cotton, Adhesive tape, Plinth, Pen and Paper, Consent form

CRITERIA FOR SELECTION:

Inclusion Criteria: Age between 25 years to 70 years, Gender: both male and female, Ischemic and hemorrhagic types of stroke, Stroke patients with sub acute and chronic stages of stroke, Patients with equino-varus foot posture.

Exclusion Criteria: Patients having language, visual, or cognitive impairments, any type of recent lower limb fracture, uncooperative patient, patients having associated other neurological disorder, patients with double hemiparesis.

METHOD

After the approval of the study from the ethical committee, 20 patients (mean age = 49.65; SD = 14.12) from Out Patient Department (OPD) centers who fulfilled the inclusion and exclusion criteria were taken for the study purpose. Purposive sampling technique has been used to select patients. Written informed consent was signed by each patient before proceeding for the study procedure.

The study variables like distal latency, CMAP amplitude, Motor Nerve Conduction Velocity of the Common Peroneal Nerve were assessed. All participants were allocated in a single group. The Distal latency, CMAP amplitude and Motor Nerve Conduction Velocity of the Common Peroneal Nerve of the hemiparetic and normal lower limb were obtained from the same participants.

The study variables like distal latency, CMAP amplitude, Motor Nerve Conduction Velocity of the Common Peroneal Nerve were assessed. The study was performed using NCV as a diagnostic tool. To study the Motor NCV of Common Peroneal Nerve three electrodes was used. The three recording electrodes were active electrode- G1 (cathode), inactive electrode- G2 (anode) and the ground electrode. The recording site used to test the Common Peroneal Nerve was the Extensor Digitorum Brevis.

The study was performed using NCV as a diagnostic tool. The participants were asked to lie in the supine position. Limb of the participants were placed in a relaxed position as any movement of the limb could hamper the results.16, 17 To study the Motor NCV of Common Peroneal Nerve three electrodes was used. The three recording electrodes were active electrode- G1 (cathode), inactive electrode- G2 (anode) and the ground electrode. The recording site used to test the Common Peroneal Nerve was the Extensor Digitorum Brevis.

On the dorsal lateral foot the G1 electrode was placed over the muscle belly, G2 electrode was placed distally over the metatarsophalangeal joint of the little toe. The ground electrode was placed between the recording electrodes and the stimulating electrode. The first stimulation site was the anterior ankle, slightly lateral to tibialis anterior tendon. The second stimulation site was 2 cm distal to the fibular head. After noting these values from the affected and unaffected lower extremities of the participants, comparison was done.

Fig: 1.1 PLACEMENT OF STIMULATING ELECTRODES

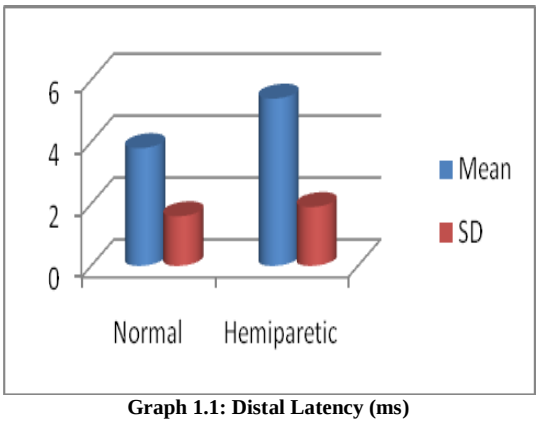
RESULTS

A total of 30 participants were screened of which 20 participants met the inclusion criteria. Electrophysiological changes in the common peroneal nerve were observed in the hemiparetic and the normal lower limb of these participants. The confidence interval was set as at 95% and data was considered statistically significant with p value <0.05. SPSS version 20 has been used and Microsoft windows 10 software has been used for data analysis. Unpaired t-test has been used for data analysis.

The mean age of participants was 49.65±14.1 years. The average age of females was 57.25 ± 9.2 years and for males was 44.58±14.8 years. The gender ratio was 12:8 (12 males and 8 females). The Distal latency of the normal lower limbs were 3.8 ± 1.6 ms. The Distal latency of the hemiparetic lower limbs were 5.4 ± 1.9 ms. On comparing the Distal latency of the normal and the hemiparetic lower limbs of the stroke participants, it was observed that this difference was highly significant. ($p < 0.05$, $t = 2.13$ with $df = 37$) (Table: 3.1).

Table 1.1: Distal Latency (ms)

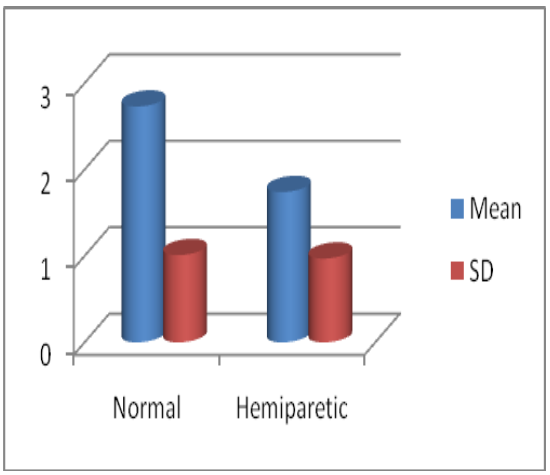
Side	Mean	SD	t- value	p- value	Result
Normal	3.8	1.6	2.13	<0.05	Significant
Hemiparetic	5.4	1.9			



Graph 1.1: Distal Latency (ms)

Table 2.1: Distal CMAP Amplitude (microvolt)

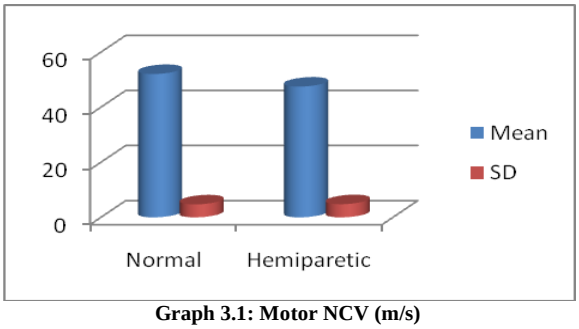
Side	Mean	SD	t- value	p- value	Result
Normal	2.73	1.01	3.21	<0.05	Significant
Hemiparetic	1.74	0.97			



Graph 2.1: Distal CMAP Amplitude (microvolt)

Table 3.1: Motor NCV (m/s)

Side	Mean	SD	t- value	p- value	Result
Normal	52.08	4.72	3.04	<0.05	Significant
Hemiparetic	47.51	4.79			



Graph 3.1: Motor NCV (m/s)

DISCUSSION

The result of the study showed that there were changes in the distal latency, CMAP amplitude, Motor Nerve Conduction Velocity of the common peroneal nerve in the hemiparetic lower limb of stroke participants.

It was observed that in the hemiparetic lower limb of the stroke patients the distal latency was prolonged, CMAP amplitudes were reduced and Motor NCV was reduced. The result was statistically significant. The study on cadavers by Noble showed that the Common Peroneal Nerve and its branches of distribution are attached to the fibular neck along with peroneus longus muscle producing T- form osteo muscular tunnel. The extensibility of the Common Peroneal Nerve in the popliteal cave is limited to 10-25 mm. [6] Severe inversion movement may lead to significant displacement of the osteo muscular tunnel causing nerve traction. [6] The peroneal nerve is supplied by two to three vasa nervorum. Severe traction may either cause hematoma or ischemia inside the nerve. Nitz A et al, found that 17% of patients with ankle sprain had alteration in the electrophysiological properties of the peroneal innervated muscle, despite the lack of clinical signs and symptoms of nerve lesion suggesting a mild axonal injury. [7]

Limitations of the Study: Small Sample size, type and site of lesion was not considered.

FURTHER RECOMANDATION: Larger sample size, same protocol can be applied in other population such as cerebral palsy, spinal cord injury.

CONCLUSION

This study concluded that the equino-varus position of foot in stroke patients causes electrophysiological changes in the Common Peroneal Nerve.

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Conflict of Interest: There was no personal or institutional conflict of interest for this study.
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