



CODEN [USA]: IAJ PBB

ISSN : 2349-7750

INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

<http://doi.org/10.5281/zenodo.4273879>Available online at: <http://www.iajps.com>

Research Article

STUDY TO COMPARE NEUROMUSCULAR FATIGUE IN CHRONIC STROKE PATIENTS WITH HEALTHY CONTROLS IN MAYO HOSPITAL LAHORE

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Article Received: September 2020 Accepted: October 2020 Published: November 2020

Abstract:

Background- The typical definition of fatigue is the feeling of aversion to effort, lack of energy, weariness, and early exhaustion. Due to inactive lifestyle, the rate of fatality became after three years of stroke in individuals who are the survivor of stroke with fatality. The induced activity which damage the ability to exert force is called Neuromuscular fatigue. Neuromuscular fatigue can be measured by the reduction in ability of muscles for exerting a force during an activity. After stroke, the walking function greatly impacted by the paretic leg muscles fatigue. That's why, muscular fatigue in people after stroke can be quantitatively measured by the association of walking function with paretic leg muscles. This is a slight research which particularly measures the neuromuscular fatigue resulting stroke. The main objective of this study was to access relation of neuromuscular fatigue which can result in stroke and compare it with gender and age matched healthy individuals.

Methodology- For this study total 80 subject were taken, and by purposive sampling these 80 participants divided in to two groups named as control group and experimental group and each group had 40 subjects. All those patients were included who were diagnosed to have chronic stroke before six months by Registered Doctors. Using Dual Bio Stimulator/Amp the hamstrings and quadriceps muscles activity of all subject were recorded of both non-paretic and paretic side. By performing "Maximum Voluntary Contraction" (MVC) exercise EMG signals induced in Pre-fatigue were recorded on both muscles of all participants. Also, in the same way "Sit to Stand test (STS)" was performed on all patients and exercise EMG signals were recorded induced in post-fatigue. To assess the chronic fatigue "Fatigue Severity Scale (FSS)" was used whereas to assess the subjective levels of pre and post exercise in fatigue "Visual Analog Fatigue Scale (VAFS)" was used.

Results- "In hamstrings the mean activity of post fatigue EMG is significantly lower as compared to the mean activity of pre-fatigue EMG in non-paretic, paretic and control study group. Likewise, in quadriceps, the mean activity of post fatigue EMG is significantly lower as compared to the mean activity of pre-fatigue EMG in non-paretic, paretic and control study group."

Conclusion- In this study it was observed that in chronic stroke, the peripheral neuromuscular fatigue is different in comparison of matched control group with same gender and age.

Keywords: Visual analog fatigue scale, Fatigue severity scale, Surface electromyography, neuromuscular fatigue, Chronic stroke, Chronic fatigue.

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Please cite this article in press King Edward Medical University *et al*, *Study To Compare Neuromuscular Fatigue In Chronic Stroke Patients With Healthy Controls In Mayo Hospital Lahore., Indo Am. J. P. Sci*, 2020; 07(11).

INTRODUCTION:

In daily life, fatigue is categorized as a psychophysiological state. The typical definition of fatigue is the feeling of aversion to effort, lack of energy, weariness, and early exhaustion. Normally, it can also be defined as the lack of physical or mental motivation and energy. In this, individuals feel muscle pain or weakness or decreased performance in cognitive or physical activities. Due to inactive lifestyle, the rate of fatality became after three years of stroke in individuals who are the survivor of stroke with fatality. The induced activity which damage the ability to exert force is called Peripheral Neuromuscular fatigue (PNMF). Neuromuscular fatigue can be measured by the reduction in ability of muscles for exerting a force during an activity. Due to reduction in impulses transmission, excitation contraction coupling, depletion of glycogen and accumulation of metabolites at neuromuscular junction, PNMF may occur. In nervous system by the reduced voluntary activation of motor neuron, central neuromuscular fatigue can be identified, and this reduced voluntary activation can be due to the nervous system changes including: spinal networks, sub-cortical structures, motor cortex, and pre-frontal areas. However, the reason behind these conducted voluntary activations can be due to deficits rate of motor unit firing, increased afferents inhibition, intracortical inhibition, critical excitability threshold and reduced motor evoked potentials.

After stroke, the walking function greatly impacted by the paretic leg muscles fatigue. That's why, muscular fatigue in people after stroke can be quantitatively measured by the association of walking function with paretic leg muscles. This is a slight research which particularly measures the neuromuscular fatigue resulting stroke. The main objective of this study was to access relation of neuromuscular fatigue which can result in stroke and compare it with gender and age matched healthy individuals.

Another term is used in place of stroke which refer brain vascular conditions and named as Cerebrovascular Accident (CVA). Motor output can be influenced by stroke in normally two ways: either changes occurred due to events which can be due to stroke like physical inactivity and immobilization or impacts of lesions of nervous system on neuromuscular output. Increased energy expenditure, decreased endurance, and decreased aerobic capacity can be due to fatigue in survivors of stroke, it can even affect walking function.

In the field of EMG with reference to STS test, neuromuscular activity during the process of rising from a chair has been studied in different physical environments. One of the variables most often considered in STS electromyographic studies is muscle fatigue, which is observed as a decrease in performance after exercise. Motor control may be affected when fatigue is induced by the repetitive voluntary contractions of muscle groups used in the STS test. In fact, there are studies that use the STS test as a prior protocol to induce fatigue in the lower limbs

METHODOLOGY:

For this study total 80 subject were taken and all those patients were included who were diagnosed to have chronic stroke before six months by Registered Doctors. Included participants had no history of illness, neurological disturbance, and cardiovascular, and also subjects of same gender and age were included. By purposive sampling these 80 participants divided in to two groups named as control group and experimental group and each group had 40 subjects. All those subjects were excluded who cannot perform STS test without assistance. Due to STS test, heterogeneity in stroke samples was seen as every participant has variation in ability of sit to stand (range 8-50 repetition). Moreover, in study it was observed that included participants have higher rate of right hemiplegia i.e. 22 subjects (55%) as compared to left hemiplegia i.e. 18 subjects (45%).

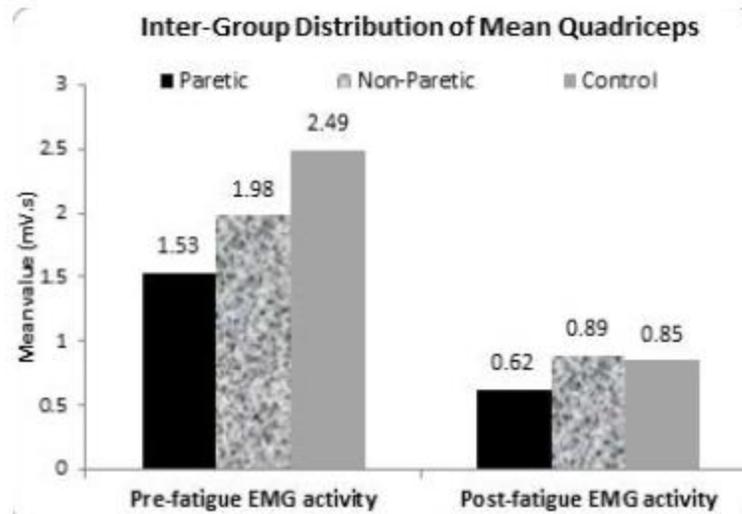


Figure 1: The inter-group distribution of mean Quadriceps muscle activity.

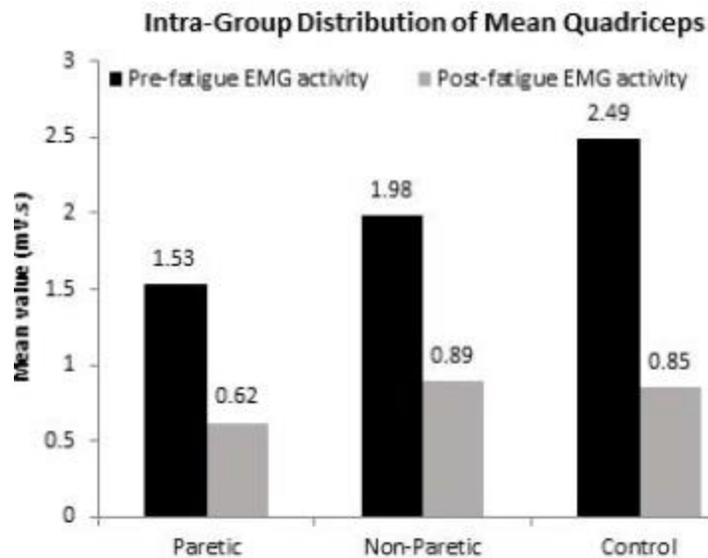


Figure 2: The intra-group distribution of mean Quadriceps muscle activity.

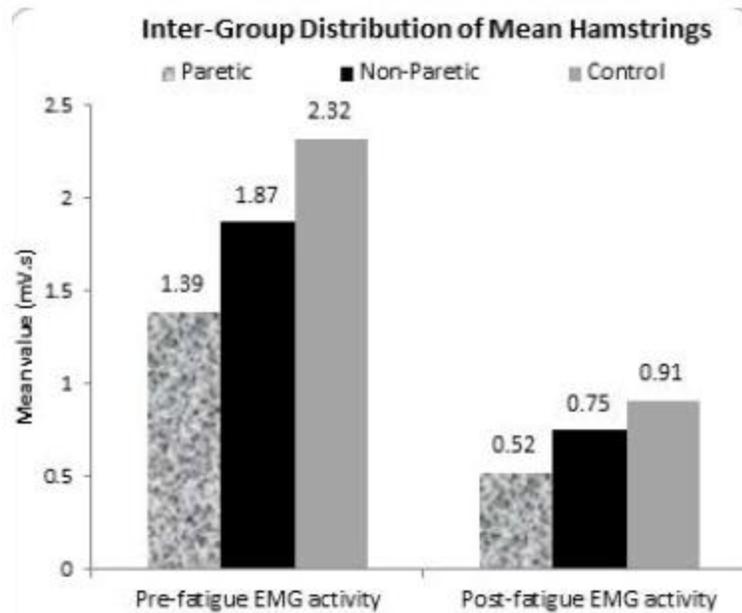


Figure 3: The inter-group distribution of mean Hamstrings muscle activity.

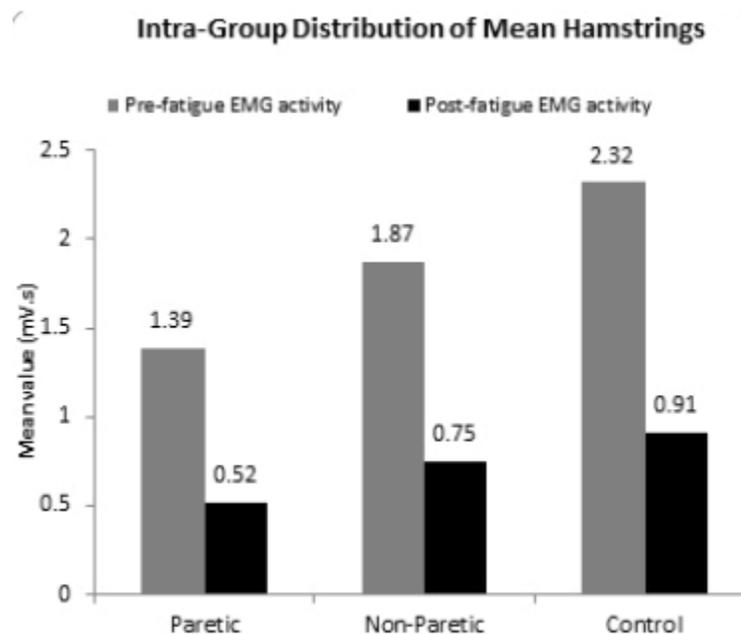


Figure 4: The intra-group distribution of mean Hamstrings muscle activity.

For this study ethical approval was taken from ethical committee of institute. Using Dual Bio Stimulator/Amp the hamstrings and quadriceps muscles activity of all subject were recorded of both non-paretic and paretic side. By performing “Maximum Voluntary Contraction” (MVC) exercise EMG signals induced in Pre-fatigue were recorded on both muscles of all participants. Also, in the same way “Sit to Stand test (STS)” was performed on all patients and exercise EMG signals were recorded induced in

post-fatigue. To assess the chronic fatigue “Fatigue Severity Scale (FSS)” was used whereas to assess the subjective levels of pre and post exercise in fatigue “Visual Analog Fatigue Scale (VAFS)” was used.

Using independent sample t-test, comparison of continuous variables between both groups was done. Also, intra-group comparison was also performed. Using SPSS version 21.0, data was analyzed statistically for MS office.

RESULTS:

Across the study groups, the distribution of quadriceps post and pre-fatigue EMG activity did not have any significant variation. Same like in hamstring in which post, and pre-fatigue EMG activity also didn't have any significant variation. However, in hamstrings the mean activity of post fatigue EMG is significantly lower as compared to the mean activity of pre-fatigue EMG in non-paretic, paretic and control study group. Likewise, in quadriceps, the mean activity of post fatigue EMG is significantly lower as compared to the mean activity of pre-fatigue EMG in non-paretic, paretic and control study group.

DISCUSSION:

Neuromuscular fatigue can be referred as the deficits in ability to exert a force and this can be due to changes in central and peripheral structures of neuromuscular system as a result of motor task.

The typical definition of fatigue is the feeling of aversion to effort, lack of energy, weariness, and early exhaustion. Normally, it can also be defined as the lack of physical or mental motivation and energy. In this, individual feel muscle pain or weakness or decreased performance in cognitive or physical activities. Due to inactive lifestyle, the rate of fatality became after three years of stroke in individuals who are the survivor of stroke with fatality. The induced activity which damage the ability to exert force is called Peripheral Neuromuscular fatigue (PNMF). Neuromuscular fatigue can be measured by the reduction in ability of muscles for exerting a force during an activity. Due to reduction in impulses transmission, excitation contraction coupling, depletion of glycogen and accumulation of metabolites at neuromuscular junction, PNMF may occur. In nervous system by the reduced voluntary activation of motor neuron, central neuromuscular fatigue can be identified, and this reduced voluntary activation can be due to the nervous system changes including: spinal networks, sub-cortical structures, motor cortex, and pre-frontal areas. However, the reason behind these conducted voluntary activations can be due to deficits rate of motor unit firing, increased afferents inhibition, intracortical inhibition, critical excitability threshold and reduced motor evoked potentials.

The observation of this study upheld the theory that, stroke members show a distinction in fringe neuromuscular weariness, when contrasted with age and sexual orientation coordinated control members. This is of significance while arranging the activity meeting of the patient as we probably are aware

weakness is a crippling manifestation which hampers the level of patient's support in any action. So it is significant to investigate patient's ADLs and treatment meeting thinking about this factor and furthermore instructing the persistent adapting techniques. Additionally, exhaustion being such a significant factor in a stroke patient's life and the deficiency of writing about it, warrants further examination in this respect which will give a totally different measurement in the board of stroke patients.

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