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Super FOR RESEARCE	Original Research Paper	Physiology		
Anternational	DOES SMOKING AFFECT NERVE CONDUCTION V LIMBS? – A COMPARATIVE CROSS SECTIO	ELOCITY IN LOWER		
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ABSTRACT

Introduction: Smoking cigarettes is one of the main independent factor leading to peripheral neuropathy. Very few Indian studies are available on the topic. Hence, the present study was undertaken

Objectives: To study Nerve Conduction Velocity (NCV) in lower limbs in sensory (Sural) and motor (Peroneal) nerves in healthy male smokers and compare with age, BMI matched non-smokers.

Material and Methods: Study was conducted in 120 subjects belonging to age group 25-45 years. Sensory and motor NCV was tested in Sural and Peroneal nerves respectively by standard method in apparently healthy male smokers, who were subdivided according to smoking index into mild, moderate and heavy smokers group (30 subjects/group). Control group had 30 age & BMI matched non-smokers. Mean values of NCV of different groups were compared statistically by one way Anova test and Bonferroni's test.

Results: The difference in mean values of NCV (m/sec) in Sural (sensory) nerve of smokers was statistically significant among all the compared groups. The difference in mean values of NCV (m/sec) in Peroneal (motor) nerve was statistically non-significant among all the compared groups.

A significant negative correlation was observed between smoking index and Sural (sensory) nerve conduction velocity. Slightly negative but non-significant correlation was observed between smoking index and peroneal nerve conduction velocity.

Conclusion: Smoking reduces conduction velocity in sensory (Sural) nerve while it does not significantly affect conduction velocity in motor (Peroneal) nerve in lower limbs in apparently healthy smokers.

KEYWORDS: Nerve conduction velocity, Smokers, Sural nerve, Peroneal nerve.

Background:

Smoking cigarettes is one of the main independent factor leading to peripheral neuropathy. Progression of peripheral neuropathy and its possible reversal has been linked to cigarette usage. Nerve conduction studies establish early diagnosis about peripheral nerve damage due to smoking, even before subjects show symptoms and signs of peripheral neuropathy. Very few Indian studies are available which can give the information about effect of smoking on peripheral nerves. Also the results of the available studies are highly ambiguous and inconclusive. Hence, the present study was undertaken to assess nerve conduction velocity in lower limbs in male smokers.

Material and methods:

The present study was a comparative cross-sectional study. The study was approved by the institutional ethics committee. The subjects were interviewed using a standard questionnaire. Details of subject including name, age, gender, address etc. were recorded on record sheet. Detailed history was taken about past illnesses and treatment. Written informed consent was taken from all the subjects. Preliminary clinical examination was done.

Subjects with age below 25 years and more than 45 years; subjects having symptoms and signs of peripheral neuropathy on history and clinical examination; subjects having past history of diabetes and raised random BSL at the time of examination; subjects having history/signs of Chronic Obstructive Pulmonary Disease; hypertensive subjects; subjects showing signs of anaemia; subjects with history of consumption of neurotoxic drugs; subjects with history of hepatitis subjects with history of consumption of alcohol, Gutaka or chewing tobacco; subjects with history of real problems; subjects with history/signs of peripheral vascular diseases and Carpal tunnel syndrome were excluded from the study.

Subjects having normal BMI (19-24.9 kg/m²); subjects having random blood sugar level below 120 mg/dl (as done on portable Accu-Chek glucometer) and subjects who gave a wilful consent for the study, were selected for the study.

Total 120 subjects were selected for the present study. 30 apparently healthy male non - smokers in age group of 25 to 45 years served as the control group. 90 apparently healthy male smokers served as

the study group. History of smoking (numbers of cigarettes/day) and duration was asked. Smoking index was calculated by the formula: Smoking index = (frequency x duration in years).¹

Based on Smoking index, subjects were then classified into following subgroups

Table 1 – Distribution of various groups with reference to smoking index

Group	Smoking Index	Description	Sample size
Group I	0	Nonsmokers (control)	30
Group II	1 to 100	Mild/Light	30
Group III	101 to 200	Moderate	30
Group IV	>200	Heavy	30

Subjects were then explained in detail about the nerve conduction study procedure and written informed consent was taken. They were all assessed in an air-conditioned room maintained at temperature of 21°-23° C.² RMS Salus 2C Electromyograph recorded on HP monitor equipment was used for finding NCV.

Before performing the study, the subjects were familiarized with the apparatus and the procedure. Nerve conduction examination test was done on Sural and Peroneal nerve in lying down position. Electrode placement was done for the test according to the standard technique.2 Readings were taken for nerve conduction velocity (NCV) (m/s). Mean values of NCV were compared between all the groups by one way Anova test. Mean values of NCV were also compared among different subgroups by bonferroni's test. p value <0.05 was taken as statistically significant (for both the tests).

Results:

Table 2: Table showing comparison of study and control group with respect to Sural nerve conduction velocity

Groups	Conduction Velocity in sural	"p" Value
	(m/sec) [mean + SD]	(One way ANOVA Test)
I	50.89+3.72	
=	49.55+2.82	
	47.51+3.43	< 0.0001
IV	(45.71+4.90	

Table 3: Bonferroni's multiple comparison test for Sural nerve conduction velocity (Post HOCTest)

Group comparison	t value	"p" value	Significance
GR I vs GR II	1.370	> 0.05	Non Significant
GR I vs GR III	3.443	< 0.05	Significant
GR I vs GR IV	5.278	< 0.05	Significant
GR II vs GR III	2.073	> 0.05	Non Significant
GR II vs GR IV	3.908	< 0.05	Significant
GR III vs GR IV	1.835	> 0.05	Non Significant

Graph 1: Correlation graph between smoking index and Sural nerve conduction velocity



Table 4: Table showing comparison of study and control group with respect to Peroneal nerve conduction velocity

Groups	Conduction Velocity in Peroneal	"p" Value	
	nerve (m/sec) [mean + SD]	(One way ANOVA Test)	
I	(45.97+2.29)		
=	(45.59+2.19)	> 0.05	
===	(44.93+3.13)		
IV	(44.24+2.40)		

Table 5 - Bonferroni's multiple comparison test for Peroneal nerve conduction velocity (Post HOCTest)

Group comparison	"t" value	"p" value	Significant
GR I vs GR II	0.6121	P > 0.05	Non-significant
GR I vs GR III	1.503	P > 0.05	Non-significant
GR I vs GR IV	1.729	P > 0.05	Non-significant
GR II vs GR III	0.8913	P > 0.05	Non-significant
GR II vs GR IV	1.117	P > 0.05	Non-significant
GR III vs GR IV	0.2255	P > 0.05	Non-significant

Graph 2: Correlation graph between smoking index and Peroneal (motor) nerve conduction velocity



Discussion :

There was a significant difference in mean values of Sural (sensory) nerve conduction velocity amongst all the groups. (Table 2)

There was no statistical difference in Sural nerve conduction velocity between non-smoker and mild smoker group, mild and moderate smoker groups and moderate and severe smoker group. However there was significant difference in Sural nerve conduction velocity between non-smoker and moderate smoker group, between non-smoker and heavy smoker group and between mild smoker and severe smoker group (p value <0.05).(Table 3)

A significant negative correlation was observed between smoking index and Sural (sensory) nerve conduction velocity of lower limb. (Graph 1)

There was no significant difference in mean values of Peroneal (motor) nerve conduction velocity amongst all the groups. (Table 4)

There was no statistically significant difference in Peroneal (motor) nerve conduction velocity when all the groups were compared individually to one another. (Table 5)

Slightly negative but non-significant correlation was observed between smoking index and peroneal nerve conduction velocity in lower limb. (Graph 2)

Thus Sural (sensory) nerve conduction velocity is reduced but Peroneal (motor) nerve conduction velocity doesn't show significant reduction as smoking index increases.

Various researchers like Suman Sharma³ et al, Tayade⁴ et al and Shrivastava⁵ et al. also found significant changes in sensory nerve conduction velocity but no significant changes seen in motor nerve conduction velocity, in smokers which is comparable to the present study.

Smoking induced oxidative stress leads to lipid peroxidation and damage of lipid component of biological membrane of peripheral nerves⁶ and causes alteration in tissue's membrane permeability properties leading to changes in signal transduction and electrolyte imbalance.⁷⁸ Reduction in total antioxidant capacity in smokers causes further increase in oxidative stress leading to reduction in nerve conduction velocity of sensory nerves.⁹ Smoking induces vasoconstriction and damages blood vessels by atherosclerosis and plaque formation leading to neural ischemia.¹⁰ Nicotine present in smoke causes subclinical changes in tunica intima of blood vessels.¹¹ and in addition has a direct effect on the myelin sheath.¹² Carbon monoxide released during smoking damages tunica intima of blood vessels and endothelial cells, which further causes deposition of fats in the vessel walls.¹¹

Conclusion:

The findings of present study conclude that smoking reduces conduction velocity in sensory (Sural) nerve while it does not significantly affect conduction velocity in motor (Peroneal) nerve in lower limbs in apparently healthy smokers.

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