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Cross-Sectional Comparative Study Of Nerve Conduction Amplitude In Median Nerve In Smokers

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Abstract

Introduction: Smoking tobacco can lead to delay in impulse conduction of nerves. Nerve conduction amplitude is a vital parameter in nerve conduction study. The present study was undertaken to assess median nerve conduction amplitude in male smokers

Objectives: To study median nerve conduction amplitude in healthy male smokers and comparing it with age, BMI matched non-smokers.

Material and Methods: Study was carried out in 120 subjects belonging to age group 25-45 years. Sensory and motor nerve conduction amplitude was tested in median nerve by standard method in 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 value of median nerve conduction amplitude of different groups was compared statistically by one way Anova test and Bonferroni's test.

Results: The difference in mean values of nerve conduction amplitude in median sensory nerve of smokers was statistically significant among all the compared groups. The difference in mean values of nerve conduction amplitude in median motor nerve was statistically non-significant among all the compared groups.

A significant negative correlation was observed between smoking index and median sensory nerve conduction amplitude. A non-significant correlation was observed between smoking index and median motor nerve conduction amplitude.

Conclusion: Smoking decreases nerve conduction amplitude in median sensory nerve. On the other hand, with same tobacco smoking exposure, it does not significantly affect median motor nerve conduction amplitude in apparently healthy smokers.

Key Words: Nerve conduction amplitude, smokers, median nerve

Introduction

Background: More than 1 million die each year due to tobacco in India.[1] Tobacco use is one of the main risk factors for a number of chronic diseases. About 17% smokers in the world live in India and they are at the higher risk.[2] There is still rising in number of smokers in the developing world.[3] Most smokers develop deficiency in impulse conduction of nerves.[4] Nerve conduction amplitude is an important component of nerve conduction studies which reflects the number of axons and muscle fibers that are depolarized. The present study was undertaken to assess nerve conduction amplitude in sensory as well as motor components of median nerve in male smokers.

Material and methods: The present comparative cross-sectional study was approved by the ethics committee of institute. The subjects were interviewed using a standard questionnaire and individual information was recorded. History was taken about past illnesses and treatment. Written informed consent was obtained from all the subjects and clinical examination was done.

Participants in the study with age below 25 years and more than 45 years; having past history of diabetes; showing symptoms and signs of peripheral neuropathy; having history of renal problems; having history/signs of Chronic Obstructive Pulmonary Disease; having hypertension; showing signs of anaemia; having history of consumption of neurotoxic drugs; having history/signs of peripheral vascular diseases and Carpal tunnel syndrome; having history of hepatitis; having history of consumption of alcohol, Gutaka or chewing tobacco; were excluded from the study.

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Participants having normal BMI (19-24.9 kg/m^2) and subjects who gave a wilful consent for participation in the study, were included. Written informed consent was taken from all the participants.

Total 120 subjects were selected for the present study. History of smoking (numbers of cigarettes/day) and duration of smoking was recorded. Smoking index was calculated by the formula: Smoking index = (frequency x duration in years).[5]

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

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

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

Subjects were acquainted with the nerve conduction study procedure. RMS Salus 2C Electromyograph recorded on HP monitor equipment was used for finding median nerve conduction amplitude. The median nerve conduction test was performed in an air-conditioned room maintained at temperature of 21^0-23^0 C.[4] Electrodes for the test were placed according to the standard technique.[6] Readings were taken for median nerve conduction amplitude. Mean values of median nerve conduction amplitude were compared between all the groups by one way Anova test. Mean values of nerve conduction amplitude were also compared individually among different subgroups by Bonferroni's test. p value <0.05 was taken as statistically significant (for both the tests).

Results:

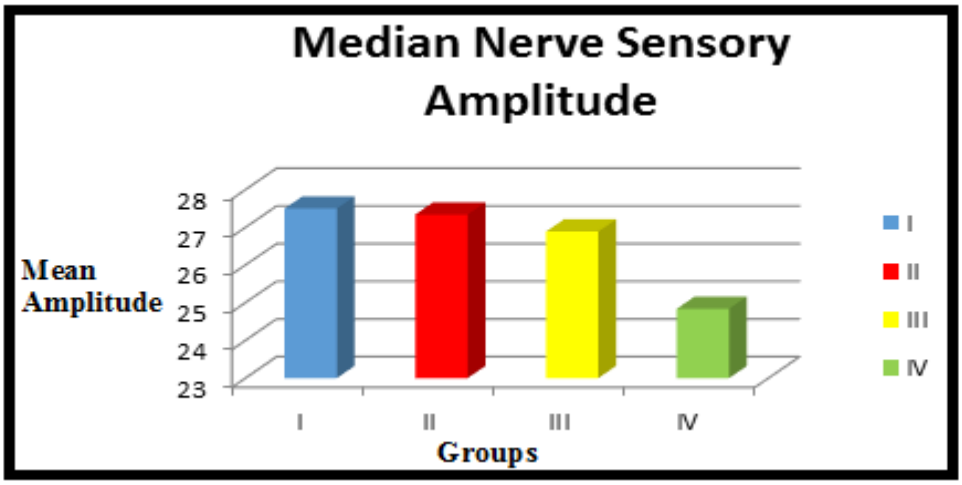
Table 2: Comparison of various groups with respect to median sensory nerve conduction amplitude

Groups	Conduction amplitude in Median sensory nerve (m/sec) [mean ± SD]	"p" Value (One way ANOVA Test)
I	27.50 ± 2.5	<0.0001 (Highly significant)
II	27.34 ± 2.2	
III	26.89 ± 2.9	
IV	24.84 ± 2.84	

Table 3: Bonferroni's multiple comparison test for median sensory nerve conduction amplitude (Post HOC Test)

Group comparison	t value	"p" value	Significance
GR I vs GR II	0.2931	P > 0.05	Non significant
GR I vs GR III	0.9202	P > 0.05	Non significant
GR I vs GR IV	3.815	P < 0.05	Significant
GR II vs GR III	0.6271	P > 0.05	Non significant
GR II vs GR IV	3.522	P < 0.05	Significant
GR III vs GR IV	2.895	P < 0.05	Significant

Graph 1: Median sensory nerve conduction amplitude in different groups



Graph 2: Correlation graph between smoking index and median sensory nerve conduction amplitude

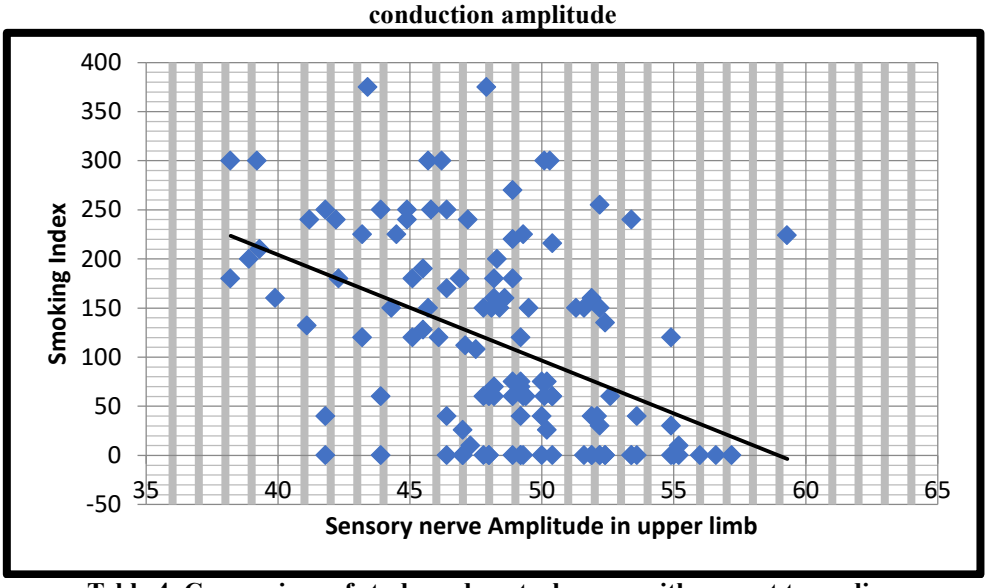


Table 4: Comparison of study and control group with respect to median motor nerve conduction amplitude

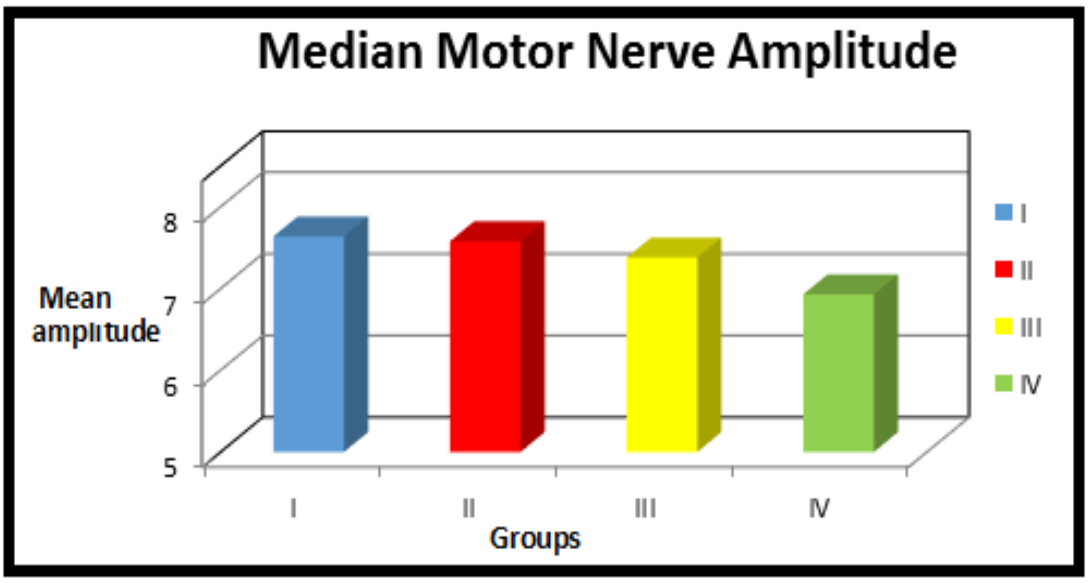
Groups	Conduction amplitude in median nerve (m/sec) [mean ± SD]	"p" Value (One way ANOVA Test)
I	7.64±1.078	> 0.05 (Not significant)
II	7.58±1.96	
III	7.38±1.22	
IV	6.93±1.41	

Table 5: Bonferroni's multiple comparison test (Post HOC Test) for median motor nerve conduction amplitude

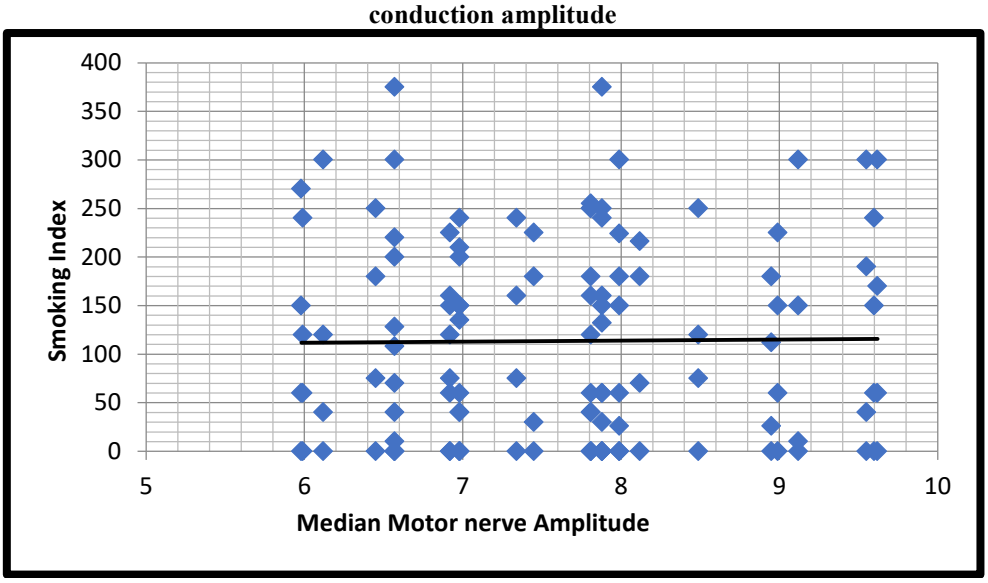
Group comparison	t value	p value	Significant
GR I vs GR II	0.8101	>0.05	Non Significant
GR I vs GR III	1.1532	>0.05	Non Significant
GR I vs GR IV	1.0874	>0.05	Non Significant

GR II vs GR III	0.3473	>0.05	Non Significant
GR II vs GR IV	0.2620	>0.05	Non Significant
GR III vs GR IV	0.0987	>0.05	Non Significant

Graph 3: **Median motor nerve conduction amplitude in different groups**



Graph 4: Correlation graph between smoking index and median motor nerve conduction amplitude



Discussion:

There was a highly statistically significant difference in mean values of median sensory nerve conduction amplitude amongst all the groups. (Table 2)

There was no statistical difference in median sensory nerve conduction amplitude between non-smoker and mild smoker group; between non-smoker and moderate smoker group and between mild and moderate smoker groups. However there was significant difference in median sensory nerve conduction amplitude between non-smoker and severe smoker group; between mild smoker and severe smoker group and between moderate smoker group and severe smoker group (p value <0.05).(Table 3)

A significant negative correlation was observed between smoking index and median sensory nerve conduction amplitude of lower limb. (Graph 2)

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

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

Non-significant correlation was observed between smoking index and median motor nerve conduction amplitude. (Graph 4)

Thus in present study median sensory nerve conduction amplitude is decreased but median motor nerve conduction amplitude doesn't show significant change as smoking index increases.

Low nerve conduction amplitudes most often result from loss of axons (as in a typical axonal neuropathy)
In the present study, all the groups were age and BMI matched. The correlation between increased BMI and lower sensory/mixed nerve amplitudes should be taken into account in clinical practice.[7]

Faden A. et al. noted peripheral nerve dysfunction in COPD patients having the history of smoking since many years. Sensory nerve conduction was more commonly affected than motor in smokers.[8]

Agarwal et al in 2007 observed decreased amplitude in all examined sensory nerves in the patients. These findings suggested predominant sensory axonal polyneuropathy. [9]

G. Valli et al conducted a study to investigate 19 patients with history of smoking and found reduced amplitude in nerve conduction. [10]

Sensory nerves are thinner than motor nerves and have lesser internodal distance. Hence sensory nerves are affected earlier than motor nerves.[11]

Nerve conduction amplitude in sensory nerves showed changes in mild smokers, however those changes are not statistically significant when compared with non-smokers (p value >0.05). This indicates that median sensory nerve conduction amplitude is not affected significantly in mild smoker, and any pathogenesis which may have occurred can be easily reversed.

This signifies that, this is the ideal time, where smoking if stopped, would prevent further functional impairment of peripheral nerves and cause reversal of pathological and functional changes, if any.

The findings of present study conclude that smoking decreases conduction amplitude in median sensory nerve while it does not significantly affect conduction amplitude in median motor nerve in apparently healthy smokers.

Early detection of peripheral nerve damage by nerve conduction studies should be carried out in smokers and followed by proper counselling which will help in prevention and progression of peripheral nerve damage.

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