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ORIGINAL RESEARCH

EVALUATION OF NERVE CONDUCTION VELOCITIES IN RADIOLOGIC TECHNOLOGISTS WORKERS OF A TERTIARY CARE HOSPITAL

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ABSTRACT
Background: Nerve conduction study (NCS) is developing as an important measuring device for confirmation of neurological disorders. The present study was conducted to assess nerve conduction velocities in radiologic technologists' workers of a tertiary care hospital.
Material and methods: The current study was conducted to assess nerve conduction velocities in radiologic technologists' workers of K.D. Medical College Hospital and Research Center, Mathura, Uttar Pradesh, India. 50 radiotechnologists with age between 30 and 60 years old were recruited. The selected cases were compared with another group of 50 healthy participants.NCS – in all subjects, NCS was performed by computerised RMS EMG EP Mark-II machine. Statistical analysis was done by descriptive and inferential statistics using Student's unpaired t-test to compare between cases and controls.
Results: The NCV of motor nerves among cases and control subjects in all the examined motor nerves, namely, median (cases –55.62±5.04m/s and controls –58.45±3.24m/s; P = 0.001), ulnar (cases –57.44±5.78m/s and controls –61.56±8.89m/s; P = 0.02), radial (cases –54.30±7.98m/s and controls –59.54±7.85m/s; P < 0.001), common peroneal (cases –46.78±5.43m/s and controls –51.67±5.56m/s; P < 0.001) and tibial nerves (cases –45.43±5.12m/s and controls –46.67±5.68m/s; P = 0.004) was statistically significant,

where cases had significantly reduced conduction velocity compared to control subjects. The NCV of sensory nerves among cases and control subjects in all the examined sensory nerves, namely, median (cases –53.65±7.87m/s and controls –55.78±5.65m/s; P < 0.001), ulnar (cases 51.35±5.34–m/s and controls –58.91±6.56m/s; P < 0.001) and radial nerves (cases –55.54±9.68m/s and controls –64.86±9.89m/s; P< 0.001) was statistically significant, where cases had significantly reduced conduction velocity compared to control subjects.

Conclusion: The present study concluded thatthe NCV of motor nerves cases had significantly reduced conduction velocity compared to control subjects.The NCV of sensory nerves cases had significantly reduced conduction velocity compared to control subjects.

Keywords: Nerve Conduction Velocities, Radiologic Technologists, Motor Activity, Sensory.

INTRODUCTION

The nerve is like electrical wire through which electricity/impulse passes from one point to another point. When the impulse is transfer from nerve to muscle, motor activity of that particular muscle occur but if the nerve is damaged, the passage of impulse is affected and hence motor activity of that particular muscle is also affected.[1]Nerve conduction study (NCS) is developing as an important measuring device for confirmation of neurological disorders.[2] NCS is an objective test, which involves electrical stimulation of a nerve and recording of the evoked potential either from the nerve itself or from the muscle.[3] Abnormal nerve conduction may be caused by various pathological processes, which hamper fast conduction such as damage or loss of myelin, focal compression (carpal tunnel syndrome), axonal loss or generalised peripheral neuropathy.[4] NCS includes assessment of motor and sensory action potentials, namely, compound muscle action potential (CMAP) in motor nerves and sensory nerve action potentials (SNAP) in sensory nerves. Commonly measured parameters of CMAP and SNAP include distal latency, amplitude, conduction velocity and duration.[5] NCS enables neurophysicians in comparing two different types of nerve disorder, namely demyelination and axonal degeneration.[6,7] The present study was conducted to assess nerve conduction velocities in radiologic technologists' workers of a tertiary care hospital.

MATERIALS AND METHODS

The current study was conducted to assess nerve conduction velocities in radiologic technologists'workers of K.D. Medical College Hospital and Research Center, Mathura, Uttar Pradesh, India. 50 radiotechnologists with age between 30 and 60 years old who were occupationally exposed to long-term low doses of ionising radiation and having a history of at least 3 years exposure in radiology were recruited. The selected cases were compared with another group of 50 healthy participants, who were not exposed to radiations for 1 year as a control group.Cases included from different types of imaging modalities and equipment, including conventional and computed tomography and computed radiography. Before the commencement of the study ethical approval was taken from the ethical committee of the institute and informed consent was taken from the patient. Participants who had any previous diseases such as gross anaemia, known history of diabetes mellitus, cardiopulmonary disease, acute or chronic infection, autoimmune disease and malignancy were excluded from the study to rule out the possible other aetiology for neural affection. And participants with <3 years of exposure were excluded from the study.NCS – in all subjects, NCS was performed by computerised RMS EMG EP Mark-II machine. Motor and sensory nerve conduction studies were done in all subjects which included the determination of motor and sensory nerve conduction velocity (NCV), amplitude and distal motor latencies of median, ulnar and radial nerve in bilateral upper limbs along with motor NCV, amplitude and distal motor latencies of common peroneal and tibial nerves in bilateral lower limbs. For motor conduction studies, gain was set at 5 mv per division for median, ulnar and tibial nerves and at 2 mv per division for radial and peroneal nerves. The duration of the electrical pulse was set at 100 μs and nerves were stimulated using a current in the range from 20 to 50 mA to achieve supramaximal stimulation. While for sensory conduction studies, the gain was set at 10 μV per division, electrical pulse of 100 μs duration was used and nerves were stimulated using a current in the range from 15 to 30 mA to achieve supramaximal stimulation. Ground electrodes were placed between stimulating and recording electrodes. For motor conduction studies, surface active electrodes were placed over the muscle belly and reference over the tendon of abductor pollicis brevis for median nerve, abductor digitiminimi for ulnar nerve, extensor digitorum indicis for radial nerve and extensor digitorum brevis for common peroneal and abductor hallucis for tibial nerve. For sensory studies, ground is placed over dorsum of the hand and the active ring electrode was placed over the 1^{st} digit for radial nerve, 2^{nd} digit for median nerve and 5^{th} digit for ulnar nerve and reference nearly 2–3 cm distally in sensory nerves.Single supramaximal stimulus given for motor recording and 20 supramaximal stimuli were averaged for smooth recording of sensory nerve and to remove artefacts. For motor studies, distance between the proximal and distal stimulating sites in mm and in sensory studies distance between the active electrode and stimulating electrode in mm was used to calculate the conduction velocities. RMS machine calculated the velocities automatically on feeding the distance in mm. Statistical analysis was done by descriptive and inferential statistics using Student's unpaired t-test to compare between cases and controls.

RESULTS

MOTOR NCV

The NCV of motor nerves among cases and control subjects in all the examined motor nerves, namely, median (cases –55.62±5.04m/s and controls –58.45±3.24m/s; P = 0.001), ulnar (cases –57.44±5.78m/s and controls –61.56±8.89m/s; P = 0.02), radial (cases –54.30±7.98m/s and controls –59.54±7.85m/s; P < 0.001), common peroneal (cases –46.78±5.43m/s and controls –51.67±5.56m/s; P < 0.001) and tibial nerves (cases –45.43±5.12m/s and controls –46.67±5.68m/s; P = 0.004) was statistically significant, where cases had significantly reduced conduction velocity compared to control subjects.

SENSORY NCV

The NCV of sensory nerves among cases and control subjects in all the examined sensory nerves, namely, median (cases –53.65±7.87m/s and controls –55.78±5.65m/s; P < 0.001), ulnar (cases 51.35±5.34–m/s and controls –58.91±6.56m/s; P < 0.001) and radial nerves (cases –55.54±9.68m/s and controls –64.86±9.89m/s; P< 0.001) was statistically significant, where cases had significantly reduced conduction velocity compared to control subjects.

Table 1: Comparison of Motor nerve conduction velocity between cases and controls

Nerve conduction velocity	Cases	Control	p-value
Motor nerve conduction velocity			
Median	55.62±5.04	58.45±3.24	0.001
Ulnar	57.44±5.78	61.56±8.89	
Radial	54.30±7.98	59.54±7.85	
Common peroneal	46.78±5.43	51.67±5.56	
Tibial	45.43±5.12	46.67±5.68	
Sensory nerve conduction velocity			
Median	53.65±7.87	55.78±5.67	
Ulnar	51.35±5.34	58.91±6.56	
Radial	55.54±9.68	64.86±9.89	

DISCUSSION

Stimulation of this nerve through slow velocity electric current by putting the electrodes to the skin surface generates nerve impulses.[8] The NCV has different components: (a) Motor NCS, (b) Sensory NCS, (c) H-reflex, and (d) F-wave.[9]

The present study was conducted to assess nerve conduction velocities in radiologic technologists' workers of a tertiary care hospital. 50 radiotechnologists with age between 30 and 60 years old were recruited. The NCV of motor nerves among cases and control subjects in all the examined motor nerves, namely, median (cases –55.62±5.04m/s and controls –58.45±3.24m/s; P = 0.001), ulnar (cases –57.44±5.78m/s and controls –61.56±8.89m/s; P = 0.02), radial (cases –54.30±7.98m/s and controls –59.54±7.85m/s; P < 0.001), common peroneal (cases –46.78±5.43m/s and controls –51.67±5.56m/s; P < 0.001) and tibial nerves (cases –45.43±5.12m/s and controls –46.67±5.68m/s; P = 0.004) was statistically significant, where cases had significantly reduced conduction velocity compared to control subjects.The NCV of sensory nerves among cases and control subjects in all the examined sensory nerves, namely, median (cases –53.65±7.87m/s and controls –55.78±5.65m/s; P < 0.001), ulnar (cases 51.35±5.34–m/s and controls –58.91±6.56m/s; P < 0.001) and radial nerves (cases –55.54±9.68m/s and controls –64.86±9.89m/s; P< 0.001) was statistically significant, where cases had significantly reduced conduction velocity compared to control subjects.

A previous study which was conducted by Navin Gupta et al demonstrated no significant difference in the motor nerve conduction velocity (MNCV)in the right and left limbs. The MNCV was also the same in the left and right limbs as was observed in a study which was conducted by Tan U.[10]

De Carolis et al. (1986) in their case study also showed that 7 months after the radiotherapy for pheochromocytoma, case suffered painful cramps in the legs and progressive bilateral leg weakness. Motor distal latencies along the common peroneal and tibial nerves were prolonged by 51% and 40% and motor conduction velocity nerves were reduced by 24% and 14%, respectively, after radiotherapy. This is suggestive of demyelinating lesion in nerves.[11]

Seema Bhorania et al found that there was no significant difference in the velocity between the dominant and non dominant limbs of the same individuals, but that the nerve conduction velocity in the right-handed subjects was more as compared to that in their counterparts.[12]

CONCLUSION

The present study concluded thatthe NCV of motor nerves cases had significantly reduced conduction velocity compared to control subjects.The NCV of sensory nerves cases had significantly reduced conduction velocity compared to control subjects.

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