NERVE CONDUCTION VELOCITY STUDIES IN PATIENTS WITH DIABETES MELLITUS (TYPE 2)
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ABSTRACT

BACKGROUND
Nerve conduction velocity study is a tool to assess the functional status of the sensory as well as motor nerves under physiological and pathological background. This study is done in association with the department of neurology where most of the cases were due to neuropathy caused by diabetes mellitus.

METHODS
The present study is a prospective study. It includes 40 patients suffering from type 2 diabetes mellitus of less than 2 years duration. These patients include both men and women in the age group of 45 to 55 years. Nerve conduction velocity study test is performed on them with the help of electromyogram.

RESULTS
According to this study, the nerve conduction velocity tests show abnormal nerve conduction in the motor nerves than in the sensory nerves. It also shows that neuropathy with decreased nerve conduction velocity is observed in the lower limbs frequently.

CONCLUSIONS
Nerve conduction velocity test is a simple and non-invasive test to diagnose neuropathy. It is useful in the prevention, detection and management of neuropathies.

KEYWORDS
Compound Muscle Action Potential (CMAP), Sensory Nerve Action Potential (SNAP), Antidromic Conduction, Orthodromic Conduction, Period of Latency, F Wave

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when compared to females. The age group of the subjects studied is 45-55 years. Olney RK. Muscle nerve Suppl 1999; 8: S225. The mean age recorded for the patients is 52.6 years. For the males the mean age is 51.8 years. While for the females the mean age is 53.46 years. This shows that the females are affected probably at a later age than the males. The involvement in the females occurs slower than in the males. Kimura J Oxford 2001. The conduction in the lower limb nerves is more commonly affected than the upper limb nerves. In the lower limb, the nerve conduction velocity is reduced commonly in the common peroneal nerve. In the upper limb, commonly the right sided median nerve showed defects in the nerve conduction velocity studies. This median nerve involvement is more commonly seen in the women, which corresponds to the higher rate of prevalence of carpal tunnel syndrome in the women. In the present study involving patients with neuropathy of both motor as well as sensory nerves the entities studied were sensory nerve action potential (SNAP) and compound muscle action potential (CMAP). Kaji R. The values of both the determinants were grossly reduced in the affected persons.

**DISCUSSION**

Nerve conduction velocity study is done to assess the velocity of conduction of impulses in the nerve. HC, Werner RA, Franzblau. A the commonly tested nerves are median nerve, ulnar nerve, radial nerve and brachial plexus in the upper limb. In the lower limb, sciatic nerve, femoral nerve, common peroneal nerve, tibial nerve and sural nerves are commonly tested. Krapap C. In the present study, the test is done by giving an external stimulation which initiates depolarisation in all the axons of the nerve that is being tested. This produces a response. This response is recorded. Two different points of the nerve are selected for this. Both motor and sensory nerves are tested in the present study. In motor nerve conduction study, onset of latency, duration, amplitude of compound muscle action potential (CAMP) and nerve conduction velocity are studied.

Nerve conduction velocity in m/sec =Distance between two points of Stimulation ÷ Difference in latency in milliseconds.

The sensory nerve conduction is similar to the motor nerve conduction. But it can be studied in two ways- antidromally and orthodromally. Overbeck BU, Van Aflen N, Bor JA, Zward S MJ. In antidromal conduction study the stimulation is given at the proximal point and response is recorded at the distal point. While in orthodromal conduction study the stimulus is given at the distal point and response is recorded at the proximal point of the nerve.

The factors that determine the nerve conduction are diameter of the nerve and the degree of myelination of the nerve fibre. Esper GJ, Nardin RA, Benatar M, et al the velocity of conduction in type a fibre is 15m/sec to 120 m/sec. In type B, nerve fibres the conduction velocity is 3 m/sec to 10 m/sec. In type C, nerve fibres the conduction velocity is 0.5 m/sec to 2 m/sec. In the present study the average motor nerve conduction velocity is found to be 55 m/sec to 65 m/sec and the average sensory nerve conduction velocity is found to be 50 m/sec to 65 m/sec. A

The other significant factors that affect nerve conduction velocity are temperature, age, height, gender and upper or lower limb. Velocity of nerve conduction increases with increase in temperature. Tamura A, Sonoo M, Hoshino S, et al. The nerve conduction velocity increases with age until adulthood and it starts to decline after around 60 years of age. As height of the individual increases the distal conduction of the impulse slows down due to axonal tapering and lesser myelination. This indicates that increase in height adversely effects the nerve conduction velocity. Nerve conduction velocity is higher in upper limbs when compared to the lower limbs. Gender also effects the velocity of nerve conduction. In males it is slightly higher when compared to the females. Age and duration of diabetes effects the degree of neuropathy. Plasma glucose levels and body mass index are not much related to the neuropathy. J Clin Neuromuscular Disease 2015; 16:141. The incidence of diabetic poly neuropathy in patients with Type 2 Diabetes is found to be approximately 8% to 15% as per different nerve conduction velocity studies done in our country. Oh SJ, Hemmi S, Hatanaka Y. Ulnar motor conduction velocity is reduced in diabetic poly neuropathy. Upper limb sensory conduction is a more sensitive parameter to diagnose neuropathy in Diabetes mellitus patients. Motor conduction velocities are more effect when compared to sensory nerve conduction in people with Type 2 Diabetes mellitus. Kwai NC, Arnold R, Poyntue AM, et al. The diabetic polyneuropathy case is defined as an abnormal sensory nerve action potential of sural nerve and abnormal compound muscle action potential of peroneal nerve. Both the sural nerves are to be abnormal to conclude the case to be a Diabetic poly neuropathy case. Fong SY, Goh KJ, Shahrizaila N, et al. The clinical and economic burden of diabetic poly neuropathy is because of its role in foot ulceration and lower limb amputation, susceptibility to falls and fractures and reduced quality of life. Glycaemic control slows the progression of Diabetic poly neuropathy. Nerve conduction velocity studies provide the information to locate lesions in the length of the nerve. Kural MA, Pugdehi K, Fuglsang Frederiksen A, et al. The main causes of error in the test are the measurement of the onset of the waveform and measurement of the length of the nerve segment. In axonal loss there is reduction of CMAP amplitude latency. The conduction velocity is not affected. This is because with axonal loss, lesser number of motor axons are connected to the nerve fibre. With increase in motor axon loss distal motor latency is prolonged and conduction velocity is reduced. Immediately after a traumatic transection, the distal part of the nerve is not affected because axonal degeneration occurs over a period of time. Hemmi S, Hatanaka Y. In demyelinating conditions nerve conduction velocity is reduced if the myelin thickness is lost. It is shown as prolonged motor latency and reduction in conduction velocity in NCS. The change also depends on the site and extent of demyelination. If the lesion is very proximal, then distal conduction velocity is normal. But there will be F wave abnormalities. Conduction block results in reduced CMAP amplitude.
CONCLUSIONS

Nerve conduction study is a standard electrophysiological test that helps in the early detection of nerve conduction defects which are indicative of neuropathies. It can be included in the routine management of neuropathies linked to diabetes mellitus Type 2, carpal tunnel syndrome, etc. The present study highlights the effectiveness of nerve conduction velocity study in the early detection of neuropathies. It also asserts the significance of clinical physiology in the diagnosis of pathological conditions.

REFERENCES


