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Evaluation of Median Nerve Conduction in Iron Deficiency Patients

DR .THAMIZHARASAN. S	Assistant Professor, Department of Pharmacology, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India.
DR.BRETHIS.C. S	Assistant Professor, Department of Pharmacology, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India.
DR.SRIDEVI.S.A	Professor, Department of Pharmacology, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India
DR.KALAISELVI.B	Professor, Department of Pharmacology, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India
DR..BALAJI SINGH.M	Associate Professor, Department of Forensic Medicine, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India
DR.MAHENDRANATH.P	Associate Professor, Department of Pathology, ACS Medical College, Dr.MGR Educational and Research Institute University, Chennai, Tamil Nadu,India

ABSTRACT

***Background**: Iron is very essential and has many important functions in energy metabolism, neurotransmission and myelin formation. Aims and **Objectives**: The aim of the present study was to evaluate the effects of Iron deficiency on median nerve conduction. **Materials and Methods**: A total number of 60 individuals (40 females and 20 males) with iron deficiency in the age range of 25-60 years from the Department of Medicine, ACS Medical College, as the study group and 40 participants (30 females and 10 males) without anemia as the control group were enrolled into this cross-sectional study. The motor nerve conduction parameters, viz., distal latency, amplitude of compound muscle action potential (CMAP), and motor nerve conduction velocity (MNCV) were recorded bilaterally in median nerves using standard protocols and settings. Results: Values from patients were compared with those of controls by unpaired student's t-test and one-way ANOVA. **Conclusion**: The results indicated that the alteration in motor conduction might be due to various functional and structural changes in peripheral nerves associated with iron deficiency.*

KEYWORDS : Median Nerve Conduction, Iron Deficiency, Action Potential

INTRODUCTION:

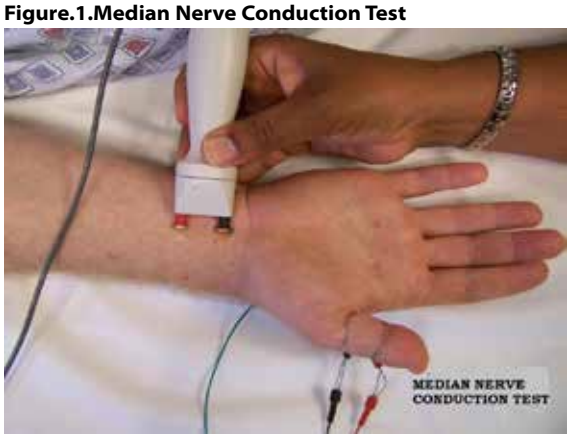
Iron deficiency is the most common nutritional deficiency in the world. Iron is present in all cells in the human body and has several vital functions, such as: carrying oxygen to the tissues from the lungs as a key component of the hemoglobin protein; acting as a transport medium for electrons within the cells in the form of cytochromes facilitating oxygen use and storage in the muscles as a component of myoglobin and as an integral part of enzyme reactions in various tissues. Too little iron can interfere with these vital functions and lead to morbidity and death. Anemia caused peripheral neuropathy (Nerve Damage) A diet that lacks iron, folic acid (folate), or vitamin B12 can prevent your body from making enough red blood cells. The first signs of developing anemia maybe loss of appetite, constipation, headaches, irritability, and or difficulty in concentrating. Established anemia can produce such symptoms as weakness, fatigue, coldness of extremities, depression, dizziness, pallor (most notable pale and brittle nails, lips, and eyelids), soreness in the mouth, and in women, cessation of menstruation. Anemia can be a symptom of an underlying disease such as arthritis, infection and other major illness. It should therefore be investigated to see find what inflammation is lurking in the body.A deficiency of iron can effect nerve conduction. A lack of B12 damages the myelin sheath that surrounds and protect nerves. Without this protection, nerves cease to function properly and conditions such as peripheral neuropathy occur. Even B12 deficiency that is relatively mild may affect the nervous system and the proper functioning of the brain. The nerve damage caused by a lack of B12 may become permanently debilitating, if the underlying condition is not treated A nerve conduction study (NCS), also called a nerve conduction velocity (NCV) test--is a measurement of the speed of conduction of an electrical impulse through a nerve. NCS can determine nerve damage and destruction. Nerve conduction studies may also be performed to identify the cause of symptoms such as numbness, tingling, and continuous pain.

MATERIALS AND METHODS:

This cross-sectional study included A total number of 60 individuals (40 females and 20 males) with iron deficiency in the age range of 25-60 years from the Department of Medicine, ACS Medical College, as the study group and 40 participants (30 females and 10 males) without anemia as the control group were enrolled into this cross-sectional study. The study was approval by the institutional ethical committee. The procedure was clearly explained to the patients recruited for the study, and written informed consent was obtained from the patients. Patients with history of cardiac, renal, hepatic, endocrine

and mental illness, any acute illness, diabetes mellitus, alcohol addiction, leprosy, neuromuscular disorders, drug-induced neuropathy, family H/o neuropathy, malignancy, HIV, myopathy, those received blood transfusion, and those under treatment for anemia, etc., were excluded. A detailed history taking and clinical examination were performed(Fig.1). Nerve conduction study was performed using the Neurostimulation machine.Three disc surface electrodes were used with surface stimulators - Recording electrode, reference electrode, and ground electrode. The electrodes were placed after applying jelly to reduce resistance in air between electrode and skin surface. The nerve is stimulated, usually with surface electrode patches attached to the skin. Two electrodes are placed on the skin over the nerve. One electrode stimulates the nerve with a very mild electrical impulse and the other electrode records it. The resulting electrical activity is recorded by another electrode. This is repeated for each nerve being tested.The nerve conduction velocity (speed) is then calculated by measuring the distance between electrodes and the time it takes for electrical impulses to travel between electrodes.A related procedure that may be performed is electromyography (EMG). An EMG measures the electrical activity in muscles and is often performed at the same time as NCS.

Figure.1.Median Nerve Conduction Test



RESULTS AND DISCUSSION: procedures help to detect the presence, location, and extent of diseases that damage the nerves and muscles. For all the patients, we recorded parameters such as distal latency (DL), amplitude of compound muscle action potential (CMAP), and motor nerve conduction velocity (MNCV) after stimulation of the median nerves on both sides. Table 1 compares the motor nerve conduction parameters between patients with mild, moderate, and severe anemia, which shows that in the median nerves. Nerve conduction was performed bilaterally on all limbs and as left side data were similar to that of the right side; only right sided values were depicted(Table.1). All the data were entered in MS Excel spreadsheet, and the statistical analysis was done using SPSS. The data were expressed as mean ± standard deviation. Descriptive tables were generated, and Student t-test and one-way ANOVA were used to demonstrate the findings. $P < 0.05$ was considered to be statistically significant.

Table 1: Comparision of median nerve conduction

Nerve	Parameters	Mean SD			F value	P value
		Mild Anemia	Moderate Anemia	Severe Anemia		
Median Nerve	DL (msec)	2.650.34	3.46	5.230.68	17.08	0.00
	CMAP amplitude	13.060.65	11.850.23	08.451.29	13.67	0.05
	MNCV (m/sec)	62.141.34	58.080.86	56.541.20	04.98	0.05

CONCLUSION:

This study reveals the involvement of median nerves in iron deficiency. In adults, as the iron deficiency has insidious onset, diagnosis can be delayed by months or years and the neuropathic manifestations can go unrecognized for a longer period. Therefore, performing electrophysiological studies in anemic patients are recommended, early in the course of the disease to detect nervous system involvement. Further research is needed to see whether the neurological dysfunction in iron deficiency is reversible with the appropriate iron replacement therapy.

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