

## EFFECT OF INTEGRATED YOGA THERAPY ON NERVE CONDUCTION VELOCITY IN TYPE -2 DIABETICS A CROSS SECTIONAL CLINICAL STUDY

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### ABSTRACT

**Background:** Type 2 diabetes mellitus comprises an array of dysfunctions resulting from the combination of resistance to insulin action and inadequate insulin secretion. It is characterized by hyperglycemia and associated with micro vascular i.e., retinal, renal, possibly neuropathic, macro vascular i.e., coronary, peripheral vascular, and neuropathic i.e., (autonomic, peripheral) complications. Yoga has been shown to reduce the hyperglycemia and thereby reducing the underlying nerve damages in diabetics. **Objectives:** To observe the nerve conduction velocity variation among practitioners and non practitioners of yoga. And propose yoga as a better method to manage neuropathies in type 2 diabetics. **Materials and methods:** Across sectional clinical study was conducted among type 2 Diabetic patients, two groups i.e. yoga practitioners and non yoga practitioners were made with a sample size of 30 in each group and yoga group was prescribed with different yogic practices and both group analyzed for nerve conduction velocity and data analyzed using Independent t-test. **Results:** Results were encouraging and Independent sample t-test showed significantly higher means in yoga group for nerve conduction velocity in right (P= 0.004), and left wrist (P=0.017). Mann-Whitney test showed similarly significantly higher mean in yoga group for the variable F-wave in right hand (P=0.004). **Conclusion:** People practicing yoga seems to have better nerve conduction parameters compare to control group, hence yoga can be used as useful supporting palliative treatment for managing diabetes mellitus type 2 induced nerve damage. **Keywords:** Yoga therapy, Type 2 Diabetes, Nerve conduction velocity

### INTRODUCTION

Notably, there is growing evidence that yoga practices may aid in the prevention and management of DM 2. By attenuating the symptoms and signs of those with clinical DM 2, with improved glycaemic control, improve lipid profile and reduce insulin resistance and thus improve its prognosis. A study of effect of forty days of yoga done in twenty-four type 2 DM cases provides

metabolic and clinical evidence of improvement in glycaemic control and autonomic functions. There was a significant decrease in fasting blood glucose level, postprandial blood glucose and glycosylated hemoglobin. Also the pulse rate, systolic and diastolic blood pressure decreased significantly. Four uncontrolled studies targeting adults with diabetes.<sup>[i,ii]</sup> and/or other chronic conditions,<sup>[iii,iv]</sup> demonstrated

significant positive changes in blood lipid levels following yoga-based interventions that ranged from 8 days to 3 months, <sup>[v]</sup> in duration.

**Yoga and nerve conduction:** A study with yogic intervention has shown that yoga asana have a beneficial effect on glycaemic control and improve nerve function in mild to moderate type 2 diabetes with sub-clinical neuropathy.<sup>[vi]</sup>

**Aims and Objectives:** Hence the present study is conducted with an objective of nerve conduction variation among practitioners and non practitioners of yoga. And to propose yoga as a better method to manage neuropathies in type 2 Diabetics.

#### **Materials and Methods:**

Recruitment was done through public announcements made at different yoga therapy centers and advertisements. Those volunteers who fulfilled the inclusion criteria were selected for the study. The signed informed consent of subjects was obtained before the data recording.

#### **Study Design**

Subjects belonging to two groups (yoga and non yoga) were assessed under standard experimental conditions. Since this was a two group comparative study with onetime assessment, the present study followed a cross sectional design.

The two groups were:

1. The patients with type two Diabetes, on allopathic medication with yoga relearning.
2. The patients with type two Diabetes, on allopathic medication

#### **Selection Criteria**

##### **A Inclusion Criteria**

- HbA1c >7

- Fasting Bold Glucose < 270 mg/dl
- Subject with history of type 2dm who have been on diet and exercise.
- Willing to participate by giving a written informed consent.
- Medication- any anti-diabetic medication.
- Women and men between 40-70 years (married or singles)
- Those who are not practicing yoga since last 3months (for non yoga group).
- Those who are practicing yoga since last 6 months (for yoga group).
- Patients with the history of DM Type-2 for minimum of 1 year.

##### **B Exclusion Criteria**

- Renal dysfunction
- Congestive heart failure.
- BMI < 20 or > 40
- Hypersensitive to Metformin
- Women of child bearing
- Uncontrolled hypertension
- Alcohol abuse
- Type I DM
- Retinopathy requiring laser therapy
- Recent myocardial infarction less than 3 months.

##### **Outcome measures:**

###### **Primary outcome measures**

- Motor nerve conduction velocity.
- Sensory nerve conduction velocity
- F- wave: F-waves reflect the antidromic conduction of the compound neural volley to the ventral spinal cord, and the postsynaptic activation of a portion of the muscle fibers in the innervated muscle.<sup>[vii]</sup>
- Amplitudes: Peak amplitude driven by maximal stimulation reflects the number

of responding fibers and the synchrony of their activity. <sup>[viii]</sup>

## **Nerve Conduction Velocity Testing (NCV)**

### **Definition**

A nerve conduction study is a test that measures the movement of an impulse through a nerve after the deliberate stimulation of the nerve. The time it takes to travel to the other end of the nerve is measured. <sup>[ix]</sup>

### **Recording procedure:**

Subjects have reported to the laboratory with prior appointment which was taken with the consent. They were made to understand the nature of the test and they were asked to sit on a comfortable chair and electrodes were placed on their palms and median nerve was stimulated in various places, through an electrical stimulator with appropriate amount of current. Then actual values of NCV viz, motor nerve conduction velocity, sensory nerve conduction velocity, and F-wave were noted for further analysis.

The nerve conduction velocity was recorded using RMS.EMG.EP.MARK- machine of recorders and Medicare systems pvt. Ltd company, haryana. The equipment has an inbuilt amplifier with digital filters along with electrical stimulator. These filters are mathematical filters that can distinguish random, background electrical signals from the actual signal produced by an activated nerve.

Before placing electrodes in place it is very important to apply gel on the points where electrodes are to be placed, then electrodes are placed in the belly and tendon method that is, active electrode was placed on the belly of adductor brevis muscle and reference electrode was placed on tendon of the same muscle just below the thumb finger.

Then grounding was placed around 3 cm away from the active electrode i.e. middle of the palm.

### **Analysis**

The analysis of the nerve signal involves the study of the movement of the signal through the nerve from one point to another. Using characteristics such as the speed of the impulse, and the shape, wavelength, and height of the signal wave, an examiner can assess whether the nerve is functional or defective.

### **Data Extraction**

The measurement for motor nerve conduction study includes the onset latency, duration, and amplitude of CMAP and nerve conduction velocity. The onset latency is the time in milli seconds from the stimulus artifact to the first negative deflection of CMAP. For the better visualization of the take off the latency should be measured at a higher gain than the one used for the CMAP amplitude measurement. The onset latency is a measure of conduction in the fastest conducting motor fibers. It also includes neuromuscular transmission time and the propagation time along the muscle membrane which constitutes residual latency. The amplitude of CMAP is measured from baseline to the negative peak (base to peak) the amplitude correlates with the number of nerve fibers. The duration of CMAP is measured from the onset to the negative or positive peak or the final return of waveform to the baseline. Duration correlated with the density of small fibers. The area under the CMAP can also be measured. However it needs computer analysis.

Motor nerve conduction velocity is calculated by measuring the distance in millimeter between two points of stimulation, which is divided by the latency difference in milli-

second. The nerve conduction velocity is expressed as m/s. Measurement of latency between the two points of stimulation eliminates the effect of residual latency.

Conduction Velocity=  $D/PL-DL$  M/S

Where PL is The Proximal Latency and DL is the Distal Latency in ms, and D is the distance between proximal and distal stimulation in mm.

### Plan of Analysis

The data were analyzed by using Statistical Package for Social Sciences (SPSS) version 10.0. Following statistical steps were followed for all types of variables.

- Descriptive statistics
- Measures of central tendency and dispersion
- Tests for normal distribution: Box whisker plot, stem and leaf plot
- Test for variance: F test
- Inferential statistics
- Data type : Ratio scale
- Mann-Whitney test was done in case of non-parametric data and independent t-test was done in case of parametric data.

### INTERVENTION

Patients in group II were practicing a particular format of yoga practices (prescribed by their Diabetologist and yoga therapist) [Table -1] one hour per day, for the period of 6 months.

### RESULTS

Data were found to be normally distributed except for the following variables: in yoga group, nerve conduction velocity in right hand elbow, nerve conduction velocity in left hand elbow, and f-wave in right hand. Hence non-parametric test (Mann Whitney test) was performed on these variables and also f-wave in left hand, which being the counterpart of f-wave in right hand. For remaining variables parametric test was per-

formed (independent sample t-tests). Variances were found to be equal for all parameters in parametric tests. [Table-2]

Nerve Conduction Velocity in Right hand Wrist ( $p=0.004$ ) and Nerve Conduction Velocity in Left hand Wrist ( $p=0.017$ ) were found to be statistically significant across yoga and non yoga groups. Higher means were observed for yoga group. Also there was a significantly higher means noticed in yoga group as compared to non yoga group, F-Wave in Right hand ( $p=0.004$ ). [Table-3]

### DISCUSSION

The result of this cross sectional two group comparative study on 60 patients with diabetes type 2 have showed statistically significant difference in nerve conduction variables nerve conduction velocity in right hand wrist ( $p=0.004$ ) and nerve conduction velocity in left hand wrist ( $p=0.017$ ) between yoga and non yoga groups. Higher means were observed for yoga group. Also there was a significantly higher means noticed in yoga group as compared to non yoga group, f-wave in right hand( $p=0.004$ ). Differences in all other parameters were found to be statistically insignificant. In addition to the DCCT,<sup>[x]</sup> three much smaller but long-term prospective studies have confirmed that maintained near-normal glycaemia prevents the development and retard the progression of DPN as assessed electro-physiologically. These include the Stockholm Diabetes Intervention Study (7.5 years),<sup>[xi]</sup> and 10 years),<sup>[xii]</sup> the Oslo Study (8 years),<sup>[xiii]</sup> and, in type 2 diabetes, the Kumamoto Study (6 years).<sup>[xiv]</sup> Thus these results are suggestive of efficiency of yoga to reduce the nerve damage occurred due to hyperglycemic condition. The observed differences found in the nerve conduction parameters seems to

support some of the existing ideas that yoga asana have a beneficial effect on glycaemic control and improve nerve function in mild to moderate Type 2 diabetes with sub-clinical neuropathy.<sup>[xv]</sup>

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Source of support: Nil

Conflict of interest: None Declared

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### CONCLUSION

People practicing yoga seems to have better nerve conduction parameters hence suggesting yoga as a useful means for managing diabetes mellitus type 2 induced nerve damage.

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### LIST OF TABLES :Table-1 List of Yoga Practices Prescribed For Group-II

Sl.no	Name of the practice	Number of Repetitions
<b>Breathing practices</b>		
1	Shashankasana breathing	5
2	Tiger breathing	5
<b>Shithili karana vyayama</b>		
1	Jogging	3mins
2	Forward and backward bending	11 rounds
3	Side bending	11 rounds
4	Dhanurasana swing	11 rounds
5	Uddiyana	11 rounds
6	Surya namaskar 12 rounds	3 rounds

YOGASANA		
1	Parivritta trikonasana	1 mins
2	Pada hastasana	3 mins
3	Ardha chakrasana	3 mins
4	Ardha matsyendrasana	3 mins
5	Ushtrasana	3 mins
6	QRT	3 mins
<b>Kriyas</b>		
1	Jalaneti	1/week
2	Sutranet	1/week

3	Vamana dhouti	1/week
4	Laghu shankha prakshalana	1/week
<b>Pranayama</b>		
1	Vibhagiya pranayama	11 rounds
2	Nadi shudhi	9 rounds
3	Bhramari	9 rounds
	<b>Meditation</b>	<b>5mins</b>

**Table: 2 Motor nerve conduction velocities recorded at wrist, elbow and axilla in both yoga and non yoga group.**

Variable (m/s)	Yoga		Non-yoga		p-value
	Mean(m/s)	Std .dev (m/s)	Mean(m/s)	Std .dev(m/s)	
MNC_RT_W	53.7053	7.46156	48.0407	7.03811	.004
MNC_LT_W	52.6873	6.71670	48.3497	6.95866	.017
MNC_RT_EL <sup>†</sup>	62.4690	11.63628	66.1430	8.75384	.280
MNC_LT_EL <sup>†</sup>	57.6677	12.70624	63.2080	11.20706	.066

**Table: 3 Sensory nerve conduction velocity of median nerve in right and left hand.**

Variable	Yoga		Non-yoga		p-value
	Mean(m/s)	Std. dev(m/s)	Mean(m/s)	Std. dev(m/s)	
SNC_RT	51.3627	6.85947	48.3190	10.50064	.189
SNC_LT	52.5860	8.04264	48.5060	9.30390	.074

**Table: 3 f-wave recorded from median nerve in left and right hand.**

Variable	Yoga		Non-yoga		p-value
	Mean(m/s)	St. dev (m/s)	Mean(m/s)	St. dev(m/s)	
FW_RT <sup>†</sup>	30.3140	3.65324	33.1017	3.94996	.004
FW_LT <sup>†</sup>	31.0700	3.91277	32.6500	3.29375	.143

**Table: 4 Demographic data**

	Non Yoga	yoga
Male	17	23
Female	13	7
Mean Age	53.3	55.36