

## “ULNAR NERVE SENSORY ACTION POTENTIAL CHANGES AROUND WRIST IN PHYSIOLOGICALLY NORMAL SUBJECTS IN DIFFERENT AGE GROUPS.”

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### ABSTRACT:

**INTRODUCTION:** It is widely accepted that nerve conduction study (NCS) parameters changes with age. Present study is to evaluate changes in ulnar nerve sensory action potential with age at wrist. Changes occurs at a greater rate in median than in ulnar nerve due to increased susceptibility of the median nerve to repetitive motion trauma or higher intracarpal canal pressure with contract stress and awkward wrist posture, Over several decades may account for the more influence of the aging process on the median nerve compared with ulnar nerve at wrist. . Electro physiological changes are probably related to the normal Histological ageing changes in peripheral nerves

**Methods:** An observational descriptive study was conducted in randomly selected 170 healthy human subjects of both sexes of members of staff of SAIMS, students and healthy relatives of patients and they volunteered for the study by Viking Quest EMG and Master copy software 48.0. The measurements of sensory amplitude were carried out on ulnar nerve at wrist.

**Result:** In the present study sensory amplitude result was statistically not correlated with increasing age, though a declining trend of amplitude with Aging was evident.

**Conclusion :** Our study on SNAP amplitude of ulnar nerve showed a declining trend with age.

**Key words:** Conduction velocity, Nerve conduction studies (NCS), Sensory action potential

### INTRODUCTION:

Nerve conduction studies (NCS) are frequently performed to evaluate peripheral nerve disease. The median, ulnar and radial nerves are the three most commonly tested nerves in the upper limb. Temperature control and standardized technique along with consideration for age, height, finger circumference, and instrumentation is imperative for appropriate interpretation of electrodiagnostic studies. It is widely accepted that nerve conduction study (NCS) parameters changes with age.<sup>1,2,3,4,5,6,7</sup> As a result many electrodiagnostic laboratories have tables of normative values that are divided by age groups.

The concepts suggests that normal nerve functioning in a normal individual changes with aging. Many studies have attempted to quantify how NCS values change with

age and this change is much more pronounced at the point where nerves are physiologically compromised due to tight compartment or repeated trauma.<sup>7,8,9</sup> This has been particularly shown in relation to median nerve conduction at wrist where conduction velocity drops faster than its counterpart ulnar nerve in similar area. The segment of ulnar nerve behind elbow is subject to repeated trauma because of its superficial location and because of its tight compartment through which it passes. Similarly it is known that the sensory action potential amplitude (SNAP) reduces with age, this is particularly well established in case of sural nerve, whether similar phenomenon is true for ulnar sensory action potential amplitude( SNAP) is not well established and more so no such data is available from central India. There are number of published studies suggesting a linear decline in

conduction velocity and amplitude with increasing age for most peripheral nerves.<sup>10,11,12</sup> Non linear effects of age on conduction calculated for the first to eight decades. They showed no changes in the mean velocity through out the second to fifth decades with significantly lower values in the six to eight decade.<sup>4,13,14</sup> There seems to be a general impression that motor nerve conduction velocity falls off rather significantly with increasing age.<sup>11,15</sup> it was shown that there is a significant and substantial decline in values of sensory nerve conduction velocity with increasing age in men.<sup>9</sup> This diminution of sensory nerve conduction velocity appears to be of greater order than that in values of motor conduction velocity as related to increasing age.<sup>10,16</sup> ulnar sensory conduction and amplitude decreased more rapidly after the age of 55 years than before but attributed this to greater incidence of subclinical damage at the cubital sulcus in older subjects.<sup>1,7</sup>

There is functional relation ship between age related morphological and physiological changes at the level of the motor unit (mu). It is well established that older humans are weaker than younger people, exhibit reduced force control, and have slower neuromuscular contractile properties and decrease in MU discharge rate.<sup>17</sup> There is loss of myelinated and un myelinated nerve fibers in elderly subjects and several abnormalities involving such as demyelination, remyelination and myelin balloon figures. Aging also affects functional and electrophysiological properties of the PNS, including decline in nerve conduction velocity, muscle strength, sensory discrimination, autonomic responses and endocrinal blood flow.<sup>18</sup>

Aging is a process that is often accompanied by physiological changes. These physiological changes include slowing in muscle contractility, alteration in muscle metabolism and neuromuscular junction and

reduction is nerve conduction velocity (NCV). Age has been widely accepted to have an influence on nerve velocity. Because of that many laboratories have produced normative nerve conduction velocity values which have been depicted according to different age group. Many investigation have attempted to study the association of aging and nerve parameters, both motor and sensory.

#### **MATERIAL AND METHOD:**

The number of subjects taken by simple random method for the study was 170 (340 ulnar nerve) between 20-70 years of age. The subjects included for the study were members of staff of this institutes (SAIMS), students and healthy relatives of patients accompanying them and they volunteered for the study. only completely healthy subjects were included for the study that was confirmed with the help of standard questionnaire, the detailed history (both general and medical). consent was obtained before the procedure though the study was totally non invasive. Study protocol was approved by SAIMS ethical committee and scientific committee. The nerve conduction studies were performed using the machine Viking Quest EMG and Master copy software 48.0. Total duration of study was about two years. Place of study was SAIMS Medical college and PG Institute, Indore, India.

#### **EXPREIMENTAL PROTOCOL:**

170 subjects divided into 5 groups of 10 years of interval as [20-29 years], {30-39 years}, {40-49 years}, {50-59 years}, {60-70 years}. Parameters recorded are age(years),Height(cm),weight(kg), Antidromic sensory action potential of ulnar nerve at little finger.

#### **RECORDING PROCEDURE:**

Ulnar Motor nerve conduction velocity measurements were performed on the right and left wrist following standard procedures. To assure adequate contact, skin was cleaned with the spirit and electrode gel was used / between the electrodes and the skin. Electrical pulses of 0.1-0.5 ms duration were

delivered by the stimulator of the electromyography. A temperature probe was used to record surface skin temperatures. Skin temp were recorded before each study at the touch pad of the mid palm & kept constant at  $25\pm 2^{\circ}\text{C}$ . All studies were performed in both upper limbs of each subjects. The ground electrode was placed on the dorsum of the hand. All studies were performed with the subjects lying comfortable in the supine position. Standardized techniques were used to obtain and record action potentials.

**STATISTICAL ANALYSIS:**

The mean and standard deviation for each dependent and independent variables were calculated. Correlation co-efficient was calculated to observe the correlation between sensory amplitude of ulnar nerve with age. There after Z test was done to compare the difference between different age group parameters. Linear regression method was used in which sensory amplitude was dependent variable and age was independent variable to evaluate the predictive value of Age on sensory amplitudes.

**RESULT:**

**Table 1 : Showing distribution of subjects according to age**

Age Groups	Male	Female	Subjects	Ulnar nerves
20 to 29 Years.	20	13	33	60 (66)
30 to 39 Years	20	11	31	59 (62)
40 to 49 Years	13	8	25	48 (50)
50 to 59 Years	12	17	29	55 (58)
60 to 70 Years	13	17	30	58 (60)

The number of ulnar nerves mentioned in parenthesis are the actual expected numbers to be included in the result. But due to technical reasons, recorded numbers were less than the actual numbers as mentioned in the table.

**Table 2 : Showing sensory amplitude (mean  $\pm$  S.D.) of ulnar nerve in different age groups**

Age Groups	Subjects	Mean
20 to 29 Years.	31	30.55 $\pm$ 16.77
30 to 39 Years	29	36.52 $\pm$ 16.73
40 to 49 Years	21	29.63 $\pm$ 11
50 to 59 Years	29	26.92 $\pm$ 8.31
60 to 70 Years	28	22.71 $\pm$ 10.91

**Table 3: Showing sensory amplitude (mean  $\pm$  S.D.) of ulnar nerve in different age groups as compared to 20-29years age group**

Age Groups	Subjects	Mean	Pvalue	r value
30 to 39 Years	29	36.52 $\pm$ 16.73	P<.05	1
40 to 49 Years	21	29.63 $\pm$ 11	p>.05	0.42
50 to 59 Years	29	26.92 $\pm$ 8.31	p>.05	0.34
60 to 70 Years	28	22.71 $\pm$ 10.91	P<.05	-0.28

It is apparent from the above table that the sensory amplitude have decreased with increase in age except in age group 30-39 years where it has increased. In age group 40-49 years, 50 -59 Years, r is moderately positive whereas in 60 -70 Years it is -ve. With increase in age sensory amplitude decreases. It is apparent from the table that the sensory amplitude was significantly high in age group 30-39 years (\*\*P<0.001) and less in age group 60 -70 years (\*\*p<0.05). The regression analysis was statistically insignificant for all the age group. Therefore, no predictor equation could be formulated, though the variable shows declining trend.

#### DISCUSSION:

In this study ,sensory amplitude of ulnar nerve was found to be declining with age. Our results are in agreement with the finding of previous studies <sup>7,19,20,21,22,23</sup>. It has been reported that loss of axons occurring especially later in life <sup>24</sup> is likely to attenuate sensory action potential more than motor as the later are maintained to some extent by collateral sprouting in the muscle. This might be the reason for declining trend of the sensory amplitude observed in our study too. The declining trend of sensory amplitude with age but no obvious change in motor conduction velocity suggests basic difference in the histological and functional characteristics. The previous Study <sup>5</sup> suggest that the regeneration capacity of motor fiber is more than the sensory fibers which might be one of the reason of difference observed in our study also. Another reason may be that the motor nerve maintained their motor activity with aging by collateral sprouting in the muscle.

and also because of their ability to follow a quadratic rather than linear relationship with age in terms of loss of motor neurons.

**CONCLUSION:** In the present study sensory amplitude result was statistically not correlated with increasing age, though a declining trend of amplitude with Aging was evident.

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