Original article:

IMPACT OF GENDER AND BODY MASS INDEX ON A NOVEL WRIST TO FINGER ANTIDROMIC MEDIAN VS ULNAR SENSORY ONSET LATENCY COMPARISON STUDY IN HEALTHY LATE TEENAGERS

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Abstract

Background

There are different comparison tests for electrodiagnosis (EDX) of median neuropathy at wrist. When routine tests fail to establish diagnosis especially in mild cases, these tests play crucial role. There are few short segmental and few long segmental median versus ulnar comparison tests.

Objectives

With current knowledge we aimed to find out whether routine sensory onset latencies difference of median and ulnar nerves can be used as long segmental comparison test for EDX of median neuropathy or not? Effect of gender and body mass index (BMI) on different variables was also assessed.

Material and methods

Routine median and ulnar sensory nerve conduction study was modified to comparison test by small change in its technique. 50 healthy late teenagers, after careful screening for neurological, musculoskeletal disorders underwent the test.

Results

Out of 50 participants, 49 actually participants underwent test. Reference values were obtained for modified comparison test. Gender and BMI effect was statistically non significant (p value >0.05) on different test variables. Median Vs Ulnar sensory Onset latency difference was [range: 0-0.6ms, upper limit: 0.3ms, mean (SD): 0.15(0.15)].

Conclusion

Gender and BMI shows no effect on Routine median Vs Ulnar onset latency comparison test. Reference values are comparable and show no obvious differences with existing comparison tests. Therefore this comparison test may be used for EDX of median neuropathy at wrist in association with other tests.

Key words

Nerve conduction study, median neuropathy, carpel tunnel syndrome.

Introduction

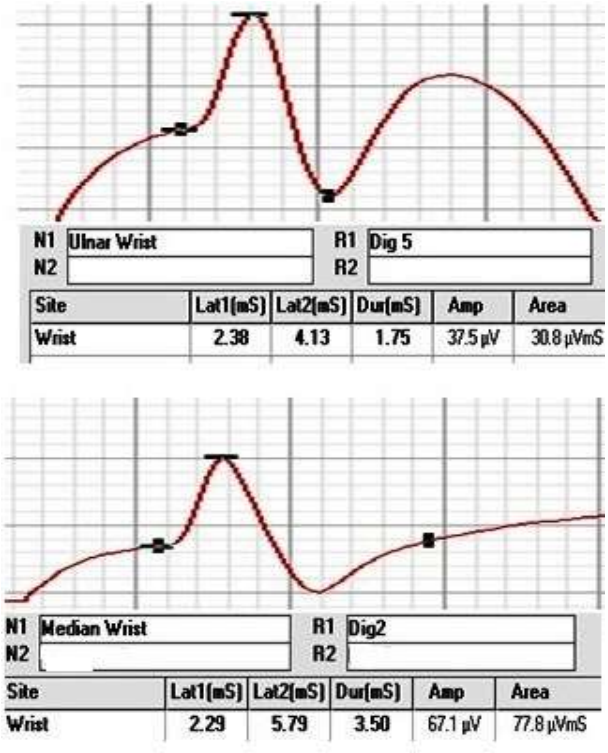
Palm to wrist Median Vs Ulnar Sensory onset latency difference is widely used for electrodiagnosis of median neuropathy at wrist when routine EDX tests fail to detect it in spite of its symptomatic presence. (1, 2) Similarly F wave minimum latencies may remain normal or slightly prolonged with reversal of median to ulnar latencies ratio. In normal human subjects median F wave minimum latency is always less than ulnar nerve. (2, 3) Short segmental palm to wrist comparison is very often used to detect mild median neuropathy at wrist. They include orthodromic median Vs ulnar mixed comparison studies and 2L-I motor onset latency study. Long segmental palm to wrist comparison includes Digit 4 median Vs ulnar sensory onset latency study. (4, 5) Comparison studies have variable sensitivities and specificities to detect median neuropathy at wrist. Short segmental palm to wrist comparison and 2L-I motor onset latency studies are highly sensitive and specific as compared to long segmental studies. We routinely perform median ulnar sensory conduction study while evaluating a case of carpel tunnel syndrome. Median sensory onset latency prolongation and CV reduction also helps in diagnosis of median neuropathy at wrist. (5) With above background, firstly we collected normative values for median and ulnar sensory antidromic conduction study (long segmental comparison study) through small change in technique. Secondly, we evaluated the influence of gender and body mass index on EDX studies in late teenager group. Finally a comparison of these normative values was done with previous studies if any.

Material methods

Total 50 participants were screened clinically and with brief electrophysiological evaluation to see whether there is any evidence of neurological disorder either central or peripheral. Out of these one male participant was excluded. Total 49 participants (24 male and 25 female) finally participated in study. Caution was taken to choose candidates with same age, height and weight among male and female groups for better comparison. Study was conducted during September 2016 to February 2018 in a neurophysiology laboratory at a tertiary medical college and hospital in Chhattisgarh. Approval from institutional Human ethics committee was duly obtained. Written informed consent was taken from participants in study.

EDX study in brief: Antidromic median and ulnar sensory conduction studies were done. For median sensory study, ring electrodes were place distally on digit 2 and median nerve was stimulated 3cm above wrist crease in forearm. Distance from cathode of stimulator to active recording ring electrode was measured. While stimulating ulnar nerve at wrist care was taken that distance between active ring electrode placed on little finger and cathode of stimulator remains exactly same as compared to median nerve stimulation. Thus antidromic sensory conduction studies were modified as long segmental (>8cm) finger to wrist comparison study with simple modification in technique. Sensory nerve action potentials (SNAPs) recorded is shown in figure No.1. All EDX procedures were conducted bilaterally, by same person on same machine (RMS-Portable Aleron-Electromyograph, manufactured by RMS Chandigarh) under constant room temperature. Standard techniques were adopted as mentioned in Preston and Shapiro's book on electromyography and neuromuscular disorders.

Figure No 1: Median and ulnar antidromic Sensory nerve conduction study in a participant.



Results

Total 49 participants (24 male and 25 female) underwent EDX test. Its demographic and physical parameters are described in table no 1. When compared between male and female groups significant difference was observed in height but that did not affect the body mass index variable among male and female groups thereby allowing further analysis to find influence of gender and BMI on NCS variables.

Table no 1: Demographic and physical profile of participants under study

Parameters	Male (n=24) Mean(SD)	Female (n=25) Mean(SD)	Total (n=49) Mean(SD)	P value (unpaired t-test)
Age (years)	18.66(2.29)	18.08 (0.493)	18.4(1.64)	0.218
Height (Cm)	169 (7.5)	159 (5.9)	164(8.2)	*7.815E-06
Weight (Kg)	59 (8.65)	53.52(8.636)	56.2(8.9)	0.031
BMI (Kg/m^2)	20.58(2.58)	20.95((3.084)	20.75(0.256)	0.613

(Note: BMI- Body mass index, SD- standard deviation, * p value <0.05)

Firstly we analyzed gender wise distribution of different NCS parameters and compared using unpaired student's t test. Side to side comparison of NCS variables was non-significant (p value >0.05). Gender wise comparison of study variables was also statistically non-significant (p value>0.05) as mentioned in table no. 2.

Table No 2: Gender-wise distribution and comparison of NCV parameters in study population.

NCV variables		MSOL Mean(SD)	USOL Mean(SD)	MUSOLD Mean(SD)
Male (n=24)	Right	2.58 (0.29)	2.39 (0.27)	0.19 (0.14)
	Left	2.52 (0.14)	2.34 (0.28)	0.17 (0.21)
Female (n=25)	Right	2.487 (0.22)	2.34 (0.11)	0.143 (0.119)
	Left	2.47 (0.24)	2.35 (0.19)	0.121 (0.117)
Total (n=49)	Right	2.53 (0.24)	2.53 (0.232)	0.167 (0.129)
	Left	2.49 (0.26)	2.35 (0.23)	0.148 (0.168)

(Note: (1) MSOL- Median sensory onset latency, USOL- Ulnar sensory onset latency, MUSOLD-Median Ulnar sensory onset latency difference, (2) Values in parenthesis indicates standard deviation (SD). (3) All latency values in milliseconds.)

Secondly, we analyzed BMI wise distribution of study variables. We categorized the data into two groups as BMI <20Kg/m2 and BMI>20Kg/m2. Comparison of study variables between groups were statistically non-significant (P value>0.05) except on 3 discrete occasions. (Table no 3)

Table No 3: Body mass Index (BMI) wise distribution and comparison of NCV parameters in study population

NCV variables		MSOL Mean(SD)	USOL Mean(SD)	MUSOLD Mean(SD)
BMI <20Kg/m^2 (n=20)	Right	2.65 (0.29) *	2.4(0.26) *	0.19 (0.15)
	Left	2.58 (0.26)	2.42 (0.24)	0.15 (0.18)
BMI >20Kg/m^2 (n=25)	Right	2.45 (0.19)	2.3 (0.18)	0.14 (0.1)
	Left	2.44 (0.24)	2.3 (0.22)	0.14 (0.16)

(Note: (1) MSOL- Median sensory onset latency, USOL- Ulnar sensory onset latency, MUSOLD-Median Ulnar sensory onset latency difference, (2) Values in parenthesis indicates standard deviation (SD). (3) All latency values in milliseconds.)

Thirdly, we analyzed data to collect reference values of sensory onset latencies, onset latencies difference for median and ulnar nerves. Total 98 nerves were considered for averaging. (Table no 4)

Table no 4: Reference values of different NCV variables under study

NCV variables	Sample size (n)	Range (Min-Max)	Upper Limit	Mean±SD

MSOL (ms)	98	1.88-3.13	2.77	2.51 (0.26)
USOL (ms)	98	1.83-3.0	2.58	2.35 (0.23)
MUSOLD (ms)	98	0- 6.2	0.3	0.15 (0.15)

(Note: (1) MSOL- Median sensory onset latency, USOL- Ulnar sensory onset latency, MUSOLD-Median Ulnar sensory onset latency difference, (2) Values in parenthesis indicates standard deviation (SD). (3) All latency values in milliseconds.)

Discussion

In present study, with little modification in antidromic sensory nerve conduction, we tried to use routine sensory nerve conduction study as long-segmental median Vs ulnar sensory onset latency comparison study. Gender wise difference observed in most of the previous studies has been finally attributed to differences in anatomical and physiological factors rather than direct effect of gender. Thus in current study also there was no statistically significant differences observed among different BMI and gender-wise in sensory conductions. This is attributed to the fact that fastest fibers conduct equally quickly in thin and heavy individuals. These findings are corroborative with Bhorania S et al. (6)

Short segmental studies palm to wrist play pivotal role in diagnosis of median and ulnar neuropathy at wrist. As described earlier this is novel attempt to use routine sensory conduction as long segmental study. Median Vs ulnar motor or sensory onset latency (short segmental) difference range varies from 0.3ms to 0.5ms in previous studies. (7) Difference in latency greater than 0.5 ms is considered as positive evidence for entrapment neuropathy at wrist. In current study, with sample size 98, comparison test values are: Latency difference range (0 to 6ms), upper limit (0.3ms) and mean (SD) - 0.15(0.15). These values are similar to that of short segmental study values. (7, 8, 9)

Conclusion

Gender and BMI shows no effect on Routine median Vs Ulnar onset latency comparison test. Reference values are comparable and show no obvious differences with existing comparison tests. Therefore this comparison test may be used for EDX of median neuropathy at wrist in association with other tests. Reference values with large sample size and variable age group may be essential prior extrapolating the results to generalized population.

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