Comparison of Two Different Methods for Superficial Peroneal Nerve Conduction Studies

G Karlikaya, T Tanridag, G Yuksel, O Us

Citation

G Karlikaya, T Tanridag, G Yuksel, O Us. *Comparison of Two Different Methods for Superficial Peroneal Nerve Conduction Studies*. The Internet Journal of Neurology. 2004 Volume 4 Number 2.

Abstract

Superficial peroneal nerve (SPN) sensory studies are quite helpful in distinguishing L5 radiculopathies from more distal lesions. The sensory nerve action potential of SPN should be preserved in L5 radiculopathies, while in sacral plexopathies, sciatic neuropathies, polyneuropathies it is expected to be either low in amplitude or absent. The most commonly used method for SPN sensory studies is the antidromic method, with recording from dorsum of the foot or at the ankle at the level of lateral malleolus, stimulating 10-14 cm proximally. Some problems maybe encountered during the recording. Responses may be unelicitable bilaterally in >5% of "normal" people of any age group; sometimes difficult to obtain due to motor artefact, and of low amplitude after middle age. We worked on a more proximal method for obtaining the SPN sensory nerve action potential. The active recording electrode was placed 2 cm medially and 7 cm proximally from the lateral malleolus and the nerve was stimulated 10 cm proximally from the recording site. We compared this method with the conventional technique in 20 healthy adults.

INTRODUCTION

The superficial peroneal nerve (SPN) is derived from the L-5 root, branching off the common peroneal nerve below the fibular head. It divides into two branches at the lower leg; the medial dorsal cutaneous nerve and the intermediate dorsal cutaneous nerve. The intermediate dorsal cutaneous branch has a higher amplitude therefore most methods involve studying this branch with a recording point at the level of the ankle ($_1$). The SPN is very useful in distinguishing L5 radiculopathies from more distal lesions, since the responses are usually normal with the former and either absent or abnormal with the latter such as sacral plexopathies, sciatic neuropathies or polyneuropathies.

We report a new proximal method (method 2) for obtaining sensory nerve conduction velocities in the superficial peroneal nerve and compared the results with the classical method defined by Jabre in 1981 (method 1) ($_2$).

MATERIALS AND METHODS

The study group consisted of 20 healthy volunteers aged between 18-60. All subjects gave their informed consent prior to the study. Individuals with a diagnosis of diabetes mellitus, endocrine disorders or any other disease capable of causing polyneuropathy, a family history of inherited neuropathies or occupational/environmental history of heavy metal exposure, history of lumbar or cervical radiculopathy as well as using medications which could cause polyneuropathy were excluded. A neurologic examination was done by the same neurologist.

Only the right side was studied in 3, and only the left side was studied in 1 subject, the rest subjects were studied bilaterally Therefore the SPN was studied with 2 different antidromic methods on 36 extremities.

For the classical method defined by Jabre the active side of the bar recording electrode was placed at the level of the ankle one fingerbreadth medial to the lateral malleolus and the nerve was stimulated with a bipolar percutaneous stimulator at a point 12 cm proximal to the active recording electrode from the anterior edge of the fibula ($_2$). For the proximal method the active recording electrode was placed 2 cm medially and 7 cm proximally from the lateral malleolus and the nerve was stimulated 10 cm proximally from the recording site.

All SNAP's were recorded using 0.1 ms stimulus duration. Filter settings were 2 20 Hz and 2 kHz. The ground electrode was placed between the recording electrode and the stimulator for all studies. The room temparature was kept at at least 22 C.

Conventional methods for the measurement of nerve conduction were employed. The latencies were measured

from the onset of the action potential and the amplitudes were measured peak to peak. Sensory nerve conduction velocities were calculated from the onset latencies.

Statistical Analysis: Mean values and standard deviations were determined for each measured nerve conduction parameter. The differences between latencies, amplitudes and nerve conduction velocities between the right and left side and between the two different methods were analyzed by the Student's t test.

RESULTS

There was 10 males and 10 females with a mean age of 39 (18-60). The results from 20 subjects are shown in table 1. There was no difference between the left and right sides for either method (p<0,05). Therefore we combined the left and right sides for each method and we used the results from 36 extremities for the comparison of the two different methods (Table 2). The difference between the two methods were significant for all the parameters; the latency, amplitude and nerve conduction velocity (p<0,05) (Table 2, Figure 1). We also compared the results from this study with previous studies (Table 3).

Figure 1

Table 1: The results of superficial peroneal nerve conduction studies

AGE	SEX		METHOD 1			METHOD 2			METHOD 2			METHOD 2		
			R side			L side			R side			L side		
		Latency (ms)	Amplitude (µV)	NCV (m/s)	Latency (ms)	Amplitude (µV)	NCV (m/s)	Latency (ms)	Amplitude (µV)	NCV (m/s)	Latency (ms)	Amplitude (µV)	NCV (m/s)
36	M	2,68	21,3	44,8	2,34	14,8	51,3	1,62	15,6	61,7	1,48	13,8	51,3
45	F	2,45	12,2	49	2,11	14,6	56,6	1,89	14,4	52,9	1,48	14,8	69,9
47	M	2,05	40,3	58,5	2,15	32,7	55,8	1,55	56,3	64,5	1,5	19,8	66,7
40	F	2,72	11,8	44,1	2,68	9,77	44,8	1,9	19,4	52,6	1,91	12,3	52,4
26	M	2,64	18,9	45,5	2,89	22,6	41,5	2,06	30,3	46,5	2,11	24,9	47,4
40	F	2,5	11,1	48	2,37	12,8	50,6	1,77	17,3	56,5	1,78	12,8	56,2
37	F	2,44	18,8	49,2	2,64	16,5	46,2	1,76	26,5	56,8	2,02	36,7	49,5
42	M	2,1	8,4	52,4	2	11,4	60	1,72	15,8	58,1	1,72	27	52,3
24	M	2,84	6,45	42,3	2,62	10,5	45,8	2,08	20	48,1	1,74	16,4	57,5
27	M	2,72	11,4	43,2	2,76	14,3	43,5	2,42	33,5	41,3	2,18	41,3	45,5
37	F	2,4	13,9	50	2,5	6,05	50,4	1,82	11,9	54,9	2	17,9	50
19	F	2,6	9,28	46,2	-	-	-	1,76	17,4	56,8	-	-	-
48	F	2,32	12,4	50	2,72	11,1	44,4	1,72	12,6	58,1	1,7	13,6	58,1
60	M	2,94	29,3	41,1	2,46	10,7	48,8	2,02	22,8	48,5	1,68	19,1	59,5
44	M	2,32	15	61,2	2,26	8,01	53,1	1,62	10,9	64,9	1,46	14,2	68,5
49	F	2,72	16,8	44,1	2,74	15,6	43,8	1,8	9,67	58,8	1,7	18,3	58,8
51	F	2,88	10	41,1	2,98	7,86	40,3	2,12	9,91	47,6	1,72	14,6	56,8
61	M	2,68	17,7	44,8	-	-	-	1,78	26,4	56,2	-	-	-
22	M	2,88	15,1	41,7	-	-	-	2,26	14,6	44,2	-	-	-
44	F	-	-	-	2,12	16,1	53,1	-	-	-	1,8	18	55,6
Mean		2,5	15,7	47,2	2,5	13,8	48,8	1,8	20,2	54,2	1,7	19,7	56,2
SD		0,2	7,9	5,5	0,2	6,2	5,6	0,2	11,1	6,5	0,2	8,3	7,0

Figure 2

Table 2: The comparison of two methods

	N	Minimum	Maximum	Mean	Std. Deviation	p
METHOD 1	Latency (ms)	2,0	2,9	2,5	,2	
	Amplitude (µV)	6,0	40,	14,8	7,1	
	NCV (m/s)	40,3	61,2	47,9	5,5	
METHOD 2	Latency (ms)	1,4	2,4	1,8	,2	>0,005
	Amplitude (µV)	9,6	56,3	20,0	9,7	=0,01
	NCV (m/s)	41,3	69,9	55,1	6,7	>0,005

Figure 3

Figure 1: The difference for the latency, amplitude and nerve conduction velocity between two different methods

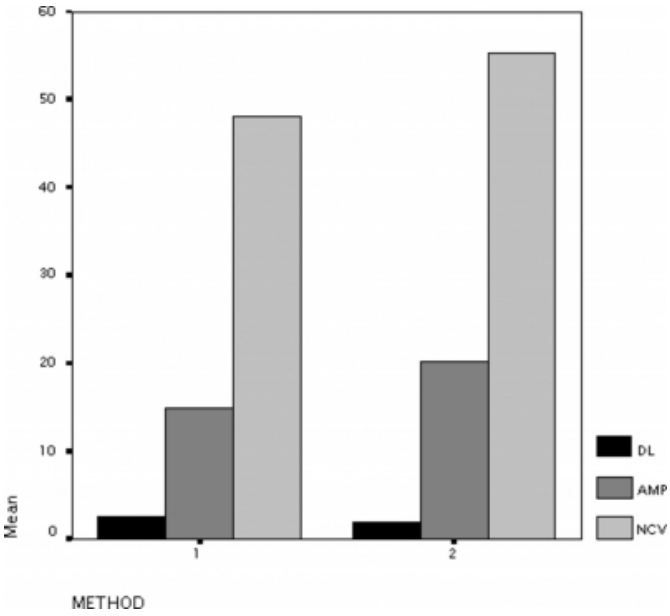

Figure 4

Table 3: The comparison of the present study with previous studies.(,,,)

	N	Onset Latency (ms)	Amplitude (µV)	NCV (m/s)
Method 1	36	2,5	14,8	47,9
Method 2	36	1,8	20	55,1
Ho et al; 2004	94	2,9	10,9	50,6
Jabre et al; 1981	56	2,9	20,5	65,7
Izzo et al;1981	80	2,8	14,1	51,3
Dibenedetto; 1970	50	-	13,9	47,3

All values are the mean values.

DISCUSSION

Some problems maybe encountered during the recording of SPN. It is known that superficial peroneal nerve responses may be unelicitable bilaterally in >5% of ‘‘normal‘‘ people of any age group; and it is sometimes difficult to obtain due to motor artefact, or a low amplitude after middle age. In the present study we found higher amplitudes with the new method, which might make it easier to obtain responses.

The distance between the stimulating and recording electrodes were different for the two methods used in this study, it was 12 cm for the first and 10 cm for the second method. As a result, the mean latency was longer in the first method than the second; 2,5 ms versus 1,8 ms respectively.

It has been reported that the standart recording location from the ankle gives a higher amplitude than the other sites over

the dorsum of the foot or ankle ([6]). We demonstrate, moving the recording electrode even more proximally gives higher amplitudes than the more distally located recording sites (Table 3).

Oh et al. described a more distal method for recording SPN ([7]). They studied two branches of the medial dorsal cutaneous nerve and two branches of the intermediate dorsal cutaneous nerve orthodromically and antidromically. They found a NCV range between 41,8-46-9 m/s and amplitude between 6,5-7-6 (μV). The mean amplitude was %50 less in the distal parts of the SPN compared to the more proximal parts. The NCV was also slower in the distal segment of the nerve ([7]). These findings are similar with our study, with the proximal part of the nerve having faster conduction velocities and higher amplitudes; which are probably related to the fact that the nerve is warmer proximally and the negative effects of the nerve branching distally.

We were able to record superficial peroneal nerve with both methods in all the subjects that were tested. Therefore we are not able to confirm the fact that 5-10 % of healthy adults have unelicitible SPN responses ([4]). One explanation for this might be our small sample size.

The fact that the SPN sensory responses were obtained reliably with this new proximal method we recommend this method as an alternative for studying the SPN, especially in cases were no results are found with the classical method.

References

1. Kimura J. Assesment of individual nerves. In Kimura J [ed): Electrodiagnosis in Diseases of Nerve and Muscle: Principles and Practice. 2nd ed. Philadelphia: F.A.Davis, 1989:105-139.
2. Jabre J. The superficial peroneal sensory nerve revisited. Arch Neurol 1981;38:666-667.
3. Izzo KL, Sridhara CR, Rosenholtz H. Sensory conduction studies of the branches of of the superficial peroneal nerve. Arch Phys Med Rehabil 1981; 62:24-27
4. HoYH, Yan SH, Lin YT, Lo YK. Sensory nerve conduction studies of the superficial peroneal nerve in L5 radiculopathy. Acta Neurologica Taiwanica 2004;13 (3);114-119.
5. DiBenedetto M. Sensory nerve conduction in lower extremities. Arch Phys Med Rehabil. 1970;51:253
6. Levin KH, Stevens JC, Daube JR. Superficial peroneal nerve conduction studies for electromyographic diagnosis. Muscle & Nerve 1986; 9:322-6.
7. Oh SJ, Demirci M, Dajani B, Melo AC, Claussen GC. Distal sensory nerve conduction of the superficial peroneal nerve: new method and its clinical application. Muscle & Nerve 2001;24 (5):689-94

Author Information

Geysu Karlikaya
2nd Department of Neurology, Haydarpasa Numune Research and Education Hospital

Tulin Tanridag
Department of Neurology, Marmara University Hospital

Gulbun Yuksel
2nd Department of Neurology, Haydarpasa Numune Research and Education Hospital

Onder Us
Department of Neurology, Marmara University Hospital