

Original Article

Diagnostic efficacy of Somatosensory Evoked Potentials (SSEP) in Lateral Femoral Cutaneous Nerve of thigh (LFCN) in detecting meralgiaparesthetica

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Abstract

Aim: To perform and Analyze Somatosensory Evoked Potentials (SSEP) in Lateral Femoral Cutaneous Nerve of Thigh (LFCN) and to estimate its diagnostic efficacy in detecting Meralgia Paresthetica .

Background: Meralgia Paraesthesia is a relatively common neuropathy of the Lateral Femoral Cutaneous Nerve of Thigh. It can be caused due to entrapment of the nerve beneath the Inguinal tunnel, which in turn may be caused due to Obesity, Pregnancy, Wearing tight seat belts/trousers/corsets etc. Clinical features include Pain, Paraesthesia, Numbness and Sensory loss over the anterolateral aspect of thigh. As such, Meralgia Paraesthesia is a clinical diagnosis. There is no diagnostic criteria that exists at present. SSEP of the LFCN can be used to assess the integrity of the nerve pathway and can aid in diagnosing Meralgia.

Method: This is an observational cross-sectional study carried out in 30 patients with complaints of pain, paraesthesia, numbness and or burning sensation over the lateral aspect of thigh. Somatosensory Evoked Potential Study of the Lateral Femoral Cutaneous Nerve of Thigh was carried out in all the patients, by placing recording electrodes over the scalp (Cz'-Fz Derivation) and stimulating the lateral aspect of the distal 1/3rd of the thigh. P31 and N49 potentials were recorded. Only the latency of P31 potential was considered while determining the results of the study. N49 potential was used to identify P31. Descriptive analysis methods like Mean, Median, Standard Deviation, Confidence Interval, Pie Chart/Bar Graph we reused to explain the SSEP changes

Result: Thirty patients with complaints of pain, paraesthesia of leg during January 2019 to May 2019 were studied. Somatosensory Evoked Potential study of the LFCN was carried out in all of them. 53.3% of patients had Unilateral Symptoms and 46.7% of patients had Bilateral Symptoms.

Conclusions: The study showed SSEP was abnormal in 86% of the individuals. In patients with unilateral symptoms, the unaffected side was a very good control and in 75% of the individuals SSEP was abnormal on the affected side. In patients with Bilateral symptoms, 72% of the individuals had bilaterally abnormal SSEP findings. Need extensive large-scale study to device a diagnostic criterion based on SSEP.

Introduction

Meralgia Paraesthesia is a neuropathy of the Lateral Femoral Cutaneous Nerve (LFCN) of thigh. One of the major causes of this neuropathy is entrapment of the nerve as it passes beneath the Inguinal tunnel. The common symptoms include pain, paraesthesia and numbness over the anterolateral aspect of thigh.¹

Somatosensory Evoked Potentials are those which are generated by stimulating the large diameter somatosensory pathways. These potentials are

recorded over the somatosensory cortex, by placing recording electrodes on the scalp. The potentials are evoked responses to stimulation of the nerve at a peripheral point.

SSEP studies are useful to assess the pathway of the nerve from the periphery to the Central Nervous System.²

Meralgia Paresthetica as such is a clinical diagnosis. There is no defined diagnostic criteria at present. One study carried out in 2000, identified the involvement of the LFCN by injecting a small amount

of bupivacaine with epinephrine around the LFCN where it passed near the anterior superior iliac spine. Symptomatic relief confirmed the diagnosis.^{3,4,5} Lumbar Radiculopathy, Femoral neuropathy etc can produce symptoms that mimic Meralgia.^{6,7,8} SSEP studies of the LFCN can be used as an electrodiagnostic aid to diagnose, prognosticate and monitor treatment outcomes.

Somatosensory Evoked Potentials

Somatosensory Evoked Potential study typically involves stimulating the nerve at a peripheral point and recording SEP's over the somatosensory cortex. SSEP studies help in evaluating the large diameter somatosensory pathways. SSEP's are commonly carried out in patients who are suspected to have Demyelinating diseases.

Parameters assessed in SSEP include latencies and amplitude of the potentials. Additionally, Central Sensory Conduction Time (CSCT) is also determined.^{9,10,11,12}

SSEP of the LFCN

For performing SSEP of the LFCN of thigh, recording electrodes are placed over Cz' and Fz. The active electrode is Cz' and the reference is Fz. Apart from this, a ground electrode is also placed. The electrodes are placed according to the International 10-20 System of electrode placement. Stimulation is carried out in the distal third of the thigh, proximal to the patella on the lateral aspect.¹³

Four potentials are recorded, namely P31, N49, P63 and N89. P31 and N49 potentials are well defined and their latencies and amplitude were measured for this study.

P31 potential is the initial down-going positive potential. The normal latency of P31 is 31±2ms. N49 potential is a negative potential with an up-going peak. N49 potential was used to identify P31 when potentials were ill-defined or when latencies were grossly prolonged. For determining the findings only P31 latency was considered.

Methods and Materials

This is an Observational cross-sectional study. The aim is to perform and analyze the Somatosensory Evoked Potential (SSEP) findings in patient's attending a tertiary care hospital with complaints of pain, burning sensation, numbness, paraesthesia over the lateral aspect of thigh. 30 patients were included in this study. Patients below 18 yrs of age and patients on whom SSEP cannot be done due to technical difficulty were excluded. Data was entered into Microsoft excel data sheet and was analyzed using IBM-SPSS 21 version software.

Results

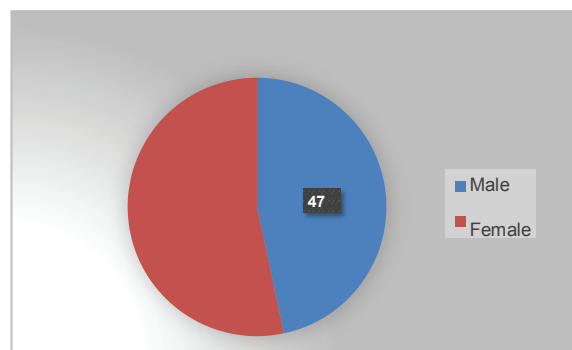


Figure 1: Gender distribution with maximum number of patients being Female(53%)

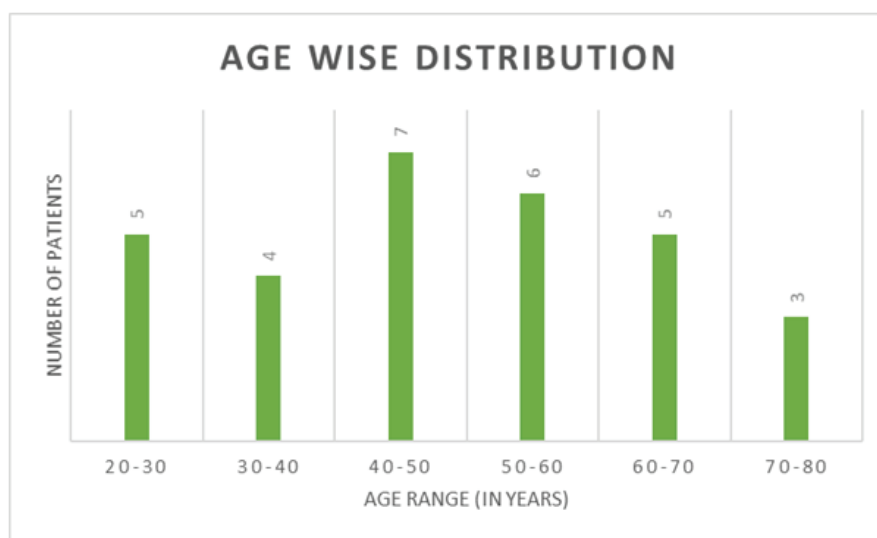


Figure 2: Bar chart showing the age range of the patients in the study.

23.3% of patients belonged to the age group 40 to 50 years.

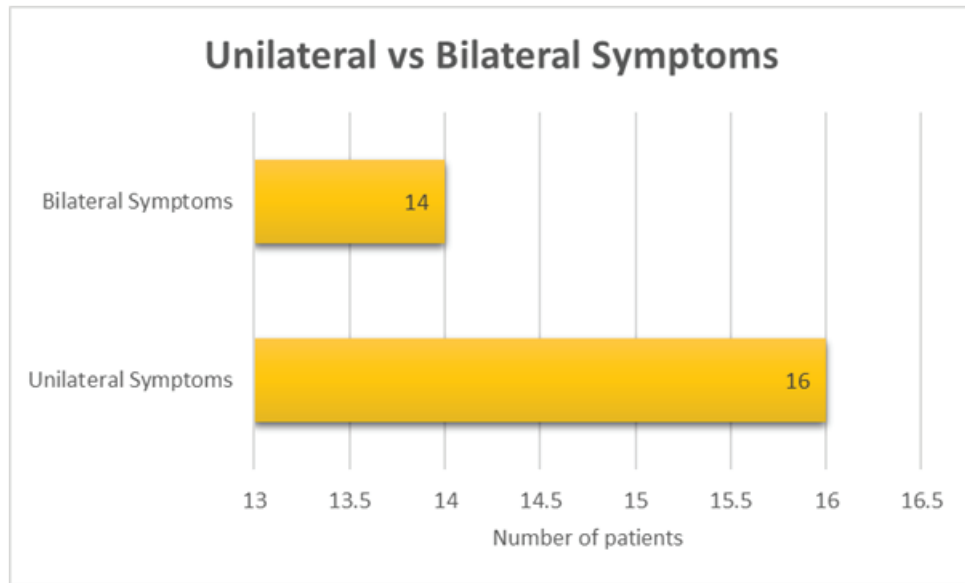


Figure 3: Distribution of patients based on symptoms.

53.3% of patients had Unilateral symptoms and 46.6% had Bilateral Symptoms.

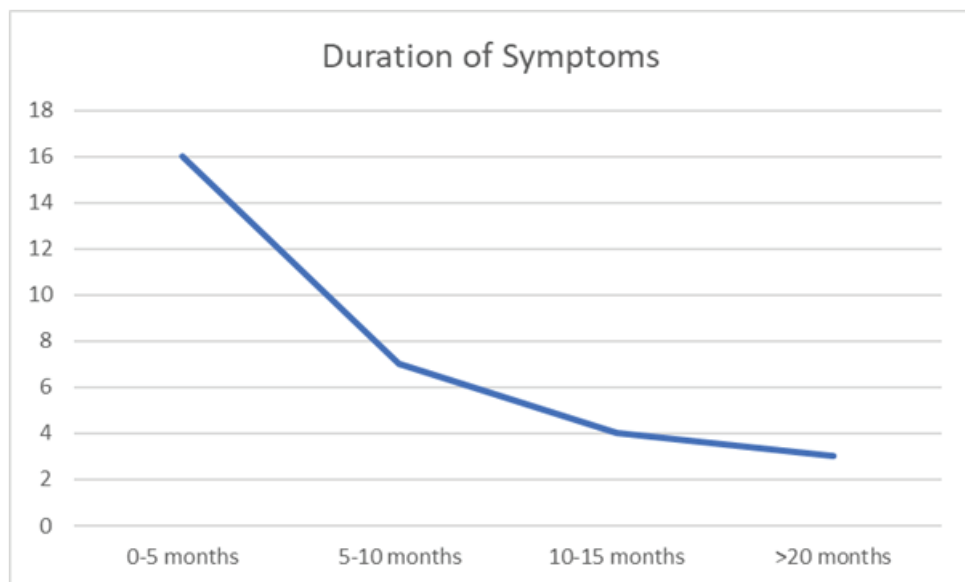
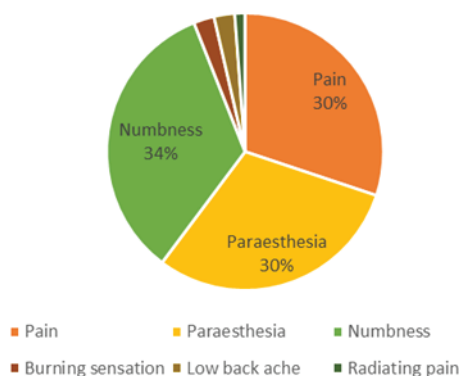


Figure 4: Duration of symptoms of each patient.

53.3% of patients had duration of symptoms in the range of 1-5 months.

Type of Symptoms



Commonest symptom was numbness (34%) followed by pain and paraesthesia (30% each). Other symptoms include burning sensation (6%), low back ache (6%) and radiating pain (3.3%).

Figure 5: Symptoms of the patients included in the

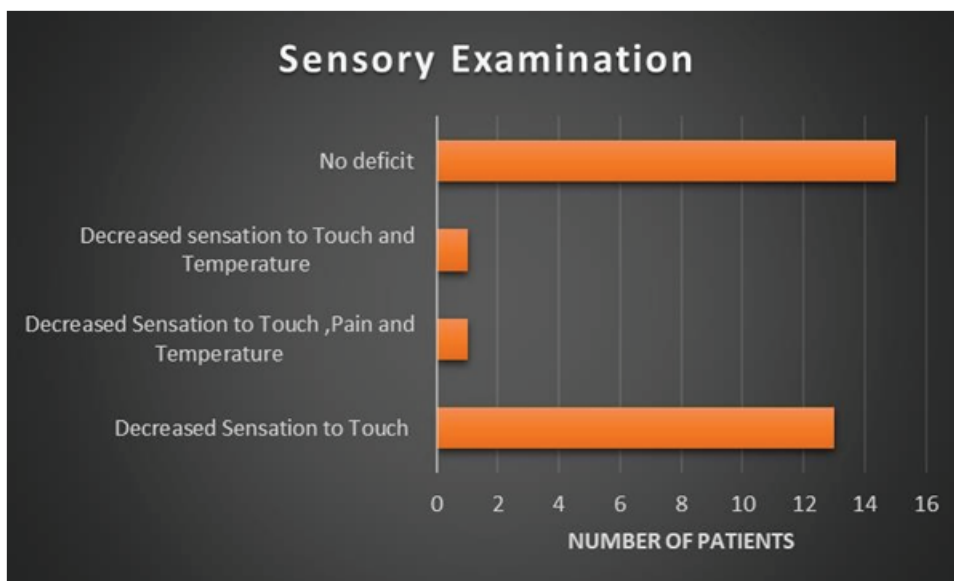


Figure 6: The sensory examination findings in all the patients.

43.3% of patients had decreased sensation to touch and 50% of the patients had no sensory deficit.

SENSORY EXAMINATION	NUMBER OF PATIENTS	PERCENTAGE
Decreased Sensation to Touch	13	43.3%
Decreased Sensation to Touch, Pain and Temperature	1	3.3%
Decreased sensation to Touch and Temperature	1	3.3%
No deficit	15	50%

Table 1: Sensory examination findings in all the patients.

43.3% of patients had decreased sensation to touch and 50% of the patients had no sensory deficit. (Table 1)

MOTOR EXAMINATION	NUMBER OF PATIENTS
Normal	29
Abnormal	1

Table 2: Motor Examination of the patients.

Motor examination was found to be normal in 29 patients. Only one patient had bilateral lower limb paraparesis. (Table 2)

SSEP FINDINGS

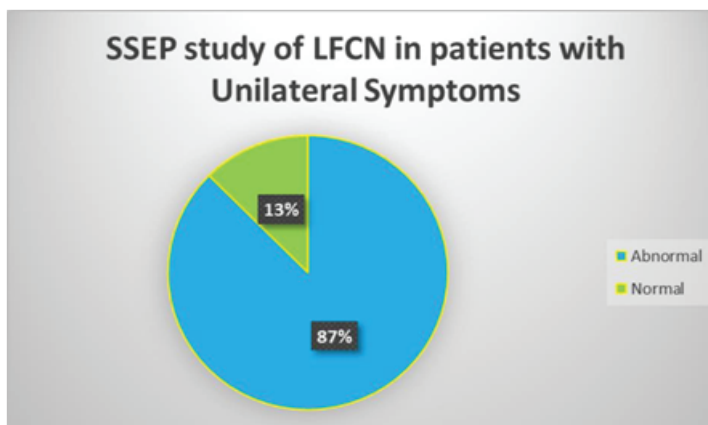


Figure 7a: Percentage of abnormal vs normal SSEP Findings in patients with Unilateral Symptoms.

87% of patients had abnormal SSEP findings. (Chart 7a)

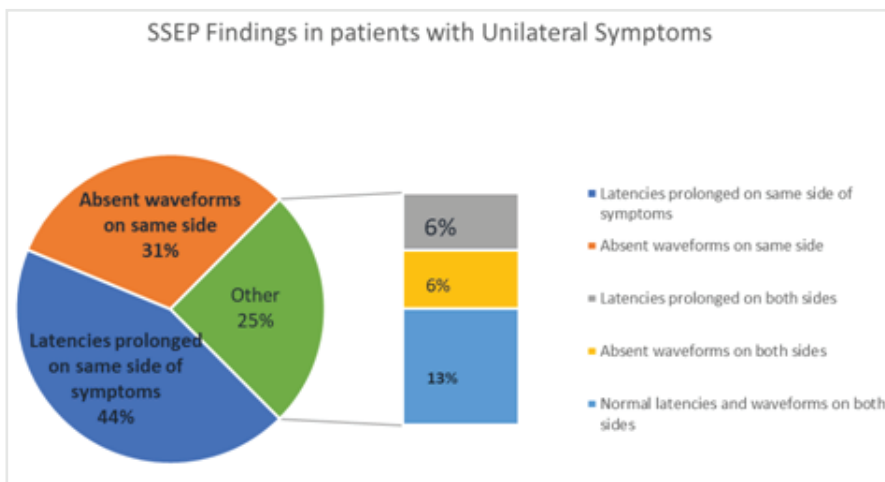


Figure 7b: SSEP abnormalities seen in patients having unilateral symptoms.

SSEP FINDINGS	NUMBER OF PATIENTS	PERCENTAGE
Latencies prolonged on same side of symptoms	7	44%
Absent waveforms on same side	5	31%
Latencies prolonged on both sides	1	6%
Absent waveforms on both sides	1	6%
Normal latencies and waveforms on both sides	2	13%

Table 3: SSEP abnormalities in patients having Unilateral Symptoms.

In patients with unilateral symptoms, 44% of patients had prolonged P31 latency on same side of symptoms, 31% of patients had absent/ unrecordable waveforms on same side of symptoms. 6% of

patients had prolonged P31 latencies on both sides, 6% of patients had absent waveforms on both sides and 13% of the patients had normal latencies and waveforms on both sides. (Table 3)



Figure 8: Percentage of normal and abnormal findings in patients with bilateral symptoms.

86% of patients had abnormal SSEP findings. (Chart 8)

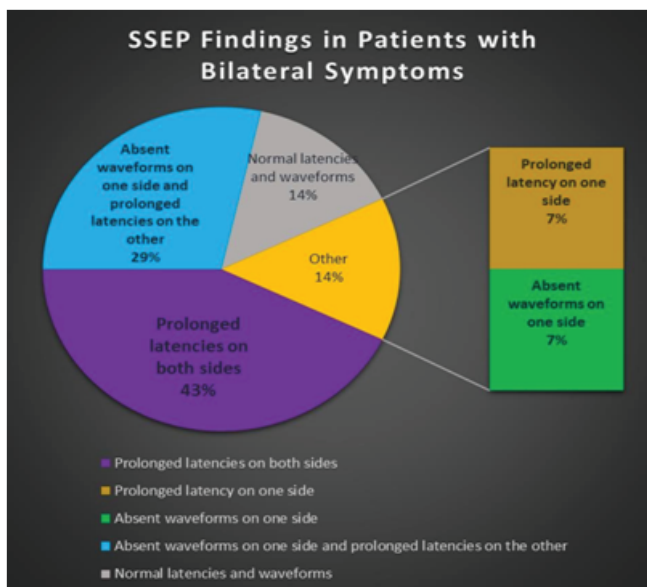


Figure 9: Various SSEP Findings in patients having bilateral symptoms.

SSEP FINDINGS	NUMBER OF PATIENTS	PERCENTAGE
Prolonged latencies on both sides	6	43%
Prolonged latency on one side	1	7%
Absent waveforms on one side	1	7%
Absent waveforms on one side and prolonged latencies on the other	4	29%
Normal latencies and waveforms	2	14%

Table 4: SSEP Findings in patients having bilateral symptoms.

43% of patients had prolonged P31 latencies on both sides, followed by 29% of patients had absent waveforms on one side and prolonged latencies on the other, 14% of patients had normal latencies and waveforms and 7% of patients had absent waveforms on one side, normal waveforms on the other and 7% of patients had prolonged P31 latency on one side. (Table 4)

SSEP Latencies in groups with Normal vs Abnormal Sensory Examination						
	Sensory Examination	N	Mean	Median	SD	SE
Right P31	Abnormal	16	27.6	32.2	14.2	3.55
	Normal	14	29.5	32.4	13.7	3.66
Left P31	Abnormal	16	23.0	30.5	16.3	4.08
	Normal	14	25.4	29.1	14.5	3.86
Right N49	Abnormal	16	39.5	47.4	19.9	4.98
	Normal	14	43.2	48.0	18.6	4.97
Left N49	Abnormal	16	32.7	45.5	23.0	5.74
	Normal	14	37.6	46.5	20.7	5.52

Table 5: Mean and median of SSEP latencies on both sides with respect to sensory examination findings

Symptom location vs Sensory Examination Findings		
Sensory Examination		
Symptom location	Abnormal	Normal
Unilateral	9	7
Bilateral	7	7

Table 6: Symptom location vs sensory examination findings.

Sensory examination findings were abnormal in 9 out of 16 patients with unilateral symptoms and 7 out of 14 patients with bilateral symptoms. (Table 6)

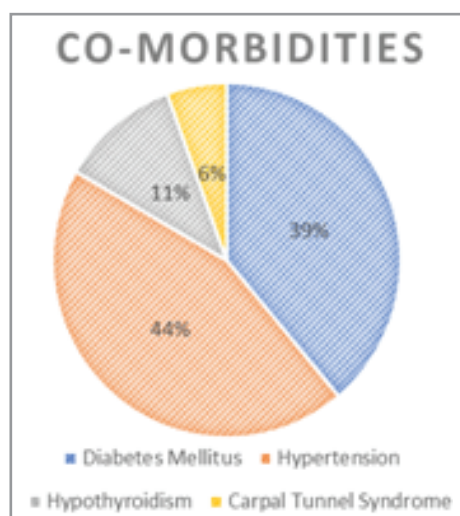


Figure 10: The above chart shows the various co-morbidities of patients in the study.

39% of patients had Diabetes Mellitus, 11% of patients had Hypothyroidism, 44% of patients had Hypertension and 6% had CTS. (Chart 10)

Discussion

In this study, incidence of symptoms was higher in females (53%) when compared to males (47%) contrary to other studies. A retrospective study carried out in 2009 by Martínez-Salio A, Moreno-Ramos T et al., analysed 140 patients with Meralgia and found a higher incidence in males.¹⁴ Similarly another retrospective study carried out in 2017 by Wei-Chieh Weng, Yi-Chia Wei showed a higher incidence in males.¹⁵ Another study by Thomas J. Parisi, Jay Mandrekar carried out in 2011 showed an almost equal incidence in males and females.¹⁶

In this study 56% of the patients belonged to 30-60 years age group. Average age of incidence as 49.8 ± 12.8 years was reported by Wei-Chieh Weng Yi-Chia Wei in their study. Multiple studies have reported a higher incidence of Meralgia in the middle age group (30-40 years).¹⁷ The results of this study are similar to the ones mentioned above.

In this study, 53.3% of patients presented with Unilateral Symptoms. A study conducted in 14 patients in 2000 by Gregory K. Ivins, showed that 13 patients had unilateral Meralgia and only one patient had bilateral Meralgia. Most studies report a higher incidence of Meralgia unilaterally.^{18,19} Though, in this study, majority of the patients had unilateral symptoms, less than half of the patients (46.6%) had bilateral symptoms. This could reflect an increased number of risk factors (Obesity, Diabetes Mellitus etc.) prevalent in the population of the patients studied. 43.3% of patients in this study had sensory impairment. Ecker et al. reported impaired sensory perception to touch, pain and temperature in 68 per cent of 150 cases studied.²⁰ This study shows similar findings.

SSEP study carried out in patients with unilateral symptoms showed that SSEP was unilaterally abnormal in 75% of the patients. In a study done in 2001, SSEP performed in 20 patients with unilateral Meralgia Paraesthetica, was unilaterally prolonged.²¹ Another case-control study showed that SSEP was abnormal in the affected thigh and was found to be normal in the unaffected thigh as well as controls.²² The findings obtained in this study are consistent with the reported findings.

In patients with Bilateral symptoms, 72% had bilateral SSEP abnormalities. There is a relative lack of studies determining the role of SSEP in patients with bilateral meralgia.

Conclusion

SSEP studies of the LFCN carried out in patients suspected to have Meralgia Paraesthetica showed that SSEP was abnormal in 86% of the individuals. In patients with unilateral symptoms, the unaffected side was a very good control and in 75% of the individuals SSEP was abnormal on the affected side. In patients with Bilateral symptoms, 72% of the individuals had bilaterally abnormal SSEP findings.

1. Grossman, Mark G, Ducey, Stephen, Nadler, Scot et al. Meralgia paresthetica: diagnosis and treatment. *JAAOS- Journal of the American Academy of Orthopaedic Surgeons*. 2009;9(5):336-344.
2. Chiappa, Keith H. *Evoked potentials in clinical medicine*. Lippincott Williams & Wilkins. 1997.
3. Ivins, Gregory K. Meralgia paresthetica, the elusive diagnosis: clinical experience with 14 adult patients. *Annals of surgery*. 2000;232(2):281.
4. Grothaus, Matthew C. Lateral femoral cutaneous nerve: an anatomic study. *Clinical Orthopaedics and Related Research*. 2005;437:164-168.
5. Parisi, Thomas J, Mandrekar J, James, Dyck. Meralgia paresthetica: relation to obesity, advanced age, and diabetes mellitus. *Neurology*. 2011;77(16):1538-1542.
6. Erbay, Hakan. Meralgia paresthetica in differential diagnosis of low-back pain. *The Clinical journal of pain*. 2002;18(2):132-135.
7. Nahabedian, Dellon M. Meralgia paresthetica: etiology, diagnosis, and outcome of surgical decompression. *Annals of plastic surgery*. 1995;35(6):590-594.
8. Ghent W. R. Further studies on meralgia paresthetica. *Canadian Medical Association Journal*. 1961;85(16):871.
9. Stookey, Byron. Meralgia paraesthetica: etiology and surgical treatment. *Journal of the American Medical Association*. 1928;90(21):1705-1707.
10. Chiravuri, Srinivas. Lateral Femoral Cutaneous Neuropathy—Meralgia Paresthetica. *Peripheral Nerve Neurosurgery*. 2018:125.
11. Cheatham SW, Kolber MJ, Salamh PA. Meralgia paresthetica: a review of the literature. *Int J Sports Phys Ther*. 2013;8(6):883-893.

12. Dureja, G. P. Management of meralgia paresthetica: a multimodality regimen. *Anesthesia & Analgesia*. 1995;80(5):1060-1061.
13. Park, Yeong M. The Diagnostic Validity of Somatosensory Evoked Potentials in Meralgia Paresthetica. *Journal of the Korean Neurological Association*. 1998;16(4): 519-523.
14. Seror P. Somatosensory evoked potentials for the electrodiagnosis of meralgia paresthetica. *Muscle & Nerve: Official Journal of the American Association of Electrodiagnostic Medicine*. 2004;29(2): 309-312.
15. Cruccu G, Aminoff, Curio, Guerit, Kakigi, Maugeire et al. Recommendations for the clinical use of somatosensory-evoked potentials. *Clinical neurophysiology*. 2008;119(8):1705-1719.
16. Po, Helen L, Mei S. Meralgia paresthetica: the diagnostic value of somatosensory evoked potentials. *Archives of physical medicine and rehabilitation*. 1992;73(1):70-72.
17. Weng, Chieh W. Risk factor analysis for meralgia paresthetica: A hospital-based study in Taiwan. *Journal of Clinical Neuroscience*. 2017;43: 192-195.
18. Salio MA, Ramos MT, Sánchez MD, Etessam JP, Aleja JG, Gutiérrez G et al. Meralgia paraesthetica: a report on a series of 140 cases. *Revista de neurologia*. 2009;49(8): 405-408.
19. Omichi, Yasuyuki, Tonogai, Ichiro, Kaji, Shinsuke et al. Meralgia paresthetica caused by entrapment of the lateral femoral subcutaneous nerve at the fascia lata of the thigh: a case report and literature review. *The Journal of Medical Investigation*. 2015;62(3,4):248-250.
20. Harney, Donal, Patijn J. Meralgia paresthetica: diagnosis and management strategies. *Pain Medicine*. 2007;8(8):669-677.
21. Ilkhani, M, Afshinmajd S, Valaei N. The Diagnostic Relationship Of Somatosensory Evoked Potential with Meralgiaparesthetica, the elusive diagnosis: clinical experience with 14 adult patients. *Ann Surg*. 2000;232:281-286.