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Contribution and Limitations of Electroneuromyography in the Evaluation of Neuropathic Pain: A Single-Center Retrospective Study of 315 Patients

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ABSTRACT

Introduction: Neuropathic pain is a common reason for consultation in neurology. Electroneuromyography (ENMG) is widely used in the assessment of peripheral nervous system disorders; however, its role in the diagnosis of neuropathic pain remains debated, particularly due to its limitations in evaluating small fiber involvement.

Objective: To assess the contribution and limitations of ENMG in patients presenting with symptoms suggestive of neuropathic pain.

Methods: We conducted a retrospective descriptive study over a 10-month period (January–October 2025), including 315 patients referred for ENMG. Clinical, demographic, and electrophysiological data were analyzed.

Results: The study population was predominantly female (77.8%), with a mean age of 42 years (range: 9–76 years). Sensory symptoms were the main reason for referral (58%). Diabetes was present in 46% of patients. ENMG findings were normal in 44% of cases. Among abnormal findings, carpal tunnel syndrome was the most frequent (21%), followed by length-dependent polyneuropathies (17%) and radiculopathies (9%).

Conclusion: ENMG is an essential tool in the evaluation of peripheral neuropathies. However, the high rate of normal findings highlights its limitations, particularly in small fiber involvement, emphasizing the need for complementary diagnostic approaches.

INTRODUCTION

Neuropathic pain is defined as pain caused by a lesion or disease affecting the somatosensory system. It represents a major public health issue due to its high prevalence, its impact on quality of life, and the complexity of its diagnostic and therapeutic management. Its clinical presentation is heterogeneous, including sensory symptoms such as paresthesias, dysesthesias, or burning pain, and may be accompanied by motor deficits or autonomic dysfunction.

The diagnosis of neuropathic pain relies primarily on clinical evaluation, supported by validated tools such as the DN4 questionnaire. However, etiological identification and precise characterization of nerve involvement often require additional investigations.

Electroneuromyography (ENMG) plays a central role in the assessment of peripheral neuropathies. It allows evaluation of nerve conduction, differentiation between axonal and demyelinating lesions, and provides clues toward specific etiologies. Consequently, it is widely prescribed in patients with symptoms suggestive of neuropathy.

However, the role of ENMG in the diagnosis of neuropathic pain remains controversial. Indeed, this examination primarily assesses large myelinated nerve fibers, whereas certain forms of neuropathic pain—particularly those related to small fiber involvement—may be associated with normal ENMG findings. This limitation may lead to a discrepancy between clinical symptoms and electrophysiological results, creating a diagnostic challenge.

In this context, it is essential to evaluate the actual contribution of ENMG in the assessment of neuropathic pain in clinical practice. The aim of this study is to analyze the contribution and limitations of ENMG in a cohort of patients referred to the Electroneuromyography Unit of the Neurology Department at CHU Mohamed VI of Tangier, with particular emphasis on the frequency of normal results and their clinical significance.

MATERIALS AND METHODS

Study design and setting

This was a retrospective descriptive study conducted in the Electroneuromyography (ENMG) unit over a 10-month period, from January to October 2025.

Study population

All patients referred to the ENMG unit during the study period for evaluation of peripheral neurological symptoms were included. A total of 315 patients were retained for analysis.

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Inclusion criteria

- Patients referred for evaluation of symptoms suggestive of peripheral nervous system involvement (sensory, motor, or mixed symptoms)
- Patients who underwent a complete ENMG examination

Exclusion criteria

- Incomplete or insufficiently exploitable medical records
- Patients who did not undergo a complete ENMG study

Data collection

Data were collected from medical records and ENMG reports. The variables studied included: **Demographic data:** age, sex

- **Clinical data:** reason for referral, type of sensory symptoms
- **Medical history:** diabetes, chronic kidney disease, thyroid disorders, autoimmune diseases and vasculitis, trauma
- **ENMG findings:** normal or abnormal results, type of abnormality (carpal tunnel syndrome, polyneuropathy, radiculopathy, polyradiculoneuropathy, traumatic nerve injury, others)

ENMG procedure

ENMG studies were performed according to standard protocols, including assessment of motor and sensory nerve conduction parameters, as well as needle electromyography when necessary. All results were interpreted by physicians specialized in neurophysiology.

Statistical analysis

Data were analyzed descriptively. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as means with ranges. Statistical analysis was performed using Microsoft Excel and SPSS (Statistical Package for the Social Sciences).

RESULTS

General characteristics of the study population

A total of 315 patients were included in the study over a 10-month period. The mean age was
42 years, with a range from 9 to 76 years. The population was predominantly female, with 245 women (77.8%) and 70 men (22.2%).

Reasons for referral

Sensory symptoms were the most common reason for referral, reported in 182 patients (58%), followed by motor symptoms in 101 patients (32%). Respiratory symptoms were observed in 25 patients (8%),while 2% of patients were referred for other clinical presentations (Figure 1).

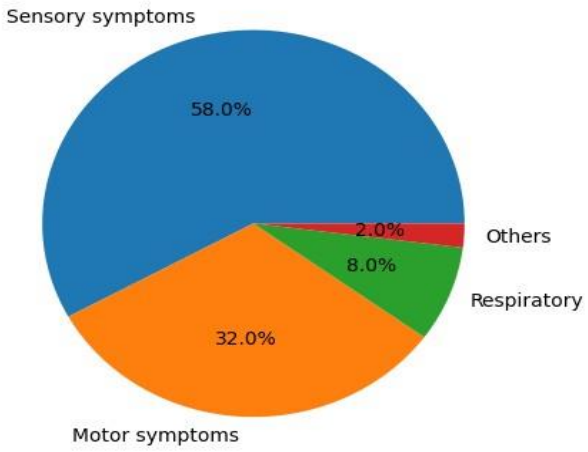

Figure 1. Distribution of reasons for referral of patients sent for ENMG evaluation

Characteristics of sensory symptoms :

Paresthesias of the upper limbs were the most frequent manifestation (31%), followed by paresthesias involving all four limbs (24%). Lumbosciatica and cervicobrachial neuralgia accounted for 19% and 16% of cases, respectively (Figure 2).

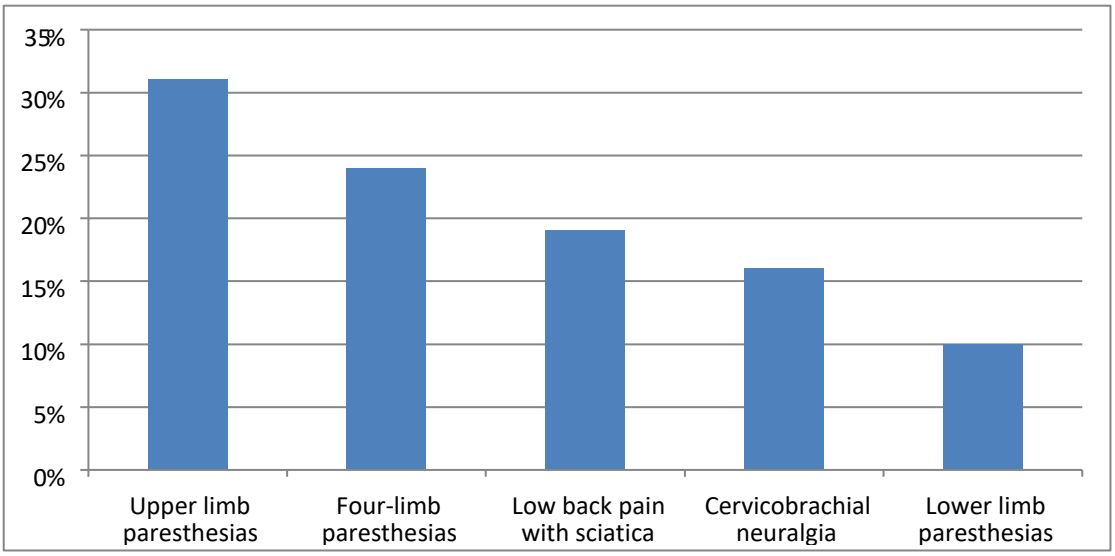

Figure 2. Distribution of sensory symptoms in the study population

Medical history

Diabetes was the most frequent comorbidity, present in 46% of patients. Chronic kidney disease was observed in 16% of cases, Sjögren's syndrome in 8%, systemic vasculitis in 6%, and thyroid disorders in 5%. A history of limb trauma was reported in 2% of patients. In addition, 17% of patients had no relevant medical history (Table 1).

Table 1. Distribution of medical history

Medical history	%
Diabetes	46
Chronic kidney disease	16
Sjögren's syndrome	8
Vasculitis	6
Thyroid disorders	5
Trauma	2
None	17

ELECTRONEUROMYOGRAPHY FINDINGS

ENMG results were normal in 44% of patients. Among abnormal findings, carpal tunnel syndrome was the most frequent (21%), followed by length-dependent polyneuropathies (17%) and radiculopathies (9%). Acute polyradiculoneuritis accounted for 3% of cases, chronic forms for 2.5%, and traumatic nerve lesions for 2%. Other abnormalities were observed in 5% of cases (Figure 4).

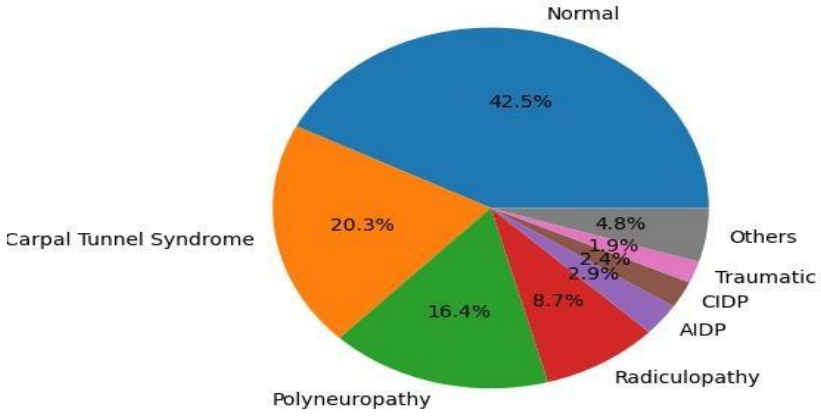

Figure 3. Distribution of electroneuromyography (ENMG) findings

DISCUSSION

Neuropathic pain is a common reason for consultation in neurology and represents a major diagnostic challenge in daily clinical practice. Its diagnosis relies primarily on clinical assessment, while electroneuromyography (ENMG) plays an essential complementary role in confirming and characterizing peripheral nervous system involvement. However, it is well established that ENMG mainly assesses large myelinated fibers, which limits its sensitivity in certain forms of neuropathy, particularly small fiber neuropathies (1).

In our series of 315 patients investigated for symptoms suggestive of peripheral neuropathy, sensory symptoms were the most frequent reason for consultation. This predominance is consistent with the literature, which reports that sensory manifestations (burning pain, paresthesias, allodynia) are often the initial presentation of peripheral neuropathies, especially in early or metabolic forms (2). Moreover, the high proportion of diabetic patients (46%) is in agreement with epidemiological data, as diabetes is recognized as the leading cause of peripheral neuropathy worldwide (3).

A major finding in our study is the high rate of normal ENMG results, observed in 44% of cases. This substantial proportion highlights an important limitation of electrophysiological testing in the evaluation of neuropathic pain. Indeed, small fiber neuropathies, which affect Aδ and C fibers responsible for pain and temperature sensation, may present with completely normal ENMG findings (4). This situation is well documented in the literature and explains part of the clinico-electrophysiological discrepancies encountered in routine practice.

These findings are also consistent with recent studies showing that a significant proportion of small fiber neuropathies may be clinically evident despite normal ENMG results, due to the inability of conventional techniques to assess unmyelinated fibers (5). Thus, neuropathic pain may exist in the absence of ENMG abnormalities, highlighting the need for a multimodal diagnostic approach integrating clinical evaluation, quantitative sensory testing, and, when necessary, skin biopsy (6).

In our cohort, carpal tunnel syndrome was the most frequent identified etiology, followed by length-dependent polyneuropathies. This distribution is consistent with the literature, where compressive neuropathies, particularly carpal tunnel syndrome, represent the most common focal neuropathies in clinical practice (7). Metabolic neuropathies, especially diabetic neuropathy, also account for a significant proportion due to their high prevalence.

Beyond its diagnostic role, ENMG remains essential for the characterization of peripheral neuropathies, allowing differentiation between axonal and demyelinating processes and contributing to etiological orientation and therapeutic management. This contribution is crucial for prognostic stratification.

However, several limitations of our study should be acknowledged. This was a retrospective, single-center study, which may introduce selection bias. Moreover, the lack of specific investigations for small fiber neuropathies (skin biopsy, quantitative sensory testing) limits the interpretation of cases with normal ENMG findings. Current guidelines emphasize the importance of complementary assessments in suspected small fiber neuropathies to avoid underdiagnosis (8).

Finally, the wide etiological spectrum of small fiber neuropathies, including metabolic, autoimmune, toxic, and idiopathic causes, highlights the need for a systematic and structured diagnostic approach to optimize patient management (9).

CONCLUSION

Neuropathic pain is a frequent and complex condition in neurological practice, requiring a rigorous and multimodal diagnostic approach. Our study highlights the value of electroneuromyography (ENMG) in the characterization of peripheral neuropathies by helping to define their type, distribution, and, in some cases, underlying etiology.

However, a significant proportion of normal ENMG findings was observed, underscoring the limitations of this examination, particularly in small fiber neuropathies. This emphasizes the need for strict clinico-electrophysiological correlation and a comprehensive diagnostic approach, including complementary investigations when necessary.

Thus, ENMG remains an essential tool in the evaluation of neuropathic pain, but its interpretation must always be integrated into a broader clinical reasoning in order to avoid incomplete or delayed diagnoses.

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