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Letter to the Editor

Response to the Commentary on: "The Diagnostic Role of Adding the Hoffman Reflex for L5 Radiculopathy in the Electrodiagnostic Laboratory: A Cross-sectional Study"

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We are grateful to Finsterer J. for his interest in our study and for providing constructive comments[1]. We will address each of the points in turn.

Generally, as previously indicated in our work, the H-reflex recorded concurrently from the tibialis anterior (TA), peroneus longus (PL), and soleus (S) muscles using sciatic nerve stimulation is not a sufficient diagnostic tool alone. The H-reflex obtained by this method provides minimal diagnostic value in the context of conventional electrodiagnostic tests for radiculopathy[2]. Electrodiagnostic examinations represent a continuation of the physical examination. The H-reflex, as a late response, provides supplementary information for the diagnosis of radiculopathy. Traditionally, it is obtained from the triceps surae muscles with tibial nerve stimulation. In our study, we employed a distinct methodology whereby we recorded and evaluated simultaneous H-reflexes from three muscles (TA, PL, and S) by stimulating the sciatic nerve[2]. We then assessed the contribution of this technique to the diagnosis of radiculopathy[3].

The initial point to be addressed is as follows: The exclusion criteria were selected in accordance with the existing literature and considered the patients' comprehensive medical history and physical examination findings[4-9]. We carefully excluded common clinical conditions that could lead to positive electromyography (EMG) findings, other than disc herniation. It is notable that other potential causes, which are not included in the aforementioned inclusion criteria and may be subclinical or mild, have not been considered. Nevertheless, it is not feasible to comprehensively assess (laboratory and radiological procedures, etc.) all potential neuromuscular disorders within the framework of our study. We wish to emphasize that such conditions were not clinically apparent in the selected cohort of patients and that no findings could be identified through routine examination and anamnesis. Furthermore, it is widely acknowledged that EMG has inherent limitations in clinical practice. Additionally, although it is widely acknowledged that EMG has inherent limitations in clinical practice and that it is not always feasible to ascertain the underlying cause of positive EMG findings with certainty, the meticulous clinical assessment and exclusion of potential confounding factors in our study were deemed sufficient to mitigate this concern.

Secondly, in our study, central nervous system (CNS) diseases were excluded based on the patients' medical histories, physical examinations, and prior imaging results. Although magnetic resonance imaging (MRI) of the brain, cervical spine, and thoracic spine was not performed on all patients, it was assumed that severe CNS pathologies would be clinically evident. The patients included in the study did not present with neurological findings that might indicate a CNS disease. Furthermore, those with negative results from previous examinations, including imaging, laboratory examinations, and so forth, were included in the study. Concurrently, it would not have been reasonable or cost-effective to conduct brain and full spinal MRIs on every participant for this study. Although it is acknowledged that rare and subclinical CNS pathologies, such as infectious diseases, may not be detected on imaging, we believe these conditions were unlikely in our patient group.

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To exclude conditions such as plexopathy, patients with suspected plexopathy in nerve conduction studies were excluded from the study. There are many causes of delayed H-reflex responses (e.g., motor neuron disease, radiculopathy, plexopathy, peripheral neuropathy, polyneuropathy, etc.) In cases where the delay in the H-reflex response is attributed to plexopathy, pathological responses in nerve conduction studies are expected distal to the dorsal root ganglion (especially in sensory responses). In our study, patients with pathological electrodiagnostic findings distal to the dorsal root ganglion in nerve conduction studies were not included.

The regular medications of the patients were meticulously documented in our study, and the potential impact of drug usage on nerve conduction was duly considered. Nevertheless, a dedicated analysis to ascertain the influence of medications on H-reflex was not conducted.

Thirdly, the anatomical fact of the cross-innervation of the L5 and S1 roots in muscles was taken into account in our study. The L5 root predominantly innervates the PL and TA muscles, while the soleus muscle is innervated by the S1 root. However, the soleus muscle also receives fibers from the L5 root, which may affect the results of our study. This anatomical detail is a factor considered in all electrophysiological studies.

When determining the specific affected root level in electrophysiological evaluations based on a radiculopathy protocol, the multiple root innervations of muscles are taken into account, and additional muscles with the same root but different peripheral nerve innervations are also examined using needle EMG[10,11]. In such cases, a more definitive conclusion regarding the affected root is made. In our study, the EMG-positive group was comprised of individuals with positive findings in two distinct muscle groups that were innervated by the same root but by different peripheral nerves. Additionally, by integrating the EMG results with the clinical findings, we aimed to distinguish between L5 and S1 radiculopathies with the greatest possible precision. In this context, the H-reflex response was not evaluated in its absolute isolation, but rather in conjunction with other electrophysiological findings and clinical assessments.

Fourth Point: No specific analysis was conducted in our study regarding the relationship between the H-reflex and the Achilles tendon reflex (ASR). The evaluation of the H-reflex and its correlation with ASR was not one of the primary objectives of our study.

In the interpretation of EMG findings, muscle weakness observed in L5 and S1 radiculopathies was considered alongside clinical evaluations. While the prevalence of foot dorsiflexion weakness in patients with L5 radiculopathy and foot plantar flexion weakness in patients with S1 radiculopathy was documented, a comprehensive analysis of these data was not undertaken in our study.

Fifth Point: It is well known that MRI findings do not always correspond precisely with clinical and electrophysiological findings. In our study, this has been taken into consideration, and the possibility of a discrepancy between MRI and EMG findings in patients diagnosed with L5 or S1 radiculopathy was acknowledged. However, cases where MRI suggests L5 radiculopathy while clinical and electrophysiological findings indicate S1 radiculopathy, or vice versa, can be attributed to factors such as anatomical variations between nerve roots, the degree of compression, and variations in nerve conduction abnormalities depending on the stage of radiculopathy.

The fact that half of the patients had negative EMG results is not unexpected, particularly in cases of chronic radiculopathy. The EMG examination can yield positive results in radiculopathy only when motor fibers are affected. In the event that only sensory fibers are involved, or if motor involvement has not yet reached a level that impairs nerve conduction studies or EMG, EMG may remain negative. Therefore, it is not always appropriate to expect EMG to be positive in all patients with radiculopathy symptoms lasting longer than three months. The sensitivity of EMG in electrophysiological evaluations is limited, and EMG may remain negative, especially in mild cases. Hence, in patients with a negative EMG result but with a disc herniation observed on MRI, making a diagnosis based on clinical findings would be a more reliable approach.

Sixth Point: The utilization of the clinically unaffected extremity as a control in our study is a methodology that has been widely accepted in the literature. This approach allows for the minimization of individual differences as well as variations according to age, gender, and body composition. Moreover, it permits for a direct comparison between the two sides. However, the possibility of contralateral subclinical involvement cannot be entirely ruled out. Criticism that this may result in subclinical but not clinically undetected involvement in the contralateral extremity is a valid concern.

Seventh Point: It is accurate to note that the number of patients with EMG-positive and EMG-negative L5 or S1 radiculopathy in our study was relatively limited. This has resulted in certain constraints with regard to the statistical comparisons that can be made between the two groups. However, the results obtained demonstrate significant findings within the current sample. Future studies with larger sample sizes could more strongly highlight the differences between the groups and enhance the reliability of the statistical comparisons.

Eighth Point: The rationale for the exclusion of patients over 65 years old in our study is that the neurological and musculoskeletal changes associated with the aging process could potentially impact electrophysiological findings, thereby complicating the study's results. It is well documented that in older individuals, particularly those aged 65 and above, age-related physiological changes including polyneuropathy, slowed nerve conduction velocity, sarcopenia, and musculoskeletal disorders are more prevalent. Such changes have the potential to influence both H-reflex and EMG outcomes, thereby complicating the interpretation of the results. Furthermore, degenerative changes in the lumbosacral vertebrae in elderly individuals may complicate the diagnosis of radiculopathy. Additionally, the presence of age-related disc degeneration may result in inconsistent findings with

regard to both clinical and electrophysiological outcomes. In our study, we excluded this age group in order to obtain a homogeneous patient group and to increase the validity of the results. In conclusion, the exclusion of patients over 65 years of age was a methodological choice made in order to minimize the effect of age-related factors on electrophysiological findings.

In conclusion, the H-reflex was obtained by recording from three muscles simultaneously with sciatic nerve stimulation and evaluated for radiculopathy with an out-of-routine protocol. It is important to note that the H-reflex obtained using this method cannot be considered a replacement for clinical evaluation, radiculopathy protocol EMG, or MRI. However, our findings suggest that it could potentially offer a modest contribution to the diagnostic process when used in conjunction with these assessments. In the diagnosis of radiculopathy, it is not advisable to rely on a single method for diagnosis in each patient. Rather, a combination of clinical, radiological, and electrophysiological findings is recommended to yield the most reliable results.

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