



ASSESSMENT OF DIFFERENCE BETWEEN MAGNETIC RESONANCE IMAGING AND ELECTROMYOGRAPHY FINDINGS OF PATIENTS WITH RADICULOPATHY (CERVICAL-LUMBOSACRAL) REFERRED TO ELECTROMYOGRAPHY DIAGNOSTIC CLINIC OF URMIA IMAM KHOMEINI

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ABSTRACT

Background: Radiculopathy is one of the most common reasons that patients are referred to the EMG clinic for evaluation of radiculopathy. Despite the use of MRI in the diagnosis of patients, EMG plays an important role in the diagnosis of these patients. EMG is used for diagnosis of radiculopathy and in localizing the root and its intensity of problem and provides important information about the differences between results of two methods. The aim of this study was to evaluate the assessment of difference between magnetic resonance imaging and electromyography findings of patients with radiculopathy.

Methods: This cross-sectional study conducted on 70 patients with a primary diagnosis of pain in the lumbar and cervical regions of radiculopathy that referred to the EMG clinic. Results of the electromyography and MRI were compared to determine the sensitivity and specificity, and positive and negative predictive values.

Results: Of 70 patients referred to the EMG clinic, there were 40 men and 30 women. The mean (SD) age of the patients was 34.42 ± 14.62 years. The most common levels of root involvement in the lumbar and neck were the LS- S1 and C5-C6. EMG of cervical and lumbosacral regions had 83.1% specificity rate and 90% sensitivity and positive predictive value of 73.72% and 97.06%, respectively, 84.1% and 40.2% respectively, and the negative predictive value was 39.13%.

Conclusion: The overall degree of correspondence between the two methods was 73%. The use of two methods may have increase the diagnostic accuracy and the two methods are complementary.

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Introduction

Radiculopathy is one of the most common reasons that patients are referred to the EMG clinic for evaluation of radiculopathy. Despite the use of MRI in the diagnosis of patients, EMG plays an important role in the diagnosis and

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evaluation of these patients. But imaging techniques such as MRI, CT scan do not get the information about nerve roots function. However, MRI and CT scan imaging studies had an important role in the diagnosis of construction and pressure reason for radiculopathy, but in the diagnosis of other causes such as inflammatory factors - infectious - infiltrative, ischemic or demyelination are powerless.

In fact, the methods of imaging do not get information of the operation of nerve - muscles. The EMG not only has an important role in the diagnosis of radiculopathy, but also localizes the location of the lesion and gives information about nerve function [1]. Today, many patients with radicular pain types and even non-radicular pain in order to confirm the diagnosis of radiculopathy or evaluation of other causes referred to the EMG clinic. Also, back pain and neck pain are one of the most common problems of human society that more than 80% of adults at some point in their lives have experienced back pain or neck pain and a greater percentage of osteoarthritis of the joints between the spine and the formation of bone spurs causes pressure on the spinal root or stenosis of intervertebral holes (intervertebral foramina) and make symptoms of radiculopathy. Today, with numerous advances in imaging of spine, the preferred method is MRI, but it should be noted a lot of changes seen on MRI that is called discopathy, are incidental findings on MRI that may not be directly related to be patient problems.

As mentioned using EMG in addition to confirming the diagnosis of root spinal level, lesions also be recognized and another point is that EMG could also show severity of the lesions for example can distinguish axonal type and demyelination and plays an important role in determining the prognosis, so that in the axonal type, prognosis is worse and recovery is incomplete and slow [2]. The other importance of EMG is in some ways that the patient undergoing surgery due to radiculopathy but their postoperative problems had not removed completely and some problems they are still visible in the high limit. EMG is the best method in these cases especially if compared with the studies of the electrodiagnostic before the operation. Clinical signs for radiculopathy included pain in the spinal root path or the corresponding dermatome, sensory disorders in the form of anesthesia, paresthesia, burning in the dermatome path and in severe cases, muscle weakness.

Usually associated with this clinical paravertebral muscle spasm and limitation of motion of the spine and reduction in the deep tendon reflexion (DTR). The most common involvement of the lumbar spinal roots are L5-S1 and in C6-C7 in the neck. Due to the overlap of adjacent nerve roots, muscle weakness is less severe, but even different degrees of muscle atrophy may be observed [2, 3].

Considering the importance of MRI, which is the most common method of imaging in patients with radiculopathy and the importance of EMG in these patients is certainly some differences in their findings in these patients. Only some studies to compare the results of these two methods inside and outside of country have been done that in some cases, there was a clear coordination between their findings. The disagreement of these two methods has been reported by 40%, which can encounter patients with difficulties in their treatment process and medical Surgeons [4].

In the study in Tabriz city and in most cases, there were good coordination between findings of this two methods and EMG even has a complementary role in the confirmation of diagnosis [5]. Due to the high prevalence of radiculopathy and the widespread use of these two paraclinical methods, low conducted studies in this field. We decided to do in the province of West Azerbaijan.

Method And Materials

This cross-sectional study conducted on 70 patients with a primary diagnosis of pain in the lumbar and cervical regions of radiculopathy that referred to the EMG clinic during 3 months. All of participants had experienced MRI with maximum distance of 8 weeks. Results of the electromyography and MRI were compared to determine the sensitivity and specificity, and positive and negative predictive values.

Inclusion criteria included evidence of the involvement of one or more root of lumbar or neck for radicular pain, loss of sensation or paresthesia in the dermatome of interest or changes in reflexes tendon associated with the level of radicular injury or muscle weakness related to roots (at least one of them), then the results of the EMG in order to confirm or roll out the root lesion were compared with the results of MRI for root involvement by discopathy or stenosis of the foramen or any of the clinical signs and it was determined whether these findings were consistent together or were inconsistent.

It should be noted that EMG was measured MYTo machine made by Italy at the clinic of Imam Khomeini Hospital and it was conducted by a neurologist person. The data were collected and recorded on the specific form. The formula for calculating regarding the observed agreement percentage in the study of Nicorta et al. (8), which was 71%, , where confidence interval (CI) of 95%, estimating error (d) of 0.15 and Z showed standard normal distribution, was as following:

$$n = \frac{(Z_{1-\frac{\alpha}{2}})^2 \times P(1-P)}{d} \quad Z_{1-\alpha/2} = 1.96 \quad P = 0.71 \quad d = 0.15$$

In data analysis to evaluate the diagnostic accuracy of EMG compared to MRI (as standard test) sensitivity, specificity, positive and negative predictive value were calculated. The kappa statistic was used to assess the percentage of agreement between the two methods. The data were analyzed using STATA version 11 software. After confirmation of the Ethics Committee, it was began to carry out the study. All information and clinical and para-

clinical findings of the patients were confidential. And no indication of any unnecessary procedure and no additional costs imposed to patients. EMG performed at the request of the physician.

Results

Of 70 patients referred to the EMG clinic, there were 40 men and 30 women. Mean age and standard deviation of patients was 34.42 ± 14.62 years, the youngest patient was 19 years old and the oldest was 73 years old.

The frequency distribution of clinical findings are presented in Table 1 and 82.9% of patients had radicular pain.

Table 1. Absolute and relative frequency of clinical findings

Finding	Relative Frequency	Absolute Frequency
Radicular pain	82.9	58
Paresthesia	57.1	40
DTR changes	17.1	12
Lasegue Test	10	7
Motor Weakness	5.7	4
Atrophy	2.9	2

According to the MRI findings, 49 discopathy (70%) and 1 stenosis of the foramen (15.7%) were detected (Table 2)

Table 2. MRI findings in patients with radiculopathy referred to EMG clinic

Finding	Relative Frequency	Absolute Frequency
Discopathy	70	49
Stenosis of the Foramen	15.7	11

The most common involved sites were L5-S1 and C5- C6. It should be noted that MRI in 13 patients was normal that 5 out of them had no positive finding of radiculopathy in EMG and 4 out of them had carpal tunnel syndrome (CTS) in EMG and in one case even though MRI detected cervical discopathy but ALS (Motor Neuron Disease) was diagnosed in EMG. Frequency distribution of requested EMG by physician, according to requested limbs, is presented in Table 3.

Table 3. Frequency distribution of requested EMG according to requested limbs

Requested limb	Relative Frequency	Absolute Frequency
Upper Limb	52.9	37
Lower Limb	41.4	29
Four Limb	5.7	4

According to the findings of the statistical analysis, the sensitivity and specificity of EMG in lumbosacral radiculopathy were 73.72% and 90%, respectively as well as positive predictive value and negative predictive value were 97.06% and 39.13%, respectively. According to the results, its efficiency was 60.21%. The sensitivity and specificity of EMG in cervical radiculopathy were 62.4% and 83.1%, respectively as well as positive predictive value and negative predictive value were 84.1% and 40.2%, respectively. According to the results, its efficiency was 45.5% (Table 4).

Table 4. The findings of the statistical analysis for lumbosacral and cervical radiculopathy

Variable	EMG in lumbosacral radiculopathy	EMG in cervical radiculopathy
specificity	%90	%83.1
sensitivity	%73.72	%62.4
Positive Predictive Value	%97.06	%84.1
Negative Predictive Value	%39.13	%40.2
Efficiency	%60.21	%45.5

Discussion

There are a little study comparing the results of two diagnostic method. In the study of Shimia et al. (5), in Tabriz the percentage of agreement was 64% in the review of radiculopathy. These findings were consistent with our study. This study

was conducted only in the lumbar radiculopathies. The most common findings in lumbar radiculopathy were MRI and EMG in level L4-L5 and L5-S1, respectively. The most common findings in cervical radiculopathy were MRI and EMG in level L4-L5 and L5-S1, respectively. According to the findings of this study, the sensitivity and specificity of EMG in the diagnosis of lumbosacral radiculopathies was more than cervical and efficacy in lumbar was more than cervical (60.21% vs. 45.5%).

In the retrospective study of Nicotra et al. [8], in 2011 that conducted on 58 patients with radiculopathy, so that 28 patients had abnormal cervical EMG (47.27%), while MRI in all patients had shown abnormal changes that the degree of agreement was reported 71% which was 73% in our study, then was consistent with our study. In the study of Mondelli et al. [10], in 2013 which conducted on 108 patients with lumbosacral radiculopathy, 49% of patients had abnormal MRI and EMG when abnormal findings of MRI was far more that these results were consistent with our study.

Another result is that whenever patients had motor weakness or DTR dysfunction, EMG had suitable consistence. In General, this study showed that the percentage of the agreement in both MRI and EMG is acceptable but when there are obvious clinical signs in a patient, EMG increases the accuracy of diagnosis and helps to continue treatment and decision making for surgery, because the help is a complementary method in MRI.

As mentioned earlier, detecting degenerative changes in MRI without clinical symptoms or nonspecific clinical symptoms and non-radicular are very common. Therefore, it seems that EMG has very important role in the differential diagnosis of pain in the limbs and increase the accuracy of diagnosis where radiculopathy is diagnosed by MRI it very increases. EMG is more important in cases of non-compressive radiculopathy such as diabetes, infectious, inflammatory causes and vasculitis. In these case, EMG is only laboratory method for the diagnosis of radiculopathy.

Conclusion

According to the results, it could be concluded that although the findings of these two methods may not accompany a high percentage, but combining these two methods can increase the diagnostic accuracy and help to choose the type of treatment (especially for surgery) for all patients.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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