

Evaluation the Difference between Results of MRI and Electrodiagnostic Methods in Inferior Lumbosacral Discopathies

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Abstract

Introduction: To achieve an appropriate treatment for low back pain we should know the exact reason of the pain. Beside physical examination, imaging modalities like CT scan and MRI are the other diagnostic methods for LBP. Furthermore, electrodiagnostic studies help to diagnose the reason behind radiculopathy. Actually when the reason of radiculopathy is unclear, these methods help to localize the exact nerve root causing the pain and rule out the similar reasons of radiculopathy. The aim of this study was to compare MRI and EMG in diagnosing the reason of lumbosacral radiculopathies. **Methods:** In this cross sectional descriptive-analytical study, the number of patients who came to neurosurgery clinics with LBP and lumbar discopathy and been evaluated by MRI and EMG were studied. Later, for every patient a questionnaire was completed based on the results achieved from MRI and EMG and the obtained results were compared. **Results:** 100 patients were participated in this study, 60% female and 40% male. The average age of patients was 39/75 years. The most frequent chief complaint of patients was LBP with a prevalence of 43%. MRI findings showed 64% involvement of L4/L5 level in these patients. On the other hand, EMG findings also showed L4/L5 level involvement in 64% of patients confirming the hypothesis of our study that MRI and EMG findings are compatible with each other in determining the level and intensity of disc involvement. **Conclusion:** For determining the level of injury in lumbosacral radiculopathies, both MRI and EMG are equally useful. Additionally, in borderline cases we can use EMG to confirm MRI findings to determine the intensity and level of injury.

Keywords: Lumbosacral radiculopathy; Magnetic Resonance Imaging; Electromyography

Introduction

One of the reasons of low back pain is interspinous disk herniation that induces the

symptoms by nerve root compression. Disc herniation occurs when the central part of the disc (nucleus pulposus) bulges out and compresses the peripheral part (annulus

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fibrosus) and extends to spinal canal and compresses a nerve root and causes the sciatic pain. On the other hand, compression of spinal cord or nerve roots can be the reason of LBP in patients with canal stenosis (2, 1). Due to different etiologies of LBP for appropriate treatment we need to know the exact reason of pain. Besides the physical examination (Table 1), one of diagnostic methods is imaging like CT- scan and MRI that are recommended when symptoms remain more for than 6 weeks (3).

Table 1: Physical examination findings in lumbar disc herniation

	Sensitivity (%)	Specificity (%)
Weakness of ankle dorsiflexion	54	89
Calf wasting	29	94
Calf paresthesia	16	86
Abnormal ankle reflex	48	89
SLR test	73-97	61-11
Cross SLR test	43-23	98-88

In 95% of patients with severe LBP, MRI can find the ultimate diagnosis; on the other hand, only 15% of patients with LBP have problems associated with disc injuries (4). Electrodiagnostic studies help the physical examination to diagnose the etiology of pain in patients with lumbar radiculopathy and should not be used only for determining the details of examinations. In fact, these studies are used in patient with leg pain or to localize the exact nerve root that causes the pain when the etiology is unclear. Additionally, it is used to rule out the other etiologies inducing the similar symptoms of radiculopathy (5). Therefore, in this study we tried to evaluate and compare the findings of two diagnostic methods (MRI and EMG) in patients with

inferior lumbosacral radiculopathy and therefore use one method to complete and confirm the other one in borderline and unclear cases. In the study by Carter and Fritz (1997), there was a statistically significant correlation ($P<0.009$) between two diagnostic methods (MRI and EMG) in patients with subacute inferior lumbar radiculopathy (6). In another study on 20 patients with LBP in 1994 by Ertekin and colleagues, it was shown that EMG is useful for localizing the nerve root involved in 80% of cases (7). In study by Windt and his colleagues, it was noted that physical examination alone is not enough to diagnose the disc herniation and should be used in addition to other radiological and electrodiagnostic studies (8).

Methods and Materials

In a cross-sectional descriptive-analytical study, 100 patients with LBP referred to clinics of neurosurgery in Shohada hospital in Tabriz, Iran in 2010 were selected. The patients with previous back surgery, neuropathy, motor neuron diseases (UMN and LMN) and canal stenosis were excluded from this study. Only patients with LBP and inferior lumbosacral discopathy (L4, L5, S1) that were evaluated by MRI and EMG were included into this study. Later, MRI and EMG findings were evaluated by a neurosurgery specialist and a questionnaire was filled for every patient and then the results of MRI and EMG were compared. All data collected from this study were evaluated and analyzed by SPSS.16 software. In this study, p -value <0.05 was considered statistically significant. The intensity of radiculopathy was classified based on the extent of disc bulging in MRI into 4 forms: (bulge-protrusion-extrusion-sequestration). On the other hand, using electrodiagnostic methods, classification was performed based on extent of recruitment in needle EMG in which if it was reduced, it was counted as mild; if discrete, counted as moderate; and if single or the test showed decrease in CMAP amplitude, it was counted as



severe.

Results

Of 100 patients participated in this study, 60% were female and 40% male. The average age of patients was 39/57+-11/7 years. According to educational degree, 86% of patients were diploma, 4% were advanced diploma and 9% were bachelor degree. Only one patient in this study had educational degree higher than bachelor. The most frequent chief complaint of patients was back pain with prevalence of 46% followed by back pain with leg paresthesia (31%). Based on MRI findings, 64% of patients had involvement in L4-L5 level and 34% of them had involvement in L5-S1 level. According to the extension of disc in MRI findings, the most common change was bulging with a prevalence of 48%. Based on extension of disc in MRI findings, 9% of all patients with bulging had normal EMG, 32% had mild radiculopathy and 7% had mild to moderate radiculopathy in EMG. In protrusion form, 1% of patients had normal EMG, 13% mild radiculopathy, 18% mild to moderate and 12% had moderate radiculopathy in EMG. Also in extrusion form, 1% had moderate and 3% had moderate to severe radiculopathy. On the other hand, in patients with normal MRI, 2% had normal EMG and 2% had mild radiculopathy in EMG. Based on EMG findings, in 64% of patients, involvement was at L4-L5 level. The intensity of radiculopathy in EMG findings can be seen in figure 7. Furthermore, based on EMGs performed, in patients with normal EMG findings, 1% had normal MRI and 9% had bulging in MRI. In patients with mild radiculopathy in EMG, 2% had normal MRI, 32% had bulging and 13% had protrusion in MRI. In mild to moderate state in EMG findings, 7% of patients had bulging and 18% had protrusion in MRI. In moderate radiculopathy cases in EMG findings, 12% had protrusion and 1% had extrusion in MRI and in all patients with moderate to severe radiculopathy in EMG, extrusion form was reported in MRI. Hence, our

study demonstrated that there is a significant correlation between MRI and EMG findings in determining the level and intensity of disc involvement ($P=0.001$).

Discussion

The most frequent chief complaint of patients with discopathy is back pain that may be accompanied by other symptoms like leg paresthesia. Back pain was the most frequent chief complaint of the participated patients as well with a prevalence of 43%. In our study, similar to the data reported from many resources, the most common level of disc involvement was L4-L5 (in 64% of MRIs) (9). Our study demonstrated that MRI and EMG findings are compatible with each other in determining the level and intensity of disc involvement ($P=0.001$). The study by Carter and Fritz showed a significant correlation ($P<0.009$) between MRI and EMG findings in subacute inferior lumbosacral radiculopathy. In another study by Eterkin and colleagues (1994) on 20 patients, it was demonstrated that for localizing the nerve root involved in radiculopathies, EMG is useful in 80% of the cases (7); as which in our study there was 100% similarity between MRI and EMG findings in localizing the involved nerve root. In another study, Windt and colleagues noted that physical examination lonely is not enough to diagnose the disc herniation and should be used beside other radiological and electrodiagnostical studies according to their excellent diagnostic help (8). Based on all researches and studies, Robinson at last indicated that mostly MRI and EMG obtain supplementary findings as so MRI gives excellent anatomical details and on the other hand EMG provides a physiological measure for detecting axon loss and can provide information as to which anatomical lesions are truly physiologically significant (10). The findings of this study indicate the same theory in which there is a complete correlation between MRI and EMG findings associating with intensity and level of involvement.



In conclusion, the results of this study indicate that for determining the level of injury in lumbosacral radiculopathies, both MRI and EMG are equally useful. Additionally, in borderline or unclear cases we can use EMG to confirm MRI findings for determining the intensity and exact level of injury.

Conflicts of interest

The authors declare that they have no conflict of interest.

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