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Musculus Extensor Digitorum Brevis is Clinical and Electrophysiological Marker for L5/S1 Radicular Lesions

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In clinical electromyography (EMG) musculus extensor digitorum brevis (MEDB) is known as «the marker» for L5/slradiculopathy. Radiculopathy is mainly sensory syndrome in which the pain appears in innervation's zone of one or more spinal nerves. Moreover, in clinical practice it is also known that radiculopathy is not only sensory disorders but also may be followed by muscle weakness and atrophy. Since atrophy of MEDB is often seen clinical feature in careful neurological exam of the patients with lumbosacral radiculopathy, it is made attempt to determine usefulness of this sign, for clinical diagnosis of radicular lesions. For this purpose 100 patients with lumbosacral radiculopathy and MEDB atrophy and 100 patients with low back pain have been studied. Control group consisted of 50 healthy volunteers. The patients underwent neurological examination, CT scan of lumbosacral region and EMG including motor conduction velocity (MCV) of deep peroneal nerve (DPN), F-wave and H-reflex analysis. The most patients in first group had moderate and severe radicular lesions of radix L5/sl proved by EMG examination. MCV in DPN on atrophy side was 43.4+/-2.65 m/sec, and on side without MEDB atrophy 47.18+/-1.63 m/sec (p<0.001). MCV in control group was significantly higher then in both group of patients (left side – 47.65+/-1.53 m7sec: right side – 47.70+/-1.59 m/sec)(p<0.001). Significant correlation between the MEDB atrophy and MCV (r=-0.67) and F-wave latency (r=0.86) and H-reflex latency (r=0.87) has been proved. It is concluded that MEDB atrophy is very important parameter in clinical evaluation of patients with lumbosacral radiculopathy and could be clinical and electrophysiological marker for L5/Sl radicular lesions. Key words: Musculus extensor digitorum brevis atrophy – L5/Sl radicular lesions

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1. INTRODUCTION

It is well known that anatomical approach in clinical examination is basical precondition for diagnostics of majority neurological disorders and particularly root and nerve lesions affecting the arm and leg, and that the most general physician and many neurologists are reluctant to attempt to make an accurate diagnosis of nerve root or peripheral nerve lesions due to deficient anatomical knowledge (1). Although exist considerable anatomical variation in the segments supplying particular muscles in different individuals musculus extensor digitorum brevis (MEDB) in most frequent cases is innervated by L5/Sl roots (2). In the lower extremities, involvement of a single root does not necessarily cause prominent weakness or wasting, reflecting multiplicity of root supply. In most leg muscles, however, a single root primarily controls certain movements such as hip flexion by L2, knee extension and hip adduction by L3, inversion of the foot by L4, toe extension by L5 (Figure 1), and aversion of the foot by Sl (1,2).

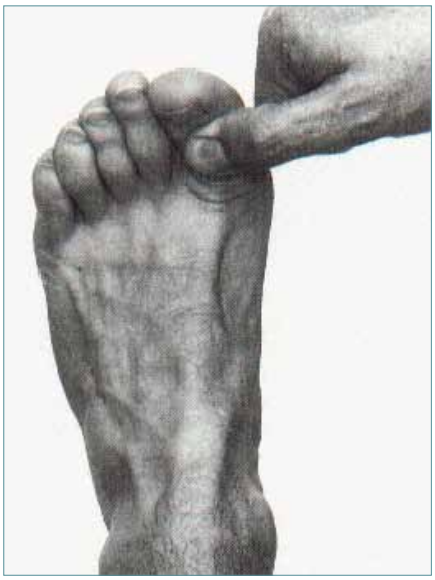

Figure 1. Musculus extensor digitorum brevis – dorsiflexion of the big toe

Radiculopathies, usually due to root compression are the single most common cause of patient referrals to many EMG laboratories (3). Radiculopathy is mainly sensory syndrome in which the pain appears in innervation's zone of one or more spinal nerves. Moreover, in clinical practice it is also known that radiculopathy is not only sensory disorders but also may be followed by muscle weakness and atrophy (2,3).

MCV in DPN on atrophy side was in normal range, but lower (43.4+/-2.65 m/sec) then on side without MEDB atrophy (47.18+/-1.63 m/sec) (p<0.001). MCV in control group was significantly higher then in both group of patients (left side–47.65+/-1.53 m/sec; right side – 47.70+/-1.59 m/sec)(p<0.001).

Electromyography (EMG) examinations help confirm the diagnosis and identify the damaged root and in EMG,

MEDB is known as «the marker» for L5/Sl radiculopathy (4).

Since atrophy of MEDB is often seen clinical future in careful neurological exam of the patients with lumbosacral radiculopathy, it is made attempt to determine usefulness of this sign, as well as usefulness of electrodiagnostic examination, for clinical diagnosis of radicular lesions.

2. SUBJECTS AND METHODS

For this purpose 100 patients with lumbosacral radiculopathy and MEDB atrophy and 100 patients with low back pain have been studied. Control group consisted of 50 healthy volunteers. The patients underwent neurological examination, CT scan of lumbosacral region and EMG including motor conduction velocity (MCV) of deep peroneal nerve (DPN), F-wave and H-reflex analysis.

3. RESULTS AND DISCUSSION

The most patients in first group had moderate and severe radicular lesion of radix L5/S1 proved by EMG examination (first of all poor recruitment of motor unit potentials in MEDB). In majority of patients with MEDB atrophy L5/Sl radicular lesions were bilateral with disk protrusion or herniation involved the both L4/L5 and L5/Sl interspaces. However in patients without MEDB atrophy radicular lesions were mainly unilateral with disk protrusion/herniation in majority of cases on level L5/Sl, and in same patients CT scan was normal. Positive correlation of EMG and neuroradiological findings is reported by others as well (5-6), and the clinical course of radiculopathy correlates with electrical abnormalities better than CT scan (2,3).

MCV measurement usually shows no significant abnormality in radicular lesions. This is because peripheral nerves, generally receive motor fibers arising from several roots (3,7). On the other hand the nerve conduction abnormalities commonly seen in brachial plexus lesions include slowing of conduction across the site of injury (2). Significant correlation between the MEDB atrophy and MCV (r =–0.67) (Table 1) and F-wave latency (r = 0.86)(Table 3) and H-reflex latency (r = 0.87)(Table 2) has been proved.

Subjects	MCV in DPN (m/sec)
With atrophy of MEDB	43.4+/-2.65
Without atrophy of MEDB	47.18+/-1.63
Healthy volunteers	47.7+/-1.59

Table 1. Distribution of subjects according to motor conduction velocity in deep peronela nerve and level of musculus extensor digitorum brevis atrophy; r = -0.67; MEDB = musculus extensor digitorum brevis; MCV = motor conduction velocity; DPN = deep peroneal nerve

Subjects	H-reflex latency (m/sec)
With atrophy of MEDB	35.67+/-2.83
Without atrophy of MEDB	32.4+/-1.81
Healthy volunteers	31.2+/-1.45

Table 2. Distribution of subjects according to H-reflex latency recording from musculus gastrocnemius and level of musculus extensor digitorum brevis atrophy; r = 0.87; MEDB = musculus extensor digitorum brevis

Subjects	H-reflex latency (m/sec)
With atrophy of MEDB	54.7+/-2.84
Without atrophy of MEDB	52.2+/-2.08
Healthy volunteers	51.15+/-1.52

Table 3. Distribution of subjects according to F-reflex latency and level of musculus extensor digitorum brevis atrophy; MEDB = musculus extensor digitorum brevis

The F wave latency may be prolonged in patients with root lesions (2,7,10), but consecutive F waves characteristically vary in latency and waveform and because oft hat is not so useful in routine diagnostics of radicular lesions. However, H reflex remain constant in response to repetitive stimuli and clinical applications of the H reflex as test for radiculopathy (delay or absent) is widely accepted, especially for S1 root lesion (2,7-10).

4. CONCLUSION

It is concluded that MEDB atrophy is very important parameter in clinical evaluation of patients with lumbosacral radiculopathy and could be clinical marker as well as electrophysiological, for presence and level of L5/Sl radicular lessons. Clinical picture of radiculopathy strongly correlates with electrophysiological abnormalities.

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