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# A new concept for evaluating muscle function in the lower extremities in cases of low back pain syndrome in anamnesis

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**Abstract**

**Introduction.** There are difficulties in objective evaluation of activity of the muscles in the lower extremities of patients after successful treatment of sciatica and pseudosciatica, when no clear clinical symptoms are detected. However, the existence of some muscle dysfunction can be hypothesised and its detection was the aim of the study.

**Objective.** Recordings from chosen lower extremity muscles during standing were performed as supplementary differential diagnosis in evaluation of these patients. EMG in standing positions constitutes a new methodological approach not described in detail.

**Methods.** Twenty patients (11 after sciatica and 9 after sciatica-like episodes) were enrolled into the study. On the day of examination, clinical and electroneurographical (ENG; M and F waves tests) studies showed no pathology. The percentage of maximal voluntary contraction (MVC) defined muscle activity during standing. Mean amplitude and number of changes in muscle activity (fluctuations) were measured in surface electromyography recordings (sEMG) during normal standing and tandem positions.

**Results and conclusions.** Activity of proximal lower extremity muscles expressed as percentage of MVC was bilaterally increased in patients after sciatica in normal standing position, compared with results from the group of healthy volunteers (N=9). Patients after sciatica were also characterized with a significant increase of mean sEMG amplitude, recorded especially in distal muscles on the affected side during tandem position. This pathological change was related to decrease in 'fluctuations' frequency in patients after sciatica ($P<0.001$) more than after pseudosciatica ($P<0.01$) groups in both standing positions, compared to parameters of healthy volunteers. Sciatica and pseudosciatica in anamnesis cause different abnormal patterns of lower extremity muscle activity during standing positions when recorded with surface EMG.

**Key words**

sciatica, pseudosciatica, anamnesis, standing positions, electromyography

## INTRODUCTION

Sciatica as the effect of lumbosacral roots compression is clinically characterized by pain radiating up to the toe, with disturbances in sensory perception, decrease in muscle strength, and decreasing or abolishing deep tendon reflexes. The pain arises during provocative tests, such as the straight leg rising test, flexion of the cervical spine, flexion of the lumbar spine and increase in abdominal pressure [1]. Pseudosciatica is described as the symptom of paravertebral facet joint affection or pyriformis syndrome and sacroiliac joint disorders. In some cases of pseudosciatica the pain radiates to the toe, but more often it is localized proximally in the lower extremity. Sensory perception, muscle strength and deep tendon reflexes are not usually disturbed. Provocative tests like Patrick's or Bonnet's, extension or flexion of the lumbar spine can evoke the pain [2]. All the above-mentioned tests are useful only in the clinically symptomatic period of the disease [3]. In general, only the pain is a common symptom for both syndromes [4, 5].

Neuroimaging examinations in cases of sciatica and pseudosciatica do not always differentiate their origin [6, 7]. Neurophysiological tests are also frequently used for confirmation of radicular or pseudoradicular pathologies. Electroneurography (M-wave and F-wave stimulation studies) is considered to be a useful method for differentiation of central and peripheral changes in motor transmission, but only in the fully symptomatic phase of sciatica [8, 9]. Needle electromyography (eEMG) performed in a lying position at rest and during voluntary contraction assesses the advancement of neurogenic changes in an acute state of sciatica [10]. These conditions do not include loading of the spine which often causes the occurrence of pain in patients with lumbosacral disorders 11, 12].

Previous sEMG recordings in the paraspinal muscles considering the loading factor as the reason of fatigue were performed mainly in patients with the chronic low back pain [13]. Fatigue was explained with inhibition of muscle's activation secondary to the pain, while the sEMG method was defined as 'possibly useful' for confirmation of clinical diagnosis [14]. The authors' previous study with sEMG

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proved the decrease of amplitude rather than changes in the frequency of motor units recruitment during prolonged contraction of the maximal muscle [15]. The usefulness of the amplitude increase analysis in sEMG recording at rest related to the assessment of muscle tension was presented for the chronic back pain patients [16]. Depending on different conditions of the spine overloading, other properties of sEMG recordings were analysed in patients with spine disorders [17, 18]. Changes in sEMG recordings from trapezius muscle described as micropauses ('gaps') lasting >0.2s or >0.6s were correlated with the muscle pain intensity. Frequencies of gaps described the muscles' inactivity periods. Periods of activation and deactivation in motor units recruitment were explained with the natural process of muscle's fatigue. In studies of Jensen et al. [18], than more short gaps appeared in EMG recording than greater muscle's motor units inactivation during the loading was expected. They concluded that the sEMG technique for measurement of shoulder muscles activity with various loadings seemed to be inadequate as a screening method for predicting the development of future risk of muscle pain symptoms.

Changes in the pattern of the sEMG reflect disturbances of motor units recruitment recorded in patients with spine disorders [15, 16]. The question arises: Will such an examination provide the diagnostically credible data when performed in patients after successful treatment of sciatica or pseudosciatica? Results of sEMG may reveal the persistent changes in the pattern of muscle activity. Hence, the diagnostic setup should resemble such positions in order that the study is as close as possible to the natural conditions of the pathology occurrence.

**Objective.** The aim of the presented study was to describe simple sEMG on-line analysis in two chosen standing positions, performed in healthy volunteers and patients after sciatica and pseudosciatica. Until now, no comparative multichannel sEMG recordings from lower extremity muscles bilaterally in a standing position have been performed.

## MATERIAL AND METHOD

Twenty-seven patients with low back pain radiating to one of the lower extremities were preliminary enrolled to this study. All of them had undergone clinical, neurophysiological and neuroimaging examinations. Seven patients were excluded from the study because of coexisting polyneuropathies of different ethiology (N=2), rheumatologic diseases (N=1), spinal injuries (N=2) or bilateral radicular conflicts (N=2). Finally, 11 women and 9 men, aged 35–55 years (average age 45.5) qualified to participate in the study. They were divided into the group with sciatica of discogenic origin (N=11; 43.8 years on average) and a group of patients with pseudosciatica (N=9; 47.2 years on average). Sensory perception disturbances with reference to peroneal nerve innervation were also clinical symptom found in 11 of the patients. The straight leg rising tests were positive but loss of muscle strength was not found [19]. The root conflict caused by disc herniation was detected in magnetic resonance imaging in a group of patients with sensory disturbances on the affected side. Electroneurography confirmed the consequences of root compression in patients with sciatica in the absence of any changes in transmission of peroneal nerve motor fibres in patients with pseudosciatica (see next chapter). Based on the results of the above studies, the patients were divided into 'sciatica' or 'pseudosciatica' groups.

During the final analysis in this paper, the function of selected muscles of the lower extremities are described 6 months after a successful treatment described previously [15]. No sciatica or sciatica-like symptoms described above were reported or detected on the day of examination. Slight changes in ENG stimulation examinations were found in patients after sciatica.

The control group consisted of 9 healthy volunteers – 5 women and 4 men – aged 26–51 years (mean age 46.4 years) who presented a general good health status with no history of neurological disorders. None of them reported any low back pain episodes during the 12 months prior to the clinical and neurophysiological examinations.

Each examined subject was informed about the aim of study and gave a written consent for participation and data publication. Ethical considerations were in agreement with the Helsinki Declaration. Approval was also received from the Bioethical Committee of University of Medical Sciences in Poznań.

Analysis of the patient's personal medical history, including neuroimaging analysis, and qualification for the study was performed by a rehabilitation doctor. All patients and healthy volunteers were clinically examined once by physiotherapists. Neurophysiologists performed sEMG and ENG recordings but did not know to which group the subject belonged – healthy volunteer or patient.

Preliminary electromyographical measurements of the maximal voluntary contraction (MVC) for examined muscles in healthy volunteers and patients were performed bilaterally in a lying position. Mean value of MVC was measured from 3 trials when the subjects were asked to voluntarily and maximally contract each of the muscles for 5 seconds against the manual resistance of appraiser. These were used to ascertain the mean percentage of muscles activity evaluated during 2 standing positions: normal standing with equal distribution of 2 legs weight bearing, and tandem with weight bearing shifted to the affected extremity. (Tab. 1).

Methodologically original electromyographical (EMG) recordings were then performed with an 8-channel Keypoint System (Medtronic A/S, Skovlunde, Denmark). Activity of the gluteus maximus, rectus femoris, gastrocnemius and extensor digiti muscles was bilaterally recorded with pairs of bipolar standard electrodes placed over the skin on the belly muscle and its tendon [20] (Fig. 1). The recordings were performed in a normal standing (A, B) and tandem position (C) lasting 30 seconds. Gluteus maximus and rectus femoris muscles are close synergists engaged in maintaining the stable standing posture, while the gastrocnemius and extensor digiti muscles innervated by L5-S1 neuromers were found in MRI studies to be compressed in patients with sciatica before treatment. The latter 2 muscles are also involved in stable posture maintaining.

EMG analysis in standing positions included parameters of mean amplitude and number of 'fluctuations' recorded in the muscles of both lower extremities in healthy volunteers and patients. The amplitude of recruiting motor units action potentials was measured as the maximal-minimal value of negative-positive inflections with reference to the isoelectric line. Fluctuation was defined as the period of temporary amplitude change (increase or decrease) lasting more than 1

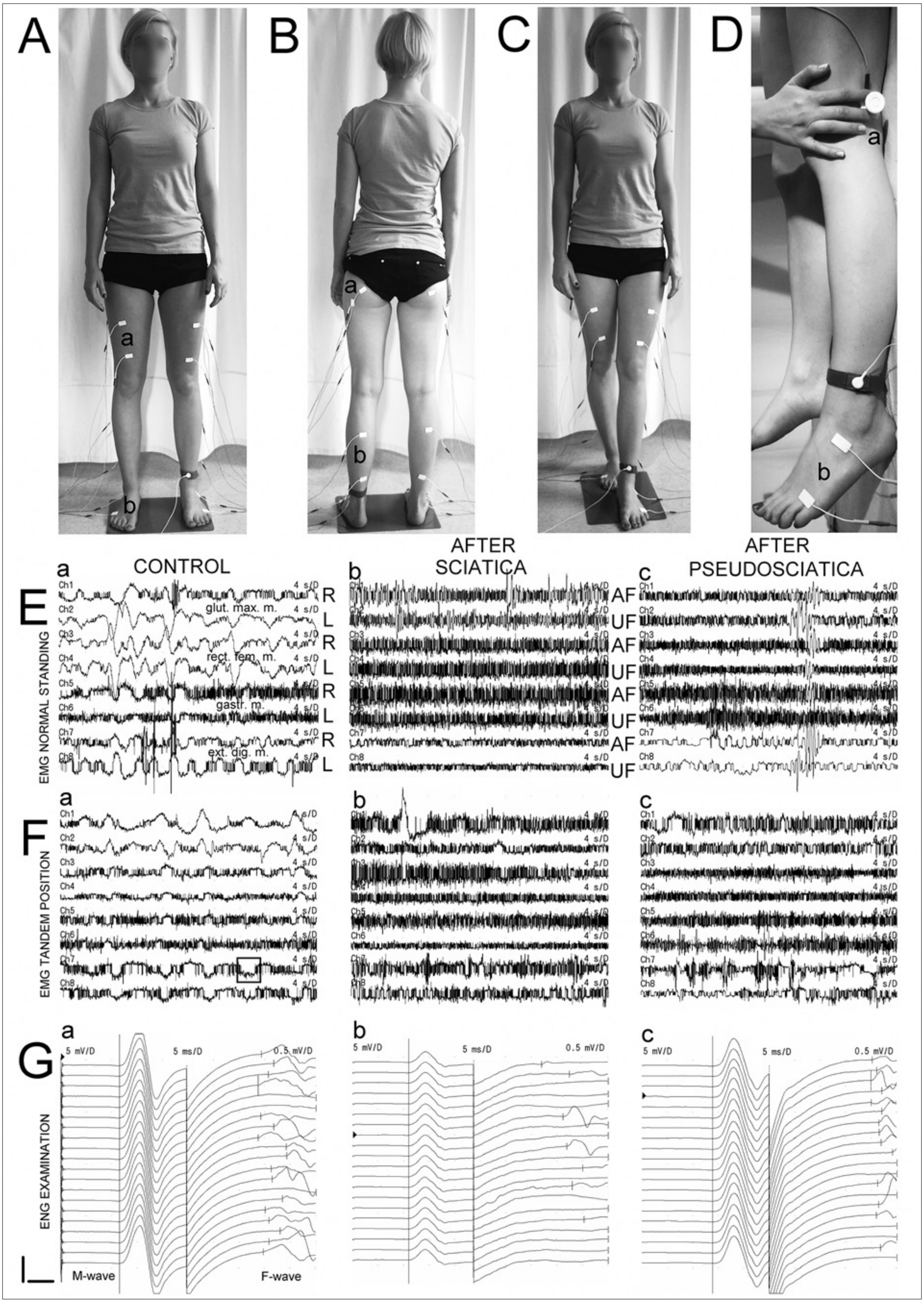


**Figure 1.** Location of surface electrodes during EMG recordings in normal standing (A, B) and tandem position (C) from rectus femoris (Aa, rect.fem.m.), extensor digiti (Ab, ext.dig.m.), gluteus maximus (Ba, glut.max.m.) and gastrocnemius (Bb, gastr.m.) muscles. D- location of bipolar stimulating (a) and recording (b) electrodes during ENG examinations. Examples of EMG recordings performed in normal standing (Ea-c) and tandem position (Fa-c) and ENG recordings in a control subject (Ga) and patients after sciatica (Gb) and after pseudosciatica (Gc) are presented for comparison. Example of one "fluctuation" measurement is shown with square in Fa recording. In the bottom left corner calibrations for sensitivity and time base used in EMG and ENG recordings are shown

**Table 1.** EMG amplitude values (mean±SD or % of MVC): healthy subjects vs. patients after sciatica and healthy subjects vs. patients after pseudo-sciatica episodes. Asterisks (*) indicate the statistically significant differences at P<0.01. Differences at P<0.01 between results recorded in patients from sciatica and pseudosciatica groups are marked with crosses (#)

| Normal standing | | | | | |
|---|---|---|---|---|---|
| Examined muscle | Control group N=9 (amplitude in µV) (% of MVC) | Patients after sciatica N=11 (amplitude in µV) (% of MVC) | | Patients after pseudo-sciatica N=9 (amplitude in µV) (% of MVC) | |
| | | Previously affected side | Previously unaffected side | Previously affected side | Previously unaffected side |
| Gluteus maximus | 41.7±22.6 9% | 96.6±153.5 20% | 94.4±154.1 20% | 51.4±22 11% | 48.6±15 10% |
| Rectus femoris | 72.2±71 9% | 153.6±149.7 19% | 184.5±133.9 22% | 135.5±96.8 16% | 168.8±122 20% |
| Gastrocnemius | 238.3±115.2 25% | 241±151.6 25% | 245.4±154.3 26% | 248.8±97.5 26% | 251.1±146.3 26% |
| Extensor digiti | 115.5±115.5 11% | 121±108.4 11% | 127.7±102 12% | 105.5±77.3 10% | 92.2±40.2 8% |
| **Tandem position** | | | | | |
| Examined muscle | Control group N=9 (amplitude in µV) (% of MVC) | Patients after sciatica N=11 (amplitude in µV) (% of MVC) | | Patients after pseudo-sciatica N=9 (amplitude in µV) (% of MVC) | |
| | | Previously affected side | Previously unaffected side | Previously affected side | Previously unaffected side |
| Gluteus maximus | 75±55.4 15% | 125±131.6 26% | 89±92.6 18% | 111.1±97.1 23% | 85±34 18% |
| Rectus femoris | 132.5±125 16% | 307±300.5 37% | 220±259.1 27% | 224.4±122 27% | 176.1±41.2 21% |
| Gastrocnemius | 383.3±245.3 40% | 748.2±356.8* # 79% | 438.2±212 46% | 502.2±349.5 53% | 411.1±207.3 43% |
| Extensor digiti | 319.4±203.7 30% | 681.8±455.1* # 62% | 510±263.6 # 46% | 561.1±231.5 51% | 383.3±246.2 35% |

second in muscle motor units activity with more than 30% to the background of recording (see square in recording 'a' in Fig. 1F) measured by the recording software. The number of fluctuations reflected the recording heterogeneity.

Bilateral ENG examinations of motor fibres in the peroneal nerves were performed. Nerves were stimulated with electrical pulses applied over the skin along their anatomical passage at the level of popliteal fossa (Fig. 1Da). Rectangular stimuli with duration of 0.2ms were delivered via bipolar electrode at 1Hz frequency, while their intensity ranged from 0–100mA. Recordings of M-waves (compound muscle action potentials) were performed from the extensor digiti muscles with a pair of standard electrodes placed over the belly and distal tendons of each subject (Fig. 1Db). Additionally recorded and analysed were the potentials evoked by long-latency F-wave evoked potentials following stimulation of the peroneal nerves, together with their frequencies, during 20 positive M-waves recordings. Examples of ENG recordings are presented in Figure 1Ga-c and details of their parameters are shown in Tab. 3. ENG tests were performed to ascertain the pathology in transmission of the motor fibres peripherally (M-wave studies) or within L5-S1 ventral roots (F-waves examinations). Changes in parameters of M-wave amplitude, together with F-wave frequency, indicated the consequences of L5-S1 radiculopathy.

For comparison, the reference values for neurophysiological examinations were obtained from the group of 9 healthy volunteers.

Calibrations for sensitivity in EMG recordings were 100µV/D (upper 4 traces) or 200µV/D (lower 4 traces) and time base with 4s/D was used (Figs. 1E – F). Commonly, the upper 10kHz and lower 20Hz filters of the recorder were used. During ENG recordings, the sensitivities of 5000µV/D for M-wave and 500µV/D for F-wave with constant 5ms/D time base were applied. Further principles of the EMG and ENG methods used have been described elsewhere [15, 21].

Statistical analysis was performed with ANOVA procedures for repetitive measurements. This required performing the normality distribution test, homogeneity of variances and the so-called data sphericity test (Shapiro-Wilk test, Bartlett chi-square test and Mauchley test were used). Then the non-parametric Friedman-ANOVA and Mann-Whitney tests were used. The level of statistical significance was accepted at P<0.01 and P<0.001. All statistical analyses were performed using Statistica software version 7.0.

## RESULTS

As presented in Table 1, in the control group of subjects MVC of the gluteus maximus muscle was approximately at 9% for normal standing and at 15% for the tandem position, for the rectus femoris muscle – 9% and 16%, gastrocnemius muscle – 25% and at 40%, and extensor digiti muscle – 11% and at 30%. No differences were found in the results obtained from sEMG recordings on both sides in this group of subjects. Values of MVC increased the most in both groups of patients after treatment in cases of recordings from the gastrocnemius and extensor digiti muscles, more after sciatica than in the pseudosciatica group, but only in the tandem position. Activity of proximal lower extremity muscles expressed as the percentage of MVC was bilaterally increased in patients after sciatica in a normal standing position.

There were no significant differences in amplitudes of sEMG recordings during normal standing and tandem positions from examined muscles of both lower extremities in the healthy volunteers. A similar observation was found in both groups of patients comparing previously affected vs. unaffected sides only in a normal standing position. Data in Table 1 indicate that the amplitudes of sEMG recorded from the gastrocnemius and extensor digiti muscles on the previously affected side significantly increased (P<0.01) in the group of patients after sciatica in a tandem position. Differences in amplitudes were also found between patients after sciatica and pseudosciatica groups with the same conditions of recordings (P<0.01). This suggests the different advancement of motor unit's dysfunction.

Other interesting results were found in the analysis of 'fluctuations' frequency in sEMG recordings in patients of both groups after treatment, in comparison to analogical analysis performed in healthy volunteers (Tab. 2). They were detected in both tested positions, especially in the gastrocnemius muscles. Abnormality was manifested in a decrease in the number of fluctuations observed during the normal standing position from almost all examined muscles of patients after sciatica, except recordings for the extensor digiti. This phenomenon could be clearly detected in both extremities, mainly in patients after sciatica (P<0.001) than pseudosciatica (P<0.01) during normal standing position. The significant decrease of fluctuations frequency (P<0.001) was observed mainly in the gastrocnemius muscles on the previously affected side in patients after sciatica. This difference seems to be the sensitive marker of pathology advancement in the motor units' recruitment pattern between normal subjects and patients after sciatica, and between patients after sciatica and pseudosciatica.

**Table 2.** 'Fluctuation' frequencies in EMG recordings (mean±SD): healthy subjects vs. after sciatica and healthy subjects vs. patients after pseudo-sciatica episodes.
Asterisks (*) indicate statistically significant differences at P<0.01 while (**) at P<0.001. Differences at P<0.01 between results recorded in patients from sciatica and pseudosciatica groups are marked with crosses (#)

| Normal standing | | | | | |
|---|---|---|---|---|---|
| Examined muscle | Control group N=9 | Patients after sciatica N=11 | | Patients after pseudosciatica N=9 | |
| | | Previously affected side | Previously unaffected side | Previously affected side | Previously unaffected side |
| Gluteus maximus | 11.9±6.2 | 5±3.9* # | 6.4±4.6 # | 6.2±6.8 | 7.4±8.2 |
| Rectus femoris | 11.6±7.4 | 3.2±2.9**# | 4.1±4.1*# | 5±7.1 | 5.2±7.1 |
| Gastrocnemius | 10.5±5.2 | 1.6±2.5**# | 1.2±2.4**# | 3.4±4.5* | 3±4.1* |
| Extensor digiti | 11.9±5.2 | 10.7±4.4 | 9.6±2.9 | 9±4.9 | 8.8±4.8 |
| **Tandem position** | | | | | |
| Examined muscle Amplitude (μV) | Control group N=9 | Patients after sciatica N=11 | | Patients after pseudosciatica N=9 | |
| | | Previously affected side | Previously unaffected side | Previously affected side | Previously unaffected side |
| Gluteus maximus muscle | 11.5±4.9 | 8.4±4.9 | 8.8±5.7 | 6.8±6.8 | 7.1±6.4 |
| Rectus femoris muscle | 9.9±5.9 | 6±4.3 | 6.8±5.7 | 6.9±5.1 | 7.4±5.6 |
| Gastrocnemius muscle | 11.7±6.0 | 4.3±2.9**# | 4.4±4.5* | 4.7±4.7* | 5.4±3.9* |
| Extensor digiti muscle | 13.5±5.5 | 6.5±4.4* | 9.4±4.8 | 7.7±3.3* | 8.1±3.7 |

Examples of sEMG recordings performed in normal standing (E) and in tandem positions (F) in the healthy volunteers (a) and patients after sciatica (b) or pseudosciatica (c) are presented in Fig. 1 for comparison. Note the decrease in the number of fluctuations, more in patients after successful treatment of sciatica than pseudosciatica, and increase in the mean amplitude value, especially in recordings from the gastrocnemius and extensor digiti muscles on the previously affected side.

Results of ENG studies in the patients showed significant changes in motor fibres transmission, expressed in the decrease of M-waves amplitudes and frequencies of F-waves during recordings only in cases after sciatica (P<0.01; Tab. 3). The smaller frequency of F-waves in ENG studies in comparison to the reference is presented in Fig. 1Gb.

**Table 3.** Comparison of results from M-wave and F-wave stimulation studies (mean±SD): healthy subjects vs. after sciatica and healthy subjects vs. patients after pseudo-sciatica episodes.
Asterisks (*) indicate statistically significant differences at P<0.01. Differences at P<0.01 between results recorded in patients from sciatica and pseudosciatica groups are marked with crosses (#)

| Parameters of ENG examinations in peroneal nerve | Control group N=9 | Patients after sciatica N=11 | | Patients after pseudo-sciatica N=9 | |
|---|---|---|---|---|---|
| | | Previously affected side | Previously unaffected side | Previously affected side | Previously unaffected side |
| M-wave amplitude (μV) | 6196.4 ±2894 | 4963.6 ±1050*# | 6318.1 ±1344 | 6833.3 ±1184 | 7222.2 ±1084 |
| M-wave conduction velocity (m/s) | 41.1 ±1.8 | 39.8±1.7 | 39.9±2.1 | 40.2±2.7 | 39±2.6 |
| F-wave frequency | 16 ±1.1 | 9±2.4*# | 12.1±2.1 | 15.1±1.8 | 16.2±2.2 |

## DISCUSSION

According to Freynhagen et al. [2], the differentiation of sciatica and pseudosciatica is not easy. Neurophysiological studies are used for confirmation or exclusion the neuropathies caused by roots entrapments, but it is generally believed that they are especially useful in the acute phase of disease. The usefulness of comparison the results from eEMG findings and MRI results in patients with cervical or lumbar disorders was underlined by Nardin et al [22]. They proved 60% compatibility of these results in confirmation of the symptomatic radiculopathy. Little information was provided from sEMG recordings in these pathologies [15] which were performed in the lying, spine non-overloading position, and during short tests lasting 5 seconds with the active muscle's stretch at about 80% of MVC.

The presented study shows the relation between the level of disturbances in motor units' recruitment (expressed in sEMG recordings as the amplitude value changes) and degree of muscle's activation (expressed as the percentage of MVC) in patients after sciatica or pseudosciatica. The activation of muscles was forced with 2 different standing positions. In the normal standing position it ranged from 11% – 20%, and in the tandem position ranged from 26% – 79% of MVC during examinations of patients after sciatica. In patients after pseudosciatica, these parameters ranged from 10% – 26% of MVC in a normal standing and from 23% – 53% in a tandem position.

Analysis showed that the tandem position forced a higher activity of the lower extremity muscles in both groups of patients after treatment (particularly during recordings from the gastrocnemius muscle). This position of testing evoked an evident disturbance in the motor units' recruitment in patients after sciatica. The normal standing position did not allow for differentiation of the muscle's activity state and the recruitment pattern in patients after sciatica and pseudosciatica. The slight increase of both parameters recorded bilaterally in proximal muscles in patients after sciatica was observed in comparison to healthy volunteers.

Similar conclusions were drawn by Tamaki et al. [23] and earlier by Veiersted et al. [17] and Jensen et al [18]. They showed that increase of muscle activation was accompanied by a greater level of motor units' recruitment, and noticed the temporary decrease of amplitudes in sEMG patterns described as 'silent periods' or 'gaps'. However, it should be mentioned that their examinations were performed in muscles of healthy volunteers.

Interpretation of the amplitude parameter changes in sEMG recordings in patients with spine pathologies is still controversial. Studies by Arendt-Nielsen et al. [24] and Van Dieën et al. [25] indicated that the value of sEMG amplitude recorded from lumbar paravertebral muscles is higher in patients with low back pain than in healthy people. Hodges and Moseley [26] underlined that the activity of these muscles can sometimes be lowered in patients. Their findings might be interpreted as the functional adaptation of muscles to the previous episodes of pain. The pattern of motor units' recruitment in the muscles of the lower extremities of patients after sciatica or pseudosciatica have not previously been studied in a standing position.

The presented study shows that in the control group of subjects the tandem position forces additional activity of the lower extremity muscles in patients after sciatica, manifested as the amplitude increase in sEMG recordings to stabilize the posture, particularly when spinal control is probably disturbed. This is confirmed by the ENG examinations in the current study showing slight disturbances in transmission of ventral root motor fibres only in patients after sciatica (Tab. 3). A decrease of amplitudes in sEMG recordings from paravertebral and lower extremity muscles during voluntary contractions were found in the authors' previous study in patients with acute sciatica [15]. This may suggest a different central mechanism being responsible for the motor units' recruitment.

The presented analysis of amplitude from sEMG recordings in a group of healthy people during standing position, mainly from the distal lower extremity muscles, indicated their heterogenic pattern. Fluctuations of this parameter can be identified with changes in sEMG described by Nordander et al. [27], and seem to be normal for healthy people when recorded from the trapezius muscle. The authors of the presented study found periods of temporary change in muscle motor units activity during standing positions, which also resembled the EMG characteristic described by Riley et al [28]. They noticed a similar phenomena in recordings at 30% of MVC and assumed them to be typical for the motor units' recruitment in healthy people during sustained contraction of muscle. Tamaki et al. [23] observed a similar heterogenic pattern of motor units' activity in the triceps muscle when sEMG recordings were performed at 10% of MVC. It can be supposed that such a temporary motor units activation and inactivation is a physiological manifestation of protection against the muscle's fatigue. In the presented study, the number of fluctuations – especially in patients after sciatica during normal standing and tandem positions – was significantly smaller. This reduced the heterogeneity of bilaterally performed sEMG recordings. The authors of the presented study are convinced that this phenomenon reflects the disturbance in muscle's motor units' recruitment as the consequences of previous radiculopathy.

## CONCLUSION

Activity of motor units recorded in lower extremities muscles during standing is different in healthy people and in patients after sciatica and pseudosciatica in an painless period of disease which can be observed in sEMG examinations.

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