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ORIGINAL ARTICLE

E. Pape
O. P. Eldevik
B. Vandvik

Diagnostic validity of somatosensory evoked potentials in subgroups of patients with sciatica

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E. Pape (✉) · B. Vandvik
Department of Neurology,
Ullevål Sykehus, Oslo City Hospitals,
University Of Oslo, Norway
Tel.: +47-22489384, Fax: +47-22489567

O.P. Eldevik
Department of Radiology,
University Of Michigan Hospitals,
Ann Arbor, Michigan, USA

Present address:
E. Pape
IF P&C Insurance Company,
Filipstad Brygge 1, P.O. Box 1374 Vika,
0114 Oslo, Norway

Abstract The diagnostic utility of scalp-recorded somatosensory evoked potentials (SEP) in patients with sciatica has generally been regarded as low. The purpose of the present study was to determine the validity of sensory nerve SEP in different subgroups of sciatic patients. A total of 65 consecutive patients with sciatica showing disc pathology and/or facet joint hypertrophy on lumbar computed tomography (CT) and/or myelography were studied. Symptomatic myelographically compressed nerve roots were defined as truly compromised roots. Asymptomatic myelographically normal nerve roots were defined as truly normal roots. Bilateral sensory nerve SEP representing nerve roots L4, L5, and S1 were performed in all patients. Evaluation of SEP included the use of P1 latency inter-root comparison. The false-positive rate of SEP was low. Pathological L4, L5, and S1 SEP therefore strongly indicate true compromise of the corresponding nerve roots. The true-positive rate was higher in patients with facet joint hypertrophy with or without additional disc disease than in patients with disc pathology only, and highest if the sciatic sensory symptoms were present during the SEP registration. Diagnostic validity was not influenced by previous episodes of sciatica, the duration of the present episode, or the number of spinal levels with ipsilateral myelographically compressed nerve roots. Pathological SEP strongly indicate sensory radiculopathy in patients with sciatica. Diagnostic efficacy is higher in patients with facet joint hypertrophy than in patients with disc pathology only and highest when the sciatic symptoms are present during registration.

Keywords Evoked potentials · Somatosensory · Diagnostic tests · Sciatica · Spinal stenosis · Intervertebral disc displacement

Introduction

The use and diagnostic validity of scalp-recorded somatosensory evoked potentials (SEP) to diagnose compromised nerve root function in patients with sciatica has long been debated [6, 10, 15, 17, 19, 27, 32, 34, 45, 48, 54]. One recent review concludes with a negative recommendation of dermatomal SEP [3]. Another assumes that dermatomal SEP may be more helpful in the evaluation of patients with lumbar spinal stenosis than of patients with unilateral, unilevel radiculopathies, but doubts that SEP elicited by cutaneous nerve stimulation have any role in the diagnosis of radiculopathies [5]. Finally, a third review suggests that both dermatomal and sensory nerve SEP may be useful in the assessment of chronic multilevel multiple rootlet disease, but not in the evaluation of acute radiculopathy [1].

In previous studies, it was shown that a system of P1 latency inter-root comparison increases the sensitivity of sensory nerve SEP to detect small P1 latency prolongations [43, 44]. The aims of the present study, which in-

cluded the use of this inter-root comparison system to evaluate the evoked responses, were to study the validity of sensory nerve SEP to diagnose L4, L5, and S1 sensory radiculopathy in sciatica and to examine whether SEP-diagnosed nerve root compromise is associated with the type of radiologically diagnosed degeneration of the lumbar spine, the presence of sensory sciatic symptoms during registration, the spinal level, the number of nerve root lesions, previous sciatic episodes, and the duration of the present episode.

Material and methods

Patients

The study group comprised patients who had not previously undergone surgery with uni- or bilateral sciatica, including patients with radiating sensory symptoms within the L5 and/or S1 dermatome extending into the lower leg and/or foot on at least one side or with "anterior sciatica," i.e., radiating pain within the L4 dermatome. The patients were referred for SEP as part of a diagnostic workup in the Neurology Department. Lumbosacral myelography and lumbar spine computed tomography (CT) with or without intrathecal contrast were performed in all patients. Patients with concurrent or other neurological diseases (polyneuropathy, radiculoneuritis, myelopathy, sequela from poliomyelitis, and cerebral paresis) or systemic diseases, including diabetes, which might influence the SEP results were excluded.

The inclusion criterion was that myelography and/or lumbar spine CT showed signs of degeneration in one or more of the three lower lumbar three-joint complexes (intervertebral disc and/or facet joints). Sixty-five consecutive patients (28 men and 37 women) were included. The mean age was 45.8±13.3 years (range, 17–76 years), and the mean duration of symptoms was 40±56 weeks (range, 1–400 weeks).

Symptomatic classification of nerve roots

The sensory symptoms (pain and/or paresthesia) in the lower extremities were classified according to their distribution [13, 21] before registration of SEP. Symptoms in the anterior distal two thirds of the thigh, with or without anteromedial symptoms in the leg, were classified as L4 root involvement. Symptoms in the thigh and/or leg, including dorsal symptoms in the foot and/or in the first or the neighboring toes except the fifth, were regarded as involvement of L5, and symptoms in the thigh and/or leg, including symptoms either in the heel and sole, or laterally in the foot and/or in the small toes, including the fifth, were classified as involvement of S1. If the symptoms could not be related to one single root according to these criteria, all the roots that were represented within the distribution of the symptoms were classified as symptomatic. Symptoms located posterolaterally in the thigh not extending past the knee, or in the thigh and leg without symptoms in the foot, were registered as combined L5 and S1 involvement.

Twenty-three of the 65 patients reported presence of their typical radiating sciatic sensory symptoms during SEP registration.

Three nerve root symptom groups were defined: (1) asymptomatic nerve roots, (2) symptomatic nerve roots with symptoms during SEP registration, and (3) symptomatic nerve roots without symptoms during SEP registration.

Radiological examinations

Myelography was performed after lumbar puncture, utilizing a 22-gauge spinal needle and injection of 12–15 cc Omnipaque 180 (Nycomed Amersham, Oslo, Norway) into the subarachnoid space. Radiographs of the lumbosacral spine were obtained in anteroposterior, lateral, and oblique projections, and additional lateral images were obtained with the patient in a sitting position with flexion and extension of the lumbar spine. Lumbar spine CT was performed on a GE 9800 CT scanner (General Electric, Milwaukee, USA) with 5-mm-thin axial images angled parallel to each disc space. Images were obtained for soft tissue and bone detail. The myelograms and lumbar spine CT were reviewed by one neuroradiologist (OPE), who was blinded to the clinical information and to the results of the SEP registrations.

Presence of nerve root compression was diagnosed when myelography showed root sleeve filling defects. Nerve roots without or with equivocal sleeve filling defects were classified as radiologically normal.

Myelography and lumbar CT were used to diagnose degeneration of the lumbar three-joint complexes. Two patient groups were defined: (1) patients with bulging and/or herniated discs, but without facet joint hypertrophy (disc pathology group), and (2) patients with facet joint hypertrophy with or without additional disc pathology (facet joint hypertrophy group).

CT was performed in all 65 patients at the L5/S1 level (13 with intrathecal contrast), in 62 at the L4/L5 level (13 with contrast), and in 44 at the L3/L4 level (9 with contrast). Only nerve roots below the level investigated with lumbar CT were included in the statistical analysis. These roots comprised bilateral L4, L5, and S1 roots in 44, bilateral L5 and S1 roots in 18, and bilateral S1 roots in 3 patients.

"True state" definitions

Symptomatic nerve roots with myelographic compression were defined as truly compromised roots. Asymptomatic nerve roots without myelographic compression were defined as truly normal.

Sensory nerve SEP

SEP were registered bilaterally after stimulation of the sural (S1), superficial peroneal (L5), and saphenous (L4) nerves at the same level on the leg, 10 cm proximal to the medial malleolus (Fig. 1). Bipolar stimulation electrodes were used. Each pole was a saline-soaked felt pad with a diameter of 6 mm. The center-to-center distance between the felt pads was 23 mm. The electrodes were attached by a plastic band around the leg. The stimulus was a constant current square wave pulse of 0.2 ms duration at a rate of

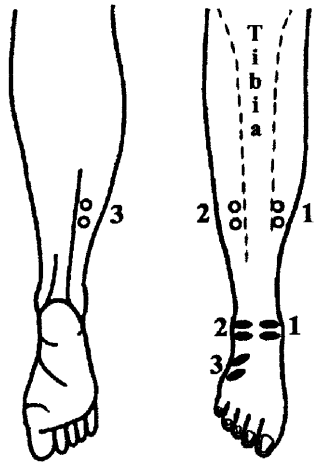

Fig. 1 Location of the electrodes for saphenous (*1*), superficial peroneal (*2*), and sural (*3*) nerve stimulation (*white circles*) and registration of sensory nerve action potentials (SNAP, *black circles*)

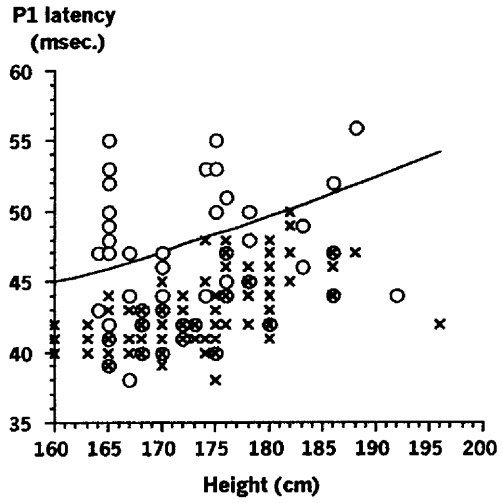

Fig. 2 Reference limit of height-corrected P1 latency (*line*) and height to P1 latency scatter diagram of the somatosensory evoked potential (SEP) results in truly compromised (*circles*) and truly normal (*crosses*) nerve roots

5 Hz. The sensory nerve action potentials (SNAP) were recorded from the sural nerve at the lateral aspect of the foot below the lateral malleolus, from the superficial peroneal nerve anterior to the lateral malleolus, and from the saphenous nerve anterior to the medial malleolus (Fig. 1) as reported previously [43]. SNAP-verified supramaximal nerve stimulation was used [4]. The evoked potentials were recorded at Cz' (2 cm behind Cz, international 10–20 system) referred to Fpz' (midway between Fz and Fpz, international 10–20 system). A Neuromatic 2000 M/C (Dantec) was used, and 500 signals were averaged for 200 ms after stimulation, with a sweep speed of 20 ms/division. High–low frequency filters were set at 100 Hz to 2 Hz.

P1 latency prolongation or absence of P1 was defined as pathological SEP. P1 latency prolongation was diagnosed by prolongation of height-corrected P1 latency and/or by P1 latency inter-root comparison. The latter comprises two criteria: (1) the P1 latency inter-root difference, defined as the difference in P1 latency between any two of the six different registrations, and (2) the P1 latency difference to own mean, defined as the difference between P1 latency in one registration and the mean P1 latency of the other registrations. Cut-off values defining P1 latency prolongation by height-corrected P1 latency are presented in Fig. 2. Further, P1 latency prolongation was diagnosed when the P1 latency inter-root difference was 5 ms or more or when the P1 latency inter-root difference was 4 ms or less, but with a P1 latency difference to own mean of 2.2 ms or more [44]. Further details of the stimulation and registration procedures were presented earlier [43].

Registrations with P1 latency prolongation but without verified supramaximal nerve stimulation were classified as non-conclusive and excluded from the statistical analysis. Conclusive SEP registrations were obtained in 313 of the 342 registrations related to the 171 CT-examined levels. Twenty-six of the non-conclusive SEP registrations comprised L4 roots, and 3 comprised L5 roots.

Statistics

True-positive SEP rates (sensitivity) were estimated in nerve roots defined as truly compromised, and false-positive SEP rates (1–specificity) in nerve roots defined as truly normal.

Multiple logistic regression analysis was used to test for an association between the SEP results and seven explanatory variables, of which four defined different nerve root groups:

1. Presence or absence of myelographic nerve root compression
2. The nerve root symptom groups (asymptomatic nerve roots and symptomatic nerve roots with presence or absence of sciatic symptoms during registration)
3. The spinal level (L4, L5, and S1 nerve roots)
4. The number of spinal levels with myelographic nerve root compression on each side (none, unilevel, two neighbor levels, or all three levels)

The three other explanatory variables defined subgroups of patients with sciatica:

1. The radiological three-joint complex degeneration groups (disc pathology and facet joint hypertrophy groups)
2. Previous episodes of sciatica or not
3. Duration of the present episode (three groups with a duration of 1–4, 5–12, or more than 12 weeks)

By the use of backward stepwise analysis, the explanatory variables without significant association with the SEP results ($P>0.05$) were excluded from the final model, which was used to predict the probabilities of positive SEP in truly compromised and truly normal nerve roots. The former represent the true-positive and the latter the false-positive rates of SEP. Using Bayes' theorem, these true- and false-positive rates were used to present the association between pre- and posttest probability of true nerve root compromise.

Results

Thirty-seven patients had unilateral symptoms, and 18 of these had a unilevel symptomatic nerve root. Eight of these 18 patients showed myelographic compression corresponding to the symptomatic nerve root. Twenty-eight patients had bilateral symptoms, but a correspondence between the symptomatic nerve roots and myelographic root compression was observed in only one of these. The disc pathology group comprised 37 and the facet joint hypertrophy group 28 patients.

Lumbar CT was performed in 77 (17 with intrathecal contrast) of 84 levels in the facet joint hypertrophy group, and in 94 (18 with intrathecal contrast) of 111 levels in the disc pathology group. The radiological findings are presented in Table 1. Only three patients in the facet joint hy-

Table 1 L3/L4, L4/L5, and L5/S1 spinal levels with radiologically diagnosed facet joint hypertrophy, bulging, or herniated discs

	Facet joint hypertrophy at L3/L4 level		Facet joint hypertrophy at L4/L5 level		Facet joint hypertrophy at L5/S1 level	
	Yes (*n*)	No (*n*)	Yes (*n*)	No (*n*)	Yes (*n*)	No (*n*)
No disc pathology	3	21	4	8	10	30
Bulging disc	10	6	13	14	4	4
Herniated disc	2	2	8	15	3	14

Table 2 Somatosensory evoked potential (SEP) results in the nerve root symptom groups, stratified according to the radiological findings

Group	Nerve roots with myelographic nerve root compression	Asymptomatic nerve roots		Symptomatic nerve roots with symptoms during registration		Symptomatic nerve roots without symptoms during registration	
		SEP positive (*n*)	SEP negative (*n*)	SEP positive (*n*)	SEP negative (*n*)	SEP positive (*n*)	SEP negative (*n*)
Disc pathology[a] (*n*=37 patients)	Yes	0	7	5	2	2	12
	No	0	78	10	11	3	46
Facet joint hypertrophy[b] (*n*=28 patients)	Yes	1	15	8	1	14	10
	No	1	44	10	5	9	19

[a]Patients with herniated and/or bulging discs without facet joint hypertrophy.
[b]Patients with facet joint hypertrophy with or without additional disc pathology.

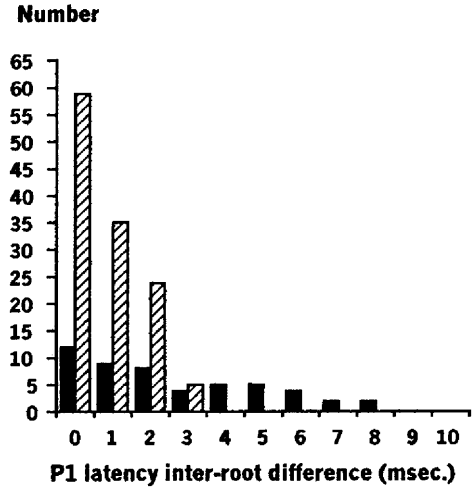

Fig. 3 The P1 latency inter-root differences in truly compromised (*black bars*) and truly normal (*hatched bars*) nerve roots

pertrophy group had no additional disc pathology. The association between positive SEP and these three patients was not different from that of the 25 patients with additional disc pathology (P=0.99).

Table 2 shows the SEP results stratified according to the nerve root symptom groups and radiological results and shows that 54 of the 167 nerve roots (32%) classified as symptomatic according to the distribution of sensory symptoms and 23 of the 146 asymptomatic nerve roots (16%) showed myelographic nerve root compression. Figure 2 presents a scatter diagram of P1 latency related to height, and Fig. 3 shows the P1 latency inter-root differences in nerve roots defined as truly normal and truly compromised, respectively. Table 3 shows the number of normal and pathological SEP results in these two groups of nerve roots, including the number of truly compromised and truly normal nerve roots defined as pathological by the different criteria used for evaluation of SEP registrations. Thirty-nine of the 77 nerve roots with myelographic compression and with conclusive SEP registrations were unilevel lesions, while 11 were three-level, and the remaining 27 were lesions at two neighboring levels. The duration of symptoms was 4 weeks or less in 4, 5–12 weeks in 11, and more than 12 weeks in 50 patients. Twenty-nine of the 65 patients had previous episodes of sciatica.

The true- and false-positive rates of SEP (Table 4) indicate that the true-positive rates are higher when sensory sciatic symptoms are present during registration than

Table 3 Somatosensory evoked potential (SEP) findings in truly compromised (symptomatic nerve roots with myelographic compression) and truly normal (asymptomatic nerve roots without myelographic compression) nerve roots

[a]Only one of the eight was defined by increased P1 latency inter-root difference.

	Truly compromised nerve roots	Truly normal nerve roots
Pathological SEP		
Defined by P1 latency inter-root comparison	8[a]	1
Defined by P1 latency inter-root comparison and by prolonged height-corrected P1 latency	12	0
Defined by prolonged height-corrected P1 latency	6	0
Defined by absent P1	3	0
NormalSEP	25	122

Table 4 True- and false-positive rates of somatosensory evoked potentials (SEP) estimated in truly compromised (symptomatic nerve roots with myelographic compression) and truly normal (asymptomatic nerve roots without myelographic compression) nerve roots

Group	True-positive rate with sciatic symptoms during registration						False-positive rate	
	Present or absent		Present		Absent		Rate	95% CI
	Rate	95% CI	Rate	95% CI	Rate	95% CI		
Disc pathology group[a] (*n*=37 patients)	0.33	0.15–0.57	0.71	0.29–0.96	0.14	0.02–0.43	0.00	0.00–0.12
Facet joint hypertrophy group[b] (*n*=28 patients)	0.67	0.48–0.82	0.89	0.52–1.00	0.58	0.37–0.78	0.02	0.00–0.12

[a]Patients with herniated and/or bulging discs without facet joint hypertrophy.
[b]Patients with facet joint hypertrophy with or without additional disc pathology.

Table 5 Association between positive somatosensory evoked potential (SEP) results and myelographic nerve root compression, CT-diagnosed degeneration of the lumbar three joint complexes, and the sensory radicular symptoms

	Odds ratio (OR) for positive SEP	
	OR	95% CI
Myelographic nerve root compression: present/absent	3.1*	1.4– 6.6
CT-diagnosed degeneration: facet joint hypertrophy/disc pathology	5.1**	2.3– 11.1
Radicular sensory symptoms:		
Symptomatic nerve roots without sensory symptoms during registration/asymptomatic nerve roots	22.6**	5.1–100.3
Symptomatic nerve roots with sensory symptoms during registration/asymptomatic nerve roots	188.2**	38.4–923.1
Symptomatic nerve roots with/without sensory symptoms during registration	8.3**	3.6– 9.3

*P=0.004; **P<0.0001.

Table 6 Probabilities of a positive somatosensory evoked potential (SEP) result predicted from the final multiple logistic regression model

	Probability of positive SEP in truly compromised nerve roots with sciatic symptoms during SEP registration				Probability of positive SEP in truly normal nerve roots	
	Present		Absent		Probability	95% CI
	Probability	95% CI	Probability	95% CI		
Patients with disc pathology[a] (*n*=37)	0.67	0.45–0.84	0.20	0.10–0.36	0.00	0.00–0.02
Patients with facet joint hypertrophy[b] (*n*=28)	0.91	0.80–0.97	0.56	0.39–0.71	0.02	0.00–0.07

[a]Patients with herniated and/or bulging discs without facet joint hypertrophy.
[b]Patients with facet joint hypertrophy with or without additional disc pathology.

when they are absent. They further indicate that the true-positive rates are higher in the facet joint hypertrophy group than in the disc pathology group and that the false-positive rates may also be higher in the facet joint hypertrophy group than in the disc pathology group.

There was no significant association between positive SEP and the duration of the present sciatic episode (P=0.21) or previous episodes of sciatica (P=0.27). The association with unilevel nerve root compression was not different from the association with compressions at two (P=0.35) or three neighboring levels (P=0.23), and the association with any one of the three spinal levels was not different from the association with the two others (P=0.64). The associations between the SEP results and the variables in the final model are presented in Table 5.

The highest predicted probability of positive SEP in truly compromised nerve roots was observed in the facet joint hypertrophy group when sciatic symptoms were present during registration (Table 6). The segmental specific probabilities (95% CI) in this group were: L4, 0.91 (0.71–0.98); L5, 0.92 (0.80–0.97); and S1, 0.90 (0.75–0.97). Figure 4 shows that the increase in probability of true

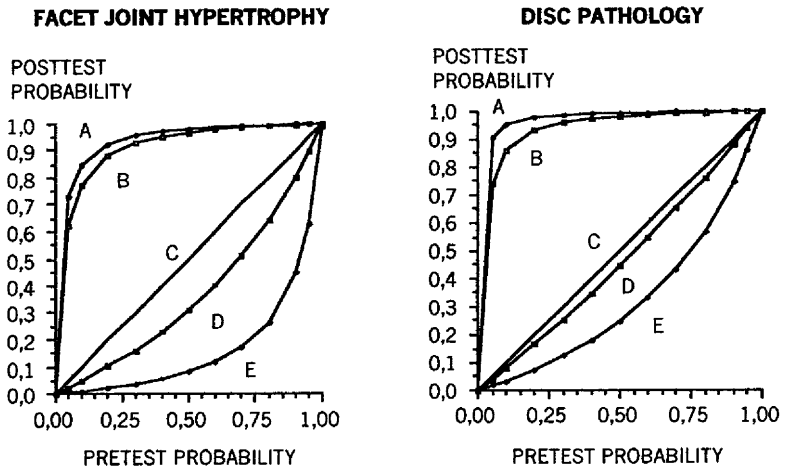

Fig. 4 Association between pre- and posttest probability of truly nerve root compromise after positive (*A*, *B*) or negative (*D*, *E*) sensory nerve somatosensory evoked potentials (SEP) in patients with facet joint hypertrophy (*left*) and disc pathology (*right*). Lines *A* and *E* represent presence and *B* and *D* absence of sciatic symptoms during registration. *C* represents a test with a likelihood ratio of 1, i.e., the line of no information

nerve root compromise after positive SEP is large and shows only minor differences between the patient groups.

Discussion

This study included inter-root comparison of P1 latency to evaluate the evoked responses, which has previously been reported to enhance the sensitivity of sensory nerve SEP to diagnose nerve root dysfunction in sciatica [44]. The results show that the false-positive rate is low. Positive L4, L5, or S1 SEP therefore strongly indicate corresponding true nerve root compromise. The results also indicate that the true-positive rate is higher in patients with facet joint hypertrophy than in patients with disc pathology alone, in agreement with the view that SEP may be useful in patients with spinal stenosis [33, 49, 52], but less useful in patients with disc pathology without elements of bony entrapment [1, 5, 14, 53]. Some of the variations between the results obtained in previous studies may be related to different prevalences of bony entrapment in the patients included in the study, since some of the studies reporting usefulness of SEP in patients with low back pain and sciatic radicular symptoms did not exclude patients with stenosis of the spinal canal or lateral recesses [30, 31, 46].

Electrodiagnostic procedures may diagnose nerve root compromise in patients with sciatica but not the etiology of the root compromise and therefore should be used as add-on and not surrogate procedures to the imaging techniques [55]. Thus SEP examination is not necessary in patients with typical unilateral, unilevel sciatica in whom imaging fully clarifies the diagnosis, but it may be useful in patients in whom the clinical significance of the anatomic abnormalities seen on imaging procedures is uncertain. It is therefore important that patients with an uncertain diagnosis should be represented in validation studies of SEP. Many of the patients in this study had been referred for SEP because of such uncertainties. This is reflected by the low rate of patients with a correspondence between symptomatic nerve roots and myelographic compression.

Retraction of a nerve root during surgery causes increased P1 latency, which promptly returns to baseline after release of the retraction [33], and dynamic F-wave studies in neurogenic claudication show increased postexercise latencies [41]. Thus the nerve root conduction may change rapidly, consistent with the present findings, which indicates that the conduction disturbance is more pronounced, and the true-positive rate of SEP higher, when sciatic sensory symptoms are present during registration than when they are absent. Previous reports do not state the patients' symptom status during SEP registration; some of the differences between the results presented in these reports may thus be due to differences in this regard.

The results of the present study do not indicate that previous episodes of sciatica or a long duration of the present episode of sciatica are associated to positive SEP results and do not support the statement that SEP are only useful in chronic radiculopathy [1].

Sensitivity to diagnose P1 latency prolongation in mixed sensorimotor nerves has been assumed to be reduced in monoradicular nerve root compromise because the evoked response may be conducted through a normal neighboring nerve root and the P1 latency may be normal [7, 8, 19, 20]. The segmental specificity of the sensory nerves used for stimulation in the present study is better than that of mixed nerves, but is not perfect [5, 18, 19, 40]. P1 latency prolongation might therefore be more strongly associated with compromised nerve roots with than without a compromised neighboring nerve root. However, the results did not support this. Further, the sensitivities of L4, L5, and S1 SEP in the facet joint hypertrophy group were high with only minor clinically insignificant differences when the registrations were performed in the presence of sciatic sensory symptoms. These results indicate that the segmental specificity of

sensory nerve SEP is sufficiently high for SEP to be used as a diagnostic procedure in L4, L5, or S1 uni- or multilevel radiculopathy when the nerves are stimulated 10 cm proximal to the medial malleolus.

It has been recommended that the sensitivity and specificity of SEP should be established in patients with unequivocal disease, e.g., as determined by operative findings, and to study patients with unilateral and unisegmental radiculopathy in order to demonstrate that SEP findings are pathological in the correct root for most patients and normal at other segmental levels and on the asymptomatic side at the same segmental level [3]. The operative findings will define the true state at the time of operation of the nerve roots with suspected radiculopathy, but not of the nerve roots at other segmental levels and not necessarily on the other side. Further, the use of operative findings in the true state definition would imply that patients with positive SEP should be operated on in spite of negative imaging studies to avoid selection bias, as can be inferred from the data reported by Katifi and Sedgwick [30].

The present true state definitions of truly compromised and truly normal nerve roots were based on the classification of sensory symptoms and the presence or absence of myelographic nerve root compression. The classification of symptoms was intentionally wide, and radiating sensory symptoms not extending beyond the knee on the symptomatically non-dominant side were classified as radicular since they may be radicular, although they usually have a different origin [21, 50]. This was done to ensure both that all compromised nerve roots were included among the symptomatic roots and that roots defined as truly normal were the nerve roots that were most probably normal, and that there were few, if any, misclassifications in this group. On the other hand, due to the wide classification of symptoms, some normal nerve roots were obviously misclassified as symptomatic. The low rate of myelographic nerve root compression in the symptomatic nerve roots (32%) reflects this low specificity of the symptom classification. Further, myelography is afflicted with false-positive nerve root compression [9]. It is therefore likely that some of the nerve roots defined as truly compromised were misclassifications. Since the classification of symptoms and the radiological evaluation were independent of the SEP results and patients with non-vertebrogenic neurological disease were excluded, the true state misclassifications should be nondifferential. Thus the association between the SEP results and the true state of the nerve roots is probably underestimated.

It may be argued that the use of magnetic resonance imaging (MRI) would have reduced the problem of nerve root compromise misclassification. However, with the possible exception of MRI myelography in patients with extreme spinal canal stenosis [16], neither contrast-enhanced MRI [11, 23, 26, 28, 29, 37, 38, 39, 42, 51] nor MRI myelography [16, 22, 24, 25, 35, 36, 47] seems to have major diagnostic advantages over conventional myelography in identifying nerve root compromise. It may further be argued that the inclusion of clinical findings might have identified some of the nondifferential misclassifications. If this were the case, it is likely that SEP would have better diagnostic efficacy than found in the present study. However, most of the clinical signs, in particular the sensory findings, used to identify the spinal level of the radiculopathy have low specificity [12] and seem to contribute little toward identifying the level of a disc herniation [2]. It is therefore unlikely that the additional information obtained from clinical examinations would have eliminated the problem of misclassifications.

Conclusion

The present study, which included inter-root comparison of P1 latency in the evaluation of the SEP results, shows that the true-positive rate of sensory nerve SEP is higher in patients with facet joint hypertrophy with or without additional disc pathology than in patients with disc pathology only and is higher when sciatic symptoms are present than absent. However, the true-positive rates are not sufficiently high for SEP registration to be used as a screening method before the imaging procedure. On the other hand, the results indicate that sensory nerve SEP have sufficiently high segmental specificity to diagnose clinically relevant lumbosacral nerve root compromise in patients with uni- and multilevel lumbosacral radiculopathy and that positive SEP have strong diagnostic validity in any individual patient with sciatica. This suggests that SEP can be used as an add-on procedure to imaging studies if the latter do not fully clarify whether or not there is nerve root compromise.

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