Complementary findings from MRI and nerve-conduction studies in military personnel with radiculopathy

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Abstract

Objective. To describe the complementary contribution of MRI and stimulation electroneuromyography in military personnel with clinical radiculopathy.

Materials and methods. The analysis used paired clinical, MRI and electrophysiological summaries for 121 symptomatic patients aged 19–49 years. MRI positivity was defined by clinical–anatomical concordance, not by the mere presence of an imaging abnormality. Stimulation ENMG findings were analysed separately. The healthy reference group from the wider study was not used as a diagnostic-accuracy standard.

Results. MRI was concordant with clinical localisation in 93/121 patients (76.9%), while ENMG abnormalities were reported in 96/121 (79.3%). Both criteria were present in 77, MRI concordance alone in 16, ENMG abnormalities without full MRI concordance in 19, and neither criterion in nine. Considering either criterion increased the descriptive proportion with a supporting instrumental finding to 112/121 (92.6%). Among patients without full MRI concordance, 19/28 (67.9%) had ENMG abnormalities.

Conclusion. MRI and electrophysiology contributed overlapping but non-identical findings. The additional 19 electrophysiological findings describe complementarity, not an increase in validated sensitivity. Root-specific diagnostic claims are limited by incomplete needle-EMG documentation and the absence of an independent reference standard.

Keywords: radiculopathy; magnetic resonance imaging; nerve-conduction studies; military personnel; diagnostic concordance; electrophysiology

Introduction

The clinical evaluation of radiculopathy involves symptoms, neurological findings and evidence of a structural or functional abnormality. MRI describes anatomy, while electrodiagnostic testing examines aspects of neuromuscular function. Agreement is useful, but disagreement is not necessarily evidence that one test is incorrect.

Comparative studies have reported incomplete agreement between MRI and electrodiagnostic findings in patients with suspected radiculopathy [1,2]. Studies incorporating nerve-conduction measurements have also examined their relationship with examination and disc pathology [3,4]. Interpretation depends on the specific electrophysiological method, because routine nerve-conduction studies and needle electromyography do not provide identical information.

The present manuscript uses the paired diagnostic results from a military clinical cohort. Its objective was to describe overlap and additional findings when MRI clinical–anatomical concordance and stimulation ENMG were considered together. It does not aim to validate a sensitivity threshold or construct a new diagnostic prediction model.

Materials and methods

Population and data source

The source investigation included 121 patients with clinical radiculopathy and 84 healthy reference participants. The present analysis is restricted to the 121 symptomatic patients aged 19–49 years with paired clinical and instrumental summaries. The healthy group is not used to define a reference standard because the groups differed in occupational history and because individual diagnostic verification was unavailable.

The source identifies the Central Military Clinical Hospital, Fergana Military Hospital and the National Guard Central Polyclinic as clinical settings. Actual recruitment dates, eligibility screening and participant flow require author confirmation. The manuscript retains the aggregate paired counts without generating individual records.

Clinical localisation and imaging

Clinical localisation was categorised as cervical, lumbosacral or multilevel radiculopathy. MRI clinical–anatomical concordance meant that the imaging findings corresponded to the clinical localisation. This endpoint differs from any abnormal MRI finding: degenerative changes outside the symptomatic distribution do not necessarily meet the concordance criterion.

The abbreviation "MRI-negative" in the source cross-tabulation is therefore rendered here as "without full MRI concordance". It should not be read as a structurally normal examination. The source separately recorded disc herniation and nerve-root compression, which are analysed as imaging features rather than as interchangeable diagnostic standards.

Electrophysiological assessment

The available methods describe stimulation electroneuromyography, including nerve-conduction measurements. A systematic needle-EMG protocol was not documented sufficiently to incorporate it into the present description. ENMG positivity refers to the abnormality classification in the source tables, not to independently verified denervation of a particular root.

Peripheral nerve disease and technical or physiological influences on conduction cannot be excluded from the aggregate data. Consequently, an additional ENMG abnormality in a clinically symptomatic patient is a reason for integrated interpretation, not automatic confirmation of the same root lesion suggested by symptoms.

Analytical approach

Counts and percentages are presented for the 121 paired observations. The joint table separates four mutually exclusive combinations. The proportion with either criterion is calculated by adding MRI-concordant patients to ENMG-positive patients without full MRI concordance, thereby avoiding double counting.

Reported morphology comparisons are retained with their original denominators and p values. No receiver-operating-characteristic curve, sensitivity, specificity or likelihood ratio was reconstructed because an independent reference standard was not available. The wider source's diagnostic-threshold models were not incorporated into this manuscript. No new patient-level or prognostic analysis was undertaken.

Results

Clinical composition of the paired cohort

Table 1. Clinical localisation and course among 121 symptomatic patients

Characteristic	Patients, n	Patients, %
Cervical localisation	19	15.7
Lumbosacral localisation	93	76.9
Multilevel localisation	9	7.4
First clinical episode	32	26.4
Recurrent course	12	9.9
Exacerbation with incomplete recovery	77	63.6

Localisation and clinical course are separate distributions. Percentages are calculated from n = 121. The small multilevel subgroup should not be used for precise subgroup-effect estimates.

Lumbosacral involvement predominated, accounting for 93 of 121 patients. Most patients were classified as having an exacerbation with incomplete recovery rather than a first episode. The findings therefore describe a selected symptomatic clinical population, not the distribution of radiculopathy in all military personnel.

The clinical localisation counts differ from the distribution of abnormalities by spinal region on MRI. Those two classifications are intentionally kept separate. A structural change in a cervical or lumbar region is not equivalent to confirmation that the region accounts for the current clinical findings.

The broader source contains inconsistent sex descriptions between its introductory text and tabulated data. Sex-specific estimates were not included in this manuscript pending verification of the individual records.

MRI concordance by clinical localisation

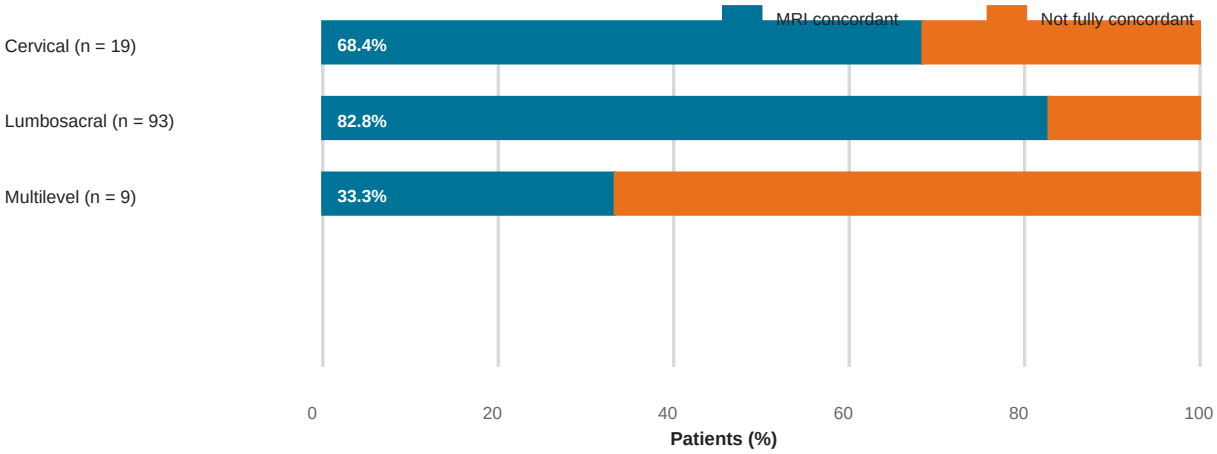


Figure 1. MRI clinical–anatomical concordance within localisation groups.

Each bar totals 100%. "Not fully concordant" is not synonymous with a normal MRI. The multilevel group included only nine patients.

Concordance was recorded in 13 of 19 cervical cases, 77 of 93 lumbosacral cases and three of nine multilevel cases. The lumbosacral group therefore contributed most of the concordant observations in absolute terms as well as having a high within-group proportion.

The lower proportion in multilevel disease should be interpreted cautiously. Multiple potential anatomical lesions complicate assignment of a single clinically relevant abnormality, and the small denominator produces an unstable descriptive estimate. No validated rule for selecting an imaging-positive level can be derived from these subgroup counts.

Joint MRI and electrophysiological findings

Table 2. Joint distribution of MRI concordance and ENMG abnormalities

MRI criterion	ENMG abnormal	ENMG not abnormal	Total
Concordant with clinical localisation	77	16	93
Not fully concordant	19	9	28
Total	96	25	121

The table contains paired observations. "ENMG not abnormal" means the source positivity criterion was not met; it does not exclude all neurological disease.

Both instrumental criteria were present in 77 patients. Sixteen had MRI concordance without an ENMG abnormality, while 19 had an ENMG abnormality without full MRI concordance. Nine met neither criterion. The latter patients remained members of the clinically selected cohort and cannot be reclassified as healthy from these two tests alone.

Considering either criterion yielded 112 patients with a supporting instrumental finding. The difference from MRI concordance alone was 19 patients, or 15.7 percentage points of the whole cohort. This is a descriptive addition to the observed findings, not a validated improvement in diagnostic sensitivity.

Among the 28 patients without full MRI concordance, 19 had ENMG abnormalities. The 67.9% proportion is conditional on membership in this discordant subgroup. It must not be reported as the percentage of all patients with normal imaging, because that was not the defining category.

The joint table also makes clear why the MRI and ENMG totals cannot simply be added. Their substantial overlap of 77 patients would otherwise be counted twice.

Descriptive contribution of the second modality

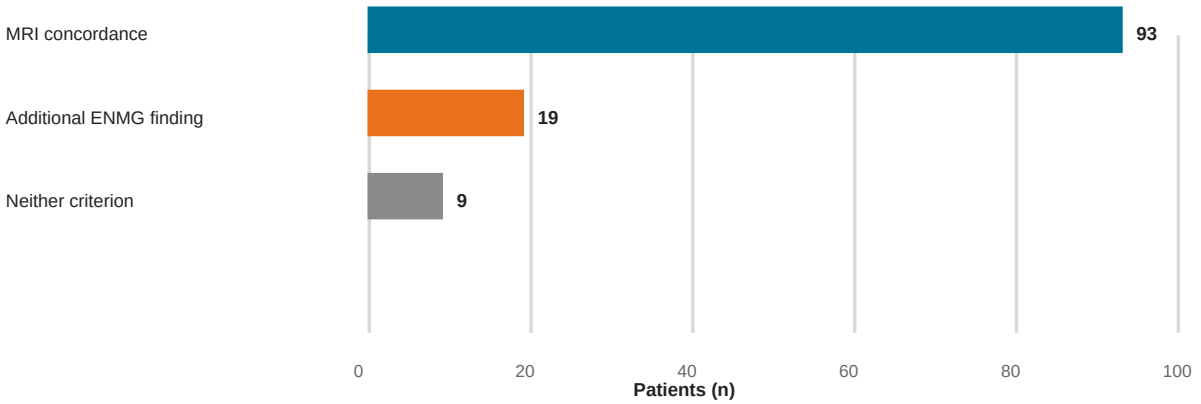


Figure 2. Mutually exclusive contributions to the combined assessment.

MRI concordance includes patients with or without ENMG abnormalities. The additional ENMG category contains only the 19 patients without full MRI concordance. The three categories sum to 121.

The graphic expresses the incremental contribution without treating the tests as competing stand-alone diagnoses. Ninety-three patients already met the MRI concordance criterion; electrophysiology supplied an additional abnormal finding in 19 of the remaining 28. Nine remained without either instrumental criterion.

The clinical meaning of that added information depends on the nature of the electrophysiological abnormality and its anatomical plausibility. Patient-level nerve-conduction and needle-EMG data, when available, are needed to distinguish root dysfunction from peripheral nerve involvement. The aggregate increase to 92.6% cannot resolve that distinction.

ENMG abnormalities by MRI morphology

Table 3. ENMG positivity in relation to selected MRI features

MRI feature	Feature present, n/N (%)	Feature absent, n/N (%)	p
Disc herniation	61/63 (96.8)	35/58 (60.3)	<0.001
Nerve-root compression	81/97 (83.5)	15/24 (62.5)	0.045
Full clinical concordance	77/93 (82.8)	19/28 (67.9)	>0.05

Counts refer to ENMG-positive patients. The feature groups overlap across rows and are not independent diagnostic cohorts.

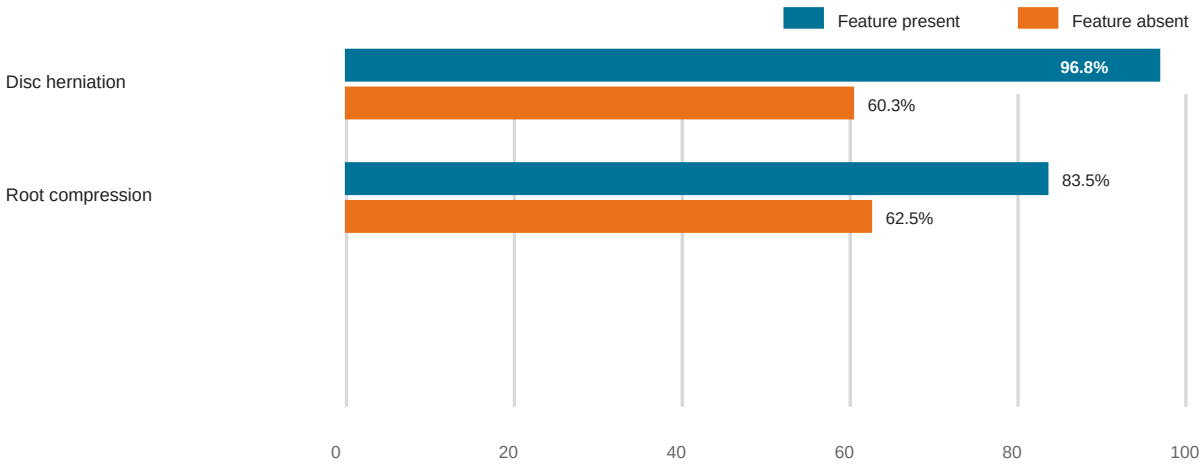


Figure 3. ENMG positivity according to two MRI features.

These are conditional proportions, not sensitivity or specificity. The same patient may contribute to both feature comparisons.

Discussion

The findings support complementary interpretation of MRI and electrophysiology. Most patients had concordant structural and functional findings, but a clinically relevant minority had only one of the two source criteria. Similar questions have been examined in comparative studies of MRI and electrodiagnosis [1,2]. The present data add a military clinical series but do not establish that one modality should replace the other.

The endpoint definition is central. MRI concordance with clinical localisation is more restrictive than the presence of degenerative change. A finding may be anatomically real yet fail to explain the current clinical pattern. Conversely, an electrophysiological abnormality may require further localisation before it is attributed to the same root.

Studies combining clinical examination, MRI and nerve-conduction measurements illustrate the importance of this distinction [3,4]. In the present source, stimulation ENMG was documented more clearly than a systematic needle-EMG protocol. It would therefore be inaccurate to assume that every ENMG-positive result established denervation in a root-specific muscle distribution.

The numerical increment of 19 patients is useful for describing additional information. It is not an estimate of sensitivity gained, because the study lacked an independent reference standard and enrolled patients on clinical grounds. An “either test positive” rule naturally increases the number meeting an instrumental criterion, but it may also incorporate abnormalities unrelated to the principal symptoms.

Limitations

The source provides aggregate rather than individual paired measurements. It does not permit blinded reassessment of MRI, verification of electrophysiological thresholds or evaluation of alternative peripheral nerve disease. Clinical selection and interpretation of imaging may also introduce incorporation bias.

The healthy reference group was not an adequate substitute for independent diagnostic verification. Sex descriptions were inconsistent, recruitment dates were incompletely specified and the multilevel subgroup was small. No prognostic follow-up was available to establish whether the additional findings altered treatment benefit or functional recovery. The conclusions are therefore limited to descriptive complementarity in the reported cohort.

Conclusion

MRI clinical–anatomical concordance was present in 93 of 121 patients. Stimulation ENMG supplied an additional abnormal finding in 19 patients without full MRI concordance, bringing the descriptive combined proportion to 92.6%. This result supports integrated interpretation of the two modalities, not a claim of validated diagnostic sensitivity or root-specific confirmation by nerve-conduction testing alone.

Declarations

Data provenance. Counts were extracted from paired clinical–instrumental tables in the supplied dissertation. No synthetic observations, diagnostic threshold or new accuracy model was created.

Ethics and consent. The ethics committee name, the approval number and the approval date, the consent documentation and the recruitment dates require author confirmation before submission.

Author information, funding and competing interests. The co-author name was supplied for publication. The official English affiliation, corresponding e-mail, author contributions, funding sources and competing interests require confirmation.

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