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Classifying idiopathic inflammatory myopathies: comparing the performance of six existing criteria

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ABSTRACT

Objective. *Various criteria have been proposed to classify the inflammatory myositides (IIMs) polymyositis (PM) and dermatomyositis (DM). However, none have received universal acceptance. Our aim was to assess the performance of the main criteria used to classify IIM. Specialist consultant diagnosis was considered the gold standard.*

Methods. *Patients attending King's College Hospital (KCH) or Reggio Emilia Hospital (REH) since 1990 with a diagnosis of IIM or non-inflammatory myopathy were identified, and their records and laboratory investigations retrospectively reviewed. Where the complete data required for the classification criteria or a final physician diagnosis was unavailable, patients were excluded. 52 patients with a specialist diagnosis of PM, DM, inclusion body myositis (IBM) or non-inflammatory myopathy were included. Agreement between specialist consultant diagnosis and classification criteria was measured using Cohen's kappa (κ) statistics. Sensitivity and specificity were also calculated.*

Results. *The Dalakas (2003) criteria demonstrated substantial agreement with specialist diagnosis: κ=0.69, sensitivity 77%, specificity 99%. The European Neuromuscular Centre criteria (ENMC) demonstrated fair agreement: κ=0.49, sensitivity 71%, specificity 82%. Other criteria performed less well. In particular, the Bohan and Peter criteria demonstrated a specificity of only 29%.*

Conclusions. *The criteria of Dalakas (2003) agreed best with specialist consultant diagnosis. The criteria of Bohan and Peter demonstrated very poor specificity. Prospective studies are required to develop improved classification criteria.*

Introduction

Idiopathic inflammatory myopathies (IIM), which include dermatomyositis (DM) and polymyositis (PM), are rare (1). To date, twelve classification criteria for IIM have been published (1-12). The various classification criteria typically have core components (muscle strength, classical rash of DM, muscle enzymes, electromyography [EMG], and muscle histology). Additional components such as further clinical features, magnetic resonance imaging (MRI), myositis-specific antibodies (MSA) and myositis-associated antibodies (MAA) have also been incorporated in some criteria. No single criteria set has received universal acceptance, although the classification criteria by Bohan and Peter criteria are still those most commonly applied in clinical trials. The Bohan and Peter criteria, however, predate the recognition of IBM and have been criticised for overdiagnosing PM (13).

In this study, we aimed to compare the performance of published criteria against specialist consultant diagnoses as our gold standard. Patients with non-inflammatory myopathies (non-IIM) were used as controls. For the purpose of this study we considered IBM a non-IIM condition because IBM, unlike DM and PM, does not respond to immunosuppressive therapy.

Methods

Criteria used

Of the twelve published classification criteria, two sets were excluded because they predated Bohan and Peter (1, 2) and are no longer in use. One set of criteria is exclusively for IBM and thus not relevant to this study (7). Two criteria sets that were based on Bohan and Peter were excluded because one used serology not widely available (5) and one retrospectively identified patients with cancer-associated myositis (12). One set was not specific about the number of clinical features required for diagnosis and could thus not be tested (9). The remaining published criteria comprised the ENMC (2004), Bohan and Peter (1975), Dalakas (1991), Dalakas (2003), Tanimoto (1995) and Targoff (1997) criteria.

Most diagnostic criteria express different degrees of certainty regarding diagnosis of IIM. To enable comparison with specialist diagnosis, we used all 'definite', 'probable' or 'mild/early' labels as a positive diagnosis, whereas we used 'possible' as a negative diagnosis.

Inclusion and exclusion criteria

Patients were included in the study if

Table I. Performance of the classification criteria in patients with myositis.

Classification criteria	Sensitivity [95% CI]	Specificity [95% CI]	Cohen's κ
Bohan and Peter (1975)	0.943 [0.814-0.984]	0.294 [0.133-0.531]	0.279
Dalakas (1991)	0.886 [0.74-0.955]	0.471 [0.262-0.69]	0.385
Dalakas (2003)	0.771 [0.61-0.879]	0.999 [0.815-1]	0.688
Targoff (1997)	0.971 [0.855-0.995]	0.294 [0.133-0.531]	0.319
Tanimoto (1995)	0.886 [0.74-0.955]	0.294 [0.133-0.531]	0.205
ENMC (2004)	0.714 [0.549-0.837]	0.824 [0.59-0.938]	0.486

they had the following: diagnosis made by a specialist consultant of IIM (DM or PM) or of a non-IIM including IBM; age 18 years or more; available records of clinical assessment including measurement of manual muscle strength; accessible results of the following investigations – creatine kinase (CK), ESR and/or CRP, full EMG report and full muscle biopsy report. Patients with an overlap with other connective tissue diseases (CTD) and those with uncertain diagnoses were excluded.

EMG features mentioned in the criteria included small-amplitude potentials and/or brief potentials, polyphasic potentials, fibrillations and/or positive sharp waves, early recruitment, and complex repetitive discharges. The latter findings were only mentioned in 2 criteria sets (3, 11), and were not consistently recorded in EMG reports, so were excluded from the analysis. There was no formal weighting of individual EMG features so results were unaffected. Anonymised data was stored in a password-protected database.

The specialist consultants comprised two rheumatologists (PG and NP) and two neurologists (MR and FN) with a specific expertise in myositis.

This study was approved by the Research Ethics committees at KCH prior to data collection. Ethics Committee approval was not needed at REH because the Trust policy requires such approval only for studies involving interventions that are not part of standard care or if patients' data are not anonymised, none of which applied to our study.

Statistical analysis

We evaluated sensitivity, specificity and accuracy of each criteria using the specialist diagnosis as the gold standard. Agreement between specialist consultant diagnosis and classification criteria was measured using Cohen's kappa (κ) statistics. Data were analysed using SPSS version 18.0.

Results

Patients

There were 24 patients with IIM (14 with DM and 10 with PM) comprising 17 females and 7 males. Their mean age at diagnosis was 50 years, with a mean of 21 months from first symptoms to diagnosis. The controls consisted of 28 patients with non-IIM comprising 11 females and 17 males. Their mean age at diagnosis was 58 years with a mean of 135 months from first symptoms to diagnosis. Within this group there were 14 patients with sporadic IBM, 2 with hereditary IBM type 1, 4 with limb girdle muscular dystrophy, 2 with necrotising myopathy, 4 with neurogenic myopathy, 1 with McArdle's disease and 1 with viral myositis.

Agreement of criteria with specialist diagnosis

The six criteria varied substantially with the gold standard of consultant diagnosis (Table I). The Dalakas (2003) criteria demonstrated substantial agreement with consultant diagnosis (κ=0.688). Sensitivity was 77% and specificity 99%. The ENMC also demonstrated fair agreement with specialist diagnosis (κ=0.49). Sensitivity was 71% and specificity 82%. The four early criteria – Tanimoto, Bohan and Peter, Targoff and Dalakas (1991) had all high sensitivities (≥86%) but low specificities (≤47%). In particular, the Bohan and Peter criteria demonstrated a specificity of only 29%.

Discussion

The classification of the IIM remains challenging. The Bohan and Peter criteria were the first widely used criteria put forward for IIM, and still remain the predominant classification criteria used in clinical studies. Their sensitivity has previously been found to range from 74% to 100% (14). Potential deficiencies of these criteria are poor definition of the items required for diagnosis, failure to use MSA or MAA, and failure to explicitly recognise IBM. They also are conceptually misleading in considering DM as "PM with a rash". Finally, the allowance of 'possible' or 'probable' definitions may also result in over-diagnosis of PM. In particular, use of the Bohan and Peter criteria may result in misclassifying patients with non-IIM such as IBM as having PM (13). Consistent with this concept, we found a very low specificity (29%) of the Bohan and Peter criteria for IIM. This is in marked contrast to the original paper, which recorded a specificity of 93% (15). The reason for the discrepancy between our and the original analysis (15) lies most probably in the selection of the controls. The original study used patients with other CTDs as controls, mainly systemic sclerosis and systemic lupus erythematosus. On the contrary, we used as controls patients with a range of non-IIM, because in clinical practice the commonest diagnostic dilemma is differentiating PM from patients with non-IIM rather than with other CTD. Furthermore, the diagnosis of another CTD does not exclude *per se* a concomitant inflammatory myopathy. Therefore, we feel that our data provides a more realistic estimate of the true specificity of the Bohan and Peter criteria for IIM.

The Dalakas (2003) criteria ranked first in our study in terms of combined sensitivity and specificity (*i.e.* accuracy). Their better accuracy may be related, at least in part, to their more precise definition of the histological features associated respectively with DM and PM, whereas the Bohan and Peter histological criteria did not discriminate between the two conditions. However, their increased specificity comes at the expense of slightly lesser sensitivity. The ENMC were not an improvement on the Dalakas 2003 criteria, although they demonstrated higher specificity compared to older criteria.

This study has some limitations, including a limited sample size and the retrospective design. Statistical modelling was not performed on the predictive value of individual features such as clinical features, neurophysiology and muscle biopsy findings because of small patients' numbers.

From our analysis, it appears that the Bohan and Peter criteria need updating. These considerations highlight the yet unmet need for the development of new criteria to classify the IIM. This need has recently been recognised by a group of investigators under the ægis of the IMACS (International Myositis Assessment and Clinical Studies Group), who have launched a multicentric study to gather patient data, with a view to define new criteria. We anticipate that the new criteria which will perform better and facilitate future studies in treatment and prognosis in myositis.

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