Concise Report

An international consensus survey of the diagnostic criteria for juvenile dermatomyositis (JDM)

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on behalf of the Network for Juvenile Dermatomyositis, a working party of the Paediatric Rheumatology European Society (PReS)

Objective. To develop revised criteria for the diagnosis of juvenile dermatomyositis (JDM) using an international consensus process.

Methods. An initial survey was circulated to members of the Network for JDM and the Paediatric Rheumatology International Trials Organisation (PRINTO). Each individual was asked to identify those criteria that were felt to be most helpful in the diagnosis of classical JDM. A second survey was derived from these results and used to rank these proposed criteria in order of their importance and usefulness in clinical practice.

Results. The first survey had a response rate of 49.8% (118 individuals) from 92 centres in 32 countries. All responders routinely used proximal muscle weakness and characteristic skin rash in the diagnosis of JDM, while 86.8% used elevated muscle enzymes. Muscle biopsy, magnetic resonance imaging (MRI) and changes on the electromyogram (EMG) were deemed important diagnostic criteria. Other criteria, including myositis-specific or -related antibodies, nailfold capillaroscopy, factor VIII-related antigen, muscle ultrasound, calcinosis and neopterin, were used by 35.3% of respondents. Seventy-eight respondents to the first survey (66%) responded to the second survey. Typical MRI and muscle biopsy changes were rated by all to be the most useful clinically relevant diagnostic criteria after proximal muscle weakness, characteristic skin rash and elevated muscle enzymes. These were followed by myopathic changes on EMG, calcinosis, dysphonia and nailfold capillaroscopy, which were ranked equally.

Conclusion. This process identified nine criteria that clinicians felt to be helpful or important in the diagnosis of JDM. A further process of refinement and validation is necessary to agree an internationally acceptable, clinically usable set of diagnostic criteria.

KEY WORDS: Juvenile dermatomyositis, Inflammatory myopathies, Muscle weakness, Skin rash, Elevated muscle enzymes.

Juvenile dermatomyositis (JDM) is the most common of the group of idiopathic inflammatory myopathies that occur during childhood, with an estimated incidence of 2–3 per million children per year [1, 2]. It principally affects the muscles and skin via inflammation of the small vessels, but may also affect other organs. Previously, the prognosis for JDM was poor, mortality occurring in almost one-third of patients and another third suffering from permanent physical impairment [3]. In the last few decades, mortality has significantly declined and there has been an improvement in functional outcome due to earlier diagnosis and more effective treatment [4].

The only published diagnostic criteria for dermatomyositis date from almost 30 yr ago [5, 6]. They depend on the use of five diagnostic criteria: characteristic skin rash, proximal muscle weakness, raised muscle enzymes, myopathic changes on the electromyogram (EMG) and typical muscle biopsy. Changes in clinical practice over time have resulted in many clinicians using non-invasive techniques, such as magnetic resonance imaging (MRI), in place of EMG and muscle biopsy. As a consequence, many affected children are unable to fulfil current diagnostic criteria as the necessary investigations have not been undertaken. This highlights the need for these criteria to be revised in line with current clinical practice.

An international collaboration was established in June 2002 by the Juvenile Dermatomyositis Working Party (Network for JDM) of the Paediatric Rheumatology European Society (PReS). Our aim was to use a consensus process to identify and agree a core group of items that could be developed into a new set of diagnostic criteria; a revised diagnostic criteria algorithm could then be developed that would be recognized and applied internationally in both clinical practice and research.

Methods

An initial survey compiled by a clinician and a statistician and approved by the working group was circulated to 237 members of...
the Network for JDM and the Paediatric Rheumatology International Trials Organisation (PRINTO) network. It reached 105 international centres in 35 countries across North and South America and Canada, Central and Eastern Europe and Asia. The survey listed those criteria thought most likely to be helpful and clinically relevant in the diagnosis of classical JDM. Respondents were specifically requested to exclude patients with overlap syndromes. These criteria comprised: proximal muscle weakness; changes on muscle biopsy typical of myositis; elevated muscle enzymes (creatine kinase, aldolase, transaminases and lactate dehydrogenase); myopathic changes on EMG; characteristic skin rash; and MRI abnormalities suggestive of inflammatory myositis. Respondents were asked to state which of these criteria they used routinely and which were readily available to them in their clinical practice. In addition, respondents were requested to list any other criteria that they believed to be useful or clinically relevant in the diagnosis of JDM. They were also asked whether they had any current JDM patients under their care and how many new patients they saw on average each year. The survey was circulated initially to the majority of members by e-mail: a small number had no e-mail address and were sent the survey by traditional mail. Those who failed to respond were re-sent the survey both by e-mail and traditional mail. E-mail addresses were cross-checked with the PRINTO database for those still not responding, and the survey was circulated a third time with a final reminder to those who still failed to reply.

The second phase of the study aimed to rank the proposed diagnostic items identified in the first survey in order of their importance, usefulness and relevance in clinical practice. A second survey was sent to all respondents to the initial phase (118 individuals in 92 centres across 32 countries) inviting them to rank the listed diagnostic items identified from the first survey. The initial survey showed that proximal muscle weakness, characteristic skin rash and elevated muscle enzymes (any or all of the available assays) were accessible to all and were the most commonly used criteria. It was agreed that these would automatically be included in any revised diagnostic criteria. The subsequent list, derived from the first survey, comprised MRI abnormalities suggestive of inflammatory myositis; calcinosis; changes on muscle biopsy typical of myositis; dysphagia; factor VIII-related (von Willebrand) antigen; myalgia; myopathic changes on EMG; myositis specific or related antibodies; muscle ultrasound; abnormal nailfold capillaroscopy; periangual erythema; neopterin; skin biopsy and skin ulcerations.

Individuals were asked to rank each listed criterion from 1 to 6, with 1 representing the most and 6 the least important/clinically useful item in the diagnosis of classical JDM. Participants were asked to leave blank those criteria they felt to be completely unimportant or irrelevant in clinical practice. The second survey was sent to all who had responded to the initial survey. E-mails were again cross-checked and updated against the PRINTO database, and the survey was circulated twice by e-mail with a reminder each time to those who failed to respond.

Results

One hundred and eighteen (49.8%) individuals from 92 centres in 32 countries responded to the initial survey. One hundred and thirteen currently cared for JDM patients, the mean annual number of new patients per centre being 3. Results of this survey are shown in Table 1.

Proximal muscle weakness, characteristic skin rash and elevated muscle enzymes (the precise test depending on availability) were the most commonly used criteria for the diagnosis of JDM. Despite ready availability, only 61.3 and 55.5%, respectively, used muscle biopsy and EMG. Access to MRI was reported by 70.6% of respondents, 58% using it routinely to detect abnormalities suggestive of inflammatory myositis. Significant variation in availability of MRI was noted, with good or reasonable access throughout Central Europe (82.9%), the USA and Canada (100%) and Eastern Europe (66.7%), but with very limited access especially in centres within South America (33.3%) and Asia (25%). The use of diagnostic items not listed in the initial survey was reported by 35.3% of respondents. These items included myositis-specific or -related antibodies, nailfold capillaroscopy, factor VIII-related (von Willebrand) antigen, muscle ultrasound, calcinosis and neopterin.

Seventy-eight individuals (66.1% of those responding to the first survey) responded to the second ranking survey. Responses came from 70 centres in 28 countries within the stated regions. The results of this survey (Table 2) suggest that, after proximal muscle weakness, characteristic skin rash and elevated muscle enzymes, MRI and muscle biopsy are thought to be the most useful or clinically relevant diagnostic criteria for JDM, with a median ranking score of 2. Myopathic changes on EMG, calcinosis, nailfold capillaroscopy and dysphonia also ranked highly, each with a median score of 3.

Dysphagia, myositis-specific or -related antibodies, factor VIII-related (von Willebrand) antigen, muscle ultrasound and ulcerations had a median score of 4. Within this group of other proposed diagnostic criteria for JDM, skin biopsy and neopterin were perceived to be the least useful/clinically relevant, both with a median score of 5.

### Table 1. Use of and access to existing and other proposed diagnostic criteria for JDM

<table>
<thead>
<tr>
<th>Proposed diagnostic criteria</th>
<th>Use (%)</th>
<th>Access (%)</th>
</tr>
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<tbody>
<tr>
<td>Proximal muscle weakness</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Characteristic skin rash</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Elevated muscle enzymes: aldolase, creatine kinase, transaminases, lactate dehydrogenase</td>
<td>86.8</td>
<td>87.2</td>
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<tr>
<td>Myopathic changes on EMG</td>
<td>55.5</td>
<td>89.1</td>
</tr>
<tr>
<td>Changes on muscle biopsy typical of myositis</td>
<td>61.3</td>
<td>87.4</td>
</tr>
<tr>
<td>Abnormalities on MRI suggestive of inflammatory myositis</td>
<td>58</td>
<td>70.6</td>
</tr>
<tr>
<td>Other: factor VIII-related (von Willebrand) antigen, muscle ultrasound, calcinosis, neopterin, dysphagia, dysphonia, myalgia, myositis-specific/-related antibodies, skin biopsy, skin ulcerations</td>
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1. most clinically relevant/useful; 6, least clinically relevant/useful.
Discussion

The only available diagnostic criteria currently used in JDM are those defined by Bohan and Peter in 1975 [5, 6]. According to these criteria, the diagnosis is made if a characteristic skin rash is present in combination with three of the remaining four criteria (proximal muscle weakness; elevated muscle enzymes; myopathic changes on EMG; characteristic muscle biopsy findings). A confirmed diagnosis therefore depends on the child having either a muscle biopsy or EMG. The advent of new non-invasive imaging techniques such as MRI means that in areas where this is readily accessible many clinicians no longer use EMG and muscle biopsy for the routine investigation of children with possible JDM. These children will therefore fail to meet current criteria for its diagnosis. This may significantly affect research and development in this area, agreed diagnostic criteria being essential if children are to be entered into collaborative research studies.

In 2002 the JDM working party of PreS agreed the need for rigorous diagnostic criteria that reflected current clinical practice. An international collaborative group was established to take this work forward and the results discussed here describe the first stage of this process, a consensus approach designed to ascertain current practice and views regarding possible new diagnostic criteria. In order to obtain a broad reflection of views, current practice and the availability of diagnostic facilities, this survey aimed to canvas the views of clinicians across a broad spectrum of countries within Europe, Asia, North and South America and Canada, and in centres providing both secondary and tertiary level care.

The first survey obtained a high level of agreement with regard to the top three diagnostic criteria, all or nearly all respondents agreeing with the inclusion of characteristic skin rash, proximal muscle weakness and raised muscle enzymes in any proposed diagnostic criteria. These criteria were available to clinicians in all countries. However, the heterogeneity of JDM means that not all affected individuals will display a characteristic skin rash, and some may have normal muscle enzymes despite evidence of myositis. These criteria applied in isolation are therefore insufficient.

The results of the second survey defined an additional six top-ranking criteria. These included muscle biopsy and EMG according to the original Bohan and Peter criteria, but they also rated nailfold capillaroscopy, muscle MRI, calcinosis and dysphonia as equally useful. It was noted that changes in nailfold capillaroscopy require more precise definition to be useful. Calcinosis, while helpful if present, occurs in only a minority of cases, sometimes late in the disease course. Although MRI is increasingly being used in some North American and European centres, its usefulness in proposed diagnostic criteria may be limited by the geographical variability in access, as highlighted by this survey.

Our results must be interpreted in the light of potential limitations in our study design. Fewer than half of the surveyed physicians responded to our initial survey; it is possible that our findings do not represent a true consensus. However, respondents came from a wide geographical spectrum of countries and from both clinical and academic units, representing a wide cross-section of the paediatric rheumatology community. There are clearly limitations of a consensus approach such as that taken in this study, but an awareness of current practice and views was deemed essential as the foundation for further work leading to the production of a revised set of validated diagnostic criteria.

The results of this collaborative process have defined nine diagnostic criteria which might form the basis of a revised diagnostic algorithm for JDM. Those diagnostic features which form the basis of the Bohan and Peter criteria will remain important, but substantial amendments are required to meet the needs of current clinical practice. Revised criteria will include some or all of the nine top-ranking criteria identified in this survey but might include alternative options or different weightings for different criteria. Consideration will need to be given to a system of review of any new criteria: as with MRI currently, new tests may become available over time or tests currently not ranked highly may become more important as clinical practice develops.

A further consensus discussion was held at the JDM working party meeting at PreS in Kosice, Slovakia, in September 2004 and it was agreed that further work should be undertaken to define a usable set of diagnostic criteria, acceptable to all. This will be achieved by the working party through a process of validation against historical clinical cases, the gold standard being clinical diagnosis by a group of experienced paediatric rheumatologists. Proposed criteria will then be validated prospectively in newly diagnosed cases. The end result should be a clinically relevant, validated, internationally agreed set of criteria for the diagnosis of JDM which should aid collaborative work in this field.

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The authors have declared no conflicts of interest.

References


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