ARTIGO ORIGINAL

PAIN IN FIBROMYALGIA AND DISCRIMINATIVE POWER OF THE INSTRUMENTS: VISUAL ANALOG SCALE, DOLORIMETRY AND THE MCGILL PAIN QUESTIONNAIRE

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Abstract

Objective: The aim of this study was to verify the discriminative power of the most widely used pain assessment instruments.

Methods: The sample consisted of 279 subjects divided into Fibromyalgia Group (FM - 205 patients with fibromyalgia) and Control Group (CG - 74 healthy subjects), mean age 49.29 ± 10.76 years. Only 9 subjects were male, 6 in FM and 3 in CG. FM were outpatients from the Rheumatology Clinic of the University of São Paulo – Hospital das Clínicas (HCFMUSP); the CG included people accompanying patients and hospital staff with similar socio-demographic characteristics. Three instruments were used to assess pain: the McGill Pain Questionnaire (MPQ), the Visual Analog Scale (VAS), and the Dolorimetry, to measure pain threshold on tender points (generating the TP index). In order to assess the discriminative power of the instruments, the measurements obtained were submitted to descriptive analysis and inferential analysis using ROC Curve – sensibility (S), specificity (S1) and area under the curve (AUC) – and Contingence tables with Chi-square Test and odds ratio. Significance level was 0.05.

Results: Higher sensibility, specificity and area under the curve was obtained by VAS (80%, 80% and 0.864, respectively), followed by Dolorimetry (77%, 77% and AUC 0.851), McGill Sensory (72% S, 67% S1 and 0.765 AUC) and McGill Afetiva (69% S, 67% S1 and 0.753 AUC).

Conclusão: A VAS apresentou mais alta sensibilidade, especificidade e área sob a curva mostrando ter maior poder discriminativo entre os instrumentos avaliados. No entanto, estes valores são bastante semelhantes aos da Dolorimetria.

Keywords: Fibromyalgia; Questionário McGill de Dor; Limiar de Dor; Escala Visual Analógica; Avaliação.

Resumo

Objetivo: Verificar o poder de discriminação dos instrumentos mais usados para avaliar a dor. Material e Métodos: A amostra consistiu em 279 sujeitos divididos em dois grupos: Grupo Fibromialgia (FM - 205 indivíduos) e Grupo Controle (GC - 74 indivíduos). Somente nove sujeitos eram do gênero masculino: seis no FM e três no GC, média de idade 49.29 ± 10,76 anos. Os pacientes do grupo FM foram recrutados na Clínica de Reumatologia do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo e o GC composto por indivíduos acompanhantes dos pacientes e indivíduos que trabalhavam no Hospital, com características sócio-demográficas semelhantes ao FM. Para avaliar a dor foram utilizados três instrumentos: Questionário McGill de dor (MPQ), Escala visual analógica (EVA) e Dolorimetria. Foi realizada a análise descritiva e inferencial através da curva ROC - calculando-se a sensibilidade (S), especificidade (S1) e área sob a curva (AUC) – e das tabelas de contingência – com cálculos de odds ratio e teste χ².

Resultados: Maior sensibilidade, especificidade e área sob a curva foi dada pela VAS (80%, 80% e 0.864, respectivamente), seguida pela Dolorimetria (77% S, 77% S1 e 0.851 AUC), McGill Sensorial (72% S, 67% S1 e 0.765 AUC) e McGill Afetiva (69% S, 67% S1 e 0.753 AUC).

Conclusão: A VAS apresentou mais alta sensibilidade, especificidade e área sob a curva mostrando ter
DISCRIMINATING POWER OF THREE PAIN INSTRUMENTS

($72\%$, $S167\%$ and AUC $0.765$) and McGill Affective ($S69\%$, $S167\%$ and AUC $0.753$).

Conclusions: VAS presented the higher sensibility, specificity and AUC, showing the greatest discriminative power among the instruments. However, these values are considerably similar to those of Dolorimetry.

Keywords: Fibromyalgia; McGill Pain Questionnaire; Pain Threshold; Visual Analog Scale; Assessment.

Introduction

Fibromyalgia syndrome (FMS) is defined as widespread musculoskeletal pain and tenderness of at least 11 of the 18 defined tender points (TP). According to the American College of Rheumatology (ACR) criteria, this diagnosis is based on the existence of pain by applying digital pressure of 4 kg/cm$^2$ to the specific areas.$^1$ No specific laboratory or radiological diagnostic tools have yet been identified for FMS diagnosis.$^2$

Patients often experience depression, anxiety, sleep disturbances, decreased pain threshold, fatigue and suffering. Likewise, they often report high disability levels and poor quality of life, along with extensive use of medical care.$^3$

The subjective experience and the multidimensional nature of pain contribute to the complexity of FMS severity assessment. Accurate pain measurement is therefore critical to both the clinical assessment and the evaluation of treatment outcome. The use of standardized instruments would reduce eventual mistakes that can compromise the diagnosis, treatment efficacy and research results. Consequently, it is important that assessment instruments have a reliable discriminative power.$^4,5$

The aim of this study was to ascertain the discriminative power of the most widely used pain assessment instruments, comparing healthy individuals and fibromyalgia patients.

Materials and methods

This study involved 279 subjects. The fibromyalgia group (FM) consisted of 205 patients, 199 females and six males, aged $49.29 \pm 10.76$ years, consecutively observed in the outpatient clinic of the university hospital. All FM patients were assessed by a senior rheumatologist and classified for this condition according to the American College of Rheumatology criteria.$^1$ Seventy-four healthy subjects (without chronic pain), 71 females and 3 males, aged $49.87 \pm 10.49$ years, matched by age, gender and education level, were recruited among the hospital staff and people accompanying patients in order to comprise the control group (CG). The presence of spinal deformities and/or other diseases that might account for chronic pain were exclusion criteria; furthermore, all CG subjects were screened for the presence of FM symptoms.

The study was approved by the Ethics Committee of the HC-FMUSP. All participants gave written informed consent (146/97).

Subjects were submitted to a single evaluation. Three distinct instruments were used to assess pain: the Visual Analog Scale (VAS), the Dolorimetry and the McGill Pain Questionnaire.

The Visual Analog Scale (VAS)$^6$ is a widely used pain evaluation instrument based on a straight line (10 cm long), scaled from 0 to 10, on which the patient marks the intensity of his or her pain.

Pressure pain threshold is defined as the minimum force applied which induces pain. Mechanical pressure, determined as kilogram (kg) per 1 cm$^2$ of skin on the sensitive areas, was applied by a Fisher’s hand dolorimeter.$^7$ The examiner placed the rubber tip on the examination site and gradually increased the pressure at a rate of approximately 1 kg/cm$^2$ per second. Subjects were instructed to say “yes” when the sensation of pressure changed to one of pain and the pain pressure threshold was recorded.$^8$ Pain threshold was measured in the 18 points specified by the ACR,$^1$ according to Okifuji instructions.$^9$ In this study, the tested points were considered as tender when a painful or unpleasant sensation was triggered with a pressure below $2.6$ kg/cm$^2$. This value is equivalent to $4.0$ kg/cm$^2$ described by Wolfe et al.$^1$ for the Fischer dolorimeter, as showed previously.$^{10}$

The McGill Pain Questionnaire$^{11}$ adapted to the Portuguese language$^{12}$ was used. The questionnaire consists of a list of 78 pain descriptors organized into 4 major categories (sensory, affective, evaluative, and miscellaneous) and 20 subcategories, each made up of at least 2 up to 6 words, to which intensity values are assigned. In this study, only the sensory and affective categories were used. As the score rises, the pain intensity increases. The highest score for the sensory category is 42 and for the affective category is 14.
**Results**

VAS was applied to 187 FM patients and 74 CG subjects. In ROC analysis the area under the curve (AUC) was 0.864 and the 95% confidence interval (CI) 0.809-0.919. A cut-off score for VAS of 4.85 cm gave a sensitivity of 80% and a specificity of 80% (Figure 1). Dolorimetry was applied to 207 FM and 74 CG. In ROC analysis the AUC was 0.851 and its corresponding 95% CI was 0.805-0.896. A cut-off score for dolorimetry of 2.519 kg/cm² gave a sensitivity of 77% and a specificity of 77% (Figure 2).

McGill Pain Questionnaire was applied to 94 FM and 33 CG. In ROC analysis the AUC was 0.765 for Sensory Category (95% CI 0.662-0.868). A cut-off score for McGill – sensory of 14.5 gave a sensitivity of 72% and specificity of 67%. In Affective category the AUC was 0.753, 95% CI of 0.643-0.862. A cut-off score for affective category of 5.5 gave a sensitivity of 69% and specificity of 67% (Figures 3A and 3B).

Table I presents frequencies of positive tender points in both FM and CG; odds ratio are shown in the right column. The greater trochanter, supraspinatus, gluteal and knee tender points displayed the greatest discriminative power between fibromyalgia patients and healthy controls. On the other hand, occipital and low cervical points had the least discriminative power.

**Comparing discriminative power of the instruments**

Table II shows ROC curve parameters and contingency table parameters. Although it seems that the two main instruments, VAS and TP, do not differ significantly, considering the sample results we would establish a discriminative power of instruments or preference order as follows: VAS, TP, McGillS, and McGillA.
Discussion

The main finding in this study is that VAS, Dolorimetry and McGill Pain Questionnaire are efficient instruments for pain measurement and discrimination between patients with fibromyalgia and healthy subjects. Tastekin stated the importance of using more than one instrument, since applying only one of them might be insufficient in pain assessment. The idea behind comparing different instruments in pain evaluation results from the fact that pain is the main symptom of fibromyalgia. In fact, fibromyalgia represents a complex hyperalgesic pain syndrome, in which abnormalities of central sensory processing interact with peripheral pain generators and psychoneuroendocrine dysfunction producing a wide spectrum of symptoms. Central sensitization includes a reduction in pain threshold (allosdynia), an increased response to painful stimuli and increased pain duration even after the cessation of the stimulation. Pain measurement may well provide helpful clues in the differential diagnosis of the underlying causes of pain.

The subjective experience and the multidimensional nature of pain function, which illustrates the severity of the syndrome, may be challenging in the assessment of FM patients. Moreover, the subjective characteristics of the physical findings and the concomitant symptoms may difficult the evaluation process. Consequently, health professionals must use different instruments for grading pain severity in FMS. Moreover, being the main complaint of FM, pain assessment may be an important tool, not only for designing a suitable treatment that brings relief but also for research purposes. Pain measurement helps to determine the most effective treatment, such as the type of analgesic drugs or other therapies necessary for pain control, and is essential in evaluating the relative effectiveness of different interventions. The initial measurement of pain experience also gives baseline information on which future therapeutic interventions can be based. Using more than one method of pain measurement may be useful for healthcare providers in order to understand the real scope of the patient’s symptoms in different aspects.

In our study, VAS was shown to be an important instrument in pain evaluation, being the most sen-
sitive and specific in the assessment of pain. Besides, VAS has the advantage of being quick and concise, easy to administer and score, and can be easily used in the clinical setting. Pöyhiä et al. used VAS to measure FM pain and have noticed it to be a consistent measure. Bigatti and Cronan evaluated several instruments and concluded that the McGill Pain Questionnaire, the Manual Tender Point Exam, the VAS, and the Arthritis Self-Efficacy Scale were the most useful in patients with FM. VAS showed the highest correlation with other measures of pain, physical function, fatigue and stiffness.

Comparing the three instruments, dolorimetry has the advantage of providing objective and direct measures of pain threshold, as well as good discriminating power. Although the group of healthy individuals also presented high scores of pain, these were significantly more intense in the FM group. High values in both groups can be attributed to the instrument. The pressure made by a rubber tip with only 1 cm in diameter, especially in some tender points where the bone surface has little muscle protection (which happens to be the case of the tender points mentioned) and a rough surface may cause discomfort. On the other hand, pain in specific points is not an exclusive characteristic of fibromyalgia individuals. In fact, in the present study some of the obtained TP indexes were very high for both groups, such as the right low cervical, where 90.2% of the FM and 68.9% of the CG reported pain or discomfort when pressures below 2.6 kg/cm² were applied. It should be kept in mind that pain may also be due to other pathologies, for example, neck pain is frequent in the population, can be produced by neck movements and, if localized, will usually be on the back side of the neck, between the inferior occipital region and the first thoracic vertebra, not to mention that fibromyalgia individuals complain of pain especially in the cervical, trapezium and shoulder regions. Similarly to our findings, others concluded that the occurrence of tender points and pain is common in the general population, where 19% of the control individuals had positive tender points. These authors also reported that the majority of the painful points, detected in healthy individuals, were mainly located on the upper half of the body, a result similar to ours. Different results were observed to Bigatti with the tender point exam having the lo-

Table I. Percentage and number of positive and negative tender points (values below 2.6 kg/cm² were considered positive)

<table>
<thead>
<tr>
<th>Tender Point</th>
<th>Fibromyalgia Group</th>
<th>Control Group</th>
<th>Odd Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative + Radio (%)</td>
<td>Positive</td>
</tr>
<tr>
<td>R Occiput</td>
<td>162</td>
<td>43</td>
<td>79.0</td>
</tr>
<tr>
<td>L Occiput</td>
<td>162</td>
<td>43</td>
<td>79.0</td>
</tr>
<tr>
<td>R Low Cervical</td>
<td>185</td>
<td>20</td>
<td>90.2</td>
</tr>
<tr>
<td>L Low Cervical</td>
<td>183</td>
<td>22</td>
<td>89.3</td>
</tr>
<tr>
<td>R Trapezius</td>
<td>161</td>
<td>44</td>
<td>78.5</td>
</tr>
<tr>
<td>L Trapezius</td>
<td>150</td>
<td>55</td>
<td>73.2</td>
</tr>
<tr>
<td>R Supraspinatus</td>
<td>153</td>
<td>52</td>
<td>74.6</td>
</tr>
<tr>
<td>L Supraspinatus</td>
<td>150</td>
<td>55</td>
<td>73.2</td>
</tr>
<tr>
<td>R Second Rib</td>
<td>184</td>
<td>21</td>
<td>9.8</td>
</tr>
<tr>
<td>L Second Rib</td>
<td>184</td>
<td>21</td>
<td>89.8</td>
</tr>
<tr>
<td>R Lat. Epicondyle</td>
<td>163</td>
<td>42</td>
<td>79.5</td>
</tr>
<tr>
<td>L Lat. Epicondyle</td>
<td>168</td>
<td>37</td>
<td>82.0</td>
</tr>
<tr>
<td>R Gluteal</td>
<td>136</td>
<td>69</td>
<td>66.3</td>
</tr>
<tr>
<td>L Gluteal</td>
<td>129</td>
<td>76</td>
<td>62.9</td>
</tr>
<tr>
<td>R GTrochander</td>
<td>133</td>
<td>72</td>
<td>64.9</td>
</tr>
<tr>
<td>L GTrochander</td>
<td>124</td>
<td>81</td>
<td>60.5</td>
</tr>
<tr>
<td>R Knee</td>
<td>156</td>
<td>49</td>
<td>76.1</td>
</tr>
<tr>
<td>L Knee</td>
<td>152</td>
<td>53</td>
<td>74.1</td>
</tr>
</tbody>
</table>

Legend: R - right; L - left; Lat - lateral
western correlation with other measures of pain.

In the present study, the McGill Pain Questionnaire (MPQ) had the least discriminative power but proved to be a useful instrument for assessing patients’ pain intensity. The MPQ, which has been translated into all major languages, attempts to pool the report of two dimensions of pain experience: sensory and affective. It has been used in different clinical situations and has proved to be reliable and effective in assessing pain. Marques et al. used the MPQ to compare the levels of pain in patients with FM, low back pain and osteoarthritis and concluded that FM patients had more intense pain and used more often words from the affective category to qualify their pain. In the present study FM patients present high MPQ scores, both in the sensorial and affective categories, thus indicating that, besides the physical ailment, their pathology also includes a psychoemotional component. The participants in our study had difficulties to understand the meaning of several words in each subcategory. As a consequence, administration was long when compared to the VAS and dolorimetry. Despite its widespread application, the MPQ is time-consuming and requires that the patient possesses a fairly sophisticated vocabulary. If the patient does not understand the words used, the value of this test is diminished.

In this sense, it is mandatory to evaluate pain by using efficient instruments. Assuming that the quality of life is directly associated with pain intensity, a better pain assessment could promote better intervention planning, aiming to stop or at least alleviate this symptom, and stimulate the individuals to return to their jobs, perform daily tasks and enhance their quality of life.

The reduced number of subjects in CG when compared with FM group is a limitation of the present study. In fact, the exclusion criteria adopted, especially the difficulty to find people without pain, determined the size of the control sample.

**Conclusion**

Our findings suggest that the three instruments used to assess pain in fibromyalgia patients have good sensitivity and specificity. All the instruments may be very useful in the evaluation of FM patients, although VAS shows better discriminating properties than dolorimetry of the tender points or the McGill pain questionnaire. The high number of positive tender points in the CG suggests that painful points may be a characteristic of the Brazilian population.

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