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

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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 de 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 trabalham 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 χ^2.
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 maior poder discriminativo entre os instrumentos avaliados. No entanto, estes valores são bastante semelhantes aos da Dolorimetria.

Palavras-chave: Fibromialgia; Questionário McGill de Dor; Limiar de Dor; Escala Visual Analógica; Avaliação.

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 (S 77%, S177% and AUC 0.851), McGill Sensory

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(S 72%, S167% and AUC 0.765) and McGill Affective (S 69%, S1 67% 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 ± 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 ± 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.

Statistical analysis

Data were analyzed by descriptive (mean, median and standard error) and interferential statistics. The statistical techniques used were the ROC curve – Receiver Operating Characteristics – with its sensitivity, specificity and area under the curve. Contingency tables with the computation of the odds ratio and the chi-square test were also done. To build the 2x2 contingency table we considered all possible cuts in the main variable and took the value that makes sensitivity and specificity equal or as closed as possible. The tender point index was defined as the mean of 18 TP.

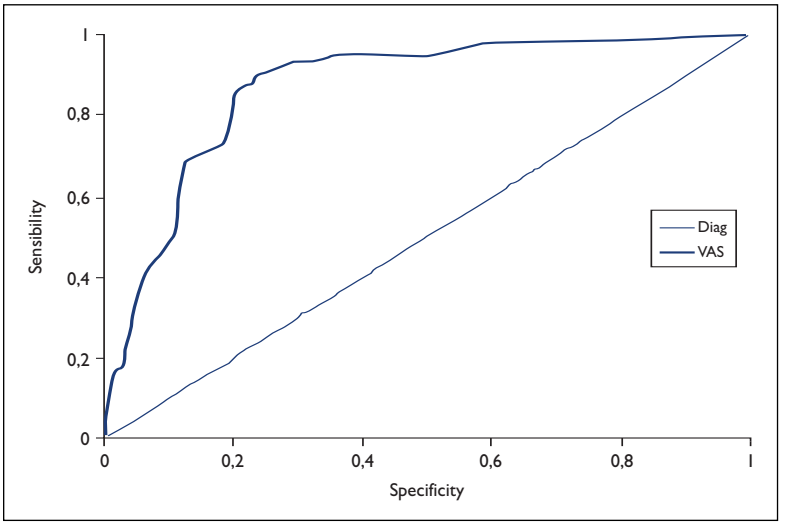

Figure 1. ROC curve for the Visual Analogue Scale (VAS). The area under curve (AUC) is 0.864.

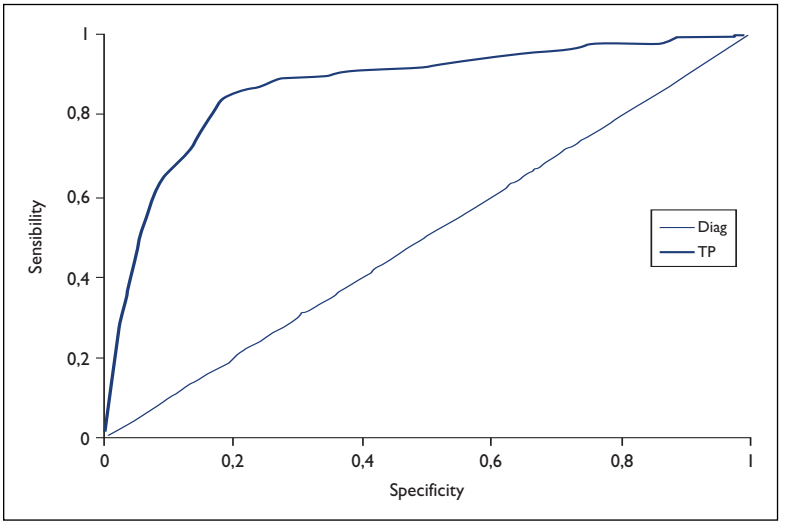

Figure 2. ROC curve for the Tender Points (TP). The area under curve (AUC) is 0.851.

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/cm^2 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.

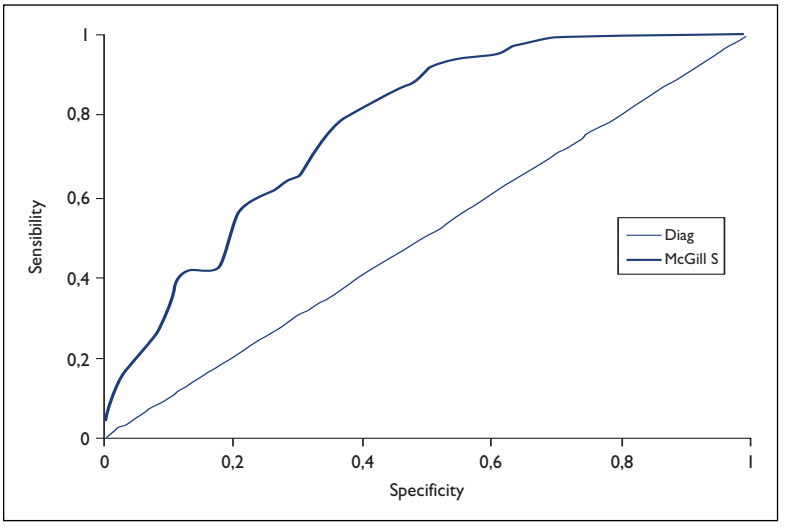

Figure 3A. ROC curve for the McGill Pain Questionnaire, Sensory Category (McGill S). The area under curve (AUC) is 0.765

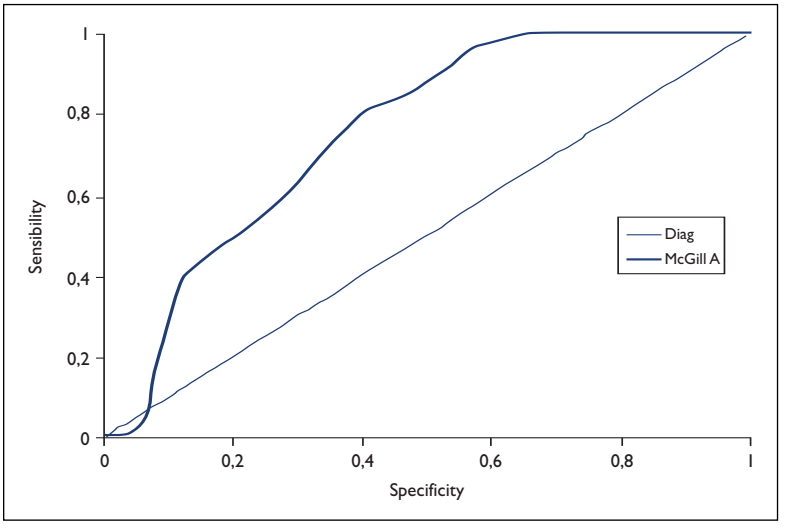

Figure 3B. ROC curve for the McGill Pain Questionnaire, Affective Category (McGill A). The area under curve (AUC) is 0.753

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.[15] 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 (allodynia), 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.[16]

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.[17,18] Consequently, health professionals must use different instruments for grading pain severity in FMS.[19]

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-

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

	Fibromyalgia Group			Control Group			
Tender Point	**Positive**	**Negative + Radio**	**(%)**	**Positive**	**Negative + Radio**	**(%)**	**Odd Ratio**
R Occiput	162	43	79,0	39	35	52,7	3,38
L Occiput	162	43	79,0	36	38	48,6	3,98
R Low Cervical	185	20	90,2	51	23	68,9	4,17
L Low Cervical	183	22	89,3	48	26	64,9	4,51
R Trapezius	161	44	78,5	19	55	25,7	10,59
L Trapezius	150	55	73,2	12	62	16,2	14,09
R Supraspinatus	153	52	74,6	12	62	16,2	15,20
L Supraspinatus	150	55	73,2	12	62	16,2	14,09
R Second Rib	184	21	9,8	45	29	60,8	5,65
L Second Rib	184	21	89,8	51	23	68,9	3,95
R Lat Epicondyle	163	42	79,5	32	42	43,2	5,09
L Lat Epicondyle	168	37	82,0	27	47	36,5	7,90
R Gluteal	136	69	66,3	9	65	12,2	14,24
L Gluteal	129	76	62,9	6	68	8,1	19,24
R GTrochander	133	72	64,9	12	62	16,2	9,54
L GTrochander	124	81	60,5	12	62	16,2	7,91
R Knee	156	49	76,1	17	57	23,0	10,67
L Knee	152	53	74,1	20	54	27,0	7,74

Legend: R - right; L - left; Lat - lateral

sitive and specific in the assessment of pain. Besides, VAS has the advantage of being quick and concise, easy to administer and score[17] and can be easily used in the clinical setting. Pöyhiä et al[22] 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.[4] VAS showed the highest correlation with other measures of pain, physical function, fatigue and stiffness.[4]

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 1cm 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 2.6kg/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,[21] 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.[20,10] 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[4] with the tender point exam having the lo-

Table II. Statistical data of pain instruments, ROC curves parameters and Contingence Table Parameters.

	Parameter	VAS	TP	McGillS	McGillA
ROC Curve parameters	AUC	0.864	0.851	0.765	0.753
	Standard Error	0.028	0.023	0.053	0.056
	Area Lim Inf	0.809	0.805	0.662	0.643
	Area Lim Sup	0.919	0.896	0.868	0.862
Contingency Table Parameters	Cut value	4.85	2.52	14.5	5.5
	Sensitivity	80%	77%	72%	69%
	Specificity	80%	77%	67%	67%
	Odds Ratio	15.95	11.11	5.23	4.48
	Odds Lim Inf	8.15	5.91	2.23	1.92
	Odds Lim Sup	31.20	20.87	12.28	10.44
	χ^2	82	68	16	13
	p-value	< 0.0001	< 0.0001	.007	.031

McGillS - McGill Sensority
McGillA - McGill Affective

west 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.[11] It has been used in different clinical situations and has proved to be reliable and effective in assessing pain.[23,4] 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.[24] 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.[25]

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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References:

1. Wolfe F, Smythe HA, Yunus M B et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia: report of the Multicenter Criteria Committee. Arthritis Rheum 1990;33:160-212
2. Fitzcharles MA. Is fibromyalgia a distinct clinical entity? The approving rheumatologist's evidence. Best Pract Res Clin Rheumatol 1999;13:437-443
3. Henriksson C, Burckhardt C. Impact of fibromyalgia on everyday life: A study of women in the USA and Sweden. Disability and Rehabilitation 1996;18:241--248
4. Bigatti SM, Cronan TA. A comparison of pain measures used with patients with fibromyalgia. J Nurs Meas 2002;10:5-14
5. Katz RS, Wolfe F, Michaud K. Fibromyalgia Diagnosis: A Comparison of Clinical, Survey, and American College of Rheumatology Criteria. Arthritis Rheum 2006;54: 169-176
6. Melzack R, Katz J. Measurement of pain. Surg Clin North Am 1996;79: 231-252
7. Fischer AA. Pressure algometry over normal muscle. Standard values, validity and reproducibility of pressure threshold. Pain 1987;30:115-126
8. Wolfe F. The relation between tender points and fibromyalgia symptom variables: evidence that fibromyalgia is not a discrete disorder in the clinic. Ann Rheum Dis 1997;56:268-271
9. Okifuji A, Turk JD, Sinclair D, Starz TW, Marcus DA. A standardized manual tender point survey. I. Development and determination of a threshold point for identification of positive tender points in Fibromyalgia Syndrome. J Rheumatol 1997;24:377-383
10. Marques AP, Ferreira EAG, Matsutani LA, Pereira CAB, Assumpção A. Quantifying pain threshold and quality of life of fibromyalgia patients. Clin Rheumatol 2005;24: 266-271
11. Melzack R. The McGill Pain Questionnaire. Anesthesiology 2005;103:199-202
12. Pimenta CAM, Teixeira MJ. Proposta de adaptação do questionário de dor McGill para a lingua portuguesa. Rev Esc Enf USP 1996;70:473-483
13. Noether GE. Introduction to Statistics: A Nonparametric Approach, Houghton Mifflin Company, New York; 1976.
14. Goodman LA, Kruskal WH. Measures of association for cross classification. Springer series in Statistics, New York: Springer Verlag;1979.
15. Tastekin N, Birtane M, Uzunca K. Which of the three different tender points assessment methods is more useful for predicting the severity of fibromyalgia syndrome? Rheumatol Int 2007;27:447-451
16. Grossman SA. Assessment of cancer pain: a continuous challenge, support. Care Cancer 1994;2:105-110
17. Gracely HG. Evoked pain measures in fibromyalgia. Best Pract Res Clin Rheumatol 2003;17:593-603
18. Pagano T, Matsutani LA, Ferreira EAG, Marques AP, Pereira CAB. Assessment of anxiety and quality of life in fibromyalgia patients. Sao Paulo Med J 2004;122:252-258
19. Russell JI. Is fibromyalgia a distinct clinical entity? The clinical investigator's evidence. Baillière's Clin Rheumatol 1999;13:445-454
20. Croft P, Burt J, Schollum J, Thimas E, Macfarlane G, Silman. More pain, more tender points: is fibromyalgia just one end of a continuous spectrum? Ann Rheum Dis 1996; 55:482-485
21. Barnsley L. Neck pain. In: Klippel JH, Dieppe PA. Rheumatology. 2nd ed. London: Mosby-Year Book; 1998. p.41-42.
22. Poyhia R, Da Costa D, Fitzcharles MA. Pain and pain relief in fibromyalgia patients followed for three years. Arthritis Rheum 2001;45:355- 361
23. Harris RE, Gracely RH, McLean SA et al. Comparison of clinical and evoked pain measures in fibromyalgia. J Pain 2006;7:521-527
24. Marques AP, Rhoden L, Oliveira J, Siqueira J, João SMA. Pain evaluation of patients with fibromyalgia, osteoarthritis and low back pain. Rev Hosp Clin Fac Med São Paulo 2001;56:5-10
25. Matsutani LA, Marques AP, Ferreira EAG, Assumpção A, Lage LV, Casarotto RA, Pereira CAB. Effectiveness of muscle stretching exercises with and without laser therapy at tender points for patients with fibromyalgia. Clin Exp Rheumatol 2007;25:67-72