MARIANA TREVISANI ARTHURI FRANCO

A INFLUÊNCIA DO SEXO E DO CICLO MENSTRUAL SOBRE A ATIVIDADE ELETROMIOGRÁFICA E A SENSIBILIDADE DOLOROSA DOS MÚSCULOS DA MASTIGAÇÃO EM INDIVÍDUOS PORTADORES DE DISFUNÇÃO TEMPOROMANDIBULAR

Tese apresentada à Faculdade de Odontologia de Piracicaba, da Universidade Estadual de Campinas, para obtenção do título de Doutor em Odontologia, Área de Concentração em Fisiologia Oral.

Orientadora:

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Ei medo
Eu não te escuto mais
Você não me leva a nada

E se quiser saber pra onde eu vou
Pra onde tenha sol, é pra lá que eu vou

Jota Quest

RESUMO

A mialgia mastigatória, é um dos principais sintomas em pacientes com disfunção temporomandibular (DTM); entretanto, sua patofisiologia ainda é pouco compreendida. Por isso, os objetivos deste trabalho foram investigar o efeito do sexo e do ciclo menstrual na atividade eletromiográfica (EMG) de pacientes com DTM, e a sensibilidade dolorosa, assim como os aspectos psicológicos destes mesmos pacientes. As respostas avaliadas, foram comparadas com as respostas do grupo controle. Os grupos DTM, foram compostos por 30 mulheres com ciclo menstrual regular; e por 23 homens. Os grupos controle, foram compostos por 30 mulheres com ciclo menstrual regular e por 30 homens, ambos sem DTM ou outras dores crônicas. Os voluntários foram avaliados, com base no Critério Diagnóstico de Pesquisa para DTM, (RDC/TMD) tanto para dor miofascial, como para artralgia (Eixo I). Os voluntários preencheram a Escala do Grau de Dor Crônica (GCPS), e as escalas de depressão e de sintomas físicos não-específicos (somatização) do RDC/TMD (Eixo II). A atividade EMG no repouso, foi registrada bilateralmente, nos músculos temporal anterior e músculos masseteres. A raiz quadrada da média (RMS) foi gerada a partir dos sinais EMG e foram normalizados, a partir dos valores obtidos durante a contração voluntária máxima. Os resultados mostraram diferenças EMG apenas nos músculos do lado esquerdo dos homens com DTM. Não houve diferenças significativas na atividade EMG dos músculos mastigatórios entre mulheres com e sem DTM. A dor miofascial foi maior na fase menstrual, comparada com as outras fases do ciclo menstrual. Além disso, as mulheres com DTM apresentaram maior GCPS, maior grau de depressão (moderado a severo), e pontuaram maiores itens de somatização (moderado a severo), comparado aos homens com DTM. Concluiu-se portanto, que: 1) Os homens com DTM apresentaram maior atividade EMG nos músculos do lado esquerdo da face, onde a dor foi mais prevalente. Não houve alteração na atividade EMG dos músculos mastigatórios de mulheres com DTM, sugerindo que existam diferenças sexuais nas respostas musculares induzidas pela dor; 2) a dor por DTM, é freqüentemente acompanhada por aspectos psicológicos, como depressão e somatização, principalmente em mulheres.

Palavras-chave: Diferenças sexuais, Dor facial, Ciclo menstrual

ABSTRACT

The masticatory myalgia is one of the most common symptoms in temporomandibular disorder (TMD) patients; however, its pathophysioloy is poorly understood. Thus, the aims of this study were to investigate the effect of sex and pain on electromyographic activity (EMG); the effect of menstrual cycle phases on EMG activity; the influence of menstrual cycle on pain sensitivity; and the psychological aspects of TMD and control group. TMD cases were 30 normally cycling women; and 23 men. Controls were 30 normally cycling women and 30 men, without TMD or other chronic pains. The subjects were assessed based on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) for both myofascial pain and arthralgia (Axis I). Subjects completed the RDC/TMD (Axis II), for Graded Chronic Pain Scale (GCPS), and measures of depression and nonspecific physical symptoms. EMG signals at rest were recorded bilaterally from the anterior temporal and masseter muscles. The root mean square (RMS) were computed from the EMG signals and normalized to the values obtained during maximal voluntary contractions. The results showed that were EMG differences only on the men's TMD left masticatory muscles. There were no statistically significant differences in the EMG activity of masticatory muscles between women with and without TMD. The myofascial pain was significantly higher in menstrual phase compared with all of other phases of the menstrual cycle. Moreover, TMD women experienced higher GCPS, more moderately to severely graded depression, and scored greater moderate and severe somatization items than men TMD patients. It was concluded that: 1) The TMD men, presented higher EMG activity on the left side of the face, where pain was more prevalent. There was no significantly differences in EMG activity of women's TMD masticatory muscles, which indicates that the pain-induced changes in muscular responses could differ in men and women; 2) TMD pain is frequently accompanied by psychological aspects, like depression and somatization mainly in women.

Keywords: Sex-differences, Facial pain, Menstrual Cycle

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INTRODUÇÃO

As disfunções temporomandibulares (DTMs), constituem uma das principais causas de dor crônica na região orofacial (Dworkin *et al.,* 1992). A dor de origem muscular (mialgia mastigatória) é um dos sintomas mais comuns apresentados por esses pacientes (Dworkin *et al.,* 1992), e a sua patofisiologia, embora há muito tempo estudada, ainda é pouco compreendida (Bodéré *et al.,* 2005) e por isso, continua oferecendo desafio para clínicos e pesquisadores.

A dor crônica persiste por mais de três meses e perde a finalidade biológica de alarme, que visa à preservação da vida, tornando-se uma doença em si. A característica mais evidente da dor crônica é a sua onipresença, cujas conseqüências podem ser devastadoras na vida do doente. Estudos mostram que homens e mulheres se comportam de maneira diferente frente à dor, devido às diferenças biológicas de sexo e diferenças dos papéis de gênero (Berkley; Holdcroft, 1999; Fillingim, 2003; Myers *et al*., 2003). Dados como esses, enfatizam a importância de uma abordagem biopsicossocial da DTM.

A busca pela causa das DTM's, incluindo a dor miofascial dos músculos mastigatórios sugere que os hormônios reprodutivos desempenhem um papel nas respostas dolorosas: a prevalência é maior em mulheres do que em homens; a idade de início é quase sempre após a puberdade; e mulheres em idade reprodutiva apresentam uma maior prevalência de dor em comparação àquelas que se encontram na menopausa (LeResche *et al.,* 1997).

A prevalência das DTMs em relação ao sexo e a idade reprodutiva apontam para um possível envolvimento da sua patogênese com os hormônios reprodutivos.

Em um estudo limitado, onde foram avaliadas amostras da articulação temporomandibular (ATM) de 14 mulheres e 8 homens, foram encontrados receptores de estrógeno e progesterona em freqüências variadas em ambos os sexos, com e sem sintomatologia de DTM (Abubaker *et al*., 1993). No entanto, Campbell et al. (1993), concluíram que as DTMs podem não ser moduladas hormonalmente pelo estrógeno, pois o estudo com 14 pacientes não revelou a presença significante de receptores de estrógeno nesse tecido.

Outro possível fator hormonal, envolvido na patogênese das DTMs, está associado à relaxina, um hormônio polipeptídico feminino, produzido pelo corpo lúteo. Ele

está presente na corrente sanguínea, nos últimos dias do ciclo menstrual (antes do início da menstruação) e durante a gravidez, e causa o afrouxamento ligamentar durante o parto. A relaxina, no entanto, não explica completamente a distribuição pelo gênero e pela idade das DTMs, mas segundo Kapila & Xie, (1998), a relaxina aumenta a expressão de enzimas que degradam a matriz e por isso, pode predispor a mulher à remodelação articular anormal. Em contrapartida, LeResche *et al*. (2005) demonstraram que a dor orofacial músculo-esquelética melhora durante a gestação. Esta melhora se justifica pelo aumento da frouxidão articular, devido às variações hormonais decorrentes da gravidez.

Muitos estudos evidenciaram além da relação dos hormônios reprodutivos com a patogênese das DTMs, a relação entre os hormônios reprodutivos e as diferentes respostas à dor entre homens e mulheres. Tem sido indicado que as mulheres reportam dores mais severas, mais freqüentes e de maior duração do que os homens (Robinson *et al*., 1998). Além de responderem diferentemente à dor, mulheres e homens, nem sempre respondem ao tratamento para a dor da mesma maneira (Keogh *et al*., 2005). Tais afirmativas sugerem que o sexo pode influenciar a resposta ao tratamento para a dor.

As diferenças na percepção e resposta à dor atribuídas ao sexo, provavelmente têm influências biológicas. Guinsburg *et al*. (2000), descreveram que neonatos humanos do sexo feminino expressam mais dor durante os procedimentos dolorosos que neonatos masculinos. Além das diferenças sexuais no processamento da dor, variações também são encontradas na analgesia a agentes endógenos e exógenos. Similarmente aos animais adultos, ratos machos são mais sensíveis ao efeito antinociceptivo da morfina que ratos fêmeas. A causa das diferentes respostas nociceptivas e sensibilidade a opióides entre machos e fêmeas parece ter grande influência hormonal. Neste sentido, Cícero *et al*. (2002) demonstraram que a administração de testosterona em fêmeas no primeiro dia de vida aumenta a sensibilidade desse animal à morfina quando adulto. Em contrapartida, a castração dos machos no primeiro dia de vida reduz sua sensibilidade à morfina quando atinge a maturidade. Esses resultados indicam que as diferenças sexuais na susceptibilidade à antinocicepção já estão presentes no dia do nascimento.

Estudos também têm demonstrado que o sistema de analgesia no sexo feminino é mais sensível que o masculino quando são utilizados analgésicos kappa opióide (Clemente *et al.,* 2004).

Os opióides endógenos parecem desempenhar um papel significante na percepção dolorosa. Em um estudo prévio realizado por Arthuri *et al.* (2005), o limiar doloroso foi elevado quando os hormônios sexuais estavam altos, tal como ocorre durante a gravidez.

A flutuação periódica de algumas condições dolorosas ao longo do ciclo menstrual foi um dos primeiros indícios sugerindo que os hormônios reprodutivos estariam envolvidos nos mecanismos da dor. No nível dos músculos da mastigação, a dor miofascial apresenta piora durante os períodos menstrual e pré-menstrual (Dao *et al*., 1998).

O papel dos hormônios gonádicos no mecanismo da dor também foi apoiado por dados demonstrando o efeito de hormônios exógenos (tais como os contraceptivos ou os hormônios usados na terapia de reposição hormonal), e o seu envolvimento na dor. Em mulheres na pós-menopausa, a terapia de reposição de estrogênio demonstrou exacerbar a enxaqueca (Kudrow, 1975) e aumentar a prevalência de DTM em 30% (LeResche *et al*., 1997). Efeitos comparáveis têm sido observados com o uso de contraceptivos orais (CO). Usuárias de CO têm maior risco de desenvolverem DTM (LeResche *et al*., 1997) e os CO podem modificar as características e a freqüência das enxaquecas pela indução, modificação ou até pelo alívio das crises de cefaléia (Kudrow, 1975).

O papel dos hormônios endógenos e dos hormônios exógenos no mecanismo da dor demonstrou, portanto, alterações cíclicas ao longo do ciclo menstrual. No entanto, o padrão varia consideravelmente entre os estudos e não há consenso a respeito da fase do ciclo hormonal associada com a maior sensibilidade dolorosa, ou seja, o menor limiar de dor. Um trabalho investigou o padrão de dor miofascial nos músculos da mastigação durante três ciclos menstruais consecutivos entre mulheres que utilizavam ou não CO. A dor, entre as usuárias de CO, foi mais constante e com baixa variação. Por outro lado, as mulheres que não tomavam CO apresentaram oscilações na intensidade da dor ao longo do ciclo menstrual (períodos alternados com dor e sem dor) (Dao *et al.,* 1998).

Para a melhor compreensão das possíveis influências dos hormônios gonadais sobre a percepção dolorosa em função do ciclo ovariano, vários protocolos de dor tem sido aplicados em mulheres, nas diferentes fases do seu ciclo menstrual. Embora existam algumas diferenças metodológicas nesses estudos (testes de indução da dor e as respostas avaliadas), as alterações na sensibilidade dolorosa em mulheres com ciclo menstrual

regular, freqüentemente seguem as variações dos níveis de hormônios gonadais. Mais especificamente, os limiares de sensibilidade dolorosa mais altos são encontrados na fase folicular (pré-ovulatória) e os limiares mais baixos, na fase lútea (pós-ovulatória). Riley *et al*. (1999) avaliaram 16 estudos publicados sobre a percepção da dor induzida experimentalmente ao longo das fases do ciclo menstrual de mulheres saudáveis, e o trabalho mostrou que os limiares de dor mais altos foram encontrados na fase folicular (dias 6-11) do ciclo menstrual. Hapidou & deCatanzaro (1988), empregaram o estímulo de pressão fria, e encontraram limiar doloroso mais baixo na fase lútea, quando comparado com a fase folicular.

Fillingim et al. (1997) constataram que o limiar doloroso e tolerância à dor isquêmica no braço foram maiores durante a fase folicular do que nas fases ovulatória ou lútea; entretanto, não houve diferença relacionada à fase do ciclo, para o limiar de dor térmica. Todavia, Tedford et al. (1977) obtiveram efeitos cíclicos em seus estudos, que foram contrários aos encontrados por esses investigadores. Usando o teste do choque elétrico, esses autores encontraram sensibilidade mínima na fase lútea, ou seja, as mulheres apresentaram limiar de sensibilidade dolorosa mais alto nesta fase, e a sensibilidade máxima, ou o limiar de sensibilidade mais baixo, ocorreu durante a menstruação. Em mulheres com DTM não-usuárias de CO, houve maior intensidade dolorosa à palpação nas fases lútea média e menstrual. No caso de mulheres com DTM, usuárias de CO, os índices de intensidade dolorosa à palpação foram estáveis nas fases menstrual, ovulatória, e fase lútea média, com um aumento da intensidade dolorosa na fase lútea tardia (Sherman *et al*., 2005).

Os prováveis efeitos dos hormônios sexuais na dor miofascial são ainda pouco entendidos. Poucos estudos avaliaram a associação entre os níveis de dor orofacial com o gênero e com o ciclo menstrual de mulheres usuárias e não-usuárias de contraceptivo oral, decorrentes de eventos naturais, ou das experiências do dia a dia. Alguns relatos indicam que os hormônios reprodutivos podem desempenhar um papel no desenvolvimento ou na manutenção de síndromes dolorosas miofasciais (Dao & LeResche, 2000), outros estudos entretanto têm demonstrado que essas condições podem ser amenizadas pelo tratamento com hormônios exógenos (Dao *et al.,* 1998). Esses dados aparentemente contraditórios ilustram a necessidade de pesquisas relativas a esse assunto.

A eletromiografia de superfície é muito utilizada como instrumento auxiliar no diagnóstico da DTM. Sua utilização tem proporcionado aos clínicos e pesquisadores um melhor conhecimento das funções e disfunções do sistema mastigatório.

Estudos eletromiográficos realizados em animais, contribuem para o conhecimento da neurobiologia da dor muscular craniofacial, e são imprescindíveis para a investigação das correlações clínicas em pacientes. Yu et al. (1995) denotaram que o efeito excitatório do óleo de mostarda na atividade EMG dos músculos mastigatórios, parece conter uma base reflexa, pois podem ser abolidos pela pré-administração de anestésico local na ATM. Cairns *et al*. (2002), demonstraram que a injeção de glutamato na ATM promove uma resposta muscular reflexa de maior magnitude em ratas do que em ratos. Essa diferença relacionada ao sexo está de acordo com outro estudo (Cairns *et al*., 2001), em que a injeção de glutamato no músculo masseter provocou resposta dolorosa maior em mulheres do que em homens, e aumento da atividade da fibra aferente do músculo masseter de ratas fêmeas em comparação aos machos. Esses dados sugerem a presença de mecanismos fisiológicos, envolvidos com a alta predominância feminina, nos distúrbios da ATM.

Apesar da extensiva investigação ao longo de cinco décadas, sobre a fisiopatologia da dor muscular relativa às DTMs (Bodéré *et al*., 2005), muitas questões permanecem em aberto; como por exemplo o papel da atividade muscular como fator contribuinte para o desenvolvimento e para a manutenção das DTMs (Lund & Widmer, 1989). Flor *et al*. (1991) relataram a presença do aumento da atividade eletromiográfica (EMG) nos músculos mastigatórios de pessoas com dor muscular devido à DTM. Alguns estudos, entretanto, contém falhas metodológicas envolvendo o critério de seleção dos sujeitos; falha compatível com a idade, o gênero; artefatos de movimento, e principalmente quanto à determinação da fase do ciclo menstrual envolvida no dia da análise eletromiográfica. Lund & Widmer (1989) ressaltaram que se a hiperatividade dos músculos masseteres fosse um fator causal nas DTMs, haveria maior atividade EMG nos músculos orofaciais no lado da queixa dolorosa comparada à atividade do lado contralateral. Em um estudo realizado em 1988, Dolan & Keefe observaram que os pacientes que tinham dor no músculo do lado direito, apresentavam aumento da atividade EMG no músculo masseter esquerdo. Em sujeitos com dor no músculo do lado esquerdo, não houve diferenças na

atividade EMG entre os músculos masseteres direito e esquerdo. Com base nesses dados, é difícil aceitar que a tensão muscular por sí só seja um fator causador da DTM.

A maioria dos estudos envolvendo diferença sexual e dor utiliza estímulos nocivos freqüentemente usados em laboratório, mas que ocorrem raramente nas experiências do dia a dia. As dores experimentais são induzidas sob condições agudas em humanos e não refletem a natureza persistente ou recorrente das condições dolorosas crônicas. Dentro desse contexto, a relevância clínica dos achados experimentais permanece limitada.

Nesse sentido, é de interesse verificar se as diferenças relacionadas ao sexo e as fases do ciclo menstrual em pacientes com dor e DTM de origem miogênica podem ser detectadas pela eletromiografia de superfície, o que seria de relevância para o diagnóstico e tratamento.

Capítulo 1

Do sex, pain and the ovarian cycle influence masticatory muscle activity in subjects with temporomandibular disorders?

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Abstract

Aims: The aim of this study was to assess variations in muscle activity at rest in relation to sex and phase of the menstrual cycle in temporomandibular disorder (TMD) patients, and to asses variations in masticatory muscle pain, in relation to phase of the menstrual cycle. ***Methods:*** TMD cases were 30 normally cycling women; and 23 men. Controls were 30 normally cycling women and 30 men, without TMD or other chronic pains. Surface electromyographic (EMG) signals at rest, were recorded bilaterally from the anterior temporal and masseter muscles. The root mean square (RMS) was computed from the EMG signals and normalized to the values obtained during maximal voluntary contractions. There were EMG differences only in the left masticatory muscles (anterior temporal and masseter). ***Results:*** There were EMG differences only in the left masticatory muscles in the men's TMD group. There were no statistically significant differences in the EMG activity of masticatory muscles between women with and without TMD. The myofascial pain was significantly higher in menstrual phase compared with all of the other phases of the menstrual cycle. ***Conclusion:*** The TMD men, presented higher EMG activity on the left side of the face, where pain was more prevalent. There were no significant differences in EMG activity of women's TMD masticatory muscles, which indicates that the pain-induced changes in muscular responses could differ in men and women. In spite of higher pain in the menstrual phase of the cycle, the EMG recording variations were unable to detect chronic-pain conditions in women with TMD.

Key words: masticatory muscle, menstrual cycle, temporomandibular disorders, myofascial pain, RDC/TMD

1. Introduction

Masticatory muscle pain (masticatory myalgia) is one of the commonest symptoms in TMD patients (1), and although its pathophysiology has been studied for a long time, it is still poorly understood (2).

The quest for the cause of TMD, including myofascial pain of the masticatory muscles, suggests that reproductive hormones may play a role in these pain conditions: the age of onset is almost always after puberty; prevalence rates are higher in women than in men; and prevalence rates peak during the reproductive years and decrease after menopause (3). Moreover, some studies (4), (5) have shown that the intensity of TMD pain is reported to vary with the stages of the menstrual cycle. In support of this view, temporomandibular pain (5), (6), migraine (7), (8) and possibly tension-type headache (7), (9), (8) appear to be more likely to occur, or to be more intense at times of low or rapidly fluctuating estrogen (10).

On the other hand, women taking oral contraceptives (OC) do not exhibit significant variation in pain perception across the menstrual stages. This could be ascribed to the fact that in OC users, the effects of estrogen and progesterone are found to be more stable (5).

Methods, such as electromyographic (EMG) assessment of muscle activity, have been used as possible aids to assess the interactions between muscle pain and temporomandibular disorders. There are good reasons to believe that jaw motor function and muscle pain are interrelated, mainly because the cardinal symptoms of TMD include both pain and tenderness in craniofacial muscles and restrictions and deviations in jaw movements (11)

Over the years, many pathophysiologic models have been presented to explain the interaction between jaw motor function and muscle pain. Nevertheless, there is no consensus on the level of EMG activity and masticatory muscle pain (11). Some studies indicated no significant differences in postural activity between patients with TMD pain and control subjects (12), (13), (14), (15), (16). Other studies have found a small increase (17), (18), (19) and some studies even reported a small decrease (20), (21). Many of the studies have been criticized for a lack of proper matching between patient and control groups with regard to age, sex, cranial morphology, and oral habits, such as bruxism (22).

This work tried to follow the established standards of reliability, validity, sensitivity and specificity useful of surface EMG, recommended by Klasser & Okeson (23).

Biological factors, such as sex-differences and the ovarian cycle, may modulate muscle pain and possibly affects the EMG activity of masticatory muscles. Electromyographic activity may therefore provide important insight into the nature of the sensorimotor interactions.

Most studies involving sexual differences, ovarian cycle and muscle pain, used noxious stimuli, which are frequently used in the laboratory, but occur rarely in day-to-day experience (24). Experimental pain is induced by acute conditions in humans and does not reflect the persistent or recurrent nature of usual pain experiences in chronic pain conditions. Moreover, the major part of experimental stimuli are employed on the skin, while endogenous chronic pain is more frequently felt in deep tissues like muscles, joints or viscera. In these circumstances, it would be interesting to investigate if the natural course of reported muscle pain could fluctuate with phases of the menstrual cycle, in normally cycling women with TMD.

Therefore, the aims of the present study were: (1) to assess variations in muscle activity at rest in relation to phase of the menstrual cycle in normally cycling women TMD patients, and to compare the findings for these women with those of men TMD patients, and pain-free controls; (2) to evaluate and to compare the variations in masticatory muscle pain in relation to phase of the menstrual cycle in normally cycling women TMD patients; and (3) to asses variations in masticatory muscle pain and to compare with variations in muscle activity at rest, in relation to phase of the menstrual cycle in normally cycling women TMD patients.

2. Methods

2.1 Subjects

The sample was obtained from patients who presented with TMD pain at Dental School of Piracicaba, University of Campinas, Brazil. One hundred thirteen subjects between the ages of 18 and 45 years (5), (25), participated in the study. The experimental group, or TMD group, was composed of 30 women and 23 men with Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (26). The control group was

composed of 30 women, and 30 men without TMD, who did not meet the selection criteria for TMD. All subjects gave informed consent to procedures approved by the Research Ethics Committee of the School of Dentistry of Piracicaba – State University of Campinas.

The subjects were assigned to one of four groups:

1. Women not using oral contraceptives: 30 subjects with TMD muscle pain - TMD group.
2. Women not using oral contraceptives: 30 subjects without TMD - control group.
3. Men: 23 subjects with TMD muscle pain - TMD group.
4. Men: 30 subjects without TMD - control group.

Subject selection was performed in accordance with very strict inclusion and exclusion criteria, as noted below:

Inclusion Criteria. Subjects with TMD were required to have pain for at least 3 months and to meet Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) for both myofascial pain (category, Ia or Ib) and arthralgia (category IIIa) - subjects had both a masticatory muscle pain diagnosis and a TMJ pain diagnosis. Female patients did not use oral contraceptives or hormone replacement therapy; and they had a regular menstrual cycle lasting between 26 and 33 days (27).

Exclusion Criteria. The following conditions were considered as exclusion criteria: Subjects presented signs or symptoms of disc displacement, arthritis and arthrosis of the temporomandibular joint (TMJ) (according to categories II and III of the RDC).

Subjects with more than 2 missing posterior teeth (excluding third molars) and those wearing removable dentures.

Subjects with a history of traumatic injuries (e.g., contusion, fracture) and one of the following diseases, according to Isselée et al. (27):

Systemic diseases (e.g., rheumatoid arthritis, fibromyalgia)

Neck complaints (e.g., limited motion, pain)

Neurologic disorders (e.g., trigeminal neuralgia)

Migraine or tension-type headache or hypertension

Less than 1 year postpartum

Use of drugs (e.g., alcohol abuse) or medications (e.g., antidepressant medication, oral contraceptives, exogenous hormone preparations)

Gynecologic disorders (e.g., endometriosis)

Current or recent (within the last 2 months) therapy for the complaints

2.2 Procedures

Initially, all patients underwent a complete medical/dental history and a clinical examination. For women in particular, a regular menstrual cycle was required as inclusion criterion. Subsequently, the subjects that met the selection criteria were examined by a calibrated examiner in strict accordance with the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (26) for both myofascial pain (i.e. Group Ia or Ib) and arthralgia or arthritis (Group IIIa or IIIb). Patients that met the selection criteria were conducted to the next step.

The subjects were instructed to keep a diary daily, consisting of: 1) a menstrual calendar; and 2) a visual analog scale (VAS). Women received a thermometer and a diary for 1 month. Subjects were instructed to begin the menstrual calendar on the 1st day of the next menstrual cycle, during three consecutive menstrual cycles, in order to establish length, cycle regularity and the occurrence of ovulation. They were instructed to return their diaries as soon they were filled in for each month, thus they were unable to compare their earlier ratings (28).

Subjects received a telephone call once a week from the study coordinator, to avoid any doubt related to diary completion. During this contact, the dates of the EMG signal recording were planned for the third month, based on the information about cycle starting day, the length of the cycle, and the day of ovulation, obtained after two consecutive months of keeping the diary.

The EMG signal of masseter and anterior temporal muscles was recorded in two phases of the menstrual cycle, according to Riley et al. (29): the menstrual phase (the second day of the menstrual cycle), and the pre-ovulatory phase (24-72 hours just before the increase in basal body temperature (BBT) due to onset of ovulation).

During the pre-ovulatory phase, the production of follicle stimulating hormones (FSH) promotes follicle maturation, which secretes estrogen. LH promotes the synthesis of androgens, which are then converted to estrogens by aromatase (30). During this phase,

estradiol gradually increases, peaking just before ovulation, followed by a peak in luteinizing hormone (LH) 10-12 hours before ovulation. BBT was used to approximate the time of ovulation. An increase in BBT of at least 0.2 ◦F, allowed retrospective confirmation of the pre-ovulatory phase. This method is reasonably well correlated with LH and FSH increases and elevated estrogen levels (31). The BBT criterion is also widely recommended by health organizations (e.g. Planned Parenthood).

After ovulation, the corpus luteum secretes estrogen and progesterone during the luteal phase. Progesterone levels rise after ovulation, and a secondary estradiol peak occurs at about the same time. The corpus luteum rapidly declines after ovulation, resulting in rapid drops in estrogen and progesterone, which reach their lowest levels at the start of the menstrual period (10). During this time, BBT usually decreases gradually (30).

BBT changes and the dates of the most recent menses/cycles were used to verify the phase during which the electromyography session actually occurred (32). If the subjects presented irregular menstrual cycles, or if they did not show minimal changes in oral temperature, they were considered "noncyclers" for the purpose of this study. In this case, the testing was discontinued, and the subjects were asked to complete an extra cycle of keeping diaries, in an attempt to obtain three ovulatory cycles for all subjects.

2.3 Diary

A diary consisted of: 1) a menstrual calendar; and 2) a visual analog scale (VAS). Subjects were instructed to keep a diary twice a day. Starting on the first day of the menstrual cycle, women were instructed to record their BBTs. The women measured their oral temperatures, within 3 minutes. They were instructed to take their temperatures on awakening (AM), while remaining prone, and before any major body movements. They recorded the temperature readings on their menstrual calendars, and recorded any comments regarding factors that may have influenced their temperatures (e.g., symptoms of illness, lack of sleep).

The second moment when the diary was kept was at night, just before bedtime. Patients used 10 cm visual analog scales (VAS) during three menstrual cycles, and on the day the EMG activity was recorded. In both cases, subjects were instructed to draw a vertical mark at the appropriate position on the VAS to indicate the pain intensity relative to day-to-day experience. Patients were asked to report their myofascial TMD pain as

‘worst pain today’, anchored with the terms such as, ‘no pain’ and ‘pain as bad as could be’.

Subjects were asked to refrain from taking any analgesic drug before rating their pain, and on study visit days. If they used analgesic drugs, they were asked to do their ratings eight hours after they had taken the medicine.

At the end of the study, the patients were followed up with treatment of their symptoms.

2.4 EMG recording

The EMG recordings took place in 2 sessions in each woman: menstrual phase and pre-ovulatory phase; and in 1 session in each man. Initially, the subjects rated their pain intensity relative to day-to-day experience, once at the beginning of each session, using a VAS.

The subject sat upright on a chair, in a comfortable and natural position, with the back and head unsupported. He/she was asked to relax the jaw as much as possible, and keep the lips together with the teeth apart during the 30-s EMG recording (postural rest position).

Before the electrodes were placed, the skin was carefully cleansed with 99.5% alcohol to reduce electrode impedance. Testing was performed in a quiet and comfortable environment.

Surface EMG was recorded bilaterally from the superficial masseter and anterior temporal muscles during the following activities: 1) at the mandibular rest position, when the subject was asked to keep his/her jaw at rest position for 10 s; 2) An adequate verbal command instructed individuals to clench the *Parafilm* “M” (Chicago, IL) at the maximal voluntary clenching (MVC), between the first and second molar bilaterally, as hard as possible for 05 s.

The rest and isometric activities were recorded three times with 2-min rests between MVC, in order to establish a mean between EMG recordings. The subjects were constantly supervised during these positions and verbally encouraged to achieve the maximal jaw clenching during the MVC. The EMG activity during isometric contraction was recorded in order to provide data for the normalization procedure.

Electrodes were positioned on the surface of the skin on the muscle bellies perpendicular to the muscle fibers. For the masseter muscle, the belly was palpated during clenching, and the electrodes were fixed to the fibers 2.5 cm above the mandibular angle to avoid influence from the end-plate location (33); for the anterior temporal muscle, the belly was palpated during clenching, and the electrodes were fixed along the anterior margin of the muscle two cm above the zygomatic arch (34).

The purpose of this test is to quantify the amount of electrical activity generated by masseter and anterior temporal muscles when they are at rest. Surface EMG recording made using active single differential surface electrodes (Lynx Electronic Technology Ltda., São Paulo, SP, Brazil), with a contact diameter 10x2 mm, parallel bars of pure silver 10 mm apart, gain of 100 x, input impedance of 10 GΩ and common mode of rejection ratio - CMRR of 130 dB. The electrodes were fixed with double-sided adhesive tapes. A plate ground electrode was secured to the sternal region. The signals were amplified and conditioned using Myosystem Br-1 equipment (Myosystem Br-1 equipment, DataHominis Tecnologia Ltda, Uberlândia MG, Brazil), with a gain of 200, band pass filtering from 20 Hz to 500 Hz, and sampled using a 12 Bit A/D converter board set to a 4KHz sampling frequency. This equipment is in accordance with the international standardization (35).

The data were analyzed in the EMG amplitude domain. The Root Mean Square (RMS) values were calculated by the Myosystem Br-1 software. The absolute EMG signal amplitude values (expressed in μV) were normalized with respect to the values obtained in the isometric contraction in order to account for possible differences in electrode repositioning and to make reliable comparisons across subjects (36), (37).

$$\text{Normalized RMS value} = \frac{\text{RMS Act}}{\text{RMS Max}} \times 100,$$

Where RMS Act is the amplitude recorded during the activity of interest and RMS Max is the amplitude recorded during isometric contraction.

3. Statistical analysis

Data were analyzed by descriptive statistical method. One way ANOVA and Tukey test as *post-hoc* were used to compare differences in EMG at rest among groups, considering the stages of menstrual cycle and sex. The normality of the distributions was

assessed by the Shapiro-Wilk *W*-test, showing that electromyography data were not normally distributed in the menstrual and pre-ovulatory phases of the menstrual cycle.

In order to verify the repeated measures of myofascial pain group, the results were analyzed statistically by the multivariate analysis of variance (MANOVA). All values are given as mean ± standard error of the mean (SEM). The level of significance was set at 5% (p<0.05).

4. Results

4.1. *EMG activity in subjects with TMD*

The influence of TMD was clearly observed in men's EMG recording at rest of the left anterior temporal and left masseter muscles. There was higher EMG activity in the left anterior temporal and left masseter muscles in the men's TMD group, as compared with men's control group (p<0.05, ANOVA + Tukey, fig 1A and 2A).

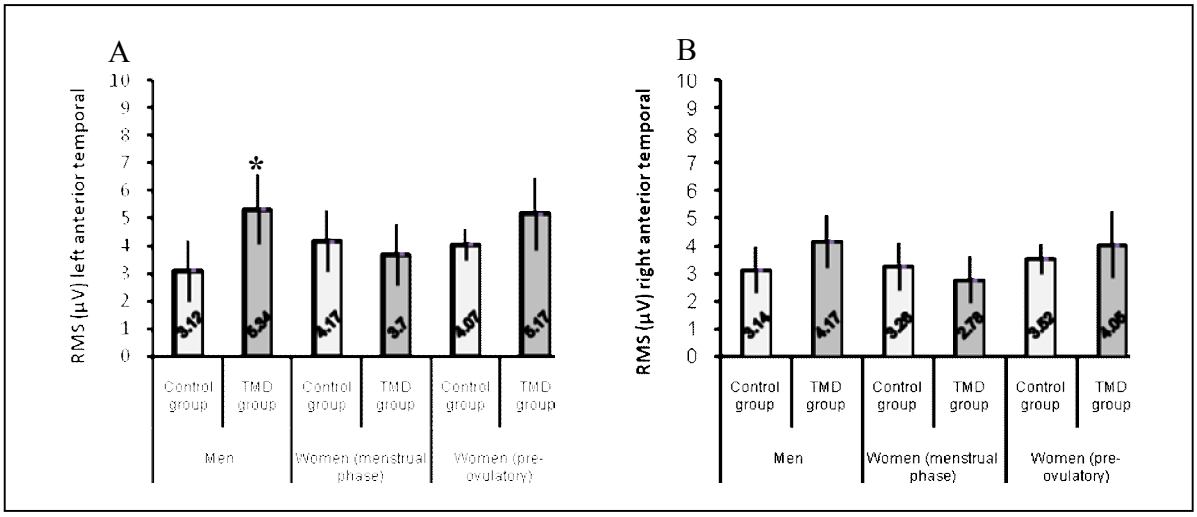

Fig.1 A,B. The RMS values of mean surface EMG and the 95% confidence intervals of left and right anterior temporal muscle. Each column represents the mean. Error bars indicate the SEM. A single asterisk indicates significant differences between real mean within the same sex (men's TMD and control group) (p <0.05) in left anterior temporal muscle (fig 1A).

There were no statistically significant differences in the EMG activity of masticatory muscles between women with and without TMD (p>0.05, ANOVA + Tukey, fig 1 and 2).

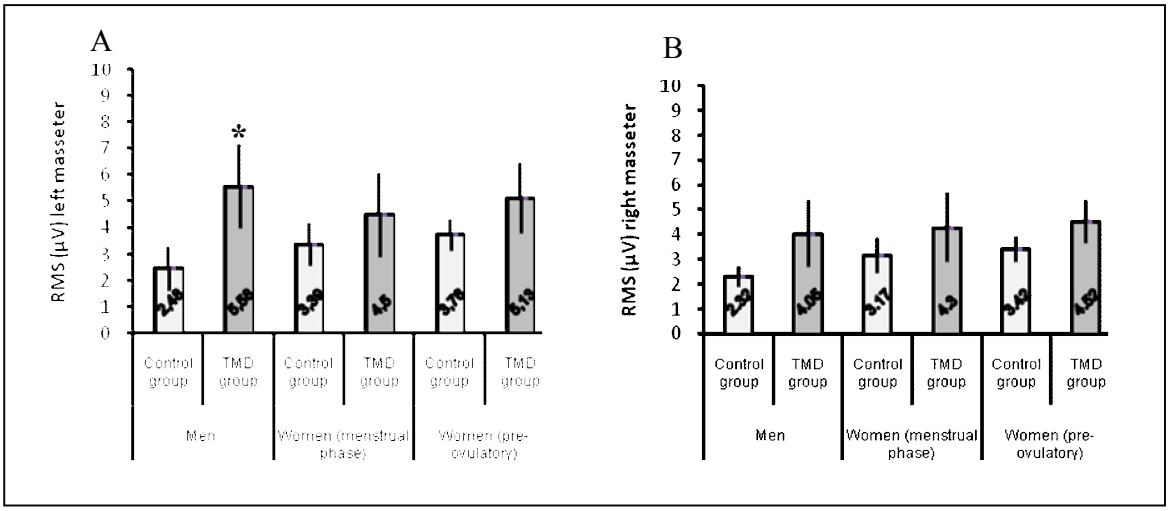

Fig. 2A, B. The RMS values of mean surface EMG and the 95% confidence intervals of left and right masseter muscles. Each column represents the mean. Error bars indicate the SEM. A single asterisk indicates significant differences between men's TMD and control group ($p < 0.05$).

4.2. *Pain sensitivity in TMD women at different phases of menstrual cycle*

In order to determine whether there was any effect of the two different phases of the menstrual cycle - menstrual and pre-ovulatory phases - on pain sensitivity, the VAS scores were measured during each session of EMG recording in both phases. Statistical analysis was performed using the repeated-measures analysis of variance (ANOVA). Data are represented as mean ± SEM. Comparisons between the mean intensity of spontaneous pain were (4.04 ± 0.51; n=30) in the menstrual phase, and (3.72 ± 0.57; n=30) in the pre-ovulatory phase. These data showed no significant differences ($p > 0.05$; Fig. 3.A).

The effect of three menstrual cycles on pain sensitivity was assessed using a multivariate analysis of variance (MANOVA) for each of the four dependant variables (menstrual, follicular, pre-ovulatory and luteal phase).The VAS score of the mean intensity of spontaneous pain were (4.92cm ± 2.18; n=30) in the menstrual phase, (3.57cm ± 2.24; n=30) in the follicular phase, (2.71 ± 2.57; n=30) pre-ovulatory, and (3.78 ± 2.12; n=30) in the luteal phase. Pain intensity was significantly higher ($p<0.01$) in menstrual phase compared with all of the other phases of the menstrual cycle (Fig. 3B).

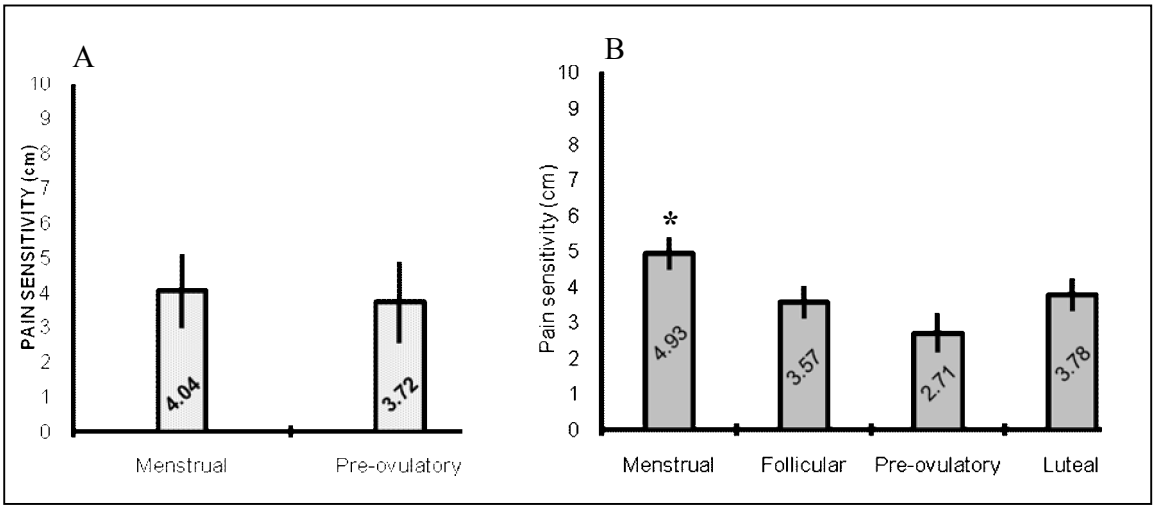

Fig. 3 A,B. The VAS scores of myofascial pain, measured during each session of EMG recording, and the 95% confidence intervals of women in menstrual and pre-ovulatory phases (fig 3A).The VAS scores of spontaneous myofascial pain intensity during three consecutive menstrual cycles, and the 95% confidence intervals of menstrual cycle phase. Each column represents the mean. Error bars indicate the SEM. A single asterisk indicates significant differences between phases of the menstrual cycle in women's TMD group ($p < 0.05$) (fig 3B).

5. Discussion

For a long time EMG activity in painful musculoskeletal disorders has caused much speculation (38). Several studies of TMD patients have found an increase in electromyographic (EMG) activity at rest in the masticatory muscle (39), (40), (41); and (42), (43) and review by Svensson & Graven-Nielsen (11), (2). Some of these studies have measured EMG activity directly in response to deep injection of hypertonic saline in humans (44), (45), (46) and the injection of algesic substances into deep craniofacial tissues (47), (48), (49) in rat jaw muscles. However, it should not necessarily be taken as direct evidence that masticatory muscle pain is associated with so-called muscle "hyperactivity"(50). The great majority of the EMG activity studies suffered from problems of experimental design. One of the most serious problems is that the two sets of EMG data of men and women groups are interpreted together. It is known that sex has significant effects on the level of resting EMG activity (51), (52). Thus, it is of questionable value to

put both sexes together in the same group analysis. This situation has been clarified by researches in which patient and control groups are assessed separately for males and females, as is the case in this study. Here, we observed that muscle activity differed between pain and non-pain patients only in the men's group. There were no significant differences in EMG activity of masticatory muscles between women with and without TMD. These findings confirm the importance of allocating the male and female sexes into different groups.

According to RDC/TMD (Axis I), in the men's group, ten patients (43.5%) reported the presence of pain on the left side of the face, seven patients (30.5%) described pain on the right side, and six (26%) on both sides of the face. The pain was more prevalent on the left side, and this could explain the EMG differences recorded only in the left masticatory muscles (anterior temporal and masseter). The absence of EMG alterations in women with TMD indicates that the pain-induced changes in motor control strategies could differ in men and women. The recognition of a relationship between sexes and pain is not new, but it has recently become a topic of considerable scientific interest. The most obvious and frequently noted distinction between females and males offered as an explanation for sex-related influences on pain involves the contribution of gonadal hormones. Evidence from animal experiments supports a role for estrogen in central pain pathways and several studies have shown differences in the pain neurotransmission and pain modulation systems of male and female rodents (53), (50), (54).

Sex is a biological factor that influences information provided by EMG (23). According to (43), the mean resting activity was lower among men than among women, showing a possible effect of sex-differences in EMG activity at rest. However, this study was also inconclusive because the sample was small, the patients aged between 13-53 years, and the data of male and female subjects were analyzed as a whole, and not allocated into gender groups. In the present study, there were no statistical differences between men and women without TMD. In TMD patients, sex differences in pain modulation and perception are important factors to be considered in order to interpret the relation between EMG activity and pain.

It was demonstrated that the levels of the natural course of related myofascial pain could fluctuate with phases of the menstrual cycle, as has been reported in other

studies in symptom-free subjects (27), (5). As was noted in the present study, pain sensitivity is highest in the menstrual and luteal phases (times of low or fluctuating endogenous estrogen), and lowest in the follicular and pre-ovulatory phases (times when estrogen increases gradually, and peaks in the days before ovulation). As shown in Fig 3, myofascial pain was significantly higher in the menstrual phase than in all of the other phases of the cycle. Animal models suggest a role for female reproductive hormones in both nociceptive and pain modulatory systems. Estradiol has been found to play a critical role in the pain modulation system of female mice (55) and administration of estradiol and progesterone to mimic the hormonal milieu of pregnancy in rats produces analgesia that is modulated through the spinal cord kappa-opiate receptor analgesic system (56). Arthuri et al. (57) demonstrated that the increase in the sex hormone levels, as result of pregnancy, induces a reduction of nociceptive behavioral responses to the TMJ formalin test in rats. As noted by LeResche et al. (6), the improvements of signs and symptoms of TMD are due to the marked sex hormone changes during pregnancy. Specifically in human research, temporomandibular pain, migraine and possibly tension-type headache appear to be more likely to occur or to be more intense at times of low or rapidly fluctuating estrogen (10).

The highest pain levels occurred at times of low estrogen (during the menstrual phase), and at times of rapid estrogen changes (5); and the lowest pain occurred at times of highest estrogen (pre-ovulatory phase). Thus, the authors hoped to encounter an increase in EMG activity in the menstrual phase. The unexpected result with regard to the absence of EMG changes in women with TMD could be attributed to the levels of pain sensitivity on the examination day, since similar results were observed when VAS was measured just before each session of EMG in women in the menstrual and pre-ovulatory phases. It seems that EMG recordings were unable to detect chronic-pain conditions in women with TMD and it raises a question: Is EMG recording an important tool to assess myofascial pain in TMD patients? Thus, the present study was not correlated with the “vicious cycle” theory (58), which proposed a mutually reinforcing relationship between chronic pain and muscle hyperactivity.

Limitations of the study

The present study results showed no effect of myofascial pain on EMG activity when VAS was measured just before each session of EMG, between the pre-ovulatory and menstrual phases. Perhaps traits could differ as a function of the day of the female's reproductive cycle. There could be large inter-and intra-individual variations in the exact timing of menstrual events and the concentrations of hormones, at the various stages (59). The EMG recording was assessed in the women's third menstrual cycle, and the VAS was assessed during the entire three menstrual cycles. The length of the luteal phase is relatively fixed at approximately 13-15 days, and the variations in cycle length largely reflect variation in the length of the follicular phase, and the timing of ovulation will vary accordingly. Hence, there was no guarantee that the same concentrations of ovarian hormones were present in the pre-ovulatory phase in the three consecutive menstrual cycles; because the criterion used to predict the pre-ovulatory phase was a change in basal body temperature, which has a large inter-individual difference in the hormone concentrations attained at each stage. Perhaps it would be necessary to monitor two or more cycles to derive a reliable estimate, instead of only one menstrual cycle.

This study was important because it is among the first of such reports examining phase-related effects on EMG activity in women with TMD and pain-free controls. With regard to the present study findings, it seems that small changes in the EMG activity of myofascial TMD patients could be a normal protective adaptation in men, and it is not one of the causes of the pain. While a role for sex hormones in modulating pain and muscle activity in women remains to be confirmed, the present study data suggest that this is a topic that deserves further investigation.

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References

1. Dworkin SF, Huggins KH, LeResche L, Von Korff M, Howard J, Truelove E, et al. Epidemiology of signs and symptoms in temporomandibular disorders: clinical signs in cases and controls. J Am Dent Assoc 1990;120:273-281.
2. Bodere C, Tea SH, Giroux-Metges MA, Woda A. Activity of masticatory muscles in subjects with different orofacial pain conditions. Pain 2005;116:33-41.
3. LeResche L, Saunders K, Von Korff MR, Barlow W, Dworkin SF. Use of exogenous hormones and risk of temporomandibular disorder pain. Pain 1997;69:153-160.
4. Dao TT, Knight K, Ton-That V. Modulation of myofascial pain by the reproductive hormones: a preliminary report. J Prosthet Dent 1998;79:663-670.
5. LeResche L, Mancl L, Sherman JJ, Gandara B, Dworkin SF. Changes in temporomandibular pain and other symptoms across the menstrual cycle. Pain 2003;106:253-261.
6. LeResche L, Sherman JJ, Huggins K, Saunders K, Mancl LA, Lentz G, et al. Musculoskeletal orofacial pain and other signs and symptoms of temporomandibular disorders during pregnancy: a prospective study. J Orofac Pain 2005;19:193-201.
7. Johannes CB, Linet MS, Stewart WF, Celentano DD, Lipton RB, Szklo M. Relationship of headache to phase of the menstrual cycle among young women: a daily diary study. Neurology 1995;45:1076-1082.
8. Waters WE, O'Connor PJ. Epidemiology of headache and migraine in women. J Neurol Neurosurg Psychiatry 1971;34:148-153.
9. Kappius RE, Goolkasian P. Group and menstrual phase effect in reported headaches among college students. Headache 1987;27:491-494.
10. Sherman JJ, Leresche L. Does experimental pain response vary across the menstrual cycle? A methodological review. Am J Physiol Regul Integr Comp Physiol 2006;291:R245-256.
11. Svensson P, Graven-Nielsen T. Craniofacial muscle pain: review of mechanisms and clinical manifestations. J Orofac Pain 2001;15:117-145.
12. Katz JO, Rugh JD, Hatch JP, Langlais RP, Terezhalmy GT, Borcherding SH. Effect of experimental stress on masseter and temporalis muscle activity in human subjects with temporomandibular disorders. Arch Oral Biol 1989;34:393-398.
13. Majewski RF, Gale EN. Electromyographic activity of anterior temporal area pain patients and non-pain subjects. J Dent Res 1984;63:1228-1231.
14. Sherman RA. Relationships between jaw pain and jaw muscle contraction level: underlying factors and treatment effectiveness. J Prosthet Dent 1985;54:114-118.
15. Flor H, Birbaumer N, Schulte W, Roos R. Stress-related electromyographic responses in patients with chronic temporomandibular pain. Pain 1991;46:145-152.
16. Carlson CR, Okeson JP, Falace DA, Nitz AJ, Curran SL, Anderson D. Comparison of psychologic and physiologic functioning between patients with masticatory muscle pain and matched controls. J Orofac Pain 1993;7:15-22.
17. Mercuri LG, Olson RE, Laskin DM. The specificity of response to experimental stress in patients with myofascial pain dysfunction syndrome. J Dent Res 1979;58:1866-1871.

18. Shi CS, Wang HY. Postural and maximum activity in elevators during mandible pre- and post-occlusal splint treatment of temporomandibular joint disturbance syndrome. J Oral Rehabil 1989;16:155-161.
19. Liu ZJ, Yamagata K, Kasahara Y, Ito G. Electromyographic examination of jaw muscles in relation to symptoms and occlusion of patients with temporomandibular joint disorders. J Oral Rehabil 1999;26:33-47.
20. Paesani DA, Tallents RH, Murphy WC, Hatala MP, Proskin HM. Evaluation of the reproducibility of rest activity of the anterior temporal and masseter muscles in asymptomatic and symptomatic temporomandibular subjects. J Orofac Pain 1994;8:402-406.
21. Intrieri RC, Jones GE, Alcorn JD. Masseter muscle hyperactivity and myofascial pain dysfunction syndrome: a relationship under stress. J Behav Med 1994;17:479-500.
22. Lund JP, Widmer CG. Evaluation of the use of surface electromyography in the diagnosis, documentation, and treatment of dental patients. J Craniomandib Disord 1989;3:125-137.
23. Klasser GD, Okeson JP. The clinical usefulness of surface electromyography in the diagnosis and treatment of temporomandibular disorders. J Am Dent Assoc 2006;137:763-771.
24. Hapidou EG, Rollman GB. Menstrual cycle modulation of tender points. Pain 1998;77:151-161.
25. Sherman JJ, LeResche L, Mancl LA, Huggins K, Sage JC, Dworkin SF. Cyclic effects on experimental pain response in women with temporomandibular disorders. J Orofac Pain 2005;19:133-143.
26. Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord 1992;6:301-355.
27. Isselee H, De Laat A, De Mot B, Lysens R. Pressure-pain threshold variation in temporomandibular disorder myalgia over the course of the menstrual cycle. J Orofac Pain 2002;16:105-117.
28. Hellstrom B, Anderberg UM. Pain perception across the menstrual cycle phases in women with chronic pain. Percept Mot Skills 2003;96:201-211.
29. Riley JL, 3rd, Robinson ME, Wise EA, Price DD. A meta-analytic review of pain perception across the menstrual cycle. Pain 1999;81:225-235.
30. Beaudoin J, Marrocco R. Attentional validity effect across the human menstrual cycle varies with basal temperature changes. Behav Brain Res 2005;158:23-29.
31. de Mouzon J, Testart J, Lefevre B, Pouly JL, Frydman R. Time relationships between basal body temperature and ovulation or plasma progestins. Fertil Steril 1984;41:254-259.
32. Tassorelli C, Sandrini G, Cecchini AP, Nappi RE, Sances G, Martignoni E. Changes in nociceptive flexion reflex threshold across the menstrual cycle in healthy women. Psychosom Med 2002;64:621-626.
33. Iwasaki S, Tokunaga T, Baba S, Tanaka M, Kawazoe T. Noninvasive estimation of the location of the end plate in the human masseter muscle using surface electromyograms with an electrode array. J Osaka Dent Univ 1990;24:135-140.
34. Tokunaga T, Baba S, Tanaka M, Kashiwagi K, Kimura K, Kawazoe T. Two-dimensional configuration of the myoneural junctions of human masticatory muscle detected with matrix electrode. J Oral Rehabil 1998;25:329-334.

35. Merletti R. Standards for Reporting EMG data. J Electromyogr Kinesiol 1999;9:III-IV.
36. McLean L, Chislett M, Keith M, Murphy M, Walton P. The effect of head position, electrode site, movement and smoothing window in the determination of a reliable maximum voluntary activation of the upper trapezius muscle. J Electromyogr Kinesiol, 2003:169-180.
37. Ge HY, Arendt-Nielsen L, Farina D, Madeleine P. Gender-specific differences in electromyographic changes and perceived pain induced by experimental muscle pain during sustained contractions of the upper trapezius muscle. Muscle Nerve 2005;32:726-733.
38. Stohler CS. Craniofacial pain and motor function: pathogenesis, clinical correlates, and implications. Crit Rev Oral Biol Med 1999;10:504-518.
39. Lous I, Sheik-Ol-Eslam A, Moller E. Postural activity in subjects with functional disorders of the chewing apparatus. Scand J Dent Res 1970;78:404-410.
40. Dahlstrom L, Carlsson SG, Gale EN, Jansson TG. Stress-induced muscular activity in mandibular dysfunction: effects of biofeedback training. J Behav Med 1985;8:191-200.
41. Rugh JD, Montgomery GT. Physiological reactions of patients with TM disorders vs symptom-free controls on a physical stress task. J Craniomandib Disord 1987;1:243-250.
42. Burdette BH, Gale EN. The effects of treatment on masticatory muscle activity and mandibular posture in myofascial pain-dysfunction patients. J Dent Res 1988;67:1126-1130.
43. Pinho JC, Caldas FM, Mora MJ, Santana-Penin U. Electromyographic activity in patients with temporomandibular disorders. J Oral Rehabil 2000;27:985-990.
44. Graven-Nielsen T, Svensson P, Arendt-Nielsen L. Effects of experimental muscle pain on muscle activity and co-ordination during static and dynamic motor function. Electroencephalogr Clin Neurophysiol 1997;105:156-164.
45. Svensson P, Graven-Nielsen T, Matre D, Arendt-Nielsen L. Experimental muscle pain does not cause long-lasting increases in resting electromyographic activity. Muscle Nerve 1998;21:1382-1389.
46. Ashton-Miller JA, McGlashen KM, Herzenberg JE, Stohler CS. Cervical muscle myoelectric response to acute experimental sternocleidomastoid pain. Spine 1990;15:1006-1012.
47. Yu XM, Sessle BJ, Vernon H, Hu JW. Effects of inflammatory irritant application to the rat temporomandibular joint on jaw and neck muscle activity. Pain 1995;60:143-149.
48. Yu XM, Sessle BJ, Haas DA, Izzo A, Vernon H, Hu JW. Involvement of NMDA receptor mechanisms in jaw electromyographic activity and plasma extravasation induced by inflammatory irritant application to temporomandibular joint region of rats. Pain 1996;68:169-178.
49. Bakke M, Hu JW, Sessle BJ. Involvement of NK-1 and NK-2 tachykinin receptor mechanisms in jaw muscle activity reflexly evoked by inflammatory irritant application to the rat temporomandibular joint. Pain 1998;75:219-227.
50. Sessle BJ. Peripheral and central mechanisms of orofacial pain and their clinical correlates. Minerva Anestesiol 2005;71:117-136.
51. Carlson KE, Alston W, Feldman DJ. Electromyographic Study of Aging in Skeletal Muscle. Am J Phys Med 1964;43:141-145.
52. Visser SL, de Rijke W. Influence of sex and age on EMG contraction pattern. Eur Neurol 1974;12:229-235.

53. Kunz M, Gruber A, Lautenbacher S. Sex differences in facial encoding of pain. J Pain 2006;7:915-928.
54. Sarlani E, Greenspan JD. Why look in the brain for answers to temporomandibular disorder pain? Cells Tissues Organs 2005;180:69-75.
55. Mogil JS, Sternberg WF, Kest B, Marek P, Liebeskind JC. Sex differences in the antagonism of swim stress-induced analgesia: effects of gonadectomy and estrogen replacement. Pain 1993;53:17-25.
56. Dawson-Basoa ME, Gintzler AR. Estrogen and progesterone activate spinal kappa-opiate receptor analgesic mechanisms. Pain 1996;64:608-615.
57. Arthuri MT, Gameiro GH, Tambeli CH, de Arruda Veiga MC. Peripheral effect of a kappa opioid receptor antagonist on nociception evoked by formalin injected in TMJ of pregnant rats. Life Sci 2005;76:1177-1188.
58. Travell J RS, Sherman M. . Pain and disability of shoulder and arm. Treatment by intramuscular infiltration with procaine hypochloride. J Am Med Assoc 1942;120:417-422.
59. Becker JB, Arnold AP, Berkley KJ, Blaustein JD, Eckel LA, Hampson E, et al. Strategies and methods for research on sex differences in brain and behavior. Endocrinology 2005;146:1650-1673.

Capítulo 2

Gender differences in emotional responses to myofascial pain

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Abstract

The objective of this study was to assess clinical characteristics of myofascial pain and arthralgia of temporomandibular disorders (TMD), based on Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) in terms of physical findings (Axis I) and psychological findings (Axis II) among women TMD group compared to control group and to men's TMD and control groups. Moreover, this study evaluated and compared the variations in the natural course of masticatory muscle pain in relation to phase of the menstrual cycle in normally cycling female TMD patients. TMD cases were 30 normally cycling women; and 23 men. Controls were 30 normally cycling women and 30 men, without TMD or other chronic pains. Subjects completed the RDC/TMD (Axis II), for Graded Chronic Pain Scale (GCPS), and measures of depression and nonspecific physical symptoms. Women experienced higher GCPS (40%), compared to men (17.39%) (Grades III and IV). The prevalence of moderately to severely graded depression in TMD patients is, higher in women (73.33%) than in men (47.83%); and women TMD patients, scored greater moderate and severe somatization items than men TMD patients. Myofascial pain was significantly higher in menstrual phase than in all of other phases of the cycle. Our results showed that TMD pain is frequently accompanied by psychological aspects. Mainly in TMD women, notably depression and somatization psychological aspects can be associated as well with major pain in women, in some phases of the menstrual cycle (menstrual and luteal phases).

Key-words: depression, somatization, temporomandibular disorders, gender

1. Introduction

Temporomandibular disorder (TMD) is the most common chronic orofacial pain condition (Dao & LeResche, 2000), and the musculoskeletal pain is the primary reason who persons seek care (LeResche *et al.,* 2005). TMD is considered a multifactorial disorder that results from physiological, behavioral and environmental factors. The prevalence, severity, and duration of TMD pain are greater in women than in men (Flake *et al.,* 2006). Moreover, inn the National Health and Nutrition Examination Survey, pain and psychologic factors like somatization and depressive symptoms tended to be more evident in women than in men (Mathias *et al.,* 1998).

The reasons for the higher prevalence of TMD and psychologic profiles in women are largely unknown (Cimino *et al.,* 2000). Hormonal and constitutional factors, along with psychosocial differences between sexes, have been claimed as possible factors involved in orofacial pain (Carlsson & LeResche, 1995; Rasmussen, 1993).

A number of aspects of the prevalence pattern of TMD disorder suggest that reproductive hormones may play a role in these pain conditions: the prevalence of TMD pain in boys and girls is low, and does not seem to differ prior to adolescence (2-4%) (see LeResche, 1997 for a review); however, prevalence rates are higher in women than in men; and prevalence rates peak during the reproductive years and decrease after menopause (Locher & Slade, 1988; Carlsson & LeResche, 1995; LeResche *et al,* 1997).

Some studies (Maixner *et al.,* 1995; Unruh, 1996; Berkley, 1997; Dao & LeResche, 2000; Sherman & LeResche, 2006) reviewed a large number of psychophysical researches (ie, researches of the relationship between the physical properties of a pain stimulus and the sensory and behavioral responses of the subject). They concluded that, overall, females exhibit greater sensibility to laboratory pain compared to males (Dao & LeResche, 2000). However, these findings are not always consistent across the studies. The sex-difference studies are influenced by some variables, as the type of stimulus employed in the experiments (Lautenbacher & Rollman, 1993); the timing characteristics of the stimulus (Lautenbacher and Rollman, 1993), the sex of the experimenter (Feine *et al.,* 1991), the menstrual phase, the reproductive status (Procacci, 1993), the motivational and nutritional factors (Dao & LeResche, 2000). It is possible that gender has an influence on these variables, while these, in turn, may be differently affected by various methods of pain

induction (Maixner *et al.,* 1995), since pain is a multidimensional experience with sensory and cognitive/emotional components.

Gender differences in pain have also been studied extensively in the laboratory, where standardized protocols allow control for some variables that can influence pain reports. Nevertheless, studies involving sexual differences, ovarian cycle and muscle pain, used noxious stimuli which are utilized frequently in the laboratory but occur rarely in day-to-day experience (Isselee *et al.,* 2002). Experimental pain is induced by acute conditions in humans and doesn't reflect the persistent or recurrent nature of usual pain experiences of chronic pain conditions. In these circumstances would be interesting to investigate if the natural course of reported muscle pain could fluctuate with phases of the menstrual cycle, in normally cycling women with TMD, and the specific pain-related emotions between sexes.

Therefore, the aims of the present study were: (1) to evaluate and to compare the variations in the natural course of masticatory muscle pain in relation to phase of the menstrual cycle in normally cycling female TMD patients; and (2) to test if TMD women would report higher levels of specific pain-related emotions compared to control group and to men's TMD group.

2. Methods

2.1 Subjects

The sample was obtained from patients who presented with TMD pain at Dental School of Piracicaba, University of Campinas, Brazil. One hundred thirteen subjects between the ages of 18 and 45 years (LeResche *et al*., 2003; Sherman *et al.,* 2005), participated in the study. The experimental group, or TMD group, was composed of 30 women and 23 men with Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (Dworkin & LeResche, 1992). The control group was composed of 30 women, and 30 men without TMD, who did not meet the selection criteria for TMD. All subjects gave informed consent to procedures approved by the Research Ethics Comittee of the School of Dentistry of Piracicaba – State University of Campinas.

The selection of the subjects was performed according to very strict inclusion and exclusion criteria, as noted below:

Inclusion Criteria. Subjects with TMD were required to have pain for at least 3 months and to meet Research Diagnostic Criteria for Temporomandibular Disorders(RDC/TMD) for both myofascial pain (category, Ia or Ib) and arthralgia (category IIIa) – subjects had both a masticatory muscle pain diagnosis and a TMJ pain diagnosis.
Female patients did not use oral contraceptives or hormone replacement therapy; and they had a regular menstrual cycle lasting between 26 and 33 days (Isselée *et al.,*(2002).

Exclusion Criteria. The following conditions were considered as exclusion criteria: Subjects presented signs or symptoms of disc displacement, arthritis and arthrosis of the temporomandibular joint (TMJ) (according to categories II and III of the RDC).
Subjects with more than 2 missing posterior teeth (excluding thirth molars) and those wearing removable dentures.
Subjects with a history of traumatic injuries (eg, contusion, fracture) and one of the following diseases, according to Isselée et al. (2002).

Systemic diseases (eg, rheumatoid arthritis, fibromyalgia)

Neck complaints (eg, limited motion, pain)

Neurologic disorders (eg, trigeminal neuralgia)

Migraine or tension-type headache or hypertension

Less than 1 year postpartum

Use of drugs (eg, alcohol abuse) or medications (eg, antidepressant medication, oral contraceptives, exogenous hormone preparations).

Gynecologic disorders (eg, endometriosis).

Current or recent (within the last 2 months) therapy for the complaints

The subjects were assigned to one of four groups:

1. Women not using oral contraceptives: 30 subjects with TMD muscle pain - TMD group.
2. Women not using oral contraceptives: 30 subjects without TMD - control group.
3. Men: 23 subjects with TMD muscle pain - TMD group.
4. Men: 30 subjects without TMD - control group.

2.2 Procedures

Initially, all patients underwent a complete medical/dental history and a clinical examination. In particular, for women, a regular menstrual cycle was required as inclusion criteria. Subsequently, the subjects meeting the selection criteria were examined by a calibrated examiner in strict accordance with the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (Dworkin & LeResche, 1992) for both myofascial pain (i.e. Group Ia or Ib) and arthralgia or arthritis (Group IIIa or IIIb). Patients, who meet the selection criteria, were conducted to the next step.

At the initial appointment, subjects completed the RDC/TMD Axis II self-reported measures (Dworkin & LeResche, 1992). These include the Graded Chronic Pain Scale (GCPS), and measures of depression and nonspecific physical symptoms.

The subjects were instructed fill in, daily; a diary, constituted by: 1) a menstrual calendar; and 2) a visual analog scale (VAS). Women received a thermometer and a diary for 1 month. Subjects were instructed to begin the menstrual calendar on day 1st of the next menstrual cycle, during three consecutive menstrual cycles, in order to establish length, cycle regularity and the occurrence of ovulation. They were instructed to return their diaries as soon as it was filled in for each month, thus they were not able to compare their earlier ratings (Hellström & Anderberg, 2003). Subjects were instructed to estimate the intensity of their pain each day during the menstrual cycle, in a diary. The menstrual cycle was divided into the following phases to Riley, *et al*. (1999): Menstrual phase, days 1-5; follicular phase, days 6-11; pre-ovulatory phase, days 12-16, and phase luteal, days 17-28. It is important to realize that there can be large inter-and intra-individual variations in the exact timing of menstrual events and the concentrations of hormones at the various stages (Becker *et al.,* 2004). Variability in cycle length reflects the variability in the length of the follicular phase, rather than luteal phase (Sherman & LeResche, 2006). During the typical menstrual cycle, serum concentrations of 17ß-estradiol range from 30–300 pg/ml (Chabbert *et al.,* 1998; Thorneycroft *et al.,* 1971), and peak concentrations are achieved directly before ovulation. Thus, based on the large inter-and-intra-individual variations in the timing of follicular phase, we use the basal body temperature (BBT) increases, to determine retrospectively the follicular, pre-ovulatory (24-72 hours) just prior to the increase of BBT due to onset of ovulation and luteal phases of the cycle.

Subjects received a telephone call once a week from the study coordinator, to avoid any doubt related to diary completion.

During the pre-ovulatory phase, the production of follicle stimulating hormones (FSH) promotes follicle maturation, which secretes estrogen. LH promotes the synthesis of androgens, which are then converted to estrogens by aromatase (Beaudoin & Marroco, 2005). During this phase, estradiol gradually increases, peaking just prior to ovulation, followed by a peak in luteinizing hormone (LH) 10-12 hours before ovulation. BBT was used to approximate the time of ovulation. The increase of BBT of at least 0.2 ◦F, allowed retrospective confirmation of pre-ovulatory phase. This method is reasonably well correlated with LH and FSH increases and elevated estrogen levels (DeMouzon *et al.,* 1984). The BBT criterion is also widely recommended by health organizations (e.g. Planned Parenthood).

After ovulation, the corpus luteum secretes estrogen and progesterone during the luteal phase. Progesterone levels rise after ovulation, and a secondary estradiol peak occurs at about the same time. The corpus luteum rapidly declines after ovulation, resulting in rapid drops in estrogen and progesterone, which reach their lowest levels at the start of the menstrual period (Sherman & LeResche, 2006). During this time, BBT usually decreases gradually (Beaudoin & Marroco, 2005).

BBT changes and the dates of the most recent menses/cycles were used to verify the phases during which the pain sensibility has occurred (Tassorelli *et al*., 2002). If the subject presented an irregular menstrual cycle, or if they not showing a minimal change in oral temperature, they were considered "noncyclers" for the purpose of this study. In this case, the testing was discontinued, and the subjects were asked to complete an extra cycle of diaries, in an attempt to obtain three ovulatory cycles for all subjects.

2.3. Measures

2.3.1 Diary

A diary was constituted for: 1) a menstrual calendar; and 2) a visual analog scale (VAS). Subjects were instructed to fill a diary twice a day. Starting the first day of the menstrual cycle, women were instructed to record their basal body temperature (BBT). Women measured her oral temperature, within 3 minutes. They were instructed to take measurements on awakening (AM), while remaining prone, and before any major body

movements. They recorded the temperature reading on a menstrual calendar, and recorded any comments regarding factors that may have influenced their temperatures (e.g., symptoms of illness, lack of sleep).

The second moment when the diary was filled, was at night, just before bedtime. Patients used 10 cm visual analog scales (VAS) during three menstrual cycles, and, on EMG activity record day. In both cases, subjects were instructed to draw a vertical mark at the appropriate position on the VAS to indicate the pain intensity relative to day-to-day experience. Patients were asked to report their myofascial TMD pain of worst pain today, anchored with the terms 'no pain' and 'pain as bad as could be'.

Subjects were asked to refrain from taking any analgesic drug before rating their pain, and on study visit days. If they use analgesic drugs, they were asked to do their ratings eight hours after they had taken the medicine.

At the end of the study, the patients were followed up with treatment of their symptoms.

2.3.2 RDC/TMD Axis II

Graded Chronic Pain Scale (GCPS), was used to assess facial pain intensity and interference with normal daily activities. There is a seven-item questionnaire for grading chronic pain severity (Questions 7-13). Characteristic pain intensity was calculated by averaging 0-to-10 ratings of current facial pain and average and worst facial pain in the past month (Von Korff *et al.,* 1992). Grade 0 identifies patients who do not report TMD pain, Grade I identifies patients reporting low pain intensity and low levels of TMD-pain related interference in usual psychosocial activities, although measures of psychological status (eg, depression and somatization) do not enter into the assessment of GCP; Grade II identifies patients reporting moderate-high levels of pain intensity (≥5 on a 0–10 scale) but low levels of pain-related activity interference. Patients characterized as Grade III (moderate interference) and Grade IV (high interference) show incrementally higher levels of psychosocial interference typically reflected as increased use of both health care and prescription medications (Dworkin *et al.,* 2002).

Psychologic status was assessed through the depression and nonspecific physical symptom scores adapted from Symptom Checklist 90 Revised (SCL-90-R)

(Derogatis, 1992). The SCL scale items appeared in the RDC history questionnaire, Question 20 as follows: Depression and vegetative symptom scale – items b, e, h, I, k, l, m, n, v, y, cc, dd, ee; and 'Additional items'(these are added to the depression scale) – items f, g, q, z, aa, bb, ff; Somatization Scale (non-specific physical symptoms) – items a*,c, d*,j*,o*,p*,r, s, t, u, w, x.

3. Statistical analysis

The clinical dates, pain intensity and severity and depression levels were obtained using the RDC/TMD questionnaire. The RDC/TMD tool was chosen because it contains methods for classifying diagnosis of TMD present in its axis I and also methods for evaluating the intensity and severity of the chronic pain and the levels of depression and somatization, present in its axis II (Tesch *et al.,* 2004). The RDC/TMD was translated into Portuguese and the author approved its back-translation. It is available on the website of the RDC/TMD international consortium whose web address is: http://rdcinternational.org.

The chi-square test was used to test for differences between groups on categorical measures. Statistical significance was set at $p < 0.05$.

In order to verify the repeated measures of myofascial pain group, the results were analyzed statistically by the repeated measures analysis of variance (MANOVA). All values are given as mean ± standard error of the mean (SEM). The level of significance was set at $p<0.05$.

4. Results

4.1 Chronic Pain Grade

The majority of female chronic pain (43.33%) presented with high pain but low disability (grade II); followed by 33.33% with high pain and disability (grade III); 16.67% presented with low pain and low disability (grade I); and 6.67% presented with severely limiting and high disability (grade IV) (Fig 1). Chi-square *p= 0.0001.* The majority of male chronic pain (43.48%) presented with high pain but low disability (grade II); followed by 39.13% with low pain and low disability (grade I); 13.04% with high pain and disability (grade III); and 4.35% with severely limiting and high disability (grade IV) (Fig 1). Chi-square *p= 0.0001.*

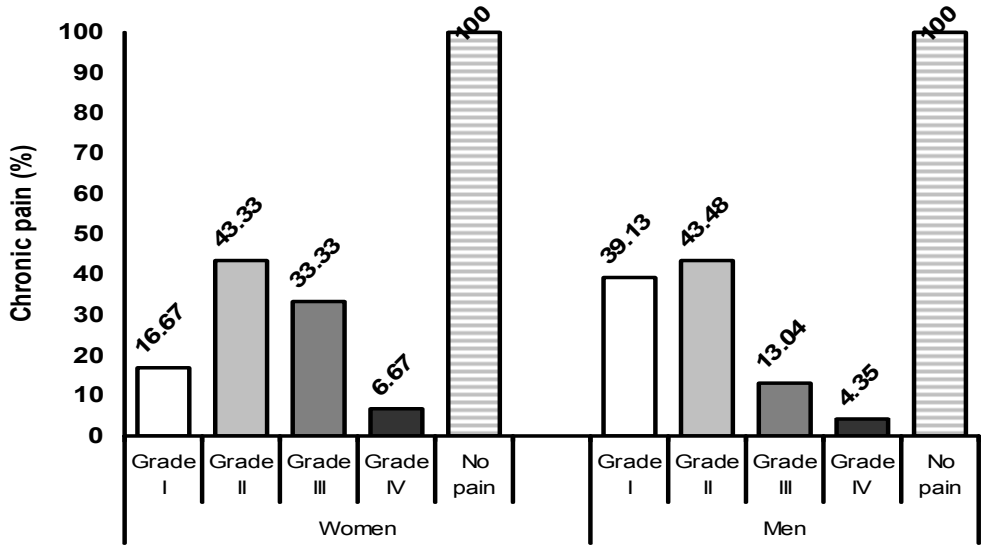

Fig 1. RDC/TMD Axis II graded chronic pain scale (GCP) percentage. Data taken from TMD patients (n = 53). Percentages of women from each group who scored in normal, moderate and severe ranges for each condition are shown.

4.2 Depression

Graphic 2 presents the women TMD group with women control group (Chi-square *p= 0.0010);* and men TMD group with men control group (Chi-square *p= 0.0094)*, distribution of depression score categories: normal, moderate or severe. As expected, women TMD group had less normal depression (26.67%) than controls (60%). The same occurred for men TMD patients (52.17%), compared to men's control group (80%). Women TMD group presented the same moderate graded depression, than women control group (40%). In spite of the little difference (1.74%), moderate graded depression is higher in men's TMD group (21.74%) compared with men's control group (20%). Women presented severe depression (33.33%), but no women control group, classified as severe. The same occurred for men's TMD group (26.09%).

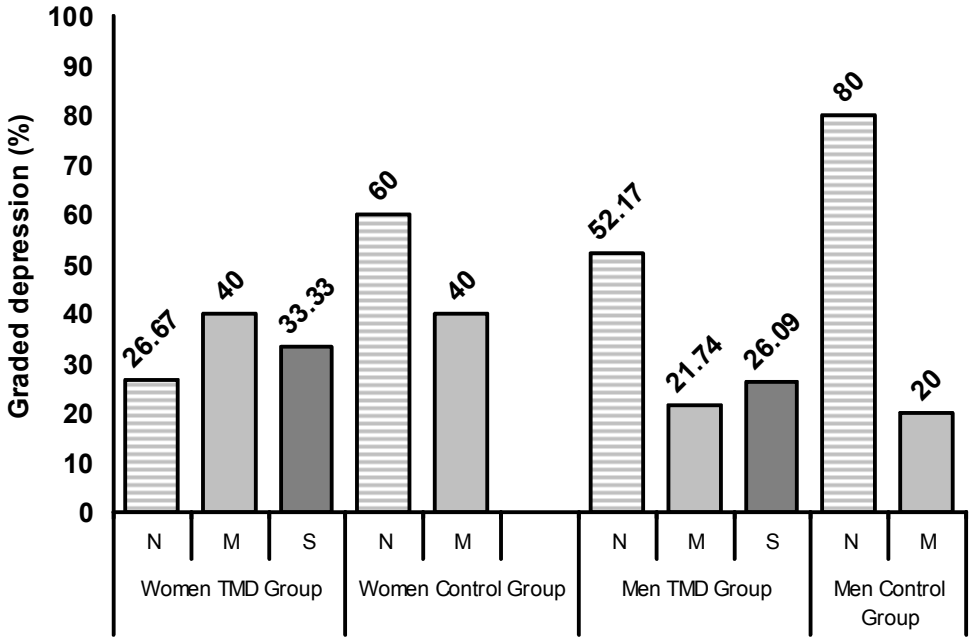

Fig 2. RDC/TMD Axis II graded depression percent. Data taken from TMD and control group (n = 113). N= normal; M= moderate; S= severe. Percentages of women and men from each group who scored in normal, moderate and severe ranges for each condition are shown.

4.3 Somatization

Axis II, also assesses somatization items related to pain, and nonspecific symptoms. Total somatization scores for women with and without pain can be classified as normal, moderate or severe. There was a statistically difference between women TMD group and control group (Chi-square *p= 0.0006*). Figure 3A, shows that TMD female somatization scores with pain, classified as normal presented with less scores (23.33%) than women's control group (60%); nevertheless, women TMD group somatization scores, classified as moderate (43.33%) presented with higher scores than women's control group (40%). Women presented severe somatization (33.33%), but no women control group, classified as severe. There was a statistically difference between men TMD group and control group (Chi-square *p=0.0009).*TMD male somatization scores with pain*)*, classified as normal presented with less scores (34.78%) than men's control group (80%); nevertheless, men TMD group somatization scores, classified as moderate (39.13%)

presented with higher scores than men's control group (20%). Men presented severe somatization (26.09%), but no men control group, classified as severe.

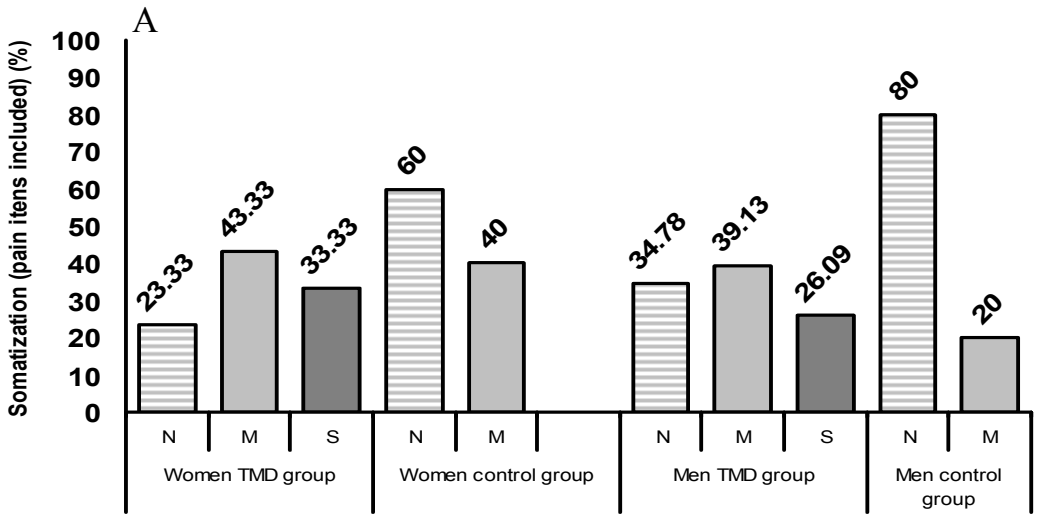

Fig. 3 A. RDC/TMD Axis II somatization scores for women and men with pain. Data taken from TMD patients (n = 113). N= normal; M= moderate; S= severe. Data taken from TMD patients (n = 53). Percentages of women from each group who scored in normal, moderate and severe ranges for each condition are shown.

Somatization items related to nonspecific symptoms. Total somatization scores for women with and without pain can be classified as normal, moderate or severe. There was a statistically difference between women TMD group and control group (Chi-square *p=0.0005*). Figure 3B, shows that TMD female somatization scores without pain, classified as normal presented with less scores (20%) than women's control group (43.33%); followed by women TMD group classified as moderate (33.33%) than women's control group (53.33%). Nevertheless, women TMD group somatization scores, classified as severe (46.67%) presented with higher scores than women's control group (3.33%). There was a statistically difference between men TMD group and control group (Chi-square *p=0.0015).* TMD male somatization scores without pain, classified as normal presented with less scores (26.09%) than men's control group (70%); nevertheless, men TMD group somatization scores, classified as moderate presented with higher scores (52.17%) than men's control group (30%). Men presented severe somatization (21.74%), but no men control group, classified as severe.

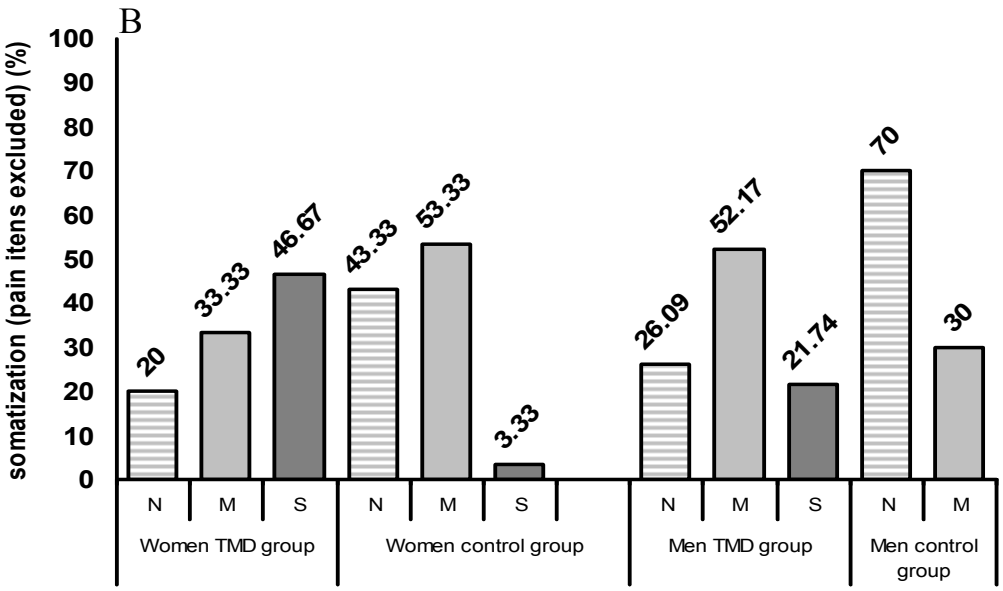

Fig. 3 B. RDC/TMD Axis II somatization scores for women and men without pain. Data taken from TMD patients (n = 113). N= normal; M= moderate; S= severe. Percentages of women from each group who scored in normal, moderate and severe ranges for each condition are shown.

4.4 Pain sensitivity in TMD women at different phases of menstrual cycle

The effect of three menstrual cycles on pain sensitivity was assessed using a two-way repeated-measures analysis of variance (ANOVA) for each of the four dependant variables (menstrual, follicular, pre-ovulatory and luteal phase).The VAS score of the mean intensity of spontaneous pain were (4.92cm ± 2.18; n=30) in the menstrual phase, (3.57cm ± 2.24; n=30) in the follicular phase, (2.71 ± 2.57; n=30) pre-ovulatory, and (3.78 ± 2.12; n=30) in the luteal phase. Pain intensity was significantly higher (p<0.01) in menstrual phase compared with all of other phases of the menstrual cycle (Fig. 4).

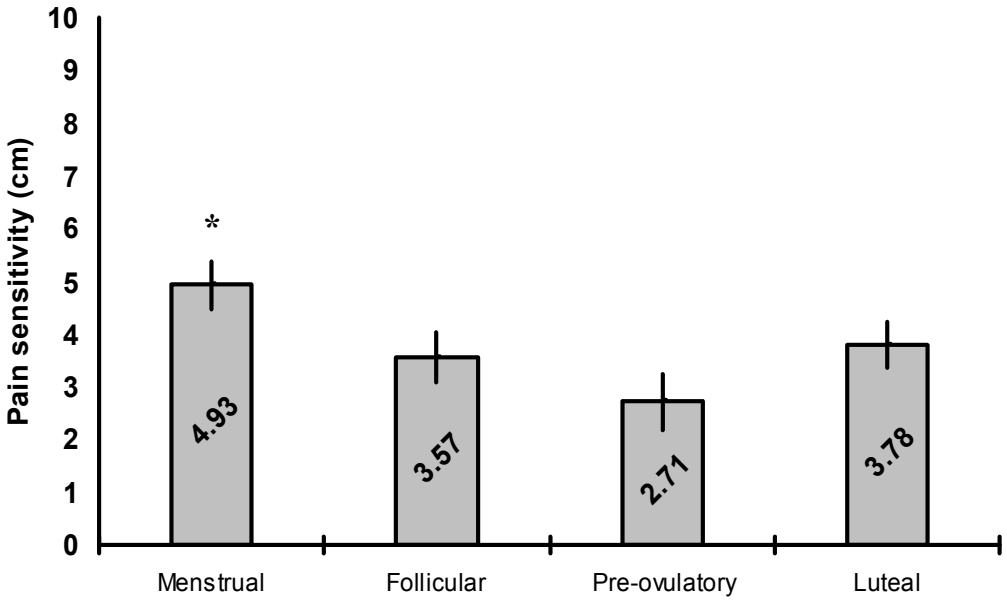

Fig 4.The VAS scores of spontaneous myofascial pain, measured during three consecutive menstrual cycles, and the 95% confidence intervals of women in menstrual and pre-ovulatory phase. Each column represents the mean. Error bars indicate the SEM. Single asterisk indicates significant differences between phases of the menstrual cycle in women's TMD group (p<0.05).

5. Discussion

Pain of the masticatory muscles (masticatory myalgia) is one of the most common symptoms in TMD patients (Simons, 1988; Dworkin *et al*., 1990). The etiology of myofascial pain is multifactorial (Al-Ani *et al.,* 2005). Psychological factors had been implicated in several aspects of masticatory pain and dysfunction problems (Yap *et al.,* 2001). First, psychological factors have been suggested to explain why some patients seem to be more bothered by TMD symptoms to others. Secondly, psychological conditions, such as depression and secondary pain have been implicated to explain why some female patients appear to be more likely to feel more myofascial pain than male patients (Rugh, 1995). It is essential that psychological conditions, if present, are identified early in the initial management of TMD, as failure to do so may result in treatment non-success and worsening of the patient's condition.

According to Riley *et al*. (2001), women would report higher levels of pain-related emotions and have greater associations between pain intensity, relative to men. Therefore, it is most likely that psychological factors are of importance in the development of chronic pain disorders (Hellström & Anderberg, 2003). In the current study, patients with coping strategies such as depression and somatization (figs 2, 3A and 3B) reported coping more often than patients who used conscious cognitive strategies. An interpretation of this could be that women who had pain and were more distressed had worse well-being than those with lower pain frequency (Hellström & Anderberg, 2003). Figure 1 shows statistically significant difference among the TMD groups. TMD women experienced low disability (Grade I - 16.67% or II – 43.33%), which corresponds to more than half (60%) of all women with myofascial pain, although much more TMD men (82.61%) presented with low disability. Nevertheless, women experienced high intensity myofascial pain (40%), compared to men (17.39%). These results showed a gender differences in pain related emotions most highly in TMD women, associated with pain intensity. It has been suggested that the female predisposition to pain-related emotions may be due to the effect of the reproductive hormones. It was demonstrated that the levels of the natural course of related myofascial pain could fluctuate with phases of the menstrual cycle, as has been reported in other studies in symptom-free subjects (Isselée *et al.,* 2002; LeResche *et al.,* 2003). As we noted, the pain sensitivity is highest in the menstrual and luteal phases (times of low or fluctuating endogenous estrogen), and lowest pain in follicular and pre-ovulatory phases (times which estrogen increases gradually, and peak in the days before ovulation). As shown in fig 2, myofascial pain was significantly higher in menstrual phase than in all of other phases of the cycle. The highest pain levels occurred at times of low estrogen (during menstrual phase), and at times of rapid estrogen changes (LeResche *et al.,* 2003); and the lowest pain occurred at times of highest estrogen (pre-ovulatory phase). Hormonal events have powerful psychologic consequences (Rollman & Lautenbacher, 2001). One study of the relation between pain reports and menopause (Bono et al., 1995) found that one third of post-menopausal woman who required medical help presented with musculoskeletal pains, which the authors attributed to ineffective coping strategies. Waxman and Zatzkis (1986), observing that fibromyalgia patients had a significantly earlier menopause than did nonpatients, suggested that estrogen deficits may affect sleep and mood, causing emotional

responses that are expressed as pain. These findings suggests that patient with graded chronic pain may play an important role in TMD pain problems. With such clarification will come improved understanding of variability in the experience of chronic pain and ultimately the ability to improve pain treatment strategies.

Chronic orofacial pain has a high degree of comorbidity with depression (Feinmann, 1999; Korszun, 1996; Vimpari *et al.,* 1995). Both depression and chronic orofacial pain show significant clinical overlap with other stress-related pain disorders such as fibromyalgia (Korszun *et al.,* 1998; Stohler, 1995), a disorder characterized by generalized myalgia. Several studies have found that patients with myofascial pain have greater depression than patients with TMJ pathologies (Yap *et al.,* 2003, Lindroth *et al.,* 2002; McCreary *et al.,* 1991). The frequent discovery of the concomitant presence of chronic orofacial pain and depression allow us to suggest an interaction between chronic myofascial pain, depression and gonadal hormones. About 73.33% of the female population examined in the present study was moderately (40%) to severely depressed (33.33%). The prevalence of graded depression in TMD patients is, higher in women than in men (47.83%), which may be related to the higher levels of myofascial pain, assessed in different phases of the menstrual cycle.

Somatization is the pattern of multiple recurring physical complaints, resulting in medical treatment seeking, that are not explained by physical conditions (American Psychiatric Association). Tender points as part of fibromyalgia have been found to be strongly associated with psychological distress as well as characteristics of somatization and its antecedents (McBeth *et al.,* 1999).

Both depression and somatization may contribute to development or maintenance of TMD and/or interfere with acceptance of and compliance with treatment (Rudy *et al.,* 1995). In addition, depression/somatization may be associated with self-report of jaw disability and pain as masticatory muscle is palpated during the course of three consecutive menstrual cycle. The frequency found for high somatization, showed a greater prevalence in women with moderate pain items included as compared with women with pain items excluded. Women TMD patients, scored greater moderate and severe somatization items than men, except for moderate somatization (with pain excluded items), which women presented (33.33%), compared with (52.17%) in men. In the current study,

the scores of patients with severe somatization were significantly greater than those who were normal, mainly in TMD women than men.

Our results showed that TMD pain is frequently accompanied by psychological aspects, notably depression and somatization, and can be associated as well with major pain in women, in some phases of the menstrual cycle (menstrual and luteal phases).

According to Kight *et al.,* 1999; Eversole *et al.,* 1985; Lundeen *et al.,* 1987, the muscle related TMD patients have shown a greater degree of concurrent psychopathology. In support of this theory, and based on our results, TMD myofascial pain, and sex ovarian hormones appear to be involved in this complex and reciprocal process of bio-psychosocial temporomandibular dysfunction.

REFERÊNCIAS BIBLIOGRÁFICAS*

Al-Ani Z, Gray RJ, Davies SJ, Sloan P, Glenny AM. Stabilization splint therapy for the treatment of temporomandibular myofascial pain: a systematic review. J Dent Educ. 2005 Nov;69(11):1242-50. Review.

American Psychiatric Association. Diagnostic and statistical manual of mental disorders.ed 4. Washington DC: American Psychiatric Press, 1994.

Beaudoin J, Marrocco R. Attentional validity effect across the human menstrual cycle varies with basal temperature changes. Behav Brain Res. 2005;158(1):23-9.

Becker JB, Arnold AP, Berkley KJ, Blaustein JD, Eckel LA, Hampson E, Herman JP, Marts S, Sadee W, Steiner M, Taylor J, Young E. Strategies and methods for research on sex differences in brain and behavior. Endocrinology. 2005 Apr;146(4):1650-73. Epub 2004 Dec 23. Review.

Berkley KJ. Sex differences in pain. Behav Brain Sci. 1997 Sep;20(3):371-80; discussion 435-513.

Carlsson GE, LeResche L. Epidemiology of TMD. In: Sessle BJ, Bryant PS, Dionne RA (eds). Temporomandibular Disorders and Related Pain Conditions. Seattle: IASP Press, 1995:211-226.

Chabbert Buffet N, Djakoure C, Maitre SC, Bouchard P . Regulation of the human menstrual cycle. 1998. Front Neuroendocrinol 19:151–186.

---

* De acordo com a norma da UNICAMP/FOP, baseada no modelo Vancouver.
Abreviatura dos periódicos em conformidade com o Medline.

Cimino R, Farella M, Michelotti A, Pugliese R, Martina R Does the ovarian cycle influence the pressure-pain threshold of the masticatory muscles in symptom-free women? J Orofac Pain. 2000 Spring;14(2):105-11.

Dao TT, LeResche L. Gender differences in pain. J Orofac Pain. 2000 Summer;14(3):169-84; discussion 184-95.

De Mouzon J, Testart J, Lefevre B, Pouly JL, Frydman R. Time relationships between basal body temperature and ovulation or plasma progestins. Fertil Steril 1984;41:254–9.

Derogatis LR: SCL-90-R: Adminstration, Scoring and Procedures Manual – II for the Revised Version. Clinical Psychometric Research, Towson, Md.

Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55. Review.

Dworkin SF, Huggins KH, LeResche L, Von Korff M, Howard J, Truelove E, et al.Epidemiology of signs and Symptoms in temporomandibular disorders: Clinical signs in cases and controls. J Am Dent Assoc 1990; 121: 11-23.

Dworkin SF, Sherman J, Mancl L, Ohrbach R, LeResche L, Truelove E. Reliability, validity, and clinical utility of the research diagnostic criteria for Temporomandibular Disorders Axis II Scales: depression, non-specific physical symptoms, and graded chronic pain. J Orofac Pain. 2002;16(3):207-20.

Dworkin SF, Turner JA, Mancl L, Wilson L, Massoth D, Huggins KH, LeResche L, Truelove E. A Randomized Clinical Trial of a Tailored Comprehensive Care Treatment Program for Temporomandibular Disorders. J Orofac Pain. 2002 Fall;16(4):259-76

Eversole LR, Stone CE, Matheson D, Kaplan H. Psychometric profiles and facial pain. Oral Surg Oral Med Oral Pathol. 1985;60:269–274.

Feine JS, Bushnell MC, Miron D, Duncan GH. Sex differences in the perception of noxious heat stimuli. Pain. 1991 Mar;44(3):255-62.

Feinmann C. The Mouth, the Face and the Mind. Oxford: Oxford University Press, 1999

Flake NM, Hermanstyne TO, Gold MS. Testosterone and estrogen have opposing actions on inflammation-induced plasma extravasation in the rat temporomandibular joint. Am J Physiol Regul Integr Comp Physiol. 2006 Aug;291(2):R343-8. Epub 2006 Feb 9.

Hellstrom B, Anderberg UM. Pain perception across the menstrual cycle phases in women with chronic pain. Percept Mot Skills. 2003 Feb;96(1):201-11.

Isselee H, De Laat A, De Mot B, Lysens R. Pressure-Pain Threshold Variation in Temporomandibular Disorder Myalgia over the Course of the Menstrual Cycle. J Orofac Pain. 2002 Spring;16(2):105-17.

Kight M, Gatchel RJ, Wesley L. Temporomandibular disorders: evidence for significant overlap with psychopathology. Health Psychol. 1999;18:177–182.

Korszun A, Hinderstein B, Wong M. Comorbidity of depression with chronic facial pain and temporomandibular disorders. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1996 Nov;82(5):496-500.

Korszun A, Papadopoulos E, Demitrack M, Engleberg C, Crofford L. The relationship between temporomandibular disorders and stress-associated syndromes. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1998 Oct;86(4):416-20

Lautenbacher S, Rollman GB. Sex differences in responsiveness to painful and non-painful stimuli are dependent upon the stimulation method. Pain. 1993 Jun;53(3):255-64

LeResche L, Saunders K, Von Korff MR, Barlow W, Dworkin SF. Use of exogenous hormones and risk of temporomandibular disorder pain. Pain. 1997;69(1-2):153-60.

LeResche L, Sherman JJ, Huggins K, Saunders K, Mancl LA, Lentz G, Dworkin SF. Musculoskeletal orofacial pain and other signs and symptoms of temporomandibular disorders during pregnancy: a prospective study. J Orofac Pain. 2005 Summer;19(3):193-201.

Lindroth JE, Schmidt JE, Carlson CR. A comparison between masticatory muscle pain patients and intracapsular pain patients on behavioral and psychosocial domains. J Orofac Pain. 2002 Fall;16(4):277-83

Locker D, Slade G. Prevalence of symptoms associated with temporomandibular disorders in a Canadian population. Community Dent Oral Epidemiol. 1988 Oct;16(5):310-3.

Lundeen TF, Sturdevant JR, George JM. Stress as a factor in muscle and temporomandibular joint pain. J Oral Rehabil. 1987;14:447–456.

McBeth J, Macfarlane GJ, Benjamin S, Morris S, Silman AJ. The association between tender points, psychological distress, and adverse childhood experiences: a community-based study. Arthritis Rheum. 1999 Jul;42(7):1397-404.

McCreary CP, Clark GT, Merril RL, Flack V, Oakley ME. Psychological distress and diagnostic subgroups of temporomandibular disorder patients. Pain. 1991 Jan;44(1):29-34.

Maixner W, Fillingim R, Booker D, Sigurdsson A. Sensitivity of patients with painful temporomandibular disorders to experimentally evoked pain. Pain. 1995 Dec;63(3):341-51.

Mathias JR, Clench MH, Abell TL, et al. Effect of leuprolide acetate in treatment of abdominal pain and nausea in premenopausal women with functional bowel disease: A double-blind, placebo-controlled, randomized study. Dig Dis Sci. 1998;43:1347-1355.

Procacci P. Chronobiological studies on pain threshold. Pain. 1993 Nov;55(2):277.

Rasmussen BK, Epidemiology. In: Olesen J, Tfelt-Hansen P, Welch DMA (eds). The Headache. New York: Raven Press, 1993:15-20.

Riley JL 3rd, Robinson ME, Wise EA, Price DD. A meta-analytic review of pain perception across the menstrual cycle. Pain. 1999; 81(3):225-35.

Rudy TE, Turk DC, Kubinski JA, Zaki HS. Differential treatment responses of TMD patients as a function of psychological characteristics. Pain. 1995 Apr;61(1):103-12.

Sherman JJ, Leresche L. Does experimental pain response vary across the menstrual cycle? A methodological review. Am J Physiol Regul Integr Comp Physiol. 2006 Aug;291(2):R245-56. Epub 2006 Feb 16. Review.

Sherman JJ, LeResche L, Mancl LA, Huggins K, Sage JC, Dworkin SF. Cyclic effects on experimental pain response in women with temporomandibular disorders. J Orofac Pain. 2005 Spring;19(2):133-43.

Simons DG. Myofascial pain syndromes of the head, neck and low back pain. In: Dubner R, Gebhart GF, Bond MR (eds). Proceedings from the Fifth World Congress on Pain. Amsterdam: Elsevier, 1988: 186-200.

Stohler CS. Craniofacial pain and motor function: pathogenesis, clinical correlates, and implications. Critical Reviews in Oral Biology & Medicine, Vol 10, 504-518, 1999.

Tassorelli C, Sandrini G, Cecchini AP, Nappi RE, Sances G, Martignoni E. Changes in nociceptive flexion reflex threshold across the menstrual cycle in healthy women. Psychosom Med. 2002;64(4):621-6.

Tesch RS, Denardin OV, Baptista CA, Dias FL. Depression levels in chronic orofacial pain patients: a pilot study. J Oral Rehabil. 2004 Oct;31(10):926-32.

Thorneycroft I, Mishell DJ, Stone S, Kharma K, Nakamura R. The relation of serum 17-hydroxyprogesterone and estradiol-17-ß levels during the human menstrual cycle. Am J Obstet Gyneco. 197, 1 111:947–951.

Unruh AM. Gender variations in clinical pain experience. Pain. 1996 May-Jun;65(2-3):123-67. Review.

Vimpari SS, Knuuttila ML, Sakki TK, Kivela SL. Depressive symptoms associated with symptoms of the temporomandibular joint pain and dysfunction syndrome. Psychosom Med. 1995 Sep-Oct;57(5):439-44.

Von Korff M, Ormel J, Keefe FJ, Dworkin SF. Grading the severity of chronic pain. Pain. 1992 Aug;50(2):133-49.

Yap AU, Tan KB, Hoe JK, Yap RH, Jaffar J. On-line computerized diagnosis of pain-related disability and psychological status of TMD patients: a pilot study. J Oral Rehabil. 2001 Jan;28(1):78-87.

Yap AU, Dworkin SF, Chua EK, List T, Tan KB, Tan HH. Prevalence of temporomandibular disorder subtypes, psychologic distress, and psychosocial dysfunction in Asian patients. J Orofac Pain. 2003 Winter;17(1):21-8.

Waxman J, Zatzkis SM. Fibromyalgia and menopause. Examination of the relationship. Postgrad Med. 1986 Sep 15;80(4):165-7, 170-1

CONCLUSÕES

De acordo com os resultados do presente trabalho, concluiu-se que:

(1) Os homens com DTM apresentaram maior atividade eletromiográfica nos músculos temporal anterior e masseter do lado esquerdo da face, onde a dor foi mais prevalente. Não houve alteração na atividade eletromiográfica dos músculos mastigatórios em mulheres com DTM, sugerindo que existam diferenças sexuais nas respostas motoras induzidas pela dor.

(2) As mulheres com DTM, apresentaram maior sensibilidade dolorosa nos períodos em que os hormônios ovarianos estavam mais baixos (fases menstrual e lútea), e menor sensibilidade dolorosa nos períodos em que os hormônios estavam mais altos (fases pré-ovulatória e folicular). Esses dados indicam que os hormônios ovarianos, podem modular a sensibilidade dolorosa em mulheres com DTM.

(3) Sugere-se que os registros eletromiográficos não foram capazes de correlacionar os relatos de dor crônica em mulheres com DTM.

(4) A dor por DTM, é freqüentemente acompanhada por aspectos psicológicos, tais como a depressão e somatização, principalmente em mulheres.

REFERÊNCIAS

Abubaker AO, Raslan WF, Sotereanos GC. Estrogen and progesterone receptors in temporomandibular joint discs of symptomatic and asymptomatic persons: a preliminary study. J Oral Maxillofac Surg. 1993;51(10):1096-100.

Arthuri MT, Gameiro GH, Tambeli CH, de Arruda Veiga MC. Peripheral effect of a kappa opioid receptor antagonist on nociception evoked by formalin injected in TMJ of pregnant rats. Life Sci. 2005;76(10):1177-88.

Bodere C, Tea SH, Giroux-Metges MA, Woda A. Activity of masticatory muscles in subjects with different orofacial pain conditions. Pain. 2005;116(1-2):33-41.

Beaudoin J, Marrocco R. Attentional validity effect across the human menstrual cycle varies with basal temperature changes. Behav Brain Res. 2005;158(1):23-9.

Campbell JH, Courey MS, Bourne P, Odziemiec C. Estrogen receptor analysis of human temporomandibular disc. J Oral Maxillofac Surg. 1993;51(10):1101-5.

Cairns BE, Gambarota G, Svensson P, Arendt-Nielsen L, Berde CB. Glutamate-induced sensitization of rat masseter muscle fibers. Neuroscience. 2002;109(2):389-99.

Cairns BE, Hu JW, Arendt-Nielsen L, Sessle BJ, Svensson P. Sex-related differences in human pain and rat afferent discharge evoked by injection of glutamate into the masseter muscle. J Neurophysiol. 2001;86(2):782-91.

---

* De acordo com a norma da UNICAMP/FOP, baseada no modelo Vancouver.
Abreviatura dos periódicos em conformidade com o Medline.

Cicero T.J., Nock B., O'Connor L., Meyer E.R. J. Role of Steroids in Sex Differences in Morphine-Induced Analgesia: Activational and Organizational Effects, Pharmacol Exp. Ther. 2202; 300 (2): 695-701.

Clemente JT, Parada CA, Veiga MC, Gear RW, Tambeli CH. Sexual dimorphism in the antinociception mediated by kappa opioid receptors in the rat temporomandibular joint. Neurosci Lett. 2004;372(3):250-5.

Dao TT, Knight K, Ton-That V. Modulation of myofascial pain by the reproductive hormones: A preliminary report. J Prosthet Dent. 1998; 79(6): 663-70.

Dao TT, LeResche L. Gender differences in pain. Orofac Pain. 2000;14(3):169-84;discussion184-95.

Dolan EA, Keefe FJ. Muscle activity in myofascial pain-dysfunction syndrome patients: a structured clinical evaluation. J Craniomandib Disord. 1988;2(2):101-5.

Dworkin SF, and LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications. J Craniomandibular Disord 1992; 6(4): 301-355.

Ervilha UF, Duarte M, Amadio AC. Estudo sobre procedimentos de normalização do sinal eletromiográfico durante o movimento humano. Revista Brasileira de Fisioterapia. 1998;3(1):15-20.

Fillingim RB, Maixner W, Girdler SS, Light KC, Harris MB, Sheps DS, Mason GA. Ischemic but not thermal pain sensitivity varies across the menstrual cycle. Psychosom Med. 1997; 59(5): 512-20.

Flor H, Birbaumer N, Schulte W, Roos R. Stress-related electromyographic responses in patients with chronic temporomandibular pain. Pain. 199; 46(2):145–152.

Guinsberg R, Peres C, Almeida M, Balda R, Berenguel RC, Tonelotto J, Kopelman B. Differences in pain expression between male and female newborn infants, Pain. 2000; 85(1-2): 127-133.

Hapidou EG, De Catanzaro D. Sensitivity to cold pressor pain in dysmenorrheic and non-dysmenorrheic women as a function of menstrual cycle phase. Pain. 1988;34(3):277-83.

Isselee H, De Laat A, De Mot B, Lysens R. Pressure-pain threshold variation in temporomandibular disorder myalgia over the course of the menstrual cycle. J Orofac Pain. 2002;16(2):105-17.

Kapel L, Glaros AG, McGlynn FD. Psychophysiological responses to stress in patients with myofascial pain-dysfunction syndrome. J. Behav. Med. 1989; 12(4):397–406.

Keogh E, McCracken LM, Eccleston C. Do men and women differ in their response to interdisciplinary chronic pain management? Pain. 2005;114(1-2):37-46. Epub 2005 Jan 22.

Kudrow L. The relationship of headache frequency to hormone use in migraine. Headache. 1975;15(1):36-40.

LeResche L, Saunders K, Von Korff MR, Barlow W, Dworkin SF. Use of exogenous hormones and risk of temporomandibular disorder pain. Pain. 1997;69(1-2):153-60.

LeResche L, Sherman JJ, Huggins K, Saunders K, Mancl LA, Lentz G, Dworkin SF. Musculoskeletal orofacial pain and other signs and symptoms of temporomandibular disorders during pregnancy: a prospective study. J Orofac Pain. 2005;19(3):193-201.

LeResche L, Mancl L, Sherman JJ, Gandara B, Dworkin SF. Changes in temporomandibular pain and other symptoms across the menstrual cycle. Pain. 2003;106(3):253-61.

Lund JP, Widmer CG. An evaluation of the use of surface electromyography in the diagnosis, documentation, and treatment of dental patients. J. Craniomand. Disord. Facial Oral Pain. 1989; 3(3)**:** 125–137.

Riley JL 3rd, Robinson ME, Wise EA, Price DD. A meta-analytic review of pain perception across the menstrual cycle. Pain. 1999; 81(3):225-35.

Robinson, M.E. et al. Sex differences in response to cutaneous anesthesia: a double blind randomized study. Pain, Amsterdam 1998; 77(2):143-149.

Sherman JJ, LeResche L, Mancl LA, Huggins K, Sage JC, Dworkin SF. Cyclic effects on experimental pain response in women with temporomandibular disorders. J Orofac Pain. 2005;19(2):133-43.

Tassorelli C, Sandrini G, Cecchini AP, Nappi RE, Sances G, Martignoni E. Changes in nociceptive flexion reflex threshold across the menstrual cycle in healthy women. Psychosom Med. 2002;64(4):621-6.

Tedford WH, Warren DE, Flynn WE. Alterations of shock aversion thresholds during the menstrual cycle. Percept Psychophys. 1977; 21, 193-196.

Yasuoka T, Nakashima M, Okuda T, Tatematsu N. Effect of estrogen replacement on temporomandibular joint remodeling in ovariectomized rats. J Oral Maxillofac Surg. 2000;58(2):189-96.

ANEXOS

COMITÊ DE ÉTICA EM PESQUISA
FACULDADE DE ODONTOLOGIA DE PIRACICABA
UNIVERSIDADE ESTADUAL DE CAMPINAS

CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa "**INFLUÊNCIA DO SEXO E DO CICLO MENSTRUAL SOBRE A ATIVIDADE ELETROMIOGRÁFICA DOS MÚSCULOS DA MASTIGAÇÃO EM INDIVÍDUOS PORTADORES DE DESORDEM TEMPOROMANDIBULAR**", protocolo nº 144/2004, dos pesquisadores **MARIANA TREVISANI ARTHURI FRANCO, FAUSTO BERZIN e MARIA CECILIA FERRAZ DE ARRUDA**, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 28/01/2005.

The Research Ethics Committee of the School of Dentistry of Piracicaba - State University of Campinas, certify that project "**The influence of gender and menstrual cycle in the electromyographic activity of the masticatory muscles in subjects with temporomandibular disorders**", register number 144/2004, of **MARIANA TREVISANI ARTHURI FRANCO, FAUSTO BERZIN and MARIA CECILIA FERRAZ DE ARRUDA**, comply with the recommendations of the National Health Council – Ministry of Health of Brazil for researching in human subjects and was approved by this committee at 28/01/2005.

Fernanda Klein Marcondes
Cinthia Pereira Machado Tabchoury
Secretária
CEP/FOP/UNICAMP

Jacks Jorge Júnior
Coordenador
CEP/FOP/UNICAMP

ANEXOS

RDC – Research Diagnostic Criteria (Critérios de Diagnóstico em Pesquisa para DTM) Tradução Oficial Autorizada Através do RDC International Project Inglês – Português.

Eixo I. Condições Clínicas de Disfunção Temporomandibular
- Avaliação Clínica -

Formulário de Exame

1. Você tem dor no lado direito da sua face, lado esquerdo ou ambos os lados ?

nenhum 0 □ direito 1 □ esquerdo 2 □ ambos 3 □

2. Você poderia apontar as áreas aonde você sente dor ?

Direito		Esquerdo	
Nenhuma	0	**Nenhuma**	0
Articulação	1	**Articulação**	1
Músculos	2	**Músculos**	2
Ambos	3	**Ambos**	3

Examinador palpa a área apontada pelo paciente, caso não esteja claro se é dor muscular ou articular.

3. Padrão de Abertura

Reto 0
Desvio lateral direito (não corrigido) 1
Desvio lateral direito corrigido (“S”) 2
Desvio lateral esquerdo (não corrigido)3
Desvio lateral esquerdo corrigido (“S”) 4
Outro 5
Tipo _____(especifique)

4. Extensão de movimento vertical - incisivos maxilares utilizados

a. Abertura passiva sem dor __ __ mm
b. Abertura máxima passiva __ __ mm
c. Abertura máxima ativa __ __ mm
d. Transpasse incisal vertical __ __ mm

Tabela abaixo: Para os itens “b” e “c” somente

DOR MUSCULAR				DOR ARTICULAR			
Nenhuma	**direito**	**esquerdo**	**ambos**	**nenhuma**	**direito**	**esquerdo**	**ambos**
0	1	2	3	0	1	2	3
0	1	2	3	0	1	2	3

5. Ruídos articulares (palpação)

a. abertura

	Direito	Esquerdo
Nenhum	0	0
Estalido	1	1
Crepitação grosseira	2	2
Crepitação fina	3	3

Medida do estalido na abertura **__ __ mm** **__ __ mm**

b. Fechamento

	Direito	Esquerdo
Nenhum	0	0
Estalido	1	1
Crepitação grosseira	2	2
Crepitação fina	3	3

Medida do estalido de fechamento __ __ mm __ __ mm

c. Estalido recíproco eliminado durante abertura protrusiva

	Direito	Esquerdo
Sim	0	0
Não	1	1
NA	8	8

6. Excursões

a. Excursão lateral direita **__ __ mm**
b. Excursão lateral esquerda **__ __ mm**
c. Protrusão **__ __ mm**

Tabela abaixo: Para os itens "a" , "b" e "c"

DOR MUSCULAR				DOR ARTICULAR			
nenhuma	**direito**	**esquerdo**	**ambos**	**nenhuma**	**direito**	**esquerdo**	**ambos**
0	1	2	3	0	1	2	3
0	1	2	3	0	1	2	3
0	1	2	3	0	1	2	3

d. Desvio de linha média **__ __ mm**

Direito	esquerdo	NA
1	2	8

7. Ruídos articulares nas excursões

Ruídos direito

	Nenhum	Estalido	Crepitação grosseira	Crepitação leve
Excursão Direita	0	1	2	3
Excursão Esquerda	0	1	2	3
Protrusão	0	1	2	3

Ruídos esquerdo

	Nenhum	Estalido	Crepitação grosseira	Crepitação leve
Excursão Direita	0	1	2	3
Excursão Esquerda	0	1	2	3
Protrusão	0	1	2	3

INSTRUÇÕES, ÍTENS 8-10.

O examinador irá palpar (tocando) diferentes áreas da sua face, cabeça e pescoço. Nós gostaríamos que você indicasse se você não sente dor ou apenas sente pressão (0), ou dor (1-3). Por favor, classifique o quanto de dor você sente para cada uma das palpações de acordo com a escala abaixo. Circule o número que corresponde a quantidade de dor que você sente. Nós gostaríamos que você fizesse uma classificação separada para as palpações direita e esquerda.

0 = Sem dor / somente pressão
1 = dor leve
2 = dor moderada
3 = dor severa

8. Dor muscular extra-oral com palpação

	DIREITO	**ESQUERDO**
a. Temporal (posterior) "parte de trás da têmpora"	0 1 2 3	0 1 2 3
b. Temporal (médio) "meio da têmpora"	0 1 2 3	0 1 2 3
c. Temporal (anterior) "parte anterior da têmpora"	0 1 2 3	0 1 2 3
d. Masseter (superior) "bochecha/abaixo do zigoma"	0 1 2 3	0 1 2 3
e. Masseter (médio) "bochecha/lado da face"	0 1 2 3	0 1 2 3
f. Masseter (inferior) "bochecha/linha da mandíbula"	0 1 2 3	0 1 2 3
g. Região mandibular posterior (estilo-hióide/região posterior do digástrico) "mandíbula/região da garganta"	0 1 2 3	0 1 2 3

h. Região submandibular (pterigoide medial/supra-hióide/região anterior do digástrico) “abaixo do queixo”	0 1 2 3	0 1 2 3

9. Dor articular com palpação

	DIREITO	**ESQUERDO**
a. Polo lateral “por fora”	0 1 2 3	0 1 2 3
b. Ligamento posterior “dentro do ouvido”	0 1 2 3	0 1 2 3

10. Dor muscular intra-oral com palpação

	DIREITO	**ESQUERDO**
a. Área do pterigoide lateral “atrás dos molares superiores”	0 1 2 3	0 1 2 3
b. Tendão do temporal “tendão”	0 1 2 3	0 1 2 3

ANEXOS

Sistema de diagnóstico para RDC/DTM

Grupo I: Desordens Musculares

As desordens musculares incluem tanto as desordens dolorosas como as não-dolorosas. Esta classificação lida somente com as desordens dolorosas mais comuns associadas as DTM. Ao usar esta classificação, as seguintes condições menos comuns deverão ser excluídas: espasmo muscular, miosite e contratura. Os critérios para estas desordens estão incluídos no Apêndice ao final dos critérios para o Eixo I.

I.a. Dor Miofascial: Dor de origem muscular, incluindo uma reclamação de dor, assim como dor associada a áreas localizadas sensíveis a palpação do músculo.

1. Relato de dor na mandíbula, têmporas, face, área pré-auricular, ou dentro da orelha em repouso ou durante a função (Q3); mais
2. Dor relatada pelo indivíduo em resposta a palpação de três ou mais dos 20 sítios musculares seguintes (os lados esquerdo e direito contam como sítios separados para cada músculo): temporal posterior, temporal médio, temporal anterior, origem do masseter, corpo do masseter, inserção do masseter, região posterior de mandíbula, região submandibular, área do pterigóideo lateral e tendão do temporal. Pelo menos um dos sítios deve estar no mesmo lado da queixa de dor. (E 1, 8, 10).

I.b. Dor Miofascial com Abertura Limitada: Movimento limitado e rigidez do músculo durante o alongamento na presença de uma dor miofascial.

1. Dor miofascial conforme definida no item 1.a; mais
2. Abertura sem auxílio e sem dor < 40 mm (E 4a, 4d); mais
3. Abertura máxima com auxílio (extensão passiva) de 5 mm ou mais, maior que a abertura sem auxílio e sem dor (E 4a, 4c, 4d).

Grupo III: Artralgia, Artrite, Artrose

Ao fazer diagnósticos das desordens deste grupo, as poliartrites, as injúrias traumáticas agudas e infecções na articulação devem antes ser excluídas, como descrito na página 330.

III.a. Artralgia: Dor e sensibilidade na cápsula articular e/ou no revestimento sinovial da ATM.

1. Dor em um ou ambos sítios articulares (pólo lateral e/ou ligamento posterior) durante a palpação (E9); mais
2. Um ou mais dos seguintes auto-relatos de dor: dor na região da articulação, dor na articulação durante abertura máxima sem auxílio, dor na articulação durante abertura com auxílio, dor na articulação durante excursão lateral. (E 2, 4b, 4c, 4d, 6a, 6b)
3. Para o diagnóstico de artralgia simples, uma crepitação grosseira deve estar ausente. (E 5, 7).

Tradução

Wilson Pimentel Filho – aluno do curso de especialização em DTM e Dor Orofacial – UNIGRANRIO

Revisão

Professor Francisco J. Pereira Jr.
Professora Katiana Aciolly Lins Vidal

ANEXOS

RDC – Research Diagnostic Criteria (Critérios de Diagnóstico em Pesquisa para DTM) Tradução Oficial Autorizada Através do RDC International Project Inglês – Português.

Eixo II. Incapacidade relacionada à Dor e Status Psicológico

Questionário de sete itens para classificar a severidade da dor crônica:

7. Como você classificaria a sua dor facial em uma escala de 0 a 10 no presente momento, isto é exatamente agora, onde 0 é "sem dor" e 10 é a "pior dor possível" ?

Sem dor 1 2 3 4 5 6 7 8 9 10 A pior dor possível

8. Nos últimos seis meses, qual foi a intensidade da sua pior dor, classificada pela escala de 0 a 10, onde 0 é "sem dor" e 10 é a "pior dor possível" ?

Sem dor 1 2 3 4 5 6 7 8 9 10 A pior dor possível

9. Nos últimos seis meses, em média, qual foi a intensidade da sua dor, classificada pela escala de 0 a 10, onde 0 é "sem dor" e 10 é a "pior dor possível" ? [Isto é, sua dor usual nas horas que você estava sentindo dor].

Sem dor 1 2 3 4 5 6 7 8 9 10 A pior dor possível

10. Aproximadamente quantos dias nos últimos 6 meses você esteve afastado de suas atividades usuais (trabalho, escola, serviço doméstico) devido a dor facial ? ____ dias

11. Nos últimos 6 meses, o quanto esta dor facial interferiu com suas atividades diárias de acordo com uma escala de 0 a 10, onde 0 é "nenhuma interferência" e 10 é "incapaz de realizar qualquer atividade" ?

Nenhuma interferência 1 2 3 4 5 6 7 8 9 10 Incapaz de realizar qualquer atividade

12. Nos últimos 6 meses, o quanto esta dor facial alterou a sua capacidade de participar de atividades recreativas, sociais e familiares onde 0 é "nenhuma alteração" e 10 é "alteração extrema" ?

Nenhuma alteração 1 2 3 4 5 6 7 8 9 10 Alteração extrema

13. Nos últimos 6 meses, o quanto esta dor facial alterou a sua capacidade de trabalhar (incluindo serviço domésticos) onde 0 é "nenhuma alteração" e 10 é "alteração extrema"?

Nenhuma alteração 1 2 3 4 5 6 7 8 9 10 Alteração extrema

Questionário para coletar os dados de Depressão e de Somatização

20. No último mês, o quanto você tem estado angustiado por:

a. Dores de cabeça

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

b. Perda de interesse ou prazer sexual

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

c. Fraqueza ou tontura

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

d. Dores no coração ou peito

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

e. Sensação de falta de energia ou lerdeza

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

f. Pensamentos sobre morte ou relacionados ao ato de morrer

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

g. Falta de apetite

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

h. Chorar facilmente

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

i. Culpar a si mesmo pelas coisas

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

j. Dores na parte inferior das costas

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

k. Sentir-se só

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

l. Sentir-se triste

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

m. Preocupar-se muito com as coisas

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

n. Sentir nenhum interesse pelas coisas

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

o. Náusea ou distúrbio gástrico

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

p. Músculos doloridos

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

q. Dificuldade em adormecer

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

v. Sentir-se desanimado sobre o futuro

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

w. Sentir-se fraco em partes do corpo

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

x. Sensação de peso nos braços ou pernas

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

y. Pensamentos sobre acabar com a sua vida

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

z. Comer demais

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

aa. Acordar de madrugada

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

bb. Sono agitado ou perturbado

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

cc. Sensação de que tudo é um esforço/sacrifício

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

dd. Sentimentos de inutilidade

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

ee. Sensação de ser enganado ou iludido

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

ff. Sentimentos de culpa

Nem um pouco 0 □ Um pouco 1 □ Moderadamente 2 □ Muito 3 □ Extremamente 4 □

ANEXOS

Critérios de Pontuação para a Dor Crônica, para a Depressão e Somatização

Questionário de História do RDC na Q20 para: Escala de Depressão e Sintomas Vegetativos – b, e, h, i, k, l, m, n, v, y, cc, dd, ee; "Itens Adicionais" (estes são somados à Escala de Depressão) – f, g, q, z, aa, bb, ff; Escala de Somatização (sintomas físicos não específicos) – a*, c, d*, j*, o*, p*, f, a, w, x. (Itens com asterisco são deixados de fora quando pontuando "sem dor" a escala de sintomas físicos não específicos).

Eixo II Critérios de Pontuação			
Critérios de Pontuação para a Classificação da Severidade da Dor Crônica			
A Característica de Intensidade da dor é pontuada de 0 a 100 pontos derivados das Questões 7 a 9: **Média (Dor Exatamente Agora, Pior Dor. Dor Média) x 10** A Pontuação de Incapacidade é de 0 a 100 pontos derivados das Questões 11 a 13: **Média (Atividades Diárias, Atividades Sociais, Atividades de Trabalho) x 10** Pontuação de Incapacidade: Somar os pontos indicados para Dias de Incapacidade (Questão 10) e para Pontuação de Incapacidade.			
Pontos de Incapacidade			
Incapacidades Diárias (0 – 180)		Pontuação de Incapacidade (0 – 100)	
0 – 6 dias	0 ponto	0 - 29	0 ponto
7 – 14 dias	1 ponto	30 - 49	1 ponto
15 – 30 dias	2 pontos	50 - 69	2 pontos
31 dias ou mais	3 pontos	70 ou mais	3 pontos
Classificação			
Grau 0	Sem dor de DTM nos 6 meses prévios		
Baixa Incapacidade			
Grau I *Baixa Intensidade*	Característica de intensidade da dor < 50 E pontuação inferior a 3 pontos no item Incapacidade		
Grau II *Alta Intensidade*	Característica de Intensidade da dor maior ou igual a 50 E pontuação inferior a 3 pontos no item Incapacidade		
Alta Incapacidade			
Grau III *Limitação Moderada*	3 a 4 Pontos de Incapacidade, independente da característica da intensidade da dor		
Grau IV *Limitação Severa*	5 a 6 Pontos de Incapacidade independente da característica da Intensidade da dor		
Pontuação da Escala SCL – 90R (modificada)			
Usa a escala média de pontuação, a qual é computada através da soma dos itens de pontuação para todos os itens respondidos e divisão pelo número de itens respondidos. Se menos do que dois terços dos itens são respondidos, a pontuação da escala é perdida.			

	Classificação		
	Normal	Moderada	Severa
Depressão (incluindo sintomas vegetativos)	< 0.535	0.535 a < 1.105	1.105 +
Sintomas Físicos Não Específicos (itens de dor inclusos)	< 0.500	0.500 a < 1.000	1.000 +
Sintomas Físicos Não Específicos (itens de dor excluídos)	<0.428	0.428 a < 0.857	0.857 +

ANEXOS

Confirmação de Envio do Artigo para Publicação (Capítulo 1)
24-Jan-2007

From: Journal of Orofacial Pain
Manuscript title: Do sex, pain and the ovarian cycle influence masticatory muscle activity in subjects with temporomandibular disorders?
Corresponding Author: Dr. Trevisani Arthuri
Manuscript ID: JOP7O357

Dear Dr. Arthuri

Thank you for your submission to the Journal of Orofacial Pain. Please note that we will not be able to process your paper until we receive the Mandatory Submission Form. Please complete and have all authors sign and date the form, and fax it to Dr. Barry Sessle (fax: 1-416-979-4936), or email a scanned copy of the completed form to < admin.jop@dentistry.utoronto.ca >.

The Mandatory Submission Form can be downloaded from < http://www.manuscriptmanager.com/jop > under < Journal main page >.

Yours sincerely,
JOP Editorial Assistant

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