LARISSA SOARES REIS VILANOVA

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"TEMPOROMANDIBULAR DISORDERS: STUDIES ON PAIN, MASTICATION AND DIAGNOSTIC".

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UNIVERSIDADE ESTADUAL DE CAMPINAS
FACULDADE DE ODONTOLOGIA DE PIRACICABA

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TEMPOROMANDIBULAR DISORDERS: STUDIES ON PAIN, MASTICATION AND DIAGNOSTIC.

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Orientadora: Prof.ª Dr.ª Renata Cunha Matheus Rodrigues Garcia

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Profa. Dra. RENATA CUNHA MATHEUS RODRIGUES GARCIA

Profa. Dra. CINARA MARIA CAMPARIS

Prof. Dr. LEONARDO RIGOLDI BONJARDIM

Profa. Dra. ALTAIR ANTONINHA DEL BEL CURY

Prof. Dr. LUIS ALEXANDRE MAFFEI SARTINI PAULILLO

RESUMO

As Disfunções temporomandibulares (DTMs) são altamente prevalentes no gênero feminino, sugerindo uma possível relação entre o ciclo menstrual e o desenvolvimento desta patologia. Além disso, a condição de dor nesses pacientes pode alterar os movimentos mandibulares e a qualidade do sono. Desta maneira, os objetivos do presente trabalho foram *(1)* avaliar se as flutuações hormonais ocorridas durante o ciclo menstrual alteram a sensibilidade dolorosa (SD), força máxima de mordida (FMM) e performance mastigatória (PM) de voluntárias com DTM, *(2)* avaliar a ocorrência de alterações nos movimentos mandibulares (MM) e na qualidade do sono (QS) após tratamento da DTM com placas oclusais estabilizadoras, e *(3)* comparar a confiabilidade do treinamento do Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) entre o treinamento formal e a autoinstução. Para tanto, no primeiro estudo, cinquenta voluntárias com DTM sintomática foram selecionadas e divididas em dois grupos (n=25): *(1)* voluntárias com ciclos menstruais regulares e *(2)* voluntárias utilizando contraceptivos orais. As variáveis SD, FMM e PM foram avaliadas durante as fases de um único ciclo menstrual completo. Para o segundo estudo, as mesmas voluntárias foram incluídas e foram avaliadas SD, MM e QS antes e após o uso de placa estabilizadora. Os dados foram submetidos à análise de variância para medidas repetidas seguido de teste de Tukey-Kramer ($p \leq 0.05$). Para a avaliação do terceiro estudo, seis examinadores foram divididos em dois grupos: *(1)* treinamento formal em um centro de treinamento para o DC/TMD, e *(2)* autoinstrução com o uso de documentos e vídeo do DC/TMD. O grupo autoinstrução posteriormente participou do curso, sendo considerado *(3) grupo autoinstrução + curso*. Cada grupo avaliou 16 voluntários, total de 48 voluntários (36 pacientes com DTM e 12 assintomáticos) e a confiabilidade em relação aos diagnósticos obtidos foram comparados com um examinador padrão de referencia por meio do coeficiente Kappa. Foram encontradas diferenças no primeiro estudo, na SD entre a fase lútea (quarta avaliação) e ovulatória (terceira avaliação) ($p = 0,01$), de ambos os grupos. Não foram encontradas diferenças na FMM ($P = 0,34$) ou PM ($P = 0,43$), entre os grupos. No segundo estudo, SD foi reduzido após o tratamento ($P = 0,0001$) e o tratamento melhorou a amplitude de movimento ($P = 0,0001$) e a velocidade de abertura ($P = 0,0001$) e fechamento ($P = 0,04$) durante a

mastigação. Houve diferença na QS (P = 0,0001) após o tratamento. No terceiro estudo, a confiabilidade foi boa em todos os três grupos para todos os diagnósticos, exceto para a mialgia local e dor miofascial no grupo Autoinstrução + curso. O curso melhorou a confiabilidade para a mialgia e artralgia quando comparado com a autoinstrução. Desta maneira, flutuações de estrogênio podem influenciar a SD de pacientes com DTM, mas não afetam a função mastigatória. O tratamento de indivíduos com dor miofascial com placas estabilizadoras foi eficaz reduzindo a dor, e esta opção de tratamento melhora os MM e QS. Além disso, os cirurgiões dentistas poderão optar por realizar a autoinstrução como treinamento do diagnóstico do DC/TMD.

Palavras-chave: dor facial, ciclo menstrual, medição da dor, mastigação, reprodutibilidade dos testes, sono, cinesiologia aplicada.

ABSTRACT

Temporomandibular Disorders (TMD) are highly prevalent in females, suggesting a possible relationship between the menstrual cycle and the development of this pathology. Furthermore, the condition of pain in these patients can modify jaw movements and sleep quality. Thus the objectives of this these were to (1) assess if hormonal fluctuations that occur during the menstrual cycle modify pain sensitivity (PS), maximum bite force (MBF) and masticatory performance (MP) to volunteers with TMD, (2) evaluate the incidence of changes in mandibular movements (MM) and sleep quality (SQ) after treatment of TMD with occlusal stabilizing splint, and (3) compare the TMD diagnosis based on Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) between formal training and self-instruction.For this, in the first study, fifty volunteers with pain and TMD were selected and divided into two groups (n = 25): *(1)* volunteers with regular menstrual cycles, and *(2)* volunteers using oral contraceptives. The following variables were measured: PS, MBF and MP throughout the period of one complete menstrual cycle. For the second study, the same volunteers were assessed and analised: PS, MM and SQ before and after the use of stabilizing splint. Data were analyzed by analysis of variance for repeated measures followed by the Tukey-Kramer ($p \leq 0.05$). For the evaluation of the third study, six examiners were divided into two groups: (1) formal training in a training center for the DC/TMD, and (2) self-instruction with the use of documents and film from the DC/TMD. The self-instruction group later attended the course being considered (3) Self-instruction + course group. Each group evaluated 16 volunteers, total of 48 volunteers (36 patients with TMD and 12 asymptomatic) and the reliability in relation to diagnoses were compared with a reference standard examiner using Kappa coefficient. Differences were found in the first study, the PS between the luteal phase (Fourth evaluation) and ovulatory (third evaluation) ($p = 0.01$) in both groups. No differences were found in the MBF ($P = 0.34$) or MP ($P = 0.43$) between groups. In the second study, PS was reduced after treatment ($P = 0.0001$) and treatment improved the range of motion ($P = 0.0001$) and the speed of opening ($P = 0.0001$) and closing ($P = 0,04$) during chewing. Differences in SQ ($P = 0.0001$) after treatment occur. In the third study, the reliability was good in all three groups for all diagnoses, except for local myalgia and myofascial pain in the self-instruction + course group. The

course improved reliability for myalgia and arthralgia compared to self-instruction. Thus, fluctuations in estrogen can influence the PS of TMD patients, but not affect chewing function. The treatment of patients with myofascial pain with splint was effective reducing pain, and this treatment option improves MM and SQ. In addition, dentists may selected training with self-instruction to perform DC / TMD.

Keywords: Facial pain, menstrual cycle, pain measurement, mastication, reproducibility of results, sleep, applied kinesiology.

Sumário

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“Quando considero quantas e quão maravilhosas coisas o homem compreende, pesquisa e consegue realizar, então reconheço claramente que o espírito humano é obra de Deus, e a mais notável.”

Galileu Galilei

INTRODUÇÃO

Disfunção temporomandibular (DTM) é um termo que abrange as condições que acometem as articulações temporomandibulares (ATMs) e a musculatura mastigatória, e se manifestam por meio de disfunção das estruturas orofaciais e/ou sintomatologia dolorosa (Cairns, 2010; Scrivani *et al*., 2008).

As DTM(s) são altamente prevalentes no gênero feminino principalmente na idade reprodutiva, iniciando-se após a puberdade e decrescendo após a menopausa o que sugere uma possível relação entre o ciclo menstrual e o desenvolvimento e manutenção desta patologia (Warren & Fried, 2001; Koidis *et al*., 1993; Abubaker *et al*., 1996; LeResche *et al*., 1997; Lee *et al*., 2006; Ribeiro-Dasilva *et al*., 2009; Oral *et al*., 2009; LeResche *et al*., 2007). Sabe-se ainda que a flutuação nos níveis hormonais femininos, principalmente do estrógeno, influencia a mobilidade articular, inclusive na ATM, e está fortemente relacionada às alterações emocionais que podem levar ao aumento da tensão muscular e consequentemente ao aparecimento de dor (Pinho *et al*., 2000; Warren & Fried, 2001; Tjakkes *et al*., 2010). Estudos sugerem que ocorre aumento do limiar de dor à pressão ou à palpação durante os períodos de declínio nos níveis de estrógeno, ou seja, nas fases menstrual, folicular e lútea final (Isselee *et al*., 2001; Cimino *et al*., 2000; LeResche *et al*., 2003). Entretanto, controvérsias permanecem, uma vez que Vignolo et al. não encontraram relação direta entre o limiar de dor à pressão e os níveis de estrógeno, expondo a necessidade de mais estudos sobre o tema (Vignolo *et al*., 2008).

Segundo Abubaker *et al*., receptores com alta afinidade ao estrógeno são encontrados com maior frequência nas ATMs de pacientes do gênero feminino que apresentam sinais e sintomas de DTM, especialmente na região do disco articular (Abubaker *et al*., 1996). Entretanto independente da presença de DTM, variáveis objetivas da função mastigatória, como força máxima de mordida (FMM), performance mastigatória (PM), não sofrem influência da flutuação hormonal do ciclo menstrual (Goncalves *et al*., 2011). Em acréscimo, a força muscular não parece variar significativamente durante um ciclo menstrual (Constantini *et al*., 2005). Sabe-se também que a dor diminui a atividade muscular agonista, e aumenta a atividade antagonista, um desequilíbrio que pode alterar a amplitude e velocidade do movimento mandibular, como parte de um processo de

adaptação normal de proteção (Lund, 1991). Esta alteração na atividade muscular pode resultar em comprometimento do movimento mandibular (MM).

A PM pode ser alterada pela magnitude da força de mordida, uma vez que indivíduos que possuem maior força muscular poderiam utilizá-la durante a mastigação, principalmente na trituração de alimentos mais consistentes, resultando em uma melhor fragmentação e consequentemente uma melhor PM (van der Bilt, 2011). Entretanto, alguns estudos sugerem que a relação entre FMM e PM pode não ser direta, uma vez que a força de mordida pode não ser totalmente utilizada durante o ato da mastigação (Goncalves *et al*., 2011; van den Braber *et al*., 2002).

A força de mordida contribui para a função mastigatória na medida em que auxilia o processo de quebra e trituração do alimento, preparando-o para a deglutição (Tosato Jde & Caria, 2007; Pereira-Cenci *et al*., 2007). Juntamente com a PM constituem importantes ferramentas de avaliação da função mastigatória (Ikebe *et al*., 2005). Para pacientes portadores de DTM , a FMM pode estar reduzida devido à presença de músculos mastigatórios sob fadiga, e além disso, pacientes com dor miofacial nos músculos mastigatórios relatam que a mastigação exacerba a dor (Koutris *et al*., 2009, Tosato Jde & Caria, 2007).

Além disso, estudos revelaram a influência negativa da DTM nos movimentos mandibulares, especialmente em pacientes com DTM sintomática (Sato *et al*., 2003; Tsolka *et al*., 1995; Sinn & Throckmorton, 1996). Tsolka et al. analisaram o movimento mandibular em máxima intercuspidação e observaram um maior intervalo vertical e anteroposterior, bem como a diminuição do movimento lateral, em comparação com o grupo controle que não apresentava sintoma, sinal ou história de DTM (Tsolka *et al*., 1995). A restrição de movimentos laterais e menor amplitude de movimento dos pacientes com DTM pode estar relacionada à deficiência do movimento mandibular, e o tratamento com placa estabilizadora pode auxiliar na melhora desse quadro.

A presença de dor também pode gerar alterações no sono. Foi observado que a presença da dor oriunda da DTM interfere no padrão de sono e cerca de 68 a 81% dos pacientes portadores de DTM apresentam baixa qualidade no sono (de Leeuw *et al*., 2005; Oliveira *et al*., 2003). Pacientes com DTM sintomática que não respondem positivamente à

terapia com placa estabilizadora, apresentam mais distúrbios de sono do que pacientes que apresentam bons resultados ao mesmo tratamento. Porém, em ambos os grupos, o sono é pior quando comparados à pacientes livres de DTM (Grossi *et al*., 2001). Sabendo-se que a presença da dor pode gerar alterações no sono e que na DTM a persistência da dor é o principal sintoma, alguns estudos buscam avaliar o perfil do sono nessa população.

Sendo a dor o sintoma mais comum de DTM, a literatura relata diversos tratamentos, terapias conservadoras e reversíveis tem sido defendidas para pacientes com dor miofacial (Al-Ani *et al*., 2005). O modelo conservador mais aceito para o tratamento, de quase todas as pacientes com DTM(s), inclui a instalação de placas estabilizadoras, aparelhos ortopédicos (férula de plano oclusal, de estabilização), aconselhamento do paciente, farmacoterapia, fisioterapia e a acupuntura (De Laat *et al*., 2003; Michelotti *et al*., 2005).

Ainda com relação a DTM, anteriormente ao tratamento é necessário que a disfunção seja diagnosticada da maneira correta e coerente. O diagnóstico é derivado de avaliação e mensuração de sinais e sintomas, sendo o sistema de classificação diagnóstica Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) internacionalmente aceito e utilizado nos dois primeiros capítulos desta tese (Dworkin & LeResche, 1992). O RDC/TMD tem provado ser uma das abordagens mais bem-sucedidas para o diagnóstico da dor relacionada à DTM em termos de procedimentos claramente operacionalizados de coleta de dados, critérios diagnósticos específicos, confiabilidade de diagnóstico e de dupla avaliação dos aspectos físicos e psicossociais para a obtenção de informações sobre a DTM bem como sobre o indivíduo (Dworkin & LeResche, 1992).

No entanto, considerando os resultados do Projeto de Validação do RDC/TMD criado pelo Instituto crânio-facial e odontológico americano (NIDCR) que avaliou a confiabilidade e a validade do diagnóstico por meio deste instrumento, verificou-se que a validade do RDC/TMD variou de muito pobre a quase perfeita, dependendo do diagnóstico e seus testes associados demonstrando a necessidade de revisão dos algoritmos do RDC/TMD Eixo I para melhorar a validade diagnóstica deste instrumento (Look *et al*., 2010; Anderson *et al*., 2010; Ohrbach *et al*., 2010; Truelove *et al*., 2010; Schiffman *et al*., 2010).

Seguindo os resultados do Projeto de validação, a validade dos dois diagnósticos de dor miofascial, em termos de sensibilidade não foi aceitável, enquanto que a eficácia em termos de especificidade foi muito boa (Truelove *et al*., 2010). Se os diagnósticos de dor miofascial forem considerados em conjunto, eliminando a limitação de abertura, a sensibilidade foi aceitável, e a especificidade foi quase perfeita (Truelove *et al*., 2010; Ohrbach *et al*., 2010). A validade e sensibilidade de cada um dos diagnósticos articulares e artrite foram pobres, mas a validade em termos de especificidade variou de muito bom a quase perfeita (Ohrbach *et al*., 2010; Look *et al*., 2010; Truelove *et al*., 2010; Schiffman *et al*., 2010). Esses resultados sugerem uma revisão de ambos os eixos do RDC/TMD, eixo I (condições clínicas de DTM) e Eixo II (incapacidade relacionada à dor e estado psicológico), para que então os casos de DTM sejam distinguidos de maneira mais eficaz em relação aos controles e que subgrupos diagnósticos possam ser diferenciados.

Com o intuito de evitar diagnósticos de DTM falso positivos e considerando-se que os diagnósticos clínicos precisavam ser ampliados e que os domínios de avaliação que compõem o Eixo II precisavam ser expandidos e apresentarem uma maior eficiência clínica, tornou-se necessário a modificação do RDC/TMD (Anderson *et al*., 2010; Schiffman *et al*., 2010; Truelove *et al*., 2010; Look *et al*., 2010; Ohrbach *et al*., 2010). A discussão crítica sobre o diagnóstico de DTM; inclui também preocupações sobre os critérios clínicos utilizados para os algoritmos de diagnóstico para a dor miofascial e deslocamentos de disco com redução, a viabilidade de alguns dos locais de palpação selecionados, e sua aplicação em contextos clínicos (Manfredini *et al*., 2010; Peck *et al*., 2014; Ohrbach *et al*., 2010). Por estas razões, o RDC/TMD foi revisto por um consórcio internacional composto por especialistas na área e um sistema de classificação modificado foi recentemente formulado. O resultado é o Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) eixo I, baseado em evidências e protocolo de diagnóstico II que fornece uma avaliação abrangente dos pacientes com DTM com base no modelo biopsicossocial de saúde (Schiffman *et al*., 2014).

O protocolo DC/TMD eixo I inclui testes e critérios para transtornos relacionados à dor comum e intra-articulares que afetam o sistema mastigatório, tendo como possíveis diagnósticos: artralgia, os quatro tipos de deslocamentos de disco, doença

degenerativa das articulações, subluxação, mialgia, mialgia local, dor miofascial, dor miofascial referida e dor de cabeça atribuída a DTM. O protocolo eixo II, avaliação psicossocial, é simplificada a partir do RDC/TMD e tem duas opções: um conjunto de instrumentos de rastreamento mais curtos iniciais ou um conjunto de instrumentos de avaliação expandido (Schiffman *et al*., 2014).

O novo critério de diagnóstico compreende importantes modificações, desde o protocolo de exame, diagnósticos da ATM, classificações taxonômicas e nomenclaturas. No relato do paciente, a dor modificada pelo movimento mandibular, função e parafunção foi inserida para todos os diagnósticos de DTM relacionados a dor. A inclusão da condição clínica de "dor familiar", ou seja, a dor que é comum ou semelhante a dor que o paciente relata, é também uma diferença do novo diagnóstico.

Com relação ao diagnóstico, devido a não utilização clínica do diagnóstico de dor miofascial com limitação de abertura, o mesmo foi excluído do novo DC/TMD. O diagnóstico de dor miofascial foi reorganizado e outros dois diagnósticos foram incluídos: mialgia (distúrbios da dor muscular) e dor miofascial referida (tipo de mialgia). A dor referida é uma disfunção clínica com localização anatômica distinta da palpação inicial, e atua como diagnóstico diferencial em relação a identificação da dor em outras localizações anatômicas.

Uma nova classificação introduzida foi a dor de cabeça atribuída a DTM devido ao fato de um subgrupo de pacientes apresentarem dores de cabeça após o uso excessivo do sistema mastigatório, como apertamento de dentes, sugerindo que algumas dores de cabeças sejam secundárias a DTM (Schiffman *et al*., 2014). Deslocamento de disco com redução e intermitente limitação de abertura também foram incluídos no novo DC/TMD. Quanto a nomemclatura, os termos osteoartrose e osteoartrite, foram substituídos por um termo mais amplo, doenças articulares degenerativas.

Em relação ao eixo II, foram incluídos questionários, tais como, PHQ-4 (funcionamento emocional), GCPS (funcionamento físico geral, usando sub-escala de interferência da dor), e JFLS (doença física e funcional espefica).

O implemento do novo protocolo DC/TMD é proposto para ser realizado em qualquer ambiente clínico, e é importante no diagnóstico de triagem, sendo possível com a

sua utilização o adequado planejamento do tratamento e estimativa de prognóstico do paciente. O novo protocolo será uma ferramenta importante para futuros projetos de pesquisa abordando mecanismos e etiologias de DTM. Tendo em vista, a recente reformulação do diagnóstico de DTM, que ocorreu no decorrer do desenvolvimento desta tese, torna-se necessário expandir este novo critério de diagnóstico - DC/TMD, para que os cirurgiões dentistas sejam capazes de realizá-lo, promovendo treinamento e calibração.

Diante do exposto acima, é importante verificar se as alterações hormonais que ocorrem durante o ciclo menstrual podem alterar a sensibilidade à dor, a força máxima de mordida e a performance mastigatória em pacientes com DTM, bem como verificar a influência do tratamento por meio da instalação de placa estabilizadora no movimento mandibular e qualidade do sono, o qual foram objetivos desta pesquisa. Além disso, avaliar se o treinamento e calibração em um centro de treinamento DC/TMD oferece uma confiabilidade maior do que a autoinstrução e se a confiabilidade após a autoinstrução é suficiente para o trabalho clínico ou de pesquisa.

CAPÍTULO 1: Hormones fluctuations intensify temporomandibular pain without impairing masticatory function.

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Larissa Soares Reis Vilanova, DDS[1], Thais Marques Simek Vega Gonçalves, Ph.D.[2], Lis Meirelles, DDS[1], Renata Cunha Matheus Rodrigues Garcia, Ph.D.[3]

[1] Graduate Student, Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Piracicaba, Brazil.

[2] Post-doctoral Student, Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Piracicaba, Brazil.

[3] Professor, Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Piracicaba, Brazil.

Corresponding author:
Dr. Renata Cunha Matheus Rodrigues Garcia
Department of Prosthodontics and Periodontology
Piracicaba Dental School, University of Campinas.
Av. Limeira, nº 901, Piracicaba, São Paulo, Brazil, 13414-903. Fax: + 55 19 2106-5211; e-mail: regarcia@fop.unicamp.br

Abstract

Aims: The influence of hormonal fluctuation on pain and mastication was evaluated in female patients with a TMD. **Methods:** A female patient sample of 50 women was assigned to menstrual cycle and oral contraceptive groups (n=25). Research Diagnostic Criteria (RDC/TMD) for diagnosing TMD were employed, and pain levels, maximum oclusal force (MOF), together with masticatory performance (MP) were measured in all menstrual cycle phases. **Results:** Lower pain level was observed in the ovulatory phase when compared to menstrual and luteal phases (P = .02). No differences were found regarding MOF (P = .20) or MP (P = .94). **Conclusion:** Hormonal fluctuations intensify pain in women with symptomatic TMD without impairing mastication.

Keywords: Myofascial pain syndromes, menstrual cycle, pain measurement, bite force, mastication.

Introduction

Women are 1.5 to 2 times more likely to suffer from temporomandibular disorders (TMD)[1,2] (and the associated pain may affect a patient's life quality. Pain onset also occurs during reproductive age and high-affinity estrogen receptors were detected in TMD patients.[1] Estrogen enhances the enzymatic activity of lipid oxidizing muscle fiber, thereby increasing the force of maximal isometric contraction which could ultimately interfere with muscle function.[1] Our previous study[3] evaluating women with painless disc displacement revealed no changes in mastication during their menstrual cycle. Since pain intensity increases during low or sudden drops in estrogen levels,[2] it is hypothesized that pain is a key factor for masticatory muscle dysfunction. This study evaluated whether hormonal fluctuations during the menstrual cycle of women with painful TMD, will alter pain level, maximum occlusal force (MOF), and masticatory performance (MP)

Material and Methods

Female patients with a painful TMD, and with intact dentitions without malocclusions or parafunctional habits were selected. Their TMD was diagnosed using the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) (Groups Ia or

Ib).[3], and all subjects signed the consent form approved by Ethics Committee of Piracicaba Dental School (protocol # 015/2011). Patients who were pregnant, at menopause, wearing dental prosthesis, presenting with hormonal disease, undergoing fertility treatment or having no TMD pain were excluded. The study's estimated sample size was based on previous data[3] and included 50 women who were then assigned to two groups (n=25 each) - menstrual cycle (MC) group (mean age: 24.7 ± 6.2) and oral contraceptive (OC – control group) (mean age: 29.2 ± 7.4). The OC complied with a 21-day regime of low-dose estrogen and progesterone medication, while Women with regular menstrual cycles, varying between 24 and 32 days, were not using OC. OC group were evaluated once a week for 1 month (4 assessments) with first assessment carried out during interval time (bleeding). The MC group was assessed in all phases of one complete menstrual cycle. Based on 28-day menstrual cycle, phases were defined as, menstrual (bleeding): days 1- 5; follicular: days 6 - 10; ovulatory: days 12 - 16, confirmed by ovulation prediction test (BioEasy Diagnóstica, Belo Horizonte, MG, Brazil); and luteal: days 21 - 28. Adjustments were performed for cycles longer or shorter than 28 days.[3]

Pain level was rated on a visual analog scale (extremes "no pain" and "worst pain imaginable"). MOF was measured twice with transducer (Spider 8 - Hottinger Baldwin Messtechnik, Darmstadt, HE, Germany) and sensors bilaterally placed in first molar and subjects occluding with maximum force (7 s). Highest values recorded were used and expressed in KgF.[3] MP was evaluated by Optosil chewing and sieving method.[3] and the median particle size (X50) was calculated.[3]

Repeated-measures ANOVA and Tukey-Kramer analyzed data using GLIMMIX SAS System (Release 9.2. SAS Institute Inc., Cary, NC, USA) ($\alpha = .05$).

Results

Lower pain was observed in the ovulatory phase for MC group and 3rd assessment for controls ($P = .02$) (Fig. 1).

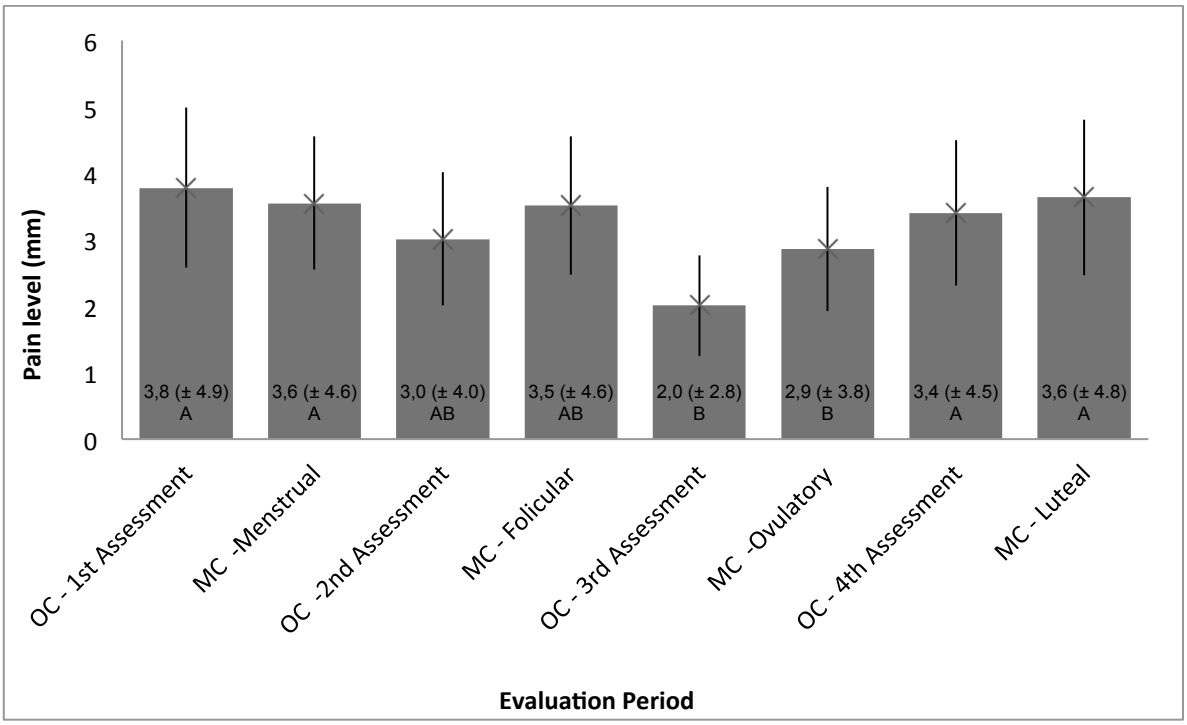

Figure 1 Mean values (standard deviation) for pain level measured by visual analogue scale according to groups and evaluation periods. Distinct letters indicate significant differences by repeated-measures ANOVA and Tukey test (F = 3.37, *P* = .02).

No differences in MOF and MP were noticed regarding menstrual cycle phases for both groups (P > .05) (Table 1).

Table 1 Statistics F (*P* values) for pain level, maximum occlusal force (MOF), and masticatory performance (MP) by generalized linear mixed model for repeated-measures analysis of variance (α = .05).

Effect	Pain level	MOF	MP
Group	0.83 (.36)	5.91 (.01)	1.46 (.23)
Phase	3.37 (.02)	1.53 (.20)	0.15 (.93)
Group*Phase	0.83 (.47)	0.55 (.65)	1.25 (.29)

MC group showed higher MOF values when compared to OC group (P = .007) (Table 2).

Table 2 Mean values (standard deviation (SD)) for Maximum Occlusal Force (KgF) in menstrual cycle (MC) and oral contraceptive (OC) groups.

Group	Mean (SD)	F	*P* value
OC group	39.59 (± 10.62)	8.10	.007
MC group	46.52 (± 11.09)		

Analysis of variance generalized by a linear mixed model, Tukey HSD (α = .05).

Discussion

The question arises as to whether painful symptoms might be hormonally modulated and which could ultimately the masticatory function. We observed that TMD pain varied during the menstrual cycle and increased in the luteal and menstrual phases when compared to the ovulation one. In the OC group, TMD pain also increased during the OC interval time. Similar findings were previously reported and showed increased facial pain associated with lower estrogen levels.[2] This might explain why painful TMD patients are more likely to be affected by estrogen fluctuations.

Although changes in TMD pain were observed, no differences were found in MOF and MP. These findings were unexpected since TMD patients complain of impaired masticatory function.[4] Similar results for MOF and MP were observed in painless TMD patients during the menstrual cycle.[3] Additionally, hormonal fluctuation seems to have no effect on the performance of several body muscles.[5] It may therefore be suggested that although the fluctuating estrogen intensifies TMD pain, masticatory muscle function is not affected.

Conclusion

Pain levels in women with TMD are influenced by hormonal fluctuations in the menstrual cycle but do not interfere with masticatory function.

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CAPÍTULO 2: Mastication movements and sleep quality of patients with myofacial pain: Occlusal device therapy improvements.

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Larissa Soares Reis Vilanova, DDS,[a] Thais Marques Simek Vega Gonçalves, PhD,[b] Marcele Jardim Pimentel, MSc,[a] Paula Furlan Bavia, DDS[a] and Renata Cunha Matheus Rodrigues Garcia, PhD[c]

Piracicaba Dental School, University of Campinas, Piracicaba, São Paulo, Brazil

[a]Graduate Student, Department of Prosthodontics and Periodontology.

[b]Post-doctoral Student, Department of Prosthodontics and Periodontology.

[c]Professor, Department of Prosthodontics and Periodontology.

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Corresponding author: Dr Renata Cunha Matheus Rodrigues Garcia

University of Campinas

Av. Limeira, nº 901,Piracicaba, São Paulo, 13414-903,BRAZIL

E-mail: regarcia@fop.unicamp.br

Acknowledgements

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ABSTRACT

Statement of problem. Patients with myofacial pain (MFP) complain of impaired mastication, which might also interfere with their sleep quality. Purpose. The purpose of this study was to evaluate the jaw motion and sleep quality of patients with MFP and the impact of device therapy on both parameters. Material and methods. Fifty women diagnosed with MFP by the Research Diagnostic Criteria (RDC/TMD) were enrolled. Pain levels (visual analog scale), jaw movements (kinesiography), and sleep quality (Epworth Sleepiness Scale – ESS; Pittsburgh Sleep Quality Index - PSQI) were evaluated before (control) and after stabilization device use. Range of motion (maximum opening, right and left excursions, and protrusion) and masticatory movements during Optosil mastication (opening, closing, and total cycle time; opening and closing angles; and maximum velocity) were also evaluated. Repeated measures ANOVA in a GLIMMIX procedure was used for statistical analysis (α=.05). Results. At baseline, participants with MFP showed a reduced range of jaw motion and poorer sleep quality. Treatment with a stabilization device reduced pain (P<.001) and increased both mouth opening (P<.001) and anteroposterior movement (P=.01). Also, after treatment, the maximum opening (P<.001) and closing (P=.04) velocities during mastication increased, and improvements in sleep scores for PSQI (P<.001) and ESS (P=.04) were found. Conclusion. MFP impairs jaw motion and quality of sleep; the reduction of pain after the use of a stabilization device improves the range of motion and sleep parameters. Clinical implications. Patients with MFP generally complain of impaired mastication and poor sleep, which can adversely affect their daily life. Thus, marked improvements in both parameters should be sought in the treatment of patients with MFP.

Key Words: myofacial pain, occlusal splint, mastication, sleep, applied kinesiology

INTRODUCTION

Myofacial pain (MFP) is the most common temporomandibular disorder (TMD) and is characterized by muscle tenderness, local and referred pain on the temporomandibular joint (TMJ) and/or masticatory muscles, and a slightly limited range of jaw motion.[1-4] Individuals with MFP move their jaws more slowly than those unaffected as they try to

minimize pain during jaw movement.[5-7] Two theories were developed to explain this protective pattern. The Vicious Cycle Theory proposed that an initiating factor, such as muscle overuse, results in pain that reflexively increases muscle activity, leading to spasm or fatigue and thereby further pain, thus perpetuating the cycle.[5] In contrast, the Pain Adaptation[8] describes a muscle pattern, where pain alters the muscle activity, decreasing the velocity of the jaw motion and the amplitude of the movements. This protective pattern aims to reduce the chance of aggravating injury, which could increase pain and jeopardize the healing process.[8] Regardless of the theory models, MFP clearly affects the regular function of the masticatory muscles.[9,10] However, the effects of MFP treatment on masticatory motion remain unclear.[2]

Patients with MFP generally complain of difficulty in masticating hard or chewy foods, [3,11] which can impair daily life.[3] Consequently, patients with MFP usually present with psychological distress that is modulated by the intensity of perceived pain, which can interfere with the sleep quality.[12] Since sleep disturbances notably affect quality of life,[13] the evaluation and improvement of sleep quality should be considered in the treatment of patients with MFP.

MFP treatment considerably reduces the pain level.[1,2,14] Unfortunately, the influence of conventional MFP treatment on mandibular motion and sleep quality is currently not well understood. A study[14] evaluating the relationship between TMD treatment and jaw motion revealed that therapies such as arthrocentesis did not improve jaw movements. However, the methodological strategy used by that study[14] (evaluation of jaw motion in masticating soft materials or a sample presenting with a structural degenerative TMD condition) could explain the lack of improvement in mandibular motion.

Studies have shown that 50% of patients with TMD report poor sleep quality. [15,16] Even in a polysomnography study, 43% of patients with TMD experienced 2 or more sleep disorders, with insomnia being the most prevalent (36%).[17] A poor night's sleep may exacerbate pain and pain may impair sleep,[18,19] leading to what has been described as a vicious cycle on the subsequent day when pain during the day is often followed by another poor night's sleep.[12,16] Thus, sleep disturbances may affect functional disability, decrease pain thresholds,[20] and impair immune function[21] and consequently contribute to associated

morbidities.[13,22] However, no evidence is available about the effect of MFP upon sleep quality or the consequences of MFP treatment on sleep parameters.[3]

A stabilization device is a noninvasive and reversible biomechanical method commonly used for MFP treatment[23,24] and has been reported to decrease pain symptoms between 70% and 90%. Its mechanism of therapy is not completely understood,[25] but it may increase the vertical dimension, thereby reducing the load on the TMJ structures, eliminating occlusal interferences, and increasing peripheral input to the central nervous system.[26] Moreover, the insertion of a stabilization device immediately balances the activity of the masseter and temporalis muscles, which could explain why the pain level decreases, making this therapy the most suitable treatment for neuromuscular problems such as MFP and muscle spasms.[27]

Considering that MFP may influence the jaw's range of motion, [3,28,29] it is reasonable to hypothesize that the use of stabilization devices could improve the jaw movements and sleep quality. Thus, the aim of this study was to determine the jaw motion and sleep quality in individuals with MFP, as well as to evaluate the effect of MFP treatment on these parameters. The tested hypothesis was that the pain in individuals with MFP impairs both jaw motion and sleep quality and that treatment with stabilization devices is effective in reducing pain, thereby improving both mastication motion and sleep quality.

MATERIAL AND METHODS

This cross-sectional study was designed as a pre-post treatment design focused on individuals with MFP. The MFP diagnosis was made with the aid of the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD).[30] Each participant was evaluated by a single trained researcher who applied the RDC/TMD. Only the axis I of the RDC/TMD was applied to diagnosis MFP. This researcher was previously calibrated. The calibration session consisted of 2 examiners (one of them being an RDC/TMD expert) applying the RDC/TMD on 11 participants selected at random from the city phone directory. The Kappa Index obtained was 0.84 (95% confidence interval of 0.65 to 1.00). Women presenting with a positive diagnosis for group Ia or Ib (myofacial pain with and

without limited mouth opening) of the RDC/TMD examination were selected.

Subsequently, pain levels, jaw movements, and sleep quality were evaluated. Additional care was taken to access all volunteers at approximately the same time of day. Since previous studies [31,32] highlighted the possible influence of estrogen on pain levels, all participants were also evaluated during the menstrual phase of the hormonal cycle.
Stabilization devices were then delivered and used by participants for 8 weeks in a regular nocturnal regime, and all variables were evaluated once again. Thus, each participant acted as her own control, assuming a paired-control study design.

Initially, 117 individuals were contacted from patients seeking dental treatment at the Piracicaba Dental School, University of Campinas. The inclusion criteria were pain in the masticatory muscles for at least 3 months, a complete dentition, and good oral and general health. Individuals presenting with severe malocclusion (anterior open occlusal relationship, unilateral or bilateral posterior reverse articulation), parafunctional habits, facial deformities, or those under TMD treatment or drug therapies were excluded. Of the 117 participants evaluated, only 57 met these inclusion criteria and were invited to participate. All participants read and signed a consent form, which was approved by the Ethics Committee of Piracicaba Dental School (protocol #015/2011). Seven participants did not complete the study because they relocated or for personal reasons. Fifty women (mean age of 26.7 ±7.1 years) comprised the final sample and evaluated before and after the treatment with stabilization devices.

The participants received a complete-arch maxillary stabilization occlusal device, which was made on dental casts mounted at a maximum intercuspal position on an adjustable articulator (Bio-Art Equipamentos Odontológicos Ltda) with a face bow. They were waxed with a 1.5- to 2-mm thickness in the posterior area and formed with thermopolymerized acrylic resin (Clássico; Artigos Odontológicos Ltda). The devices were remounted in the adjustable articulators and the occlusal contacts were adjusted.

After finishing and polishing, the devices were fitted in the participant's mouth to achieve bilateral posterior occlusal contacts. Adjustments were performed in protrusive and lateral movements, providing anterior and lateral guidance and avoiding contact with the posterior teeth during protrusive and lateral excursions. All occlusal contacts were adjusted

by using articulating paper (AccuFilm II; Parkell Inc), and areas of eccentric contact were removed. Participants were instructed to use the devices primarily at night.

Participants were instructed to rate their pain on a visual analog scale (VAS).[33] The VAS used was a noncolor scale with a 10-cm line anchored by the words "no pain" and "worst pain imaginable." This scale was chosen because it is the most suitable method for measuring orofacial pain.[34]

The magnetic jaw-tracking method was used to record mandibular movements, with a kinesiograph (JT-3D Jaw Tracker; BioResearch). The reproducibility of this device was previously verified by using 2 different measurements from 10 volunteers within a 1-week interval. By using a 95% confidence level, we assessed the intraclass correlation coefficient (ICCs) of all the parameters evaluated. The ICCs ranged from 0.89 to 0.98, which were considered excellent.

The participants were seated in a relaxed and upright position. A small magnet (Biopack; BioResearch) was temporarily attached to the labial surface of the mandibular incisors with adhesive strips without interfering with the maximum occlusal position or mandibular excursions. A magnetic sensor array was adjusted on the participant's head according to the manufacturer's instructions. Images of the mandibular movements were projected on a computer screen and recorded in real time for posterior analyses.

Jaw movement was evaluated by measuring the maximum range of jaw motion and the movements during mastication. Participants were instructed to perform maximum opening, closing, lateral, and protrusion movements. The range of these movements was evaluated as the maximum opening and lateral motion (frontal plane), anteroposterior movement (sagittal plane), and maximum lateral movements (right and left) in the horizontal plane. Next, participants were instructed to masticate a 17-cube portion of Optosil (Heraeus Kulzer) in the usual way while a single trained researcher counted the masticatory cycles. After 20 cycles, participants were asked to stop masticating, and the masticated material was discharged.

A custom computer program (BioPack; BioResearch) was used to analyze the masticatory cycle movements. The first masticatory cycle of each test was unvalued because it involved the initial positioning of the test material.[29] The masticatory movements

were evaluated as the duration of the opening and closing phases, entire duration of the masticatory cycle, opening and closing angles, and maximum velocity.[35]

Sleep quality was evaluated by the Epworth Sleepiness Scale (ESS)[36] and the Pittsburgh Sleep Quality Index (PSQI).[37] The ESS evaluates the chance of falling asleep while performing some usual activities of daily living, such as sitting and reading or watching TV.[22] Participants were asked to rate in recent times how likely they would be to doze off or fall asleep in 8 different common situations. Responses were given based on a 4-point response rating from 0 to 3 points. All participants were instructed to answer the questionnaire, and the 8 response items were summed to calculate a total score. The score range was 0 to 24, with scores higher than 10 indicating excessive daytime sleepiness.

The Pittsburgh Sleep Quality Index (PSQI)[37] consists of self-reporting questions to discriminate between the sleep quality of "good" and "poor" sleepers and comprises 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction. Nineteen items were evaluated and scored, including the usual wake up time and bedtime, minutes spent before falling asleep, hours slept per night, frequency of specified sleep problems, overall assessment of sleep quality, and psychological assessment of anxiety. Each of the 7 sleep component scores was determined based on scoring algorithms, with each component yielding a score of 0–3. A PSQI global (total) score was obtained by summing all of the component scores. The total score ranges from 0 to 21, with scores higher than 5 indicating poorer sleep quality.[37]

Analysis of variance (ANOVA) was applied to test the effect of the device therapy, and, since the measurements were made in the same volunteers before and after the treatment, a generalized linear mixed model was adopted to permit the adequate consideration of the repeated measures effect. In all response variables, the adherence of the residuals to the Gaussian distribution was tested and considered reasonable by the Shapiro-Wilk test, a clear signal of the model adequacy. All statistical analysis was calculated by software (SAS release 9.3; SAS Institute Inc) (α=.05).

RESULTS

Participants with MFP exhibited higher pain levels before the stabilization device therapy (P<.001) (Fig. 1).

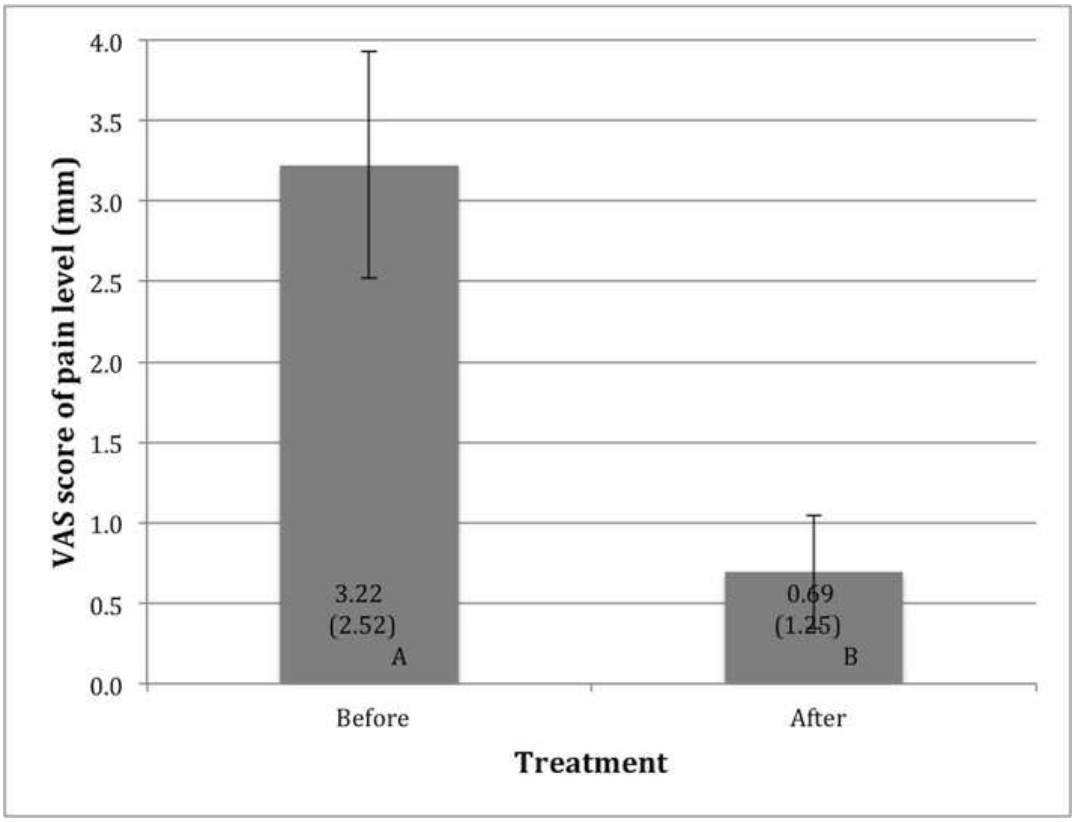

Fig. 1. Pain levels measured by visual analogue scale (mm) before and after stabilization occlusal device therapy. Significant reduction of pain level was observed after treatment (F=11.31; P<.001).

The range of jaw motion increased after treatment for both the anteroposterior range (P=.01) and mouth opening (P<.001) (Table I).

Table I: Range of motion (mean ±standard deviation) (mm) before and after stabilization occlusal device therapy.

		Before	After	*F*	*P*
Sagittal Plane	Anteroposterior range (mm)	21.9 ± 11.5	25.4 ± 10.7	6.8	.01
Frontal Plane	Mouth opening (mm)	35.5 ± 7.2	38.1 ± 5.1	19.2	.0001
	Lateral Deviation (mm)	4.4 ± 3.5	2.7 ± 3.0	0.3	.60
Horizontal Plane	Maximum Lateral Right (mm)	9.1 ± 2.4	9.7 ± 2.9	3.4	.07
	Maximum Lateral Left (mm)	8.9 ± 2.4	9.1 ± 2.6	0.5	.47

Repeated measures ANOVA, α=.05; Degrees of Freedom: 1;49.

The use of stabilization devices also increased maximum velocity during the opening (P<.001) and closing (P=.04) phases of the masticatory cycle (Table II).

Table II: Mandibular movements during chewing (mean ±standard deviation) before and after stabilization occlusal device therapy.

	Before	After	*F*	*P*
Opening time (s)	219.7 ± 46.7	206.9 ± 44.0	4.0	.05
Closing time (s)	324.8 ± 71.7	319.3 ± 75.0	1.1	.30
Cycle time (s)	711.1 ± 111.7	686.0 ± 119.4	5.4	.30
Maximum Opening Velocity (mm/s)	124.6 ± 39.9	137.8 ± 37.9	7.0	.01
Maximum Closing Velocity (mm/s)	105.8 ± 29.5	113.5 ± 30.6	4.1	.04
Opening angle	92.3 ± 20.0	89.8 ± 20.5	0.6	.45
Closing angle	88.9 ± 28.6	92.6 ± 30.0	0.4	.50

Repeated measures ANOVA, α=.05; Degree of Freedom:1;49.

ESS results showed that 32% of the participants with MFP presented excessive daytime sleepiness in the baseline evaluation (Table III). After treatment, the ESS total score reduced, and 82% of these participants no longer complained of excessive daytime sleepiness. PSQI values were also reduced after treatment (P<.001) with 68% of participants being classified as good sleepers (Table III).

Table III: Mean and percentage values of sleep quality (ESS and PSQI) before and after stabilization occlusal device therapy.

Treatment	ESS		*F*	*P*	PSQI		*F*	*P*
Before	Excessive daytime sleep	16 (32%)			Poor Sleeper	38 (76%)		
	No excessive daytime sleep	34 (68%)			Good Sleeper	12 (24%)		
			36.3	.0001			4.3	.04
After	Excessive daytime sleep	9 (18%)			Poor Sleeper	16 (32%)		
	No excessive daytime sleep	41 (82%)			Good Sleeper	34 (68%)		

ESS = Epworf Sleepness Scale ; PSQI = Pittsburgh Sleep Quality Index. Repeated measures ANOVA, α=.05; Degree of Freedom:1;49.

Seven participants had the same PSQI score as at the baseline, and only 3 participants showed an increase in the total value after treatment. Considering the cutoff of 5 points in the total score, 38 participants (76%) were classified as poor sleepers at the baseline and after treatment, this percentage dropped to 32%. After treatment, a significant reduction was noted in the values of the following PSQI domains: subjective sleep quality (P<.001), sleep latency (P<.001), sleep duration (P<.001), sleep disturbance (P<.001), and daytime sleep dysfunction (P<.001) (Table IV).

Table IV: Pittsburgh Sleep Quality Index (PSQI) values before and after stabilization occlusal device therapy.

PSIQ Score	Treatment period	Mean	Median (quartis)	*F*	*P*
PSQI total score	Before	7.4	7 (4-10)	29.8	<.0001
	After	5.2	5 (3-9)		
Subjective sleep quality	Before	1.4	1.5 (1-2)	12.6	.0008
	After	1.0	1 (0-2)		
Sleep latency	Before	1.4	2 (0-2)	8.9	.004
	After	1.0	1 (0-2)		
Sleep duration	Before	0.8	1 (0-2)	14.0	.0005
	After	0.4	0 (0-1)		
Sleep efficiency	Before	0.3	0 (0-1)	2.8	.10
	After	0.2	0 (0-0)		
Sleep disturbance	Before	1.6	2 (1-2)	13.3	.0006
	After	1.3	1 (1,2)		
Use of medication	Before	0.3	0 (0-1)	.08	.78
	After	0.4	0 (0-1)		
Daytime sleep dysfunction	Before	1.4	1 (1-2)	21.7	.0001
	After	0.9	1 (0-1)		

Repeated measures ANOVA, α=.05; Degree of Freedom: 1;49.

DISCUSSION

This study was one of the first to elucidate the role of MFP in mandibular movements and sleep quality, confirming that pain really impairs these variables. In addition, it supported the hypothesis that the reduction of MPF symptoms after stabilization

device therapy also improves jaw movement and sleep quality. Similar results have been previously reported.[9,10] The mechanism by which pain is relieved after device use and why this treatment is efficient for some patients but not effective for others remains unclear.[10] The most acceptable theory is that well-adjusted devices balance the activity of masticatory muscles by eliminating occlusal interference, distributing the occlusal force over teeth uniformly and balancing the action of agonist and antagonist muscles, as measured by electromyography.[9] This muscle balance results in better muscle function and a consequently reduction in pain as found in the present study. In addition, the multifactorial etiology of TMD could probably help explain the different responses of patients to treatment.[1,11]

Significant increases in mouth opening and in the anteroposterior range of mandibular motion were observed after the use of stabilization devices by participants with MFP. Although studies considering only MFP participants are scarce, these results are consistent with previous studies [7,29] evaluating patients with different TMD conditions, such as nonreducing disk displacement and/or osteoarthritis. According to their results, [7,29] a positive effect of the device treatment was observed on maximum mouth opening. Moreover, individuals without TMD showed a higher maximum mouth opening than patients with MFP even after the treatment, which could support the findings that pain reduction aids in the recovery of a normal range of motion. [28]

No significant changes were noted in lateral deviation during opening or in the maximum range of right and left lateral movements. Contrasting results were reported by Sato et al [4]; however, they evaluated the jaw motion after TMD treatment in patients with nonreduced disk displacement. Since TMJ structural disorders could cause mechanical interference to lateral jaw movements, [28] the inclusion of only participants with MFP could explain the lack of changes in these variables in the present study.

In our mastication evaluation, we observed no changes in the masticatory cycle time and angles (opening and closing) after the use of stabilization devices by participants with MFP. In fact, similar results were obtained by previous studies. [14,33]According to Kuwahara et al, [6] patients with MFP have no defined mastication pattern, because they do not present any structural disease in the TMJ that could act as a mechanical interference to the

mandibular motion. In addition, an interesting study [33] showed that experimentally induced MFP by the infusion of hypertonic saline solution into the masseter muscle increased the velocity of masticatory movements, producing a more vertical pattern of motion. Those authors[33] also reported that pain was not the most important factor in determining changes in masticatory rhythm.[33] These findings could explain why the pain reduction after treatment was unable to alter the masticatory movement.

In contrast, after the use of stabilization devices, the maximum velocity during opening and closing movements increased. A previous study[7] evaluating patients with disk derangements, osteoarthritis, or TMJ inflammatory disorders confirmed that pain reduction after TMD treatment leads to increased mastication speed, supporting the findings of the present study. Soboleva et al[14] showed no differences in mastication velocity after device use. However, the use of soft material during mastication analysis and the optoelectronic system to record the reflecting markers attached to the participant's chin in the former study [14] may explain this difference.

Patients suffering from painful syndromes usually have changes in sleep quality. [12,17] This assumption was confirmed in the patients with MFP evaluated in the present study. Patients with chronic pain spent more time in bed with the lights off, woke more during the night, and slept less efficiently than the the controls.[12] Two possible theories attempt to explain the relationship between pain and sleep disorders.[19] The first hypothesizes that insomnia or sleep loss occurs as a consequence of chronic pain. [18,19] The second theory hypothesizes that sleep interruption increases the pain intensity levels.[19] Also, sleep disturbances may directly contribute to central sensitization and pain amplification.[17] Thus, a cyclical condition where the trigger factors act as perpetuating factors could occur in patients with pain; however, there is no consensus of cause and effect in relation to pain and sleep disorders. [12,19]

The ESS results reflect the poor sleep quality presented by the participants with MFP at the baseline. Similarly, a previous study[20] using polysomnography showed that poor nighttime sleep was associated with increased daytime pain and pain complaints during the following day.[20] Regarding the PSQI evaluation, the mean score values decreased after the treatment, indicating significant improvements in perceived sleep

quality. Since the main goal of the MFP treatment is to decrease pain, it may be suggested that pain intensity affects sleep quality.[18] These findings indicate that professionals treating patients with MFP should be aware of the quality of their sleep so that they can individualize therapy.

The present study did not include a nontreatment or placebo control group, which is a limitation. However, this paired controlled study was an effort to verify the influence of the conventional MFP treatment on jaw motion and sleep quality. Future studies evaluating different MFP treatments are needed.

CONCLUSION

MFP impairs certain elements of jaw motion as well as the quality of sleep. Stabilized device therapy improves masticatory movements and sleep quality by reducing the pain of patients with MFP.

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CAPÍTULO 3: Diagnostic Criteria for Temporomandibular Disorders: Self-instruction or formal training and calibration?

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Larissa Soares Reis Vilanova, Renata Cunha Matheus Rodrigues Garcia, Thomas List and Per Alstergren

Larissa Soares Reis Vilanova, DDS

Graduate Student, University of Campinas, Piracicaba Dental School, Department of Prosthodontics and Periodontology, Piracicaba, Brazil; and Malmö University, Faculty of Odontology, Department of Orofacial Pain and Jaw Function, Malmö, Sweden and Scandinavian Center for Orofacial Neurosciences (SCON).

Renata Cunha Matheus Rodrigues Garcia, DDS, MSc, PhD

Professor, Department of Prosthodontics and Periodontology, Piracicaba Dental School, University of Campinas, Piracicaba, Brazil.

Thomas List, DDS, Odont Dr

Professor and Chair, Department of Orofacial Pain and Jaw Function, Faculty of Odontology, Malmö University, Malmö, Sweden; Skåne University Hospital, Specialized Pain Rehabilitation, Lund, Sweden and Scandinavian Center for Orofacial Neurosciences (SCON).

Per Alstergren, DDS, PhD, Med Dr

Associate Professor, Department of Orofacial Pain and Jaw Function, Orofacial Pain Unit, Faculty of Odontology, Malmö University, Malmö, Sweden, Skåne University Hospital, Specialized Pain Rehabilitation, Lund, Sweden and Scandinavian Center for Orofacial Neurosciences (SCON).

Correspondence

Larissa Soares Reis Vilanova.

Malmö University, Faculty of Odontology, Department of Orofacial Pain and Jaw Function, 205 06 Malmö, Sweden.

Fax: +46 40 665 70 00; e-mail: larissasrvilanova@gmail.com

Abstract

Aims

To investigate the difference in diagnostic reliability between self-instructed examiners and examiners taught in a DC/TMD course and if the reliability of self-instructed examiners improves after the course.

Methods

Six examiners were divided into two groups: (1) formal two-day training and calibration course at a DC/TMD training center (Course group) and (2) self-teaching through documents and movie (Self group). The Self group later participated in the course (Self + course group). Each group examined sixteen subjects and the reliabilities in relation to the diagnoses derived by a Reference Standard Examiner were compared by Cohen's Kappa coefficient.

Results

The reliability was good to excellent in all three groups of examiners for all diagnoses, except for *Myofascial pain with referral* in the Self + course group. The course improved the reliability regarding *Myalgia* and *Arthralgia* at the same time as the examiners experienced the course to be valuable for self-perceived ability and confidence.

Conclusion

In conclusion, this study shows that the diagnostic reliability of formal DC/TMD training and calibration and DC/TMD self-instruction are similar, except for subgroups of *Myalgia*. Thus, self-instruction seems to be possible to use to diagnose the most common TMDs in dental practice. The course further improves the reliability regarding *Myalgia* and *Arthralgia* at the same time as the examiners experienced the course to be valuable for self-perceived ability and confidence.

Keywords

Diagnosis, Orofacial pain, Pain**,** Reliability, Temporomandibular disorders

Introduction

Orofacial pain (OFP) and temporomandibular disorders (TMD) are conditions that affect more than 10% of the population.[1,2] Clinically, OFP/TMD is characterized by pain or dysfunction of the masticatory muscles, temporomandibular joint (TMJ) and/or related structures.[3,4] Diagnosis of OFP/TMD is to various degree covered in diagnostic classifications by for example American Association of Orofacial Pain (AAOP),[5] International Headache Society (HIS) classification,[6] International Association for the Study of Pain (IASP),[7] Classification of Chronic Pain and International Statistical Classification of Diseases and Related Health Problems (ICD-10).[8] In 1992, the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) was published. RDC/TMD was developed to cover the most common TMDs and incorporated two axes: Axis I covered the clinical condition and Axis II the psychosocial status and pain-related disability according to the biopsychosocial model of chronic pain.[9] The RDC/TMD has been used extensively over the last two decades. Reliability and validity have been widely studied[10-14] but the use of RDC/TMD has also been criticized.

Recently, a validated development of the RDC/TMD was published,[15] The Diagnostic Criteria for TMD (DC/TMD) that provides a comprehensive assessment of the most common TMD conditions, based on the biopsychosocial model of chronic pain.[15] The DC/TMD similarly comprises two axes which the DC/TMD axis I protocol includes reliable, strictly specified and valid diagnostic criteria for the most common pain-related TMDs and intra-articular disorders.[15] Regarding Axis II, other studies have shown that the original RDC/TMD biobehavioral measures are incomplete in terms of prediction of disease course.[2,5,15] The DC/TMD instruments was therefore developed from RDC/TMD.[15] The DC/TMD is intended to be used in general dentistry as a validated tool to diagnose the most common OFP/TMD conditions.

In a research setting high operator reliability is important to strive for to gain the highest reliability.[13,16-18] DC/TMD training and calibration can be conducted on five levels depending on the purpose of its use, i.e. general dentistry, speciality clinics or research. The training and calibration levels span from self-instruction via an instruction video and

reading the documentation to a comprehensive two-day training and calibration course. This course should be given by a DC/TMD Training Center. A reliability assessment day can also be included. The latter level is of course very time- and resource-consuming and only allows three persons at a time to train, calibrate and assess their reliability at each occasion. In order to promote fast dissemination of the DC/TMD for clinical or research use, especially in general dentistry, self-instruction that gives acceptable diagnostic reliability compared to the training and calibration course would be ideal.

The strict examination and diagnostic procedures in DC/TMD require a certain amount of training. However, one main aim of the DC/TMD remains that it should be simple to learn and adopt, while still showing an acceptable reliability on a diagnosis level.[15] Training and calibration of examiners has previously, however, been shown to improve diagnostic reliability and accuracy.[19-22]

The aim of this study was to investigate the difference in diagnostic reliability between self-instructed examiners and examiners taught by formal training and calibration in DC/TMD as well as if the reliability of self-instructed examiners improves after taking the course.

Materials and Methods

Setting

Reliability assessment data was gathered at three occasions at two OFP/TMD clinical centers in Linköping and Kalmar, Sweden. The first reliability assessment was performed after a two-day course in DC/TMD (Course group), the second was performed with self-instructed subjects (Self group) and the third occasion (three months after the second occasion) was performed after the self-instructed subjects also participated in the course (Self + Course group).

Subjects

The subjects whose data is analyzed in this study of DC/TMD diagnostic reliability are three OFP/TMD specialists and three general practitioners. The Course group consisted of three female specialists in OFP/TMD (mean age 54 years) and the Self/Self + course group comprised one male and two female general practitioners (mean age 31 years). An

OFP/TMD specialist from the DC/TMD Training and Calibration Center in Malmö, Sweden acts as Reference Standard Examiner (RSE). In addition, another OFP/TMD specialist from the DC/TMD Training and Calibration Center in Malmö, Sweden participated as the Protocol Supervisor (PS).

This study involved convenience samples of 36 patients referred for OFP/TMD examination and treatment to the two OFP/TMD clinical centers as well as 12 healthy individuals (Table 1). The inclusion criteria were participants presenting with TMD symptoms or healthy individuals without current or previous OFP/TMD symptoms. Exclusion criteria for both groups were individuals with age below 18 years and severe physical disease with ASA class ≥3 (cardiovascular, renal, pulmonary or autoimmune disease or malignancy), psychiatric disease (bipolar disorder, ADHD, autism spectrum disorders, anorexia nervosa, bulimia nervosa, schizophrenia and personality disorders whereas depression or anxiety disorders does not exclude the subject).

Before the examination all patients and healthy individuals answered the DC/TMD Axis II instruments used for assessment of psychosocial status and distress. The demographic characteristics of the sample regarding each group are described in Table 1. The subjects were informed about the project and signed a consent form. The project was approved by the regional Ethical Review Board.

Table 1 Demographic characteristics of patients with temporomandibular disorders and healthy individuals in DC/TMD reliability assessments by three groups with examiners taught in a two-day course (Course group), self-instructed (Self group) and self-instructed examiners that also participated in the course (Self + course group).

		Group			
		Course	Self	Self + course	***P***
Age	*Years*	48 (42/68)	52 (30/58)	53 (47/61)	0.709
Gender	*Men*	7	2	4	0.135
	Women	9	14	12	
Participants	*Patients*	11	12	13	0.717
	Healthy individuals	5	4	3	
Family situation	*Single*	0	1	3	**0.040**
	Married/Partner	10	7	12	
	Other (ex. Divorced/widow)	6	8	1	
Education	*High school*	4	4	1	0.618
	Gymnasium	8	7	9	
	College/University	4	5	6	
Occupation	*Working/studying*	2	12	10	**0.005**
	Retired/housewife/parental leave	13	3	5	
	Unemployed/ early retirement/sick listed	1	1	1	
Characteristic Pain Intensity	*0-10*	2 (0/5)	4 (2/6)	4 (2/5)	0.646

DC/TMD = Diagnostic criteria for temporomandibular disorders. Age and characteristic pain intesity are reported as median (25th/75th percentile). P-vaules are from the Chi-square test or the Kruskall-Wallis ANOVA on ranks (age and characterstic pain intensity).

Sample sizes were based on prior studies [21,23,24] to determine reliability of DC/TMD clinical examiners in detecting signs and symptoms of TMD. The sample sized used proved

adequate for patient tolerance of repeated examination procedures and allowed useful and reliable clinical data to emerge, as demonstrated in published accounts of RDC/TMD assessments.[21,23,24] Other factors influencing sample size include the feasibility of conducting such trials in an acceptable time frame. Each patient and healthy individuals were examined by respectively examiner at each occasion.

DC/TMD training and calibration course

Information and full documentation were sent to the participants prior to the course in order to ensure that they had the possibility to learn about DC/TMD and especially to learn and memorize all mandatory commands. The standardized two-day course in DC/TMD training and calibration comprised the following steps: the first half-day consisted of theoretical education about DC/TMD purpose, history and future as well as clinical diagnoses (Axis I) and psychosocial status and distress (Axis II). The second half-day included a detailed explanation of the clinical examination using the instruction movie and clinical training for the participants by performing the clinical examination on the RSE while the RSE gave immediate and detailed feedback. The morning of the second day started with clinical training of the participants by clinical examination of each other while the RSE was standing beside and giving immediate feedback. After that, clinical calibration of the participants was performed by clinical examination of patients where the RSE was present in the room and giving detailed feedback after completion of the procedure. The last afternoon included diagnostic exercises on patient cases, patient case discussions and discussions about how to implement DC/TMD in the clinical practice.

DC/TMD self-instruction

The three operators in the Self Group were instructed to download the instruction movie as well as the full documentation and learn the DC/TMD examination procedure by themselves.

Reliability assessment

The reliability on a diagnostic level of DC/TMD Axis I diagnoses, based on the questionnaire and clinical examination, was assessed during one day. The examiners

individually examined all patients and healthy individuals, blinded from each other's findings. An incomplete Latin square design was used such that order of the examiners was randomized to balance and minimize examiner's examination order effects. The reliability assessment was performed in four two-hour blocks of DC/TMD examinations. Each examination was performed over a maximum of twenty minutes in order to allow the subject to rest at least ten minutes between examinations. The examiners moved between the participating patients and healthy individuals within each dental clinic setting, with the patient/healthy individual remaining seated in the same clinical operatory. A recorder was assigned to each operatory. Manuals were provided to the examiners which defined all variables and how they are assessed. All instructions to patients and healthy individuals were delivered by the examiner in Swedish, using standardized translations produced by DC/TMD Training and Calibration Center in Malmö, Sweden in accordance to accepted standards for producing such translations as required and adopted by the International DC/TMD Consortium.[25]

Protocol Supervisor observation and feedback

The PS observed one examiner at a time during the clinical examinations and covered during the day all examiners, including the RSE. After each clinical examination, the PS gave detailed feedback to the examiner that was observed by the PS. After each two-hour block, the PS recorded feedback from the subjects and recorders regarding any differences between the examiners related to instructions, commands and procedures. This was summarized and forwarded to the examiners after each two-hour block.

Self-perceived ability to perform DC/TMD diagnostics and satisfaction with DC/TMD learning

After the reliability assessment, the examiners were asked to rate their degree of agreement with statements about their self-perceived ability in DC/TMD diagnosis (regarding several aspects of the DC/TMD procedure) and their satisfaction regarding how they learnt various aspects of the DC/TMD procedure. The questionnaire comprised 10 statements with end-points "No ability" and "Very high ability" as well as "Not satified" to "very satisfied".

The Self + course group completed a separate questionnaire after their second reliability assessment. The examiners were asked to rate to what extent the course improved (end-points "Not at all" and "To a very high degree") their ability and learning regarding various aspects of the DC/TMD procedure.

DC/TMD diagnoses

The DC/TMD clinical data, as described above, were used to derive DC/TMD diagnoses by the use of the DC/TMD diagnostic algoritms.[15] The following DC/TMD Axis I diagnoses were derived:

Pain-related TMD and Headache

- Local myalgia (per subject)
- Myofascial pain with referral (per subject)
- Myalgia (local myalgia and myofascial pain with referral; per subject)
- Arthralgia (per joint)
- Headache attributed to TMD (per subject)

Intra-articular joint disorders and Degenerative joint disorder

- Disc displacement with reduction (per joint)
- Disc displacement with reduction with intermittent locking (per joint)
- Disc displacement without reduction (per joint)
- Disc displacement without reduction without limited opening (per joint)
- Degenerative joint disease (per joint)

Data analysis

The diagnoses derived from the clinical data from the examiners, i.e. based on responses to the questionnaires as well as data from the clinical examination, were compared to those derived from the RSE clinical data.

The Cohen's kappa coefficient was used to calculate the reliability of the DC/TMD diagnoses. TMJ specific diagnoses were treated as independent observations, *i.e.* two diagnoses per individual: one for the left and/or one for the right TMJ, for each of the

possible diagnoses. The reliability of DC/TMD diagnoses was determined for each reliability assessment. Kappa values as follows were interpreted as: < 0: less than chance agreement, 0.01–0.20: slight agreement, 0.21– 0.40: fair agreement, 0.41–0.60: moderate agreement, 0.61–0.80: substantial agreement and 0.81–0.99: almost perfect agreement.[26,27] Statistics were performed using Stata software, version 12-SE (Stata Corp., College Station, TX, USA).

The Chi-square test was used to calculate the significance for differences in distribution of gender, participants, family situation, education level and occupation between the sites. The Kruskall-Wallis ANOVA on ranks was used to calculate the significance of a difference in age and characteristic pain intensity between the patients and healthy individuals participating at the reliability assessment in each group. A probability level of $P < 0.05$ was considered as significant.

Results

DC/TMD diagnoses

Table 2 shows the distribution of diagnoses derived at each reliability assessment by the RSE. There was a significantly higher prevalence of the diagnosis *Arthralgia* in the patients and healthy individuals at the reliability assessment for the Self + course group compared to those included at the Self group and Course group reliability assessments ($P = 0.027$). No other significant difference regarding distribution of diagnoses was found.

Table 2 Prevalence of DC/TMD diagnoses as derived from data gathered by the reference standard examiner among 16 patients and healthy individuals at three reliability assessments by examiners taught in a two-day course (Course group), self-instructed examiners (Self group) and self-instructed examiners that also participated in the course (Self + course group).

	Group			
Diagnosis	Course n (%)	Self n (%)	Self + course n (%)	***P***
Pain-related TMD and headache				
Myalgia	7 (43%)	8 (50%)	13 (81%)	0.070
Local myalgia	4 (25%)	0	4 (25%)	0.091
Myofascial pain with referral	3 (18%)	8 (50%)	9 (56%)	0.070
Arthralgia	9 (28%)	9 (28%)	18 (56%)	**0.027**
Headache attributed to TMD	5 (31%)	4 (25%)	6 (37%)	0.789
Intra-articular joint disorders				
Degenerative joint disease	9 (28%)	7 (21%)	7 (21%)	0.796
Disc displacement with reduction	6 (18%)	3 (9%)	8 (25%)	0.257
Disc displacement with reduction, with intermittent locking	0	0	2 (6%)	0.130
Disc displacement without reduction	0	2 (6%)	0	0.364
Disc displacement without reduction, with limited opening	0	2 (6%)	0	0.132
No DC/TMD diagnosis	5 (31%)	4 (25%)	3 (18%)	0.751

DC/TMD = Diagnostic criteria for temporomandibular disorders; n = number of observations.
The diagnosis Myalgia is the diagnoses Local myalgia and Myofascial pain with referral combined to be used in general practice.

Diagnostic reliability

The Kappa values (median and range) for the inter-operator reliability compared to the RSE for each investigated DC/TMD diagnosis are shown in Table 3. The reliability was moderate or better for all diagnoses except for *Local myalgia* and *Myofascial pain with referral* for the Self + course group. Disc-related diagnoses other than *Disc displacement*

with reduction were not possible to compare between the examiner groups due to the low prevalence in the participating subjects preventing the calculation of Kappa values.

The low reliability for *Local myalgia* and *Myofascial pain with referral* in the Self + Course group motivated a deeper analysis. The number of patients diagnosed with *Myofascial pain with referral* by the RSE was higher than patients diagnosed by the examiners. Accordingly, the number of patients diagnosed with *Local myalgia* by the RSE was lower than patients diagnosed by the examiners. This indicates a discrepancy between the RSE and examiners regarding assessment of referred pain. An analysis of the number of sites with referred pain showed that there was a relation between the findings of the RSE and the examiners but that the RSE in general found more sites with referred pain (data not shown).

Table 3 Reliability (Cohen's Kappa values) of DC/TMD diagnoses derived by clinical data from three examiners in each group compared to the reference standard examiner. The examiners were either taught in a two-day course (Course group), self-instructed examiners (Self group) and self-instructed examiners that also participated in the course (Self + course group).

	Course		**Self**		**Self + course**	
Diagnosis	Median	Range	Median	Range	Median	Range
Pain-related TMD and headache						
Myalgia	0.91	(0.88 - 1.00)	0.65	(0.50 - 0.75)	1.00	(0.82 - 1.00)
Local myalgia	0.84	(0.71 - 1.00)	n.a.	n.a.	0.43	(0.14 - 0.70)
Myofascial pain with referral	0.76	(0.60 - 0.81)	0.62	(0.35 - 0.70)	0.26	(0.07 - 0.70)
Arthralgia	0.66	(0.42 - 0.87)	0.47	(0.47 - 0.60)	0.74	(0.62 - 0.81)
Headache attributed to TMD	0.84	(0.70 - 0.86)	0.82	(0.60 - 1.00)	1.00	(0.87 - 1.00)
Intra-articular joint disorders						
Degenerative joint disease	0.66	(0.66 - 0.92)	0.81	(0.71 - 0.81)	0.73	(0.73 - 0.81)
Disc displacement with reduction	0.44	(0.24 - 0.61)	0.52	(0.35 - 0.84)	0.73	(0.73 - 0.81)

DC/TMD = Diagnostic criteria for temporomandibular disorders. n.a. = not applicable (due to prevalence = 0). The diagnosis *Myalgia* is the diagnoses *Local myalgia* and *Myofascial pain with referral* combined to be used in general practice.

The lower Kappa values for all three groups regarding *Arthralgia* also motivated a separate analysis. The degree of agreement between the RSE and the examiners for separate variables related to the DC/TMD diagnoses *Arthralgia* is presented in Table 4. The Self group showed a lower agreement than the other groups regarding pain location, TMJ pain on movement and TMJ palpation pain than the other groups.

Table 4 Agreement between three examiners in each group, either taught in a two-day course (Course group), self-instructed examiners (Self group) and self-instructed examiners that also participated in the course (Self + course group, and the Reference Standard Examiner [RSE] regarding clinical findings related to the DC/TMD diagnosis Arthralgia.

			Agreement with RSE		
			C	S	S + C
ARTHRALGIA					
TMJ pain location	*Agreement*	%	92	76	91
	Disagreement	%	8	24	9
TMJ pain on movement	*Agreement*	%	76	67	88
	Disagreement	%	24	33	12
TMJ palpation pain	*Agreement*	%	91	70	96
	Disagreement	%	9	31	4

DC/TMD = Diagnostic criteria for temporomandibular disorders.
C = Course Group, S= Self Group, S+C = Self + Course Group.

Protocol Supervisor observations

The subjects reported that the examiners initially used individual words but there was an early and substantial improvement in all three groups to match the RSE. The subject's understanding of the commands and what the subjects expected to do were clear. For procedures, there were minor initial differences between the examiners in the Course group and Self + course group. In the Self group, there were initial differences regarding force used as well as sites and time for palpation, differences that disappeared early during the day after individual feedback from the PS. For the Self group, the PS noticed that approximately 50% more feedback was required and that the variation between the examiners were larger in the beginning of the day. The examiners were very similar to the RSE at the last two-hour block of the day regarding commands and instructions.

The recorders noticed that the communication was adequate in general for the Course group and the Self + course group. However, the communication was unsatisfactory and inadequate from the examiners in the Self group for the first subjects examined. The recorders noticed a substantial improvement in communication between the reliability assessments for the Self group and the Self + course group.

Self-evaluation of diagnostic ability and learning satisfaction

The self-evaluation by the examiners in the Course group and Self group regarding confidence in their ability to perform the clinical examination, derive DC/TMD Axis I diagnoses and to interpret the Axis II instruments as well as their satisfaction about their learning of the DC/TMD procedure is presented in Table 5. The examiners evaluated their ability and satisfaction to be high and very similar, in general.

The Self + course group scored that the course improved their confidence in their ability to perform the clinical examination, derive DC/TMD Axis I diagnoses and to interpret the Axis II instruments to a great extent in general.

Table 5 Median and range of self-evaluation scores (0 corresponded to no ability or no satisfaction with own learning and 10 corresponded to very high ability and very high satisfaction with learning) in three examiners in each group that either were taught in a two-day course (Course group) and self-instructed examiners (Self group). The self-instructed examiners also participated in the course (Self + course group) and rated how much the course improved their ability and their learning satisfaction compared to self-teaching (0 = not at all, 10 = to a very large degree; grayed areas).

	Ability			**Satisfaction**		
	Course	Self	Self + course	Course	Self	Self + course
Clinical examination						
Give correct instructions to the patient	8 (7-8)	9 (8-10)	9 (8-10)	7 (6-8)	9 (7-10)	8 (8-10)
Identify pain localization	9 (8-9)	8 (6-10)	7 (5-8)	8 (8-9)	9 (6-10)	8 (8-10)
Measurements (range of motion, overbite, etc.)	9 (9-10)	9 (8-10)	9 (8-10)	9 (9-10)	9 (6-10)	8 (8-10)
Assessment of temporomandibular joint sounds	7 (7-8)	7 (5-8)	8 (7-10)	8 (7-9)	7 (5-8)	8 (8-10)
Palpation of muscles	9 (8-9)	8 (6-8)	7 (5-9)	9 (8-9)	7 (3-9)	7 (8-10)
Palpation of temporomandibular joints	9 (8-9)	8 (6-8)	7 (5-9)	8 (8-9)	7 (3-9)	7 (8-10)
Identifying familiar pain	9 (8-9)	8 (6-10)	8 (8-10)	9 (9-10)	9 (5-9)	8 (8-10)
Identifying referred pain	8 (8-9)	8 (6-10)	7 (5-8)	9 (8-10)	9 (3-10)	7 (8-10)
Diagnostics, etc.						
Derive DC/TMD-diagnosis (Axis I)	7 (6-8)	7 (6-8)	8 (7-8)	7 (6-8)	8 (6-10)	8 (7-10)
Interpretation of instruments used to assess psychosocial factors (Axis II)	8 (7-9)	7 (5-8)	9 (6-10)	8 (7-9)	7 (5-8)	8 (5-10)

Discussion

The results of the present study show that diagnostic reliability was moderate to almost perfect after self-teaching DC/TMD or participating in the two-day DC/TMD training and calibration course. The Self group improved their reliability regarding *Myalgia* and *Arthralgia* after participating in the two-day DC/TMD training and calibration course. For

potential use in general practice, the diagnosis *Myalgia* showed substantial to almost perfect reliability in all groups.

The validated DC/TMD with established sensitivity and specificity for the most common OFP/TMD conditions comprise strict clinical procedures and diagnostic criteria. These procedures must be trained and learned in order to ensure reliability and to achieve the established sensitivity and specificity. The formalized two-day training and calibration course is likely optimal to learn DC/TMD but it is time- and resource-consuming. It also requires participation of a RSE or PS from a DC/TMD Training and Calibration Center. This severely limits the availability of such courses, at least today. To promote spread of the use of DC/TMD, not the least among general practitioners that wants to use this in their clinical practice, a less resource-consuming self-instruction that achieves acceptable diagnostic reliability would be highly advantageous.

The self-instruction, as applied in this study, means that the participants download an instruction movie as well as the DC/TMD documentation. The results in this study are thus partly based on the pedagogical quality of this material. This study gives indications on how the self-instruction material can be improved. When accomplished, such improvement should have the possibility to give even higher reliability.

Diagnostic reliability

The diagnostic reliability was moderate to almost perfect after self-teaching DC/TMD or participating in the two-day DC/TMD training and calibration course, indicating that self-teaching is sufficient in order to achieve adequate reliability for the investigated diagnoses but that the reliability can be improved further by the course.

The differences in reliability between the groups regarding *Local myalgia* and *Myofascial pain with referral* is likely explained by differences in assessing referred pain, according to the deeper analysis. As a consequence, assessment of referred pain should be improved and carefully taught in DC/TMD training. We cannot explain why the Self + course group showed the lowest reliability for *Local myalgia* and *Myofascial pain with referral*. The reliability for *Myalgia* was, however, very high showing that the examiners were very good

at identifying patients with masticatory muscle pain in general but not as good to divide the patients into subgroups of muscle pain with or without referred pain. This was surprising since the examiners that participated in the Self and Self + course groups had learnt DC/TMD by themselves as well as taken the two-day course.

This is the first study regarding diagnostic reliability of the recently published DC/TMD criteria.[15] Examiner training and calibration, rather than professional experience, is the most important factor for reliable diagnosis of TMD symptoms using RDC/TMD.[20] Re-training and re-calibration of examiners in RDC/TMD diagnostics improves reliability of most of clinical variables[16,19,28] whereas experienced clinicians that did not participate in training and calibration showed low reliability.[9] The Self group improved their reliability regarding *Myalgia* and *Arthralgia* after participating in the two-day DC/TMD training and calibration course. This points to a need for the course in situations where the highest possible reliability is important, like multi-center research projects.

The reliability for *Arthralgia* was substantial for the Course group and the Self + course group and only moderate for the Self group. The difference in reliability is probably not due to a too low prevalence in one or more groups. Our raw data indicate that the disagreement between the RSE and the examiners in the Self group was due to differences in recording of TMJ pain during the last 30 days, TMJ pain on movements and TMJ palpation pain. The Course group and the Self + course group showed the highest agreement to the RSE, indicating a significant contribution of the training and calibration course to the correct DC/TMD assessment of TMJ pain. This part must thus be thoroughly emphasized in the final self-teaching material.

Diagnosis of *Disc displacement with reduction* showed a substantial reliability for the Self + course group but a moderate reliability for both the Course group and the Self group. The Kappa value is affected by the prevalence of the finding under consideration and for rare findings, low values of kappa may not necessarily reflect low rates of overall agreement.[29] Among the subject included for the Course group and the Self group, the prevalence of *Disc displacement with reduction* was fairly low, 9 and 18% respectively. In the subjects in

the Self + course group the prevalence was higher, 25%. The difference in prevalence may therefore be one reason for the difference in reliability between these groups. The deeper analysis of which clinical variable that may have contributed to this difference did not show any particular differences between the groups, supporting the fact that it was the prevalence that explains the difference in reliability.

Taken together, self-teaching DC/TMD seems to result in sufficient actual and self-perceived ability on a diagnostic level to derive the diagnoses *Myalgia*, *Arthralgia*, *Degenerative joint disease*, *Disc displacement with reduction* and *Headache attributed to TMD*. This is important for promoting the dissemination of the use of DC/TMD, especially in general dentistry. If use of the subgroups *Local myalgia* and *Myofascial pain with referral* is important, for example in specialist clinics or certain research projects, the course is probably crucial to improve the reliability of these subdiagnoses as well as *Arthralgia*.

Observations by the subjects, recorders and the Protocol Supervisor

The observations by the subjects, recorders and the PS indicate that the training and calibration course is important in order to assure that identical commands as well as palpation sites and forces are used, that the pain location is checked and updated throughout the examination and that the communication with the recorder is adequate from the first clinical examination. However, during the reliability assessment day the Self group improved these aspects and at the last examination session the examiners in the Self group were very similar to the RSE, just as the Course group and the Self + course group.

Self-evaluation of the ability and learning of DC/TMD

The self-perceived ability in performing the DC/TMD procedure as well as the satisfaction of learning DC/TMD was in general high and with no apparent difference between the Self group and Course group. However, the Self + course group appraised that the course improved both their ability and satisfaction to a great extent. This is most probably due to the intense theoretical teaching and clinical training, including feedback and discussion, provided in the course. This means that the course is appreciated and has effects on the self-

perceived ability in DC/TMD but that self-teaching is still sufficient for performing the DC/TMD procedure and deriving diagnoses from the clinical data.

Methodological considerations

There was a difference in the distribution of subjects regarding occupation and family situation, a difference that we consider to be insignificant for this project and therefore with no influence on our results.

Improving the self-teaching material

Based on the findings of the present study, the instruction movie and documentation to be used for self-instruction should be improved to emphasize i) the need to update the pain location in the clinical form as the clinical examination proceeds, ii) the assessment of referred pain on palpation and iii) the assessment of pain location in the TMJ and masseter muscle or both.

Conclusion

In conclusion, this study shows that the diagnostic reliability of formal DC/TMD training and calibration and DC/TMD self-instruction are similar, except for subgroups of *Myalgia*. Thus, self-instruction seems to be possible to use to diagnose the most common TMDs in dental practice. The course further improves the reliability regarding *Myalgia* and *Arthralgia* at the same time as the examiners experienced the course to be valuable for self-perceived ability and confidence.

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CONSIDERAÇÕES FINAIS

O sistema mastigatório é responsável por funções complexas como mastigação e deglutição, além disso as funções de sorrir, rir, gritar e beijar também são desempenhadas pelo mesmo sistema (Bhatka *et al*., 2004; Auerbach *et al*., 2001). Doenças orais e desordens podem levar a complicações em diferentes níveis, limitações na função orofacial, limitações na função psicossocial ou ambas. A sensibilidade dolorosa provocada pela DTM, o que está associada à alteração na FMM, PM, limitação na movimentação mandibular e qualidade do sono é um dos exemplos de limitação da função orofacial e um adequado diagnóstico é fundamental para o tratamento da desordem (Schutz *et al*., 2009; Murray & Peck, 2007; Peck *et al*., 2008).

Segundo os resultados obtidos no primeiro estudo dessa tese, os níveis de sensibilidade dolorosa em mulheres com DTM são influenciados por flutuação hormonal do ciclo menstrual, sem no entanto interferir na função mastigatória. Ou seja, os níveis de dor de DTM variou ao longo do ciclo menstrual e aumentou quando os níveis de estrogênio são baixos, o que correspondeu à fase lútea. Além disso, as mulheres com DTM que utilizam anticoncepcional, tiveram um aumento do nível de dor facial no final do ciclo, durante o intervalo de tempo que não estavam utilizando o anticoncepcional, demostrando um aumento na dor facial quando os níveis de estrogênio são mais baixos, durante a semana de intervalo de uso da pílula hormonal. Em acréscimo, mulheres com o ciclo hormonal normal mostraram níveis mais baixos de dor orofacial durante a fase ovulatória.

Estes achados concordam com estudos anteriores que mostraram um aumento na dor facial quando os níveis de estrogênio eram mais baixos, correspondendo às fases lútea e menstrual ou a semana de intervalo de uso da pílula hormonal, durante os dias 21-28 (LeResche *et al*., 2003; LeResche *et al*., 1997; Yu *et al*., 2009; Isselee *et al*., 2002). De acordo com Landi *et al.* 2005, as mulheres com DTM dolorosa apresentam níveis de estrogênio maiores em comparação com indivíduos saudáveis, o que pode explicar a maior influência do estrogênio encontrado em pacientes com DTM durante este período *(Landi et al*., 2005).

O estrogênio pode estar envolvido na patogénese da DTM por meio do aumento da síntese de citocinas inflamatórias, que atuam como mediadores intercelulares e estão

envolvidos na remodelação e processos degenerativos da ATM (Haskin *et al*., 1995). Além disso, o estrogênio pode regular negativamente a síntese de prostaglandinas, que pode conduzir a uma relação inversa entre os níveis de estrogênio em circulação e dor nas articulações (Haskin *et al*., 1995). De acordo com Smith et al., uma baixa de estradiol esta associado com um estado de vulnerabilidade da dor por uma redução na função do sistema de opióides endógenos (Smith *et al*., 2006). Estudos anteriores também revelaram que o estrogênio atua sobre os músculos da mastigação reforçando a atividade enzimática da oxidação de lípidos das fibras musculares, aumentando assim a força de contração isométrica máxima (Campbell & Febbraio, 2001; Warren & Fried, 2001; Skelton *et al*., 1999).

Embora tenham sido observadas alterações significativas nos níveis de dor, não foram encontradas diferenças nos valores de FMM e PM, entre as fases do ciclo menstrual. Estes resultados foram inesperados, uma vez que estudos anteriores relataram uma influência da flutuação do estrogênio sobre a dor orofacial em pacientes com DTM (Warren & Fried, 2001; Isselee *et al*., 2001). Desta maneira, é provável que a função que o estrogênio desempenha nas estruturas relacionadas à DTM não alteram a função do sistema estomatognático.

De acordo com o segundo estudo, foi possível concluir que o tratamento de DTM com o uso de placa estabilizadora beneficiou os movimentos mandibulares e qualidade do sono por meio da redução de dor em pacientes com dor miofacial. Portanto, após o tratamento os pacientes conseguiram reduzir a dor e aumentar a abertura bucal, bem como a amplitude do movimento mandibular, beneficiando por sua vez o paciente. A qualidade do sono também sofreu variação, que pode estar relacionada em consequência da dor constante. Além disso distúrbios do sono podem contribuir diretamente com a sensibilização central e ampliação da dor. Os voluntários da pesquisa apresentaram uma má qualidade do sono que foi favorecida após o tratamento.

Em relação ao diagnóstico de DTM, sabe-se que o DC/TMD tem o propósito de elaborar diagnósticos úteis que podem ser utilizados também na prática clínica (Schiffman *et al*., 2014). O treinamento e calibração para aplicação do DC/TMD pode ser obtido por meio de cindo níveis distintos, sendo que o clínico ou pesquisador pode optar pelo nível

desejado. Os cinco níveis de formação e calibração incluem resumidamente: 1) Fazer o download do vídeo e documentos a partir do site por meio de uma autoaprendizagem; 2) Treinamento e calibração fornecido por um especialista previamente calibrado no nível 3; 3) Treinamento e calibração por um Examinador Padrão de Referência treinado em um centro de treinamento para DC/TMD 4); Treinamento, calibração e avaliação de confiabilidade com um Examinador Padrão de Referência e um Supervisor Padrão no centro de treinamento DC/TMD e 5) a) Formação, calibração e avaliação da confiabilidade em Inglês por um Examinador Padrão de Referência e um Supervisor Padrão de um centro de treinamento DC/TMD, b) Formação, calibração e avaliação da confiabilidade na língua local, por um Examinador Padrão de Referência e um Supervisor Padrão de um centro de treinamento DC/TMD. Existem dois centros de treinamento e calibração do DC/TMD no mundo nesse momento: (1) Malmö, Suécia e (2) Buffalo, EUA.

Clinícos e especialistas em DTM devem ser calibrados e treinados para a realização do DC/TMD, para que o exame seja corretamente realizado e que os seus resultados possam ser comparados mesmo quando realizado por diferentes profissionais. O exame do DC/TMD é dividido em duas partes, a primeira em que o paciente é instruído a responder o Questionário Histórico do Paciente (QHP), que foi reformulado em comparação ao RDC/TMD, diferenças notáveis incluem: requisitos de diagnóstico do Eixo I (exceto para a cronicidade da dor), a colocação de todos os instrumentos do Eixo II como um conjunto separado de documentos, e colocação dos dados demográficos em um documento separado. A organização modular (ou seja, a separação do Eixo II e instrumentos demográficos em documentos distintos) aumentando a flexibilidade na maneira como o protocolo DC/TMD pode ser adaptado para configurações específicas.

Os instrumentos do Eixo II se dividem em dois grupos, o pequeno conjunto para fins de triagem, e o longo conjunto para uma avaliação mais abrangente. O curto conjunto inclui dois instrumentos (QSP-4, JFLS-8), e o longo inclui 9 instrumentos, entre eles, Graded Chronic Pain Scale (GCPS) para avaliação de intensidade de dor; Desenho da dor para localização; Graded Chronic Pain Scale (GCPS) para função física; Jaw Functional Limitation Scale (JFLS-20) para limitação de abertura; Patient Health Questionnaire-4 (PHQ-4) para estresse; Patient Health Questionnaire-9 (PHQ-9) para depressão;

Generalized Anxiedty Disorder-7 para anxiedade; Patient Health Questionnaire-15 (PHQ-15) para sintomas físicos e Oral Behaviors Checklist (OBC) para parafunções.

A segunda parte do diagnóstico é composta pelo exame clínico, que complementa a história clínica do paciente relatada no QHP. Modificações no exame também foram incluídas, como relatado anteriormente, dentre elas a inclusão do relato do paciente a qualquer ruído articular (clique ou crepitação), sendo necessário apenas uma observação no número de ciclos de abertura e fechamento. Além disso, a detecção do ruído na posição de protusão foi eliminada e a crepitação identificada mesmo quando delicada.

Dentro deste contexto, o terceiro estudo, realizado no centro de treinamento e calibração de Malmö, Suécia, comparou os dois nível de formação do DC/TMD, (i) realizar o download do vídeo e documentos a partir do site por meio de uma autoaprendizagem e (ii) treinamento e calibraçãoo por um Examinador Padrão de Referência treinado em um centro de treinamento para DC/TMD, indicando que a confiabilidade do grupo de autoaprendizagem se apontou satisfatória em relação a do grupo que obteve um treinamento prévio. Assim, o cirurgião dentista poderá optar tanto pela autoaprendizagem quanto pelo treinamento por meio do curso. Sugere-se que pesquisadores utilizem o curso para se calibrarem no diagnóstico, e os cirurgiões dentistas optem pela conveniência.

CONCLUSÃO

Perante os resultados apresentados pode-se concluir que os níveis de dor em pacientes do gênero feminino são influenciados por flutuações hormonais do ciclo menstrual. O uso de placas estabilizadoras, durante oito semanas, foi eficaz no tratamento de indivíduos com dor miofascial, reduzindo os níveis de dor e melhoramento da qualidade do sono, a abertura máxima da boca, e a velocidade de mastigação. Além disso, os cirurgiões dentistas poderão optar por realizar a autoinstrução como treinamento do diagnóstico do DC/TMD.

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ANEXOS

Anexo 1 – Certificado de aprovação do Comitê de Ética em Pesquisa da Faculdade de Odontologia de Piracicaba

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 **"Efeito dos hormônios femininos sobre a sensibilidade dolorosa, força de mordida e performance mastigatória de pacientes com desordens temporomandibulares"**, protocolo nº 015/2011, dos pesquisadores Renata Cunha Matheus Rodrigues Garcia e Larissa Soares Reis Vilanova, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 13/04/2011.

The Ethics Committee in Research of the Piracicaba Dental School - University of Campinas, certify that the project **"Feminine hormones effect on pain sensitivity, bite force and masticatory performance in patients with temporomandibular disorders"**, register number 015/2011, of Renata Cunha Matheus Rodrigues Garcia and Larissa Soares Reis Vilanova, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee on Apr 13, 2011.

Profa. Dra. Lívia Maria Andaló Tenuta
Secretária
CEP/FOP/UNICAMP

Prof. Dr. Jacks Jorge Junior
Coordenador
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.
Notice: The title of the project appears as provided by the authors, without editing.

Anexo 2 – Figuras

Teste de Ovulação

Figura 1- Teste preditor de Ovulação Bioeasy (BioEasy Diagnóstica, Belo Horizonte, Brasil).

Figura 2 – Resultados obtidos a partir do uso do teste de ovulação. Na parte superior da figura encontra-se um teste de resultado negativo, ao centro com resultado falso-negativo e na parte inferior pode-se observar o resultado positivo.

Força Máxima de Mordida

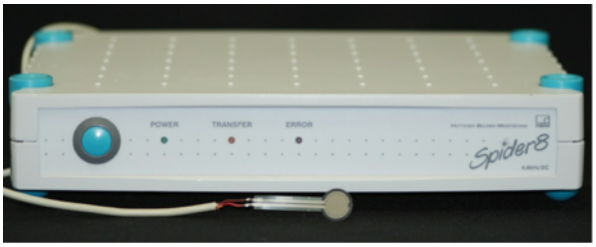


Figura 3 – Equipamento analítico de registro e amplificação do sinal emitido pelo sensor para o registro de força Spider 8 (HBM do Brasil, São Paulo, Brasil).

Figura 4 – Sensor (FSR No151, Interlink Electronics Inc., Echternach, Luxembourg) para mensuração da força máxima de mordida.

Figura 5 – Sensores (FSR No151, Interlink Electronics Inc., Echternach, Luxembourg) para registro da força máxima de mordida em posição.

Performance Mastigatória

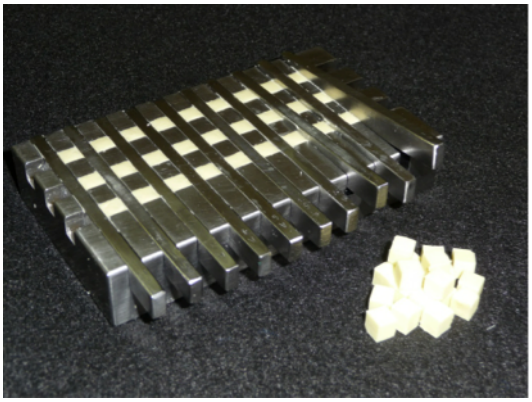


Figura 6 – Confecção de cubos de Optosil® com 5,6mm de aresta, utilizando-se matriz metálica.

Figura 7 - Material teste artificial triturado.

Figura 8 - Sistema de peneiras acopladas ao agitador

(Bertel Indústria Metalúrgica Ltda., São Paulo, Brasil).

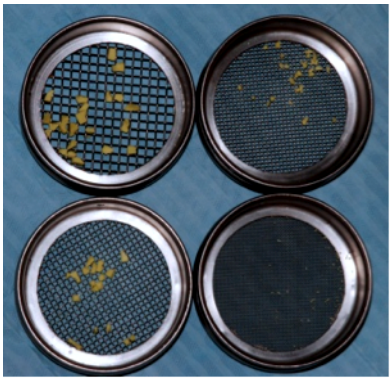


Figura 9 – Material triturado retido nas peneiras.

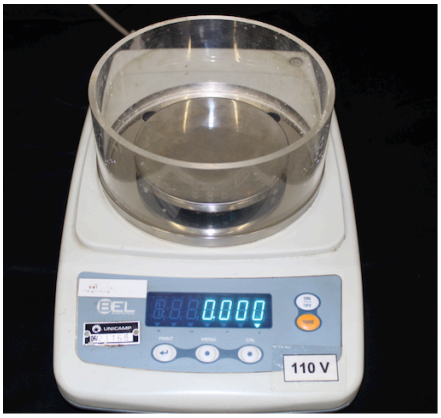


Figura 10 – Pesagem do material triturado retido em cada peneira.

Cinesiografia

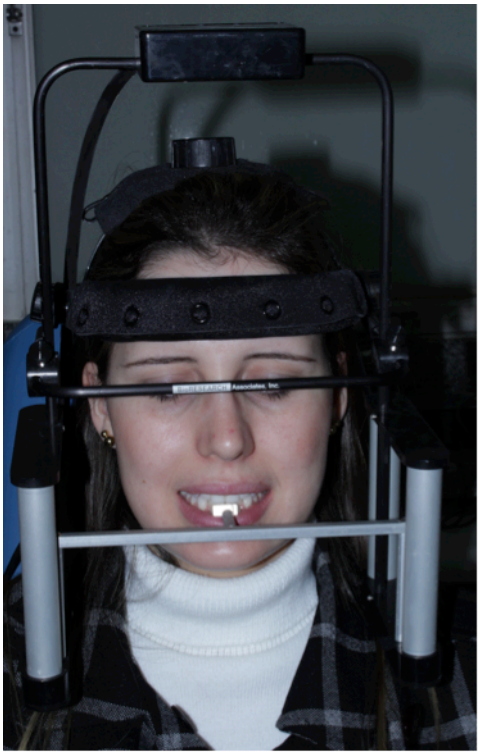


Figura 11 – Cinesiógrafo JT3D (BioResearch, Myalwalkee, USA) em posição no voluntário.

Figura 12- Magneto instalado provisoriamente na região dos incisivos inferiores de modo a não interferir em máxima intercuspidação.

Anexo 3 – Questionários do Sono

ESCALA DE SONOLÊNCIA DE EPWORTH

Qual possibilidade de você cochilar ou adormecer nas seguintes situações?

Situações	**Chance de cochilar - 0 a 3**
1. Sentado e lendo	
2. Vendo televisão	
3. Sentado em lugar público sem atividades como sala de espera, cinema, teatro, igreja	
4. Como passageiro de carro, trem ou metro andando por 1 hora sem parar	
5. Deitado para descansar a tarde	
6. Sentado e conversando com alguém	
7. Sentado após uma refeição sem álcool	
8. No carro parado por alguns minutos no durante trânsito	
Total	

0 - nenhuma chance de cochilar
1 - pequena chance de cochilar
2 – moderada chance de cochilar
3 - alta chance de cochilar

Dez ou mais pontos – sonolência excessiva que deve ser investigada

Fonte - Johns MW. Sleep 1991; 14: 540- 5

Enviada pelo Dr Luiz Fernando F. Pereira. MG
Incluida no site em junho de 2007

Nome: _____ Data: _____

ÍNDICE DE QUALIDADE DO SONO DE PITTSBURGH

Instruções:
1) As questões a seguir são referentes aos hábitos de sono apenas durante o mês passado.
2) Suas respostas devem indicar o mais corretamente possível o que aconteceu na maioria dos dias e noites do mês passado.
3) Por favor, responda a todas as questões.

1) Durante o mês passado, à que horas você foi deitar à noite na maioria das vezes?
HORÁRIO DE DEITAR: _____:_____

2) Durante o mês passado, quanto tempo (minutos) você demorou para pegar no sono, na maioria das vezes?
QUANTOS MINUTOS DEMOROU PARA PEGAR NO SONO: _____

3) Durante o mês passado, a que horas você acordou de manhã, na maioria das vezes?
HORÁRIO DE ACORDAR: _____:_____

4) Durante o mês passado, quantas horas de sono por noite você dormiu? (pode ser diferente do número de horas que você ficou na cama)
HORAS DE SONO POR NOITE: _____

Para cada uma das questões seguinte escolha uma única resposta, que você ache mais correta. Por favor, responda a todas as questões.

5) Durante o mês passado, quantas vezes você teve problemas para dormir por causa de:
a) Demorar mais de 30 minutos para pegar no sono
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

b) Acordar no meio da noite ou de manhã muito cedo
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

c) Levantar-se para ir ao banheiro
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

d) Ter dificuldade para respirar
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

e) Tossir ou roncar muito alto
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

f) Sentir muito frio
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

Dr. Eduardo H Genofre – Pneumologia (InCor/HC-FMUSP)
CRM-SP: 94.403

Nome: _____ Data: _____

ÍNDICE DE QUALIDADE DO SONO DE PITTSBURGH

(CONTINUAÇÃO)

g) Sentir muito calor
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

h)Ter sonhos ruins ou pesadelos
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

i) Sentir dores
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

j)Outra razão, por favor, descreva: _____
Quantas vezes você teve problemas para dormir por esta razão durante o mês passado?
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

6) Durante o mês passado, como você classificaria a qualidade do seu sono?
( )Muito boa ( )ruim
( )Boa ( )muito ruim

7) Durante o mês passado, você tomou algum remédio para dormir, receitado pelo médico, ou indicado por outra pessoa (farmacêutico, amigo, familiar) ou mesmo por sua conta?
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

Qual(is)? _____
_____
_____

8) Durante o mês passado, se você teve problemas para ficar acordado enquanto estava dirigindo, fazendo suas refeições ou participando de qualquer outra atividade social, quantas vezes isso aconteceu?
( )nenhuma vez ( )menos de uma vez por semana
( )uma ou duas vezes por semana ( )três vezes por semana ou mais

Dr. Eduardo H Genofre – Pneumologia (InCor/HC-FMUSP)
CRM-SP: 94.403

Nome: _____ Data: _____

ÍNDICE DE QUALIDADE DO SONO DE PITTSBURGH

(CONTINUAÇÃO)

9) Durante o mês passado, você sentiu indisposição ou falta de entusiasmo para realizar suas atividades diárias?
( )Nenhuma indisposição nem falta de entusiasmo
( )indisposição e falta de entusiasmo pequenas
( )Indisposição e falta de entusiasmo moderadas
( ) muita indisposição e falta de entusiasmo

Comentários do entrevistado (se houver): _____

_____

_____

10) Você cochila? ( ) Não ( ) Sim

Comentários do entrevistado (se houver): _____

_____

_____

Caso Sim –Você cochila intencionalmente, ou seja, pôr que quer?
( ) Não ( ) Sim

Comentários do entrevistado (se houver): _____

_____

_____

Para você, cochilar é
( )Um prazer ( )Uma necessidade ( )Outro – qual?

Comentários do entrevistado (se houver): _____

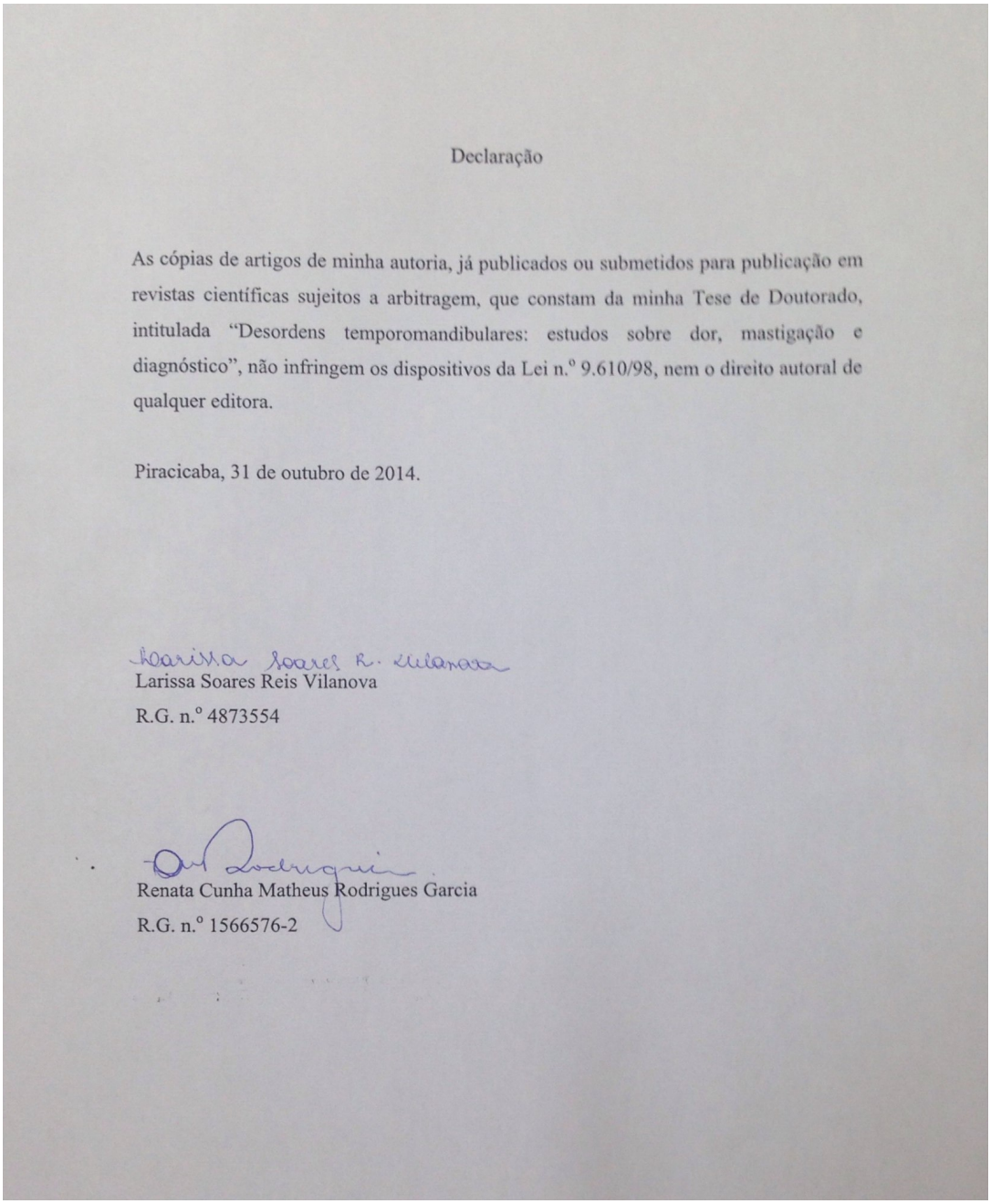
_____

_____

Pontuação do componente:
1:_____; 2: _____ ; 3: _____; 4: _____ 5: _____; 6: _____; 7: _____

Dr. Eduardo H Genofre – Pneumologia (InCor/HC-FMUSP)
CRM-SP: 94.403

Anexo 4 – Declaração de não infração de direito autoral



Declaração

As cópias de artigos de minha autoria, já publicados ou submetidos para publicação em revistas científicas sujeitos a arbitragem, que constam da minha Tese de Doutorado, intitulada "Desordens temporomandibulares: estudos sobre dor, mastigação e diagnóstico", não infringem os dispositivos da Lei n.º 9.610/98, nem o direito autoral de qualquer editora.

Piracicaba, 31 de outubro de 2014.

Larissa Soares Reis Vilanova
R.G. n.º 4873554

Renata Cunha Matheus Rodrigues Garcia
R.G. n.º 1566576-2

Anexo 5 - Confirmação de aceite e/ou submissão dos manuscritos
Capítulo 1

Assunto: manuscript 4040 - Decision - International Journal of Prosthodontics
De: "International Journal of Prosthodontics" <ijp@manuscriptmanager.com>
Data: Seg, Março 3, 2014 11:09 am
Para: regarcia@fop.unicamp.br
ijp@manuscriptmanager.com

Manuscript title: Hormones fluctuations intensify temporomandibular pain without impairing masticatory function.

Dear Professor Rodrigues Garcia

It is a pleasure to inform you that the above paper is nowacceptable for publication as per the final edited format.

Would you please complete the submission form found on the journal homepage and forward it to Aimee Newth at Quintessence as soon as possible.

Email: anewth@quintbook.com

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USA

I thank you very much for submitting this valuable report and hope that you will continue to consider The International Journal of Prosthodontics the primary journal of publication for your most interesting and important studies.

Yours sincerely,
Dr. George A. Zarb

Capítulo 2

---------- Mensagem Original ----------
Assunto: Your Submission to The Journal of Prosthetic Dentistry
De: "JPD" <JPD@gru.edu>
Data: Qui, Julho 17, 2014 8:46 am
Para: regarcia@fop.unicamp.br

Jul 17, 2014

Re: Manuscript # JPD-D-14-00120R2

Dear Prof. Rodrigues Garcia:

I am happy to report that the reviewers of manuscript #JPD-D-14-00120R2, entitled "Chewing movements and sleep quality of myofacial pain patients: splint therapy improvements.," have recommended that it be accepted for publication, pending your responses to the following final requests:

1. Please review the edited manuscript to ensure that your meaning has not been inadvertently altered. Please address the comments.

Please note that editors and/or reviewers have uploaded files related to this submission. To access these file(s) while you are not logged into the system, please click on the link below. (Note: this link will expire after 5 clicks or 30 days.) Alternatively, you may log in to the system and click the 'View Review Attachments' link in the Action column.

http://ees.elsevier.com/jpd/l.asp?i=11977&l=ZET562B1

Please make appropriate revisions to the attached manuscript and provide a short response to reviewers letter that responds to the numbered items above individually and specifically. Our preference is that you type each response in BOLD directly below its corresponding comment in this letter. Distinguish your changes in the manuscript document by putting them in bright blue font, then return the complete correspondence file with your revised manuscript. Please do not otherwise change the format of the manuscript document in any way. Work directly from our version. Be sure to remove all Track Changes and comments before returning the manuscript.

The manuscript will go through a final editing process before being formatted in pseudopages. If the manuscript editor has any additional questions or concerns, she will contact you. Otherwise, you will receive an e-mail when the file has been forwarded to our compositor for layout in proofs.

Please be aware that we have a backlog of manuscripts and cannot estimate a publication date until after the pseudopages have been prepared. If you have a pressing need for publication (tenure application, promotion concern, etc.), please let us know.

To submit your revision, please do the following:

1. Go to: http://ees.elsevier.com/jpd/

2. Enter your login details

3. Click [Author Login]
This takes you to the Author Main Menu.

4. Click [Submissions Needing Revision]

Thank you for submitting your manuscript to The Journal of Prosthetic Dentistry and for allowing us to evaluate your work. I look forward to receiving your response and to seeing your work in print.

Best regards,

Stephen F. Rosenstiel BDS, MSD
Editor

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For further assistance, please visit our customer support site at http://help.elsevier.com/app/answers/list/p/7923. Here you can search for solutions on a range of topics, find answers to frequently asked questions and learn more about EES via interactive tutorials. You will also find our 24/7 support contact details should you need any further assistance from one of our customer support representatives.

Capítulo 3

---------- Forwarded message ----------
From: **Journal of Oral and Facial Pain and Headache** <jop@manuscriptmanager.com>
Date: 2014-09-23 17:11 GMT+02:00
Subject: manuscript 1466 - Receipt - Journal of Oral and Facial Pain and Headache
To: larissasrvilanova@gmail.com

Manuscript title: Diagnostic Criteria for Temporomandibular Disorders:

Self-instruction or formal training and calibration?

Dear Miss Vilanova,

Thank you very much for submitting the above article to the Journal of Oral & Facial Pain and Headache. The manuscript is being evaluated and we will contact you as soon as a decision has been made. The standard review process is conducted by an Associate Editor and independent reviewers who are selected for their expertise in that topic. Each article is treated as a confidential document. Dr. Christian Stohler (Email: cs3221@cumc.columbia.edu) is the Associate Editor handling the review of the article. Please contact him if you have any questions about your paper.

The progress of your manuscript can be followed from the progress report accessed from your user account.

Yours sincerely,

Barry J. Sessle

Editor-in-Chief

Journal of Oral and Facial Pain and Headache
Faculty of Dentistry
University of Toronto
124 Edward Street
Toronto
Ontario M5G 1G6
CANADA
Fax +1 416 979 4936
jop@manuscriptmanager.com