



Changes in jaw and neck muscle coactivation and coordination in patients with chronic painful TMD disk displacement with reduction during chewing

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ABSTRACT

The treatment of a complex temporomandibular disorder (TMD), such as disk displacement with reduction (DDR) associated with arthralgia and myalgia, may depend on understanding the impairments in muscle function. The aim of this study was to investigate the behavior of the anterior temporalis, masseter and sternocleidomastoid muscles in the time and frequency domains during chewing in patients with chronic painful TMD-DDR using electromyographic (EMG) analysis. Thirty-three patients who met the diagnostic criteria for TMD and 32 volunteers without TMD (control group) underwent clinical examination, chewing pattern classification and EMG analysis. For the EMG analyses, the side of habitual unilateral chewing, as determined by the chewing pattern classification, was selected for recording; in cases of bilateral chewing, the recording side was randomly selected. The EMG-EMG coherence function and EMG-EMG transfer function (gain and phase) values were obtained at the first chewing frequency peak, and the working-side masseter signal was used as a reference in the analyses of the other muscles. Compared to the control group, the TMD group showed a longer chewing stroke duration ($P = 0.01$) as well as changes in the coactivation and coordination strategies of the jaw muscles, evidenced by greater relative energy expenditure ($P < 0.01$) and impaired differential recruitment ($P < 0.05$) and coherence ($P < 0.01$). Delays in peak and temporal asynchrony occurred in the jaw and neck muscles ($P < 0.05$). Patients with chronic painful TMD-DDR during chewing presented changes in the jaw and neck muscles, with more compromised function of the former, which are specific to chewing.



Swallowing changes related to chronic temporomandibular disorders

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Abstract

Objectives To investigate whether chronic temporomandibular disorder (TMD) patients showed any changes in swallowing compared to a control group. Moreover, it was examined whether swallowing variables and a valid clinic measure of orofacial myofunctional status were associated.

Material and methods Twenty-three patients with chronic TMD, diagnosed with disc displacement with reduction (DDR) and pain, according to the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD), and 27 healthy volunteers (control group) were compared. Surface electromyography (EMG) of the temporalis, masseter, sternocleidomastoid, and suprahyoid muscles was performed during swallowing tasks of thin liquid (10 and 15 mL) and spontaneous saliva. Data were normalized.

Results Compared to the control group, TMD patients showed a prolonged duration of swallowing for liquid and saliva and required a longer time to reach the activity peak and half the integral. While the overall mean value of the relative peaks was similar for the groups, the suprahyoid peak was significantly lower in the TMD group during swallowing of liquid. Moreover, TMD patients recruited the jaw elevator muscles proportionally more than controls. The orofacial myofunctional status was moderately correlated with EMG parameters.

Conclusion Patients with chronic TMD showed temporal prolongation and changes in the relative activity of the muscles during the swallowing tasks.

Clinical relevance The present results contribute additional evidence regarding the reorganization of muscle activity in patients with chronic TMD.

Keywords Temporomandibular disorders · Deglutition · Swallowing · Electromyography · Jaw muscles · Suprahyoid muscles



Standardized mastication increases the coordination in masticatory activity in women with chronic temporomandibular joint disorders: a case control study.

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ABSTRACT

Background: The effects of jaw movement pattern on masticatory activity during chewing remains unclear in chronic temporomandibular joint disorders individuals. **Objective:** to assess the effect of habitual and non-habitual mastication patterns based upon the activation of the masseter and temporalis muscles in individuals with or without temporomandibular joint disorder (TMJD). **Methods:** Fifty-four participants (age: 18–44 years) were divided into two groups: the TMJD (n=27) and control (n=27) groups. TMJD was identified using the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). Electromyographic activity of the masticatory muscles was measured during 2 tasks: habitual mastication with parafilm (HM) and non-habitual mastication with parafilm (NHM). MATLAB software was used to process electromyography (EMG) signals. The root mean square, symmetry index (SI%), anteroposterior coefficient (APC%) and torque coefficient (TC%) were determined from the processed EMG signal. **Results:** Reduced right masseter activation was observed for the TMJD group ($p<0.05$) during jaw agonist phase. During the jaw agonist phase, all muscles presented with more activation during NHM. Symmetry of temporalis (ST%) and APC% were the lowest for HM. TC% was increased for HM. **Conclusion:** Habitual and non-habitual mastication differ in masticatory activity during jaw agonist and antagonist phase and TMJD individuals presented a different way to recruit muscles under these circumstances. Non-habitual mastication has a more coordinating and stable motor pattern in masticatory activity and has less variability than habitual mastication to assess masticatory activity.

Keywords: Mastication; Electromyography; Temporomandibular Joint Disorder; Masticatory Muscles; Motor Activity.

Correlations between masticatory muscle activity, quality of life, and dysfunction severity in women with chronic temporomandibular disorder

Relação entre atividade elétrica mastigatória, qualidade de vida e gravidade da disfunção em mulheres com disfunção temporomandibular crônica

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ABSTRACT

BACKGROUND AND OBJECTIVES: Assessing the possible interactions between the activity of masticatory muscles and quality of life and severity of the temporomandibular disorder can help clarify how changes in muscle activity can be associated with a chronic temporomandibular disorder in women. This study aimed to investigate the correlations between masticatory electrical activity during mandibular resting, maximum voluntary contraction, the severity of the temporomandibular disorder, and quality of life in women with chronic temporomandibular disorder and to compare these parameters with healthy asymptomatic controls.

METHODS: Sixty women, 30 with temporomandibular disorder and 30 asymptomatic, participated in this case-control observational study. Diagnostic Criteria for Temporomandibular Disorder was used to identify the presence or absence of temporomandibular disorder. The SF-36 questionnaire was used to assess the quality of life in participants, and ProTMD-multi-part-II was applied to assess the severity of signs and symptoms of temporomandibular disorder.

RESULTS: During jaw clenching, the masticatory activity of the right temporal and left masseter muscles, the symmetry of the masseter muscles, and anteroposterior coefficient were significantly smaller in the temporomandibular disorder group than in the asymptomatic group. Masticatory activity at rest, signs and symptoms of chronic temporomandibular disorder, and impairment of the quality of life were correlated using Spearman coefficient ($p < 0.05$).

CONCLUSION: Our results contribute to findings on the associations between the masticatory activity in chronic signs and symptoms of the temporomandibular disorder, impairment in quality

of life, and differences in the masticatory activity during clenching in patients with temporomandibular disorder and controls.

Keywords: Chronic pain, Electromyography, Masticatory muscles, Quality of life, Temporomandibular disorder.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Avaliar a possível interação entre a atividade dos músculos mastigatórios com a qualidade de vida e a gravidade da disfunção temporomandibular pode ajudar a esclarecer como as alterações na atividade muscular podem estar associadas a mulheres com disfunção temporomandibular crônica. O objetivo deste estudo foi avaliar a correlação entre atividade elétrica mastigatória durante o repouso mandibular, contração voluntária máxima, gravidade da disfunção temporomandibular e qualidade de vida em mulheres com disfunção temporomandibular crônica e comparar esses parâmetros com indivíduos assintomáticos (grupo controle).

MÉTODOS: Sesenta mulheres, 30 com disfunção temporomandibular e 30 assintomáticas, participaram deste estudo observacional caso-controle. O instrumento critérios diagnósticos para disfunções temporomandibulares foi usado para detectar a presença ou ausência de disfunção temporomandibular. O questionário SF-36 foi usado para avaliar a qualidade de vida, e o ProDTMD multi parte II foi aplicado para avaliar a gravidade dos sinais e sintomas de disfunção temporomandibular. A atividade mastigatória durante o repouso mandibular e apertamento dentário foram medidos usando eletromiografia de superfície.

RESULTADOS: Durante o apertamento dentário, a atividade do músculo masseter, temporal direito e esquerdo, simetria do masseter e coeficiente anteroposterior foram significativamente menores no grupo disfunção temporomandibular em comparação ao grupo assintomático. A atividade mastigatória em repouso, sinais e sintomas de disfunção temporomandibular crônica e os prejuízos na qualidade de vida foram correlacionados conforme determinado pelo coeficiente de Spearman ($p < 0,05$).

CONCLUSÃO: Os presentes achados contribuem para evidenciar as associações entre atividade mastigatória em sinais e sintomas crônicos de disfunção temporomandibular, comprometimento da qualidade de vida e diferenças na atividade mastigatória durante o apertamento dentário entre disfunção temporomandibular e grupo controle.

Descritores: Dor crônica, Eletromiografia, Músculos da mastigação, Qualidade de vida, Síndrome da disfunção da articulação temporomandibular.

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Temporomandibular dysfunction, myofascial, craniomandibular and cervical pain: effect on masticatory activity during rest and mandibular isometry

Disfunção temporomandibular, dor miofascial crâniomandibular e cervical: efeito na atividade mastigatória durante o repouso e isometria mandibular

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ABSTRACT

BACKGROUND AND OBJECTIVES: Craniomandibular and cervical symptoms interfere with mandibular stability. Determining whether these disorders influence muscle activation when chewing, it is possible to improve interventions for this population. The objective of this study was to verify the effect of the temporomandibular joint dysfunction, craniomandibular and cervical pain on the electromyographic activity of the masticatory muscles during rest and mandibular isometry.

METHODS: Fifty-five women aged between 18 and 30 years were divided into two groups: with temporomandibular dysfunction (n=28) and without temporomandibular dysfunction (n=27). The diagnosis of temporomandibular dysfunction was established using the Research Diagnostic Criteria for Temporomandibular Disorder (RDC/TMD). The RDC was also used to determine the presence of craniomandibular pain. Cervical pain was defined by physical examination. The electromyographic activity of masseter and temporalis muscles was evaluated in the rest position and mandibular isometry. The amplitude of muscle activation was represented by the root mean square values (RMS%) and normalized by maximum voluntary contraction. The Mann-Whitney U test was used to detect differences between the groups with and without temporomandibular dysfunction; with and without myofascial craniomandibular pain; and with and without cervical myofascial pain.

RESULTS: It was observed greater amplitude in the activation of masseter and right temporalis muscles in the rest position in individuals with myofascial craniomandibular pain compared to asymptomatic (p<0.05). There was no difference among individuals with and without cervical myofascial pain, and with and without temporomandibular dysfunction.

CONCLUSION: The presence of myofascial craniomandibular pain did not affect the masticatory activity, with greater muscle activation in mandibular rest.

Keywords: Chewing, Electromyography, Myofascial pain, Temporomandibular dysfunction.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Sintomas crâniomandibulares e cervicais interferem na estabilidade mandibular. Ao determinar se essas condições influenciam na ativação muscular durante a mastigação é possível aprimorar intervenções para essa população. O objetivo deste estudo foi verificar o efeito da disfunção temporomandibular, dores crâniomandibular e cervical na atividade eletromiográfica dos músculos mastigatórios, durante o repouso e a isometria mandibular.

MÉTODOS: Cinquenta e cinco mulheres com idade entre 18 e 30 anos, foram divididas em grupo com disfunção temporomandibular (n=28) e sem disfunção temporomandibular (n=27). O diagnóstico de disfunção temporomandibular foi estabelecido por meio do *Research Diagnostic Criteria for Temporomandibular Disorder* (RDC/TMD). O RDC também foi utilizado para determinar a presença de dor crâniomandibular. A dor cervical foi definida por meio de um exame clínico. A atividade eletromiográfica dos músculos temporal e masseter foi avaliada durante o repouso e a isometria mandibular. A amplitude de ativação muscular foi representada por valores de raiz quadrada da média (RMS%) e normalizada pela contração voluntária máxima. O teste U de Mann-Whitney foi utilizado para detectar diferenças entre os grupos, com e sem disfunção temporomandibular; com e sem dor miofascial crâniomandibular; e com e sem dor miofascial cervical.

RESULTADOS: Observou-se maior amplitude de ativação dos músculos temporais e masseter direito durante o repouso para indivíduos com dor miofascial crâniomandibular em relação a assintomáticos (p<0,05). Não houve diferença entre indivíduos com e sem dor miofascial cervical e com e sem disfunção temporomandibular.

CONCLUSÃO: A presença de dor miofascial crâniomandibular exerceu efeito sobre a atividade mastigatória, com uma maior ativação muscular no repouso mandibular.

Descritores: Disfunção temporomandibular, Dor miofascial, Eletromiografia, Mastigação.

INTRODUÇÃO

A disfunção temporomandibular (DTM) é caracterizada por um grupo de condições clínicas associadas a ruídos e travamentos na articulação temporomandibular (ATM)¹. O *Research Diagnostic*

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Artigo Original

Original Article

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Descritores

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Temporomandibular Joint Dysfunction

Syndrome

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Pain

Influência da dor craniomandibular e cervical na atividade dos músculos mastigatórios em indivíduos com Disfunção Temporomandibular

Influence of craniomandibular and cervical pain on the activity of masticatory muscles in individuals with Temporomandibular Disorder

RESUMO

Objetivo: O objetivo deste estudo foi determinar a prevalência de dor nas regiões craniomandibular e cervical em indivíduos com Disfunção Temporomandibular (DTM) e analisar o efeito dessas desordens na ativação bilateral dos músculos temporal anterior (TA) e masseter (MA) durante o ciclo mastigatório. **Métodos:** Participaram deste estudo 55 voluntários do sexo feminino com idade de 18 a 30 anos. A presença de DTM e de dor craniomandibular e cervical foi avaliada por meio do questionário *Research Diagnostic Criteria for Temporomandibular Disorders* (RDC/TMD) e uma combinação de testes para a região cervical. A análise da ativação muscular do TA e MA durante o ciclo mastigatório foi realizada através dos índices de simetria e do coeficiente anteroposterior. **Resultados:** A atividade dos músculos TA, durante o ciclo mastigatório, é mais assimétrica em indivíduos com DTM. A dor craniomandibular, mais prevalente nesses indivíduos, influencia nesses resultados. **Conclusão:** Indivíduos com DTM apresentam alteração no padrão mastigatório do músculo TA e estímulos nociceptivos da região craniomandibular podem influenciar no aumento da assimetria de ativação dessa musculatura.

ABSTRACT

Purpose: This study aimed to establish the prevalence of pain in the craniomandibular and cervical spine region in individuals with Temporomandibular Disorders (TMD) and to analyze the effects of these disorders on the bilateral activation of anterior temporalis (AT) and masseter (MA) muscles during the masticatory cycle. **Methods:** The participants were 55 female volunteers aged 18–30 years. The presence of TMD and craniomandibular and cervical spine pain was evaluated by applying the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) questionnaire and using a combination of tests for the cervical region. The muscle activity of AT and MA during the masticatory cycle was assessed using the symmetry and antero-posterior coefficient indices. **Results:** The AT activity during the masticatory cycle is more asymmetric in individuals with TMD. The craniomandibular pain, more prevalent in these individuals, influenced these results. **Conclusion:** Individuals with TMD showed changes in the pattern activity of AT. The craniomandibular nociceptive inputs can influence the increase in asymmetry of the activation of this muscle.