Correlation between clinical and imaging findings in patients with temporomandibular disorders*

Correlação entre os achados clínicos e imaginológicos nas disfunções temporomandibulares

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Abstract **OBJECTIVE: To correlate the signals and symptoms observed on clinical examination of patients with temporomandibular disorder with the results demonstrated by magnetic resonance imaging. MATERIALS AND METHODS: Thirty patients presenting with signs and symptoms of temporomandibular disorders underwent clinical evaluation and subsequent magnetic resonance imaging. The magnetic resonance imaging studies were independently evaluated by two experienced radiologists. Magnetic resonance imaging studies consisted of 12 images in coronal, T1-weighted sequences with 3 mm-thick slices with the mouth closed, sagittal, T1- and T2-weighted sequences with both open and closed mouth positions, and on progressive opening/closing movement at 5 mm intervals, in order to demonstrate the full mandibular movement. The statistical significance between the clinical findings in the evaluation of the patients and results found on the magnetic resonance imaging studies was analyzed by means the kappa test. RESULTS: Interobserver agreement was respectively 56.7% (kappa = 0.1) and 56.7 (kappa = 0) for the left and right sides. CONCLUSION: No correlation was found between the clinical and magnetic resonance imaging findings in the diagnoses of disc displacement.**

Keywords: Magnetic resonance imaging; Temporomandibular joint; Disorders.

Resumo **OBJETIVO: Verificar a relação entre sinais e sintomas observados no exame clínico de pacientes com diagnóstico de disfunção temporomandibular, conforme os resultados fornecidos pelo exame de ressonância magnética. MATERIAIS E MÉTODOS: Trinta pacientes que apresentavam sinais e sintomas de disfunção temporomandibular foram submetidos a exame clínico e de ressonância magnética. Cada exame de ressonância magnética de articulação temporomandibular foi interpretado, independentemente, por dois radiologistas experientes. Os exames de ressonância magnética foram realizados com 12 cortes de 3 mm de espessura, em orientação coronal (T1) em posição de boca fechada, cortes sagitais em posição de boca aberta e fechada (T1 e T2) e em abertura e fechamento progressivos, com intervalo de 5 mm, para reproduzir toda a extensão do movimento mandibular. A significância estatística entre a análise clínica dos pacientes com disfunção temporomandibular e os resultados obtidos no exame de ressonância magnética foi avaliada pelo teste kappa. RESULTADOS: Obteve-se, na análise interobservadores de imagens, concordância bruta do lado esquerdo e direito, respectivamente, de 56,7% (kappa = 0,1) e 56,7 (kappa = 0). CONCLUSÃO: Não foi encontrada correlação entre o diagnóstico clínico da luxação discal e imagens de ressonância magnética.**

Unitermos: Ressonância magnética; Articulação temporomandibular; Distúrbios.

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INTRODUCTION

Internal temporomandibular joint (TMJ) disorders lead to painful conditions and mandibular dysfunction, as well as symptoms primarily affecting TMJ soft tissues and the articular disk positioning.

Imaging methods can significantly contribute to the final diagnosis and therapeutic evaluation in this context. Conventional radiographic methods (panoramic and transcranial radiography) and techniques dedicated to the TMJ (arthrography, arthrotomography, conventional and computed tomography) present some limitations considering the localization, composition and size of the TMJ, besides the level of ionizing radiation exposure.

Magnetic resonance imaging (MRI) has revolutionized the diagnosis and treatment of temporomandibular joint disorders (TMJD), because of its high-resolution for demonstrating the TMJ tissues, without necessity of changing the patient's positioning and with no ionizing radiation. MRI has been the method of choice for the diagnosis of abnormalities in the TMJ soft tissues, because of its high accuracy in the determination of the articular disk positioning [1].

The present study was aimed at correlating signs and symptoms observed in the clinical assessment of patients diagnosed with TMJD according to the results of MRI.

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MATERIALS AND METHODS

The sample of the present retrospective study included 30 patients referred to the Department of Odontology at Universidade Cruzeiro do Sul, with a diagnosis of TMJD, in the period between January 2002 and January 2006. This project was approved by the Committee for Ethics in Research of Universidade Cruzeiro do Sul, under the number 036/05. Inclusion criteria were: patients diagnosed with TMJD presenting headache, otalgia, pre-auricular and orofacial pain. Exclusion criteria were patients below the age of 18 and previously submitted to surgery for treating TMJD.

The MRI studies were independently interpreted by two experienced radiologists who elaborated the diagnostic reports according to the criteria established by Nebbe et al.[2] (Table 1; Figures 1 and 2). In case of disagreement between these diagnostic reports, the final diagnosis was achieved by consensus between both radiologists.

The disease indicators consisted in a questionnaire developed by the American Academy of Orofacial Pain – Guidelines for Assessment, Diagnosis and Management of temporomandibular Joint Disorder[3]. The main complaint was obtained by means of an interview as the initial step of the clinical evaluation. Then, the presence of articular pain was evaluated by means of both lateral and posterior palpation of the TMJ and auscultation for articular sounds (clicking and crepitus). The presence of muscular pain was evaluated by bilateral, extraoral palpation of the following muscles or regions: superficial masseter, deep masseter, temporal anterior, temporal posterior, frontal, vertex, posterior cervical regions, digastric and sternocleidomastoid; and intraoral palpation of temporalis, pterygoid and lateral pterygoid.

According to previous studies[4–6], temporomandibular joint clicking or popping sounds are brief noises which occur in some points during opening, closing or lateral movements; and crepitus is a mildly perceptible grating sound, suggestive of subchondral sclerosis.

MRI studies were performed in a 1.5 tesla Gyroscan ACS-NT apparatus (Philips; Amsterdam, Holland). Twelve 3 mm-thick slices were acquired with surface coil, on coronal T1-weighted sequences (400/20 ms, FOV = 19 cm) with the patient's mouth closed; on sagittal, T1-weighted sequences (400/20 ms, FOV = 19 cm) with the patient's mouth opened and closed, and T2-weighted sequences (2670/15 ms, FOV = 19 cm) during progressive mouth opening and closing (three positions: maximum, intermediate opening and closed mouth), at 5 mm intervals and 30° flip angle to obtain the cine effect in an attempt to reproduce

Table 1 Criteria established by Nebbe et al.[2].

a. Normal positioning of the articular disk.
b. Mild anterior articular disk displacement with opening reduction.
c. Moderate anterior articular disk displacement with opening reduction.
d. Total anterior articular disk displacement with opening reduction.
e. Total anterior articular disk displacement without opening reduction.
f. Other categories of articular disk positioning alteration.

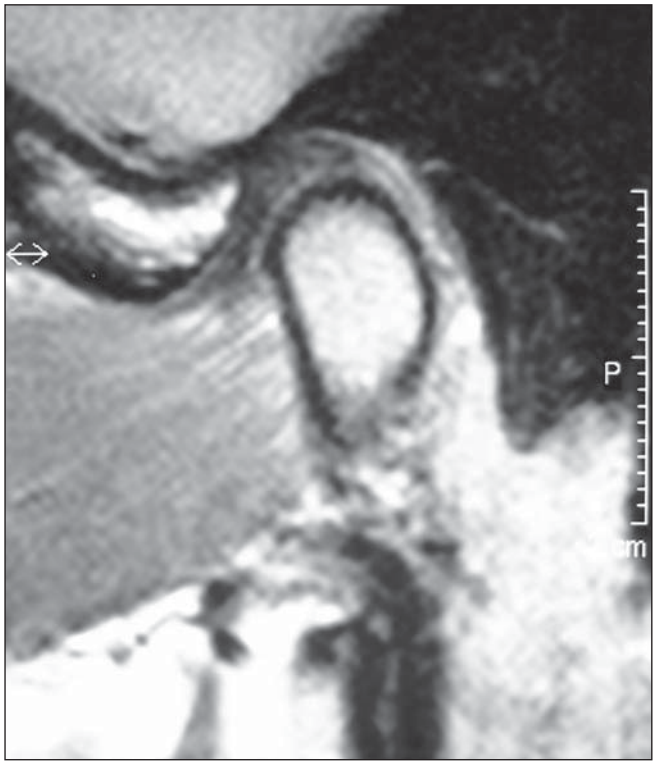

Figure 1. MRI sagittal image of closed mouth demonstrating a normal disk positioning.

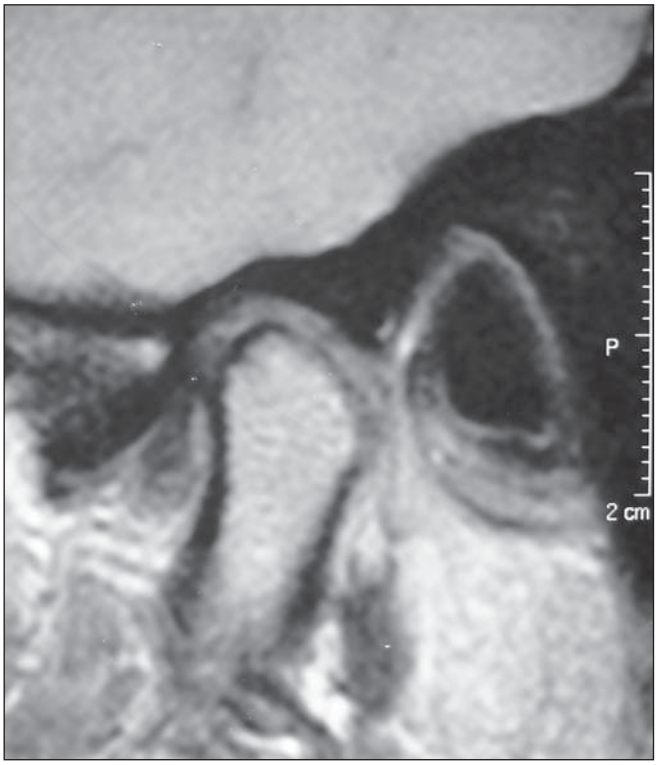

Figure 2. MRI sagittal image of closed mouth demonstrating anterior disk displacement.

the whole extent of the mandibular movement, with dynamic video images. All the images were acquired with the patient in dorsal decubitus.

Descriptive statistics was utilized for summarizing the data regarding sex and age range, facial pain, articular sounds and disk positioning at MRI. The correlation between MRI and facial pain and articular sounds was based on MRI versus clinical findings respectively on the right and left sides. The statistical significance of the clinical assessment of patients with TMJD and MRI findings was evaluated with the kappa test for determining the correlation level.

RESULTS

A female predominance was observed (24 patients), with a women/men ratio equal to 3.2:1, and higher incidence in the age range between 18 and 29 years (41.7% of the patients). As regards painful symptoms, 14 patients (46.7%) presented bilateral pain, 4 (13.3%), right-sided pain, 3 (10.0%), left-sided pain, and 9 patients (30.0%) had no pain-related complaint.

As regards the presence or absence of articular sounds, the right side was affected in 7 patients (23.3%), the left side in 7 (23.3%), both sides in 6 (20.0%), and absence of this symptom was observed in 10 (33.3%). The incidence of the different articular sounds was the following: on the left side — clicking in 12 patients (40.0%), crepitus in 1 (3.3%), and absence in 17 (56.7%); on the right side — clicking was observed in 12 patients (40.0%), crepitus in 1 (3.3%) and absence in 17 (56.7%).

Table 2 shows the frequency of articular alterations and distribution related to their side according to the MRI diagnostic reports. Tables 3 and 4 present the frequency of articular alterations as well as the incidence in both sides of each type of alteration according to the MRI diagnostic reports. Table 5 shows the relation between the clinical and the MRI diagnosis of left-sided disk displacement while the right-sided findings are shown on Table 6.

DISCUSSION

An attempt was made to combine the utilization of MRI (the method of choice for evaluating TMJ) with a clinical questionnaire. MRI is considered as the method of choice for evaluating the TMJ functioning, because of its non-invasiveness and absence of collateral effects, besides the high accuracy comparable to arthrography for visualizing functioning structures. However, the association of clinical and imaging findings is essential for an accurate diagnosis and prognostic evaluation of TMJD[4]. Data collected by means of the anamnesis and clinical examination of the patients constitutes the basis for a correct diagnosis of TMJD[7].

A high interobserver agreement was observed in the evaluation of TMJD by MRI, corroborating the acceptance and reliability of this diagnostic method[8–12]. Many

Table 2 Distribution in relation to frequency and side of articular alterations.

Variable	Frequency	Percentage
Normal	9	30.0%
Right-sided MRI	3	10.0%
Left-sided MRI	5	16.7%
Both sides	13	43.3%
Total	30	100.0%

Table 3 Distribution of left-sided MRI results.

Variable	Frequency	Percentage
Normal	14	46.7%
Anterior displacement with mild reduction	9	10.0%
Anterior displacement with moderate reduction	2	6.7%
Anterior displacement with severe reduction	3	10.0%
Anterior displacement without reduction	2	6.7%
Total	30	100.0%

Table 4 Distribution of right-sided MRI results.

Variable	Frequency	Percentage
Normal	12	40.0%
Anterior displacement with mild reduction	10	33.3%
Anterior displacement with moderate reduction	1	3.3%
Anterior displacement with severe reduction	4	13.3%
Anterior displacement without reduction	3	10.0%
Total	30	100.0%

Table 5 Distribution of the diagnosis of left-sided displacement by MRI versus clinical findings.

		Clinical diagnosis of left-sided displacement		
Variables		Normal	With displacement	Total
MRI	Normal	4	10	14
	MRI – displacement	28.6%	71.4%	100.0%
	Clinical – displacement	57.1%	43.5%	46.7%
	With displacement	3	13	16
	MRI – displacement	18.8%	81.3%	100.0%
	Clinical – displacement	42.9%	56.5%	53.3%
Total		7	23	30
	MRI – displacement	23.3%	76.7%	100.0%
	Clinical – displacement	100.0%	100.0%	100.0%

The agreement for the left-sided displacement was 56.7% (kappa = 0.1; $p = 0.526$).

Table 6 Distribution of the diagnosis of right-sided displacement by MRI versus clinical findings.

Variables		Clinical diagnosis of right-sided displacement		
		Normal	With displacement	Total
MRI	Normal	3	9	12
	MRI – displacement	16.7%	83.3%	100.0%
	Clinical – displacement	40.0%	40.0%	40.0%
	With displacement	3	15	18
	MRI – displacement	16.7%	83.3%	100.0%
	Clinical – displacement	60.0%	60.0%	60.0%
Total		6	24	30
	MRI – displacement	20.0%	80.0%	100.0%
	Clinical – displacement	100.0%	100.0%	100.0%

The agreement for right-sided displacement was 56.7% (kappa = 0.1 and p = 1).

times, the clinicians are not aware of the actual nature of TMJD, as their diagnosis is based only on clinical findings[13]. However, they should be aware of the imaging methods both for recommending and interpreting them.

The female prevalence observed in this group is similar to the one demonstrated in other study about TMJD[14], which has evaluated 73 patients (56 women and 17 men). The patients were evaluated according to the distribution of the facial pain, and the most frequent type of facial pain occurred in both sides para 14 patients (46.7%), similarly to data described in other casuistics of TMJD[15]. A study about morphological alterations of the styloid process in patients with TMJD demonstrated their presence in 74 female and 9 male patients concentrated in the age range between 41 and 50 years (32.5%)[16].

A descriptive analysis demonstrated that the presence of clicking was the most frequent clinical finding — 20 cases (63.3%), 14 (46.6%) of them unilateral and six (20%) bilateral — while another study[17] with 98 patients demonstrated unilateral articular sound in 60% of cases and bilateral in 40%..

On Table 2, it can be observed that, most frequently, articular alterations occurred in both sides in a total of 13 patients, similarly to the results of another study[18]. In 34 cases (70%) some type of TMJ alteration was found at MRI, the most frequent one being anterior displacement with mild reduction in 19 cases (Tables 3 and 4). In another study [19] 37.3% of the patients were diagnosed with mild disk displacement by MRI, while 74.4% presented a severe disk displacement. The correlation between right-sided MRI results and clinical diagnosis of right-sided disk displacement (Tables 5 and 6) demonstrated that of 12 patients (100%) who had normal MRI studies, nine (83.3%) had clinical diagnosis of disk displacement. Also on the right side, 18 patients (100%) were diagnosed with disk displacement by MRI, 15 of them (83.3%) with clinical diagnosis of disk displacement. Interobserver agreement for the right side was 56.7% (kappa = 0 and p = 1). On the left side, of 14 patients (100%) who had a normal MRI study, 10 (71.4%) were clinically diagnosed with disk displacement, and, of 16 patients (100%) with MRI results positive for disk displacement, 13 (81.3%) were clinically diagnosed with disk displacement. The interobserver agreement for the left side was 56.7% (kappa = 0.1 and p = 0,526). Similar results have been obtained in a study of 46 patients with disk displacement with reduction compared with clinical assessment, with an interobserver agreement of 40.7% and kappa = 0.2[20].

Based on these results, it can be observed that the presence of MRI findings does not correspond to the presence of painful symptoms and vice-versa.

Pain is an extremely individualized experience, whose threshold is quite variable among patients. The type or site of the pain may correspond to different etiological factors. In the case of TMJD, several factors may lead to painful symptoms. Notwithstanding, a high incidence of asymptomatic patients affected by disk displacement with and without reduction (33%) is observed. But there is a prevalence of symptomatic patients, representing up to 77% of cases with disk displacement[21,22].

The present study demonstrated a high incidence of patients symptomatic for TMJD (19 TMJs) with no MRI finding. Individual observation of the MRI studies demonstrated the following situations: patients with clicking, but with MRI showing a normal disk positioning without displacement; and patients with clicking, and with MRI findings of anterior displacement with or without reduction. In another series, correlation has not been observed between the degree of disk displacement and pain at palpation of masticatory muscles, articular sounds or occlusal findings[23] neither between symptoms severity and degree of disk displacement[24]. However, another series shows a significant relationship between MRI images and clinical evaluation[25]. Another study of patients submitted to MRI[26] has correlated clicking with normal disk positioning in 36% of TMJs, and with anterior displacement with reduction in 82%, concluding that the clinical diagnosis of clicking cannot be considered as a rule for determining the presence and type of disk displacement.

Although this is a frequent finding in patients with suspicion for TMJD, clicking should not be considered as a pathognomonic sign of disk displacement, considering that it was found in only 53% of these patients, with only 7% of crepitus[27]. The present study demonstrated that the presence of clinical signs, clicking or crepitus is not sufficient for the diagnosis of anterior disk displacement.

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