

# Correlation between gender, temporomandibular joint disc position and clinical findings in patients with temporomandibular disorder

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**OBJECTIVE:** The objective of this study was to assess gender differences in temporomandibular joint disc position using magnetic resonance imaging and to check for symptoms in patients with temporomandibular disorders.

**MATERIALS AND METHODS:** Eighty-seven consecutive patients (70 females and 17 males) were evaluated. Bilateral magnetic resonance imaging was performed to determine the temporomandibular joint disc positions; these were divided into four diagnostic categories: no disc displacement, right disc displacement, left disc displacement and bilateral disc displacement. The clinical data assessed were pain on muscle and temporomandibular joint palpation. The data were analyzed using the Fisher's exact test, chi-square test or analysis of variance. Significance was set at  $p \leq .05$ .

**RESULTS:** The study population had more females (80.5%) than males (19.5%) and the mean age of females ( $31 \pm 11$  years) was lower than the mean age of males ( $41 \pm 12$  years). Bilateral disc displacement was significantly most frequent in females. Clinical examination showed more pain on muscle palpation for female than for male patients.

**CONCLUSION:** Women had a higher frequency of temporomandibular joint disc displacement, as well as a larger number of painful points on muscle palpation than men.

**KEYWORDS:** Temporomandibular joint disorders; Temporomandibular joint; Gender; Internal derangement; Magnetic resonance imaging.

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## INTRODUCTION

Temporomandibular Disorder (TMD) is defined as a set of disorders involving the masticatory muscles, the temporomandibular joint (TMJ) and associated structures. The most common symptoms include facial pain, but other symptoms are ear manifestations such as tinnitus, ear fullness and vertigo. There is no single cause that justifies all symptoms.<sup>1</sup>

An epidemiological study in the Brazilian population reported that at least one TMD symptom was present in 39.2% of participants. TMJ sound was the most common, followed by TMJ pain which was the second most commonly reported symptom and the

prevalence is significantly increased in women, relative to men.<sup>2</sup> The high prevalence of females among patients with TMD is emphasized in several studies.<sup>3-5</sup> Female sex hormones, mainly estrogen, seem to play an important role in this.<sup>3,6</sup>

TMJ pain may be indicative of an internal derangement, such as TMJ disc displacement, condyle remodeling or osteoarthritis.<sup>7</sup> Regarding disc displacement, anterior disc displacement with reduction (ADDR) is the most common TMJ internal derangement, and the prevalence of ADDR is 7.9% for girls and 2.5% for boys.<sup>8</sup> A retrospective study of a series of 850 patients with temporomandibular dysfunction revealed that 51.3% were diagnosed with disc displacement. In this study, 85% of entries were women.<sup>9</sup>

Magnetic Resonance Imaging (MRI) is the gold standard method to diagnose disc displacement.<sup>10,11</sup> Disc

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position is well imaged because the densely collagenous fibrous connective tissue of the disc has an intermediate MRI signal that provides good contrast between the osseous and the soft tissue components of the TMJ.<sup>12,13</sup>

## ■ MATERIALS AND METHODS

### Subjects

Data were collected from 87 consecutive patients [70 females, 17 males; average age (mean  $\pm$  SD)  $33.2 \pm 12.2$  years (range 12–62 years)] seeking treatment for TMD at the Temporomandibular Disorder and Orofacial Pain Service of our institution.

The exclusion criteria were the presence of at least one of the following characteristics: patients wearing dental removable prostheses, recent mandibular fracture and systemic inflammatory disorders, such as rheumatoid arthritis. As inclusion criterion, patients should have occlusal contacts in four premolars and four molars checked with shim stock film of 12 micra.

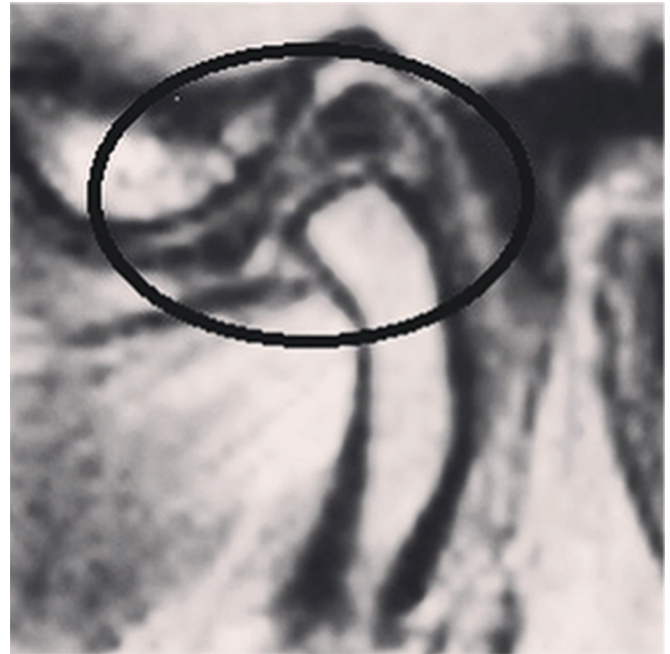
The patients were diagnosed according to Research Diagnostic Criteria for TMD (RDC/TMD).<sup>14</sup> The Ethics Committee in Human Research of School of Dentistry of our university approved the research protocol (under case number 160/03 CEP-FOUSP). Written informed consent was obtained from each subject prior to inclusion in the study.

### Magnetic Resonance Imaging of Temporomandibular Disorder

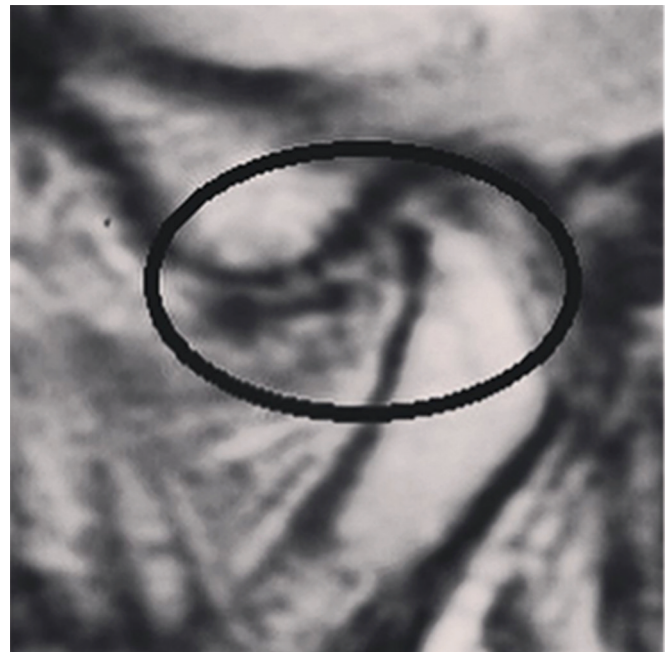
MRIs of the TMJ were obtained using Phillips Intera 1.5 T, Sense Flex S Dual Coil, Eindhoven, Netherlands. Images used for reading were the four most central sagittal sections of TMJ, performed with the patient in closed mouth position. Two experienced mutually calibrated examiners read the images. To evaluate the inter- and intra-examiner reliability, the images of 20 randomly selected patients were read twice by the two examiners after mutual calibration. The cases of incongruence were reviewed for a final diagnosis consensus. Images that did not allow correct visualization of the TMJ were excluded.

The disc position of the TMJ was determined through MRI: at no displacement disc position, the disc was located superior to the condyle with the posterior band of the TMJ disc at the apex of the condylar head (12 o'clock position),<sup>15</sup> as shown in Figure 1; for the "Disc Displacement" condition, the disc was considered displaced when the posterior band was misplaced in relation to the functional surface of the condyle in the closed mouth position,<sup>15</sup> as shown in Figure 2.

The diagnoses were divided into four groups: no displacement disc (NDD), right disc displacement (RDD), left disc displacement (LDD) and bilateral disc displacement (BDD).



**Figure 1** - Magnetic resonance image of a normally positioned temporomandibular joint, with no displacement disc position, with the disc was located superior to the condyle (posterior band of the TMJ disc at the apex of the condylar head).



**Figure 2** - Magnetic resonance image of a displaced temporomandibular joint, with the posterior band misplaced in relation to the functional surface of the condyle in the closed mouth position.

### Clinical examination

Each patient was evaluated according to the following parameters:

The muscles (temporal, masseter, medial and lateral pterygoid) and TMJ were palpated in both sides, with the examiner's finger applying a pressure on the muscle (1

kg) and on the TMJ (.5 kg) under examination for 3–6 s.<sup>16</sup> The tender points were classified into two groups: group 1, the masticatory muscles and group 2, other structures, as follows:

- group 1: temporal (anterior, middle and posterior), masseter (deep and superficial), and medial and lateral pterygoid.
- group 2: sternocleidomastoid, cervical muscle and posterior bilaminar zone and posterior aspect of the TMJ capsule (intra-auricular).

All procedures were performed by the same examiner, who had great experience in examining patients with TMD. For each tender point, pain could be found on right, left or bilaterally. One point for each painful site was assigned. The points for pain were added, building two variables:

- Pain: sum of all painful points of group 1 (total of 14 possible points – 7 for each side).
- Total Pain: sum of painful points of groups 1 and 2 (total of 20 possible points – 10 for each side).

### Data analysis

Qualitative data were analyzed by Fisher's exact test for the comparison of gender distribution among different diagnoses of disc position. The association between age, gender and disc position was checked by Chi-square test or Fisher's exact test. Numeric variables were subjected to analysis of variance (ANOVA) for gender and age. *P* values less than .05 were considered statistically significant for all statistical tests.

## RESULTS

The study population had more females (80.5%) than males (19.5%), and the mean age of females (31 ± 11 years) was lower than the mean age of males (41 ± 12 years).

A classification of the disc position analyzed by RMI is shown in Table 1. Considering the total of 87 patients, 10 (11,5%) were classified as NDD, 57 (65,5%) showed BDD, 13 (15%) showed LDD and 7 (8%) showed RDD. Regarding to gender distribution, there was a significant correlation between females and the prevalence of BDD (*p* = .002). BDD was most frequent in females (91%), while males showed more evenly distributed among the four diagnostic groups.

Table 2 correlates the presence of Pain and Total Pain to gender. Palpation of masticatory muscles, TMJs, sternocleidomastoid and cervical muscles (Total Pain) showed significantly more pain on palpation for female than for male patients (*p* < 0.001). Concerning the masticatory muscles only (Pain), females also showed significantly more pain than males (*p* = 0.001). TMJ pain was positive in 23 patients (23.5%), all of which were female. The distribution of the presence of TMJ pain to the different diagnostic groups was not significant (*p* = 0.1).

**Table 1** - Distribution and percentage of disc position according to gender

TMJ disc	Gender		p value*
	Male	Female	
NDD	5	5	
RDD	2	5	
LDD	5	8	
BDD	5	52	0.002
Total	17	70	

\* Analysis by Fisher's exact test at 5% significance level. NDD; No displacement disc; RDD: Right disc displacement; LDD: Left disc displacement; BDD: Bilateral disc displacement.

**Table 2** - Means, medians, standard deviations (sd) and p values for pain according to gender

	Gender		p value*
	Male	Female	
Pain			
mean ± sd	3.8 ± 3.1	6.6 ± 2.9	
median	4	6	0.001
min - max	0 - 10	0 - 14	
Total pain			
mean ± sd	4.5 ± 3.6	9.1 ± 4.0	
median	5	9	< 0.001
min - max	0 - 10	0 - 20	

\*Analysis by ANOVA one way test at 5% significance level.

## DISCUSSION

The purpose of this study was to assess the distribution of TMJ disc position between the genders using MRI and to check whether pain on palpation was different between males and females. In this study the mean age was 33.2 ± 12.2 years, a range similar to that reported in the literature.<sup>10,17</sup>

TMD mainly affects young adults or middle-aged persons. Several studies of patients with TMD showed a higher prevalence in females, with ratios of 6:1,<sup>18</sup> 2:1<sup>19</sup> and 8:1,<sup>20</sup> which was also observed in this study where 80.5% are female (ratio: 5:1). However, it should be noted that Sylvester et al.<sup>13</sup> found a similar prevalence in men and women.

The causes of the higher prevalence in females remain unclear. Some authors associate estrogen to the development of TMD, because the higher incidence of TMD occurs in women during the reproductive period. This indicates that female sex hormones may play a role in the etiology or maintenance of TMD.<sup>21</sup>

Regarding the magnetic resonance imaging findings, our results showed a significantly higher prevalence of bilateral displaced disc in females, while males showed more evenly distributed among the four groups. In a study of Milano et al.,<sup>22</sup> disc displacement

was found to be more prevalent in females (120 joints, 71%) compared with 48 in males. These authors stress that this has been frequently reported and suggest that genetic factors may contribute to this, but that no clear explanation has been given on how this would come about.<sup>22</sup> Furthermore, females showed significantly more pain on palpation than males, a finding similar to that reported by Bagis et al.<sup>23</sup> In fact, there are gender differences in the prevalence, severity and different courses with longer duration of signs and symptoms of TMD in women, since men seem to recover faster.<sup>24</sup>

Disc displacement is correlated with sensitivity to palpation of the lateral and medial pterygoid muscles, and the presence of pain is significantly more common in cases of anterior disc displacement.<sup>25</sup> Besides, the disc displacement seen on MRI is well correlated with the clinical symptom painful joint.<sup>26</sup> Women have more bilateral disorders, which may explain the presence of more painful points (both masticatory muscle pain and total pain), confirming the impression that the female TMJ has different characteristics of adaptation compared to male TMJ.<sup>27</sup> Our results contradict the hypothesis of another study<sup>28</sup> stating that the gender ratio found in patients with TMD should be due to a greater concern that women have with regard to their health and symptoms.

The variable TMJ pain can have a significant presence on the prevalence of internal TMJ dysfunction as detected by means of MRI.<sup>29</sup> The results of this study do not agree with this statement, as the internal dysfunction was present in 88.5% of patients, while joint pain had a prevalence of only 23.5%, confirming the observation that pain alone is not a reliable factor for predicting internal derangement. The pain on palpation in posterior bilaminar zone and posterior aspect of the TMJ capsule (capsulitis, synovitis or retrodiscitis) seems to trigger a muscle reaction more intense than the various internal disorders.

Most studies use groups of patients with a TMD vs. a control group with total absence of signs and symptoms. These studies have reported high levels of difference between these groups showing that no great difficulties exist in terms of distinguishing patients with TMD from the normal population. In contrast, when the study proposes to differentiate between the various internal disorders among individuals with TMD the differential diagnosis is not easily elucidated clinically, and requires additional tests.<sup>30</sup>

## ■ CONCLUSION

We conclude that not only is TMD more prevalent in females, but also the severity of the diagnosis of disc position and the presence of a greater number of painful points on palpation occurs. More accurate studies on the differences of anatomical, physiological and histological

features of the temporomandibular joints of males and females should be conducted to understand the reason for this difference in the adaptive capacity between genders.

## ■ AUTHOR CONTRIBUTIONS

Witzel AL: responsible for imaging diagnosis; Costa JES: responsible for screening patients; Bolzan MC: responsible for clinical diagnosis; Carli ML: responsible for writing the article; Nunes TB: responsible for writing the article; Di Matteo RC: responsible for collecting data; Luca CEP: responsible for imaging diagnosis; Silveira FRX: responsible for planning the research, reviewing and correcting the article.

## ■ CONFLICT OF INTEREST

Authors declare no conflict of interest regarding this publication.

## CORRELAÇÃO ENTRE SEXO, POSIÇÃO DO DISCO DA ARTICULAÇÃO TEMPOROMANDIBULAR E OS RESULTADOS CLÍNICOS EM PACIENTES COM DISFUNÇÃO TEMPOROMANDIBULAR

**OBJETIVO:** O objetivo deste estudo foi avaliar as diferenças de gênero na posição do disco da articulação temporomandibular usando ressonância magnética para verificar se há sintomas em pacientes com disfunção temporomandibular.

**MATERIAIS E MÉTODOS:** Foram avaliados oitenta e sete pacientes consecutivos (70 mulheres e 17 homens); foi realizada ressonância magnética bilateral para determinar as posições do disco da articulação temporomandibular; estes foram divididos em quatro categorias diagnósticas: nenhum deslocamento de disco, deslocamento de disco a direita, deslocamento de disco a esquerda e deslocamento de disco bilateral. Os dados clínicos avaliados foram: dor a palpação no músculo e na articulação temporomandibular. Os dados foram analisados utilizando o teste exato de Fisher, teste do qui-quadrado ou análise de variância. Significância foi de  $p \leq 0,05$ .

**RESULTADOS:** A população do estudo tinha mais mulheres (80,5%) que homens (19,5%). O deslocamento bilateral de disco foi significativamente mais frequente no sexo feminino. O exame clínico mostrou mais dor à palpação muscular para mulheres do que para homens.

**CONCLUSÃO:** As mulheres apresentaram uma maior frequência de deslocamento de disco da articulação temporomandibular, bem como um maior número de pontos dolorosos à palpação muscular do que os homens.

**PALAVRAS-CHAVE:** distúrbios da articulação temporomandibular. Articulação temporomandibular. Gênero. Desarranjo interno. Imagem de ressonância magnética.

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