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By Flores Lara Alejandro, Espinosa de Santillana Irene, Rebollo Vásquez Jaime,
Silva Avelar Janeth & López Martínez Margarita
Benemérita Universidad Autónoma de Puebla, Mexico

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Objective: To assess Dynamic Postural Balance (DPB) in patients with Temporomandibular Disorders (TMD) compared to a control group at the Stomatology Clinic of the Autonomous University of Puebla (BUAP).

Materials and methods: Forty patients with TMD were tested, diagnosed by a standardized researcher with DC/TMD; 75% female average aged 27.7 ± 9.5 and 40 controls without TMD, paired by age and sex without significant differences in body mass index (BMI) between groups ($p > .05$). The 80 patients were tested with the Biodex® Stability System of the Physiotherapy School of the Autonomous University of Puebla (BUAP) by a trained researcher.

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Dynamic Postural Balance in Patients with Temporomandibular Disorders (TMD)

Flores Lara Alejandro ^α, Espinosa de Santillana Irene ^σ, Rebollo Vásquez Jaime ^ρ, Silva Avelar Janeth ^ω & López Martínez Margarita [¥]

Abstract- Temporomandibular Disorders (TMD) is a set of painful conditions that involve the masticatory muscles, Temporomandibular Joint (TMJ), and/or associated orofacial structures. Some studies have established that patients with TMD present postural alterations.

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Results: The Dynamic Postural Balance of patients with TMD resulted similar as the control ones. Descriptively, the Overall Index was lower in patients with TMD (1.66±.94 vs. 1.83±1.27), as well as the Anterior-Posterior Index (1.20±.73 vs. 1.26±.83), the Medial-Lateral Index (.92±.45 vs. 1.05±.84), and the permanence time in the optimum balance zone (95.62 vs. 93.65), without statistically significant differences in the three indices ($p > 0.05$).

Conclusion: The Dynamic Postural Balance of patients with TMD is equal as the control ones.

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I. INTRODUCTION

Temporomandibular Disorders (TMD) is a collective term embracing all the problems relating to Temporomandibular Joint (TMJ), the masticatory muscles, and/or associated orofacial structures as bones, ligaments, and cartilages¹⁻².

Over 25% of the adult population presents symptoms of TMD, nevertheless, only a small percentage of affected individuals look for treatment³. Other studies conducted in this same population have detected TMD symptoms from 16% to 59%⁴, but only

3% to 7% seek treatment for pain and dysfunction associated to TMD⁵. Yuasa additionally reports that approximately 75% of the population has at least one TMD sign and 33% has at least one symptom, but only 3.6% to 7% seeks treatment for severe TMD symptoms⁶.

In addition, TMD symptoms occur disproportionately between sexes, with an increased incidence reported in women; the female-male ratio ranges between 2:1 and 8:1⁷⁻¹⁰. Most of the patients who present symptoms are between 20 and 50 years old¹¹⁻¹².

On the other hand, Postural Balance has been defined by Riemann et al¹³ as the process of coordinating corrective movement strategies and movements at the selected joints to remain in postural equilibrium. Dynamic Postural Balance is the ability to maintain the center of gravity over the base of support while it moves or an external disturbance is applied to the body. There are some studies in the bibliography which suggest a link between the Temporomandibular Joint (TMJ)/dental occlusion and posture. Some authors have reported postural alterations in subjects with TMD in comparison to healthy ones¹⁴. Other studies inform that patients with TMD have an advanced cephalic position in contrast to subjects without TMD¹⁵. Changes in mandibular position induced or not by TMD, may influence in the neck and posture muscles¹⁶⁻¹⁸ and such subjects have a deviation in the anterior or posterior pelvic line¹⁹. To emphasize this, it has been demonstrated that changes in the mandibular position cause changes in the electromyographic activity of the masticatory muscles and neck muscles (trapezius and sternocleidomastoid), which suggest that alterations in the mandibular position disturb the cervico-cranial system²⁰. Some studies have established that patients with TMD have a higher prevalence of cervical hyperlordosis²¹.

Furthermore, it has been shown the influence of the various mandibular positions in the postural balance, specifically, the myocentric mandibular position has proved to improve postural balance²².

Apparently, the Postural Balance has an association with Temporomandibular Disorders and/or dental occlusion, so that the objective of the current study was to establish the association between Temporomandibular Disorders and the Dynamic Postural Balance in patients with any ailment in comparison with a control group from the Stomatology

Author ^α ^σ ^ρ ^ω: Faculty of Stomatology of the Autonomous University of Puebla, Mexico. e-mails: alifloreslara90@hotmail.com, irene.espinosa@correo.buap.mx

Author [¥]: Physiotherapy School of the Benemérita Universidad Autónoma de Puebla, Mexico.

Clinic of the Autonomous University of Puebla (BUAP), Mexico..

II. MATERIALS AND METHODS

A prolective, case-control study was conducted at the Stomatology Clinic of the Autonomous University of Puebla. Through convenience sampling method, in which 40 patients per group were selected.

Forty patients with TMD were tested, diagnosed by a standardized researcher with DC/TMD; 75% female average aged 27.7 ± 9.5 and 40 controls without TMD, paired by age and sex without significant differences in body mass index (BMI) between groups ($p > .05$). To assess the Dynamic Postural Balance, the Biodex Stability System was used (BSS) (Biodex Medical Systems, Shirley, NY, USA), which consists of a movable multiaxial balance platform that provides up to 20° of surface tilt in a 360° range of motion. The prearranged level of instability of the platform ranged between a slightly unstable surface, level of stability 8, to a very unstable surface, level of stability 2. Three indices were obtained electronically based on the platform degree tilt: Anterior-Posterior Stability Index (APSI), Medial-Lateral Stability Index (MLSI) and the Overall Stability Index (OSI). Additionally, the system determined the percentages of time used in the four concentric balance zones: A, B, C and D as shown in Figure 1. Lower values in the Dynamic Postural Balance Indices represent better stability than the higher ones; in the same way a greater permanence in the most peripheral zones reveals a poor balance.

Once obtained the results, a database was developed with the SPSS v.19 statistical program, for the analysis with descriptive statistics (mean, median, mode and standard deviation) and inferential statistics. The Dynamic Postural Balance difference between groups was assessed by the Student's T-test, with statistical significance $< .05$.

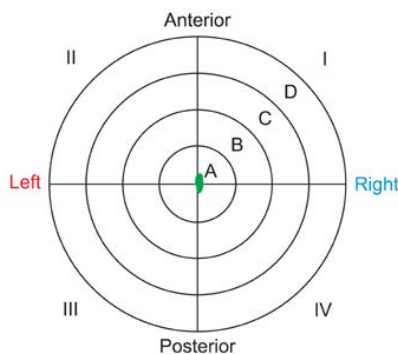


Fig. 1 : Indices and balance zones of the Biodex Balance System

III. RESULTS

Forty patients with TMD were tested, diagnosed by a standardized researcher with DC/TMD; 75% female

average aged 27.7 ± 9.5 and 40 controls paired by age and sex without significant differences in BMI between groups ($p > .05$).

As shown in Table 1, the three indices: OSI, APSI and MLSI revealed a slightly better balance in the cases, compared to the control ones. Nevertheless, none of the above comparisons showed statistical significance.

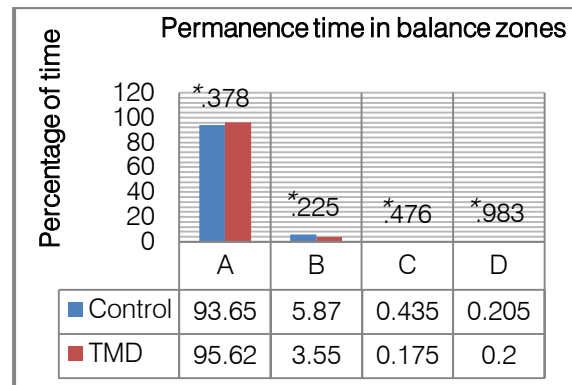
Table 1 : Comparison by group of the Dynamic Postural Balance Indices

Indices	Group				*p
	Cases n=40		Controls n=40		
	\bar{x}	SD	\bar{x}	SD	
OSI	1.66	.94	1.83	1.27	.507
APSI	1.20	.73	1.26	.83	.754
MLSI	0.92	.45	1.05	.84	.431

* Student's T-test

The permanence time in the balance zones showed that the group cases remained more time in the optimum balance zone (A) compared to the control group. None of the above comparisons showed statistical significance.

Table 2 : Comparison by group of the percentage of time in balance zones



* Student's T-test

IV. DISCUSSION

The current study did not find association between the Temporomandibular Disorders and the Dynamic Postural Balance.

Descriptively, the three balance indices: OSI, APSI and MLSI, as well as the permanence time in the optimum balance zone (A) were lower in the TMD group, however, it did not show statistically significant differences between groups.

Authors as Lee and Okeson¹⁵ proved that patients with TMD show an advanced cephalic position, Zonnenberg and Van Maanen¹⁹ revealed a deviation in the anterior or posterior pelvic line in patients with TMD,

Munhoz and colleagues²¹ observed that patients with TMD have higher prevalence of cervical hyperlordosis, all this leads to the hypothesis that TMD could affect Postural Balance.

Kittel and Bérzin²³ assessed through the Chattecx Balance System the stability and weight distribution in orthostatic position of subjects with TMD and a control group. Those authors demonstrated that the TMD group has greater symmetrical weight distribution than the control group, similar to the results of the current study, however, Kittel and Bérzin found statistically significant differences between groups.

These results could be supported by the fact that subjects with present TMD reduced muscular activity throughout maximum intercuspation due to a protective effect to minimize Temporomandibular Joint movement, this coupled to presence of pain in patients with TMD, also appears to have an effect in reduction of body sway²⁴.

Perinetti²⁵ on the other hand, by the use of the Lizard statokinesigram, researched on the correlation between TMD and postural alterations and did not find statistically significant differences in evaluating a group of patients with TMD and a control group, as in the current study. It should be noted that one of the possible explanations for the type of instrument could support the controversy in the results reported in the literature used to determine the Postural Balance. The Biodex Stability System (Biodex Medical Systems, Shirley, NY, USA), instrument used in this study, consists of a movable multiaxial circular platform with 360° range of motion, with the potential of varying surface tilt, which makes the Postural Balance assessment to be carried out in a fully dynamic position.

This instrument has demonstrated reliability and validity in previous studies²⁶⁻²⁷. On the other hand, other studies have used different instruments to assess Postural Balance. These other instruments do not allow dynamic multiaxial assessment of Postural Balance, as the Chattecx Balance System and others, these latter only use force plates combined with software to determine the center of gravity and based on this, measure the rate of Postural Balance. Such diversity in the use of instruments could be the main cause of the controversial result found in the literature.

The main strength of this study is based on the use of a valid and reliable instrument to establish the Postural Balance Index; it is noteworthy that there is no bibliographical evidence that has assessed Dynamic Postural Balance within concentric zones mentioned above. In the current study, it was observed that patients with TMD presented higher percentages of optimal balance (95.6%) compared to the control subjects (93.6%), although no significant differences were denoted. On the other hand, a weakness of this research lies in the absence of a prior calculation of sample size, which could influence in the absent

association between Temporomandibular Disorders and Dynamic Postural Balance reported in the current study.

V. CONCLUSION

The Dynamic Postural Balance of patients with TMD; OSI, APSI, MLSI, as well as the permanence time in optimum balance zone, is equal to the control ones.

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