

DYNAMIC POSTUROGRAPHY IN PATIENTS WITH ORTHODONTIC AND VESTIBULAR DISORDERS

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Abstract: Posture of human body corresponds to a certain stable relationship between head, torso and limbs, where a minimal amount of energy is needed for its support. Although clinicians in the field have studied the connection between the muscle chains, maintaining balance of the body, and the musculature in the maxillofacial area (cervical, masticatory), more can be studied and proven in the area. If there is a change of the center of gravity of the body, it is certain that a negative change of posture has been diagnosed. Postural disorders are increasingly common nowadays. The prevalence of musculoskeletal disorders is increasing as well, along with temporomandibular disorders (TMD), vertigo, dizziness, tinnitus, memory loss and others.

The present study aims to demonstrate the need for complex examination of patients with symptoms from the audio-vestibular system, stomatognathic and other anatomical systems in the head and neck area.

In the present study, 40 (20 male and 20 female) patients who have passed through the Audio-vestibular and Sleep laboratory of the University Medical and Dental Center at the Faculty of Dental Medicine of Medical University – Varna in the period February – June 2022 were included. All of them were invited to fill out an informed consent form. They were also given questionnaires to describe the symptoms, concerning audio-vestibular and stomatognathic systems. Thorough examinations were performed by an ENT-specialist and a physician in dental medicine. All patients were examined on a dynamic stabilometric platform, under different modalities – with eyes open/closed, teeth clenched/relaxed, head tilted left and right, for fixed amount of time – 20 sec. Posturographic platform is not a source of ionizing radiation.

Patients who reported pain and noise from the temporomandibular joints, when examined with the posturography platform, shifted the center of gravity of the body more often backwards and to the right side (especially if the TMD was bilateral). In patients who also had vestibular symptoms (dizziness, vertigo), with or without a disorder in the mandibular joints, the center of gravity of the body was more often shifted back and to the right as well. Most of the patients with the described displacement also had an orthodontic deformity. Based on intraoral dental examination, cephalograms, and analysis, patients with Angle class 2 (distal bite), crossbite in the lateral area, laterognathia were diagnosed, the first being the most common in patients with a shift in the center of gravity. In all studied patients, an increase in the length of the stabilogram curve above the reference values of 150 mm was found. A change in the feet - flat feet - was found in half of the patients, included in the study.

Postural problems can worsen existing symptoms from other systems with a disorder. Establishing the direction of the displacement helps to establish the genesis of the disorder and directs the appropriate therapy, according to the specific clinical case.

Keywords: dynamic posturography, malocclusions, vertigo, temporomandibular disorders

1. INTRODUCTION

Posture of the human body corresponds to a certain stable anatomic relationship between head, torso and limbs, where a minimal amount of energy is needed for its support. (1, 2, 8) Although clinicians in the field have studied the connection between the muscle chains, maintaining balance of the body, and the musculature in the maxillofacial area (cervical, masticatory), more can be proven in the area. There are authors who confirm that there are relationships between the posture system, the stomatognathic system and the audio-vestibular system (3, 4, 5, 9, 10, 15) and scientists who have proven the contrary (6, 11, 14). If there is a change of the center of gravity of the body, it is certain that a negative change of posture has been diagnosed. Postural disorders are increasingly common nowadays. The prevalence of musculoskeletal disorders is increasing as well, along with temporomandibular disorders (TMD), vertigo, dizziness, tinnitus, memory loss and others. (7) The science for the human posture is called posturology and it deals with posture disorders. Although its history dates back to the middle of 20th century, it was not until the last 10 years, when society, thanks to the scientific data obtained in the field, paid more attention. (1, 2, 18) Special attention should be paid on the cases of children and adolescents who have posture and orthodontic disorders (16, 17), especially in these days, where there is a pandemic of tinnitus among youngsters as well.

The present study aims to demonstrate the need for complex examination of patients with symptoms from the audio-vestibular system, stomatognathic and other anatomical systems in the head and neck area.

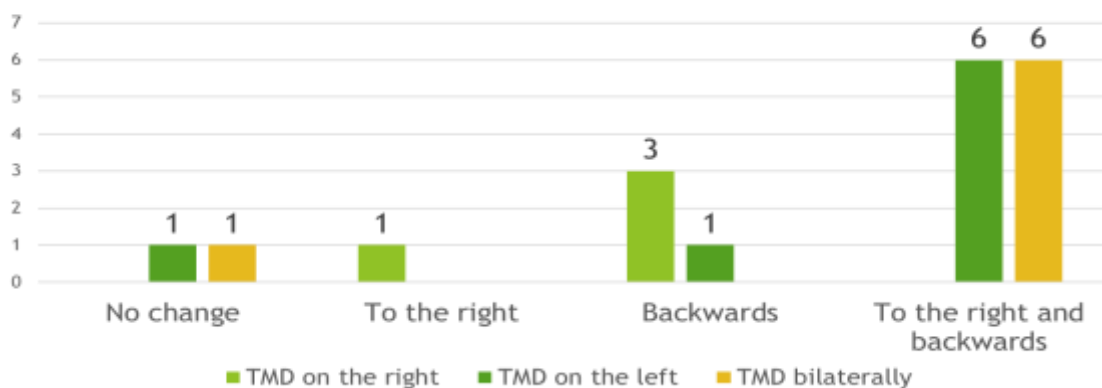
2. MATERIALS AND METHODS

In the present study, 40 (20 male and 20 female, age 18-75) patients who have passed through the Audio-vestibular and Sleep laboratory of the University Medical and Dental Center at the Faculty of Dental Medicine, Medical University – Varna in the period February – June 2022 were included. All of them were invited to fill out an informed consent form for participation in the presented study. It has received approval for execution by Medical University – Varna's Ethic Commission (KENI, MU-Varna). Patients were also provided with questionnaires to fill out in order to describe the symptoms, concerning audio-vestibular and stomatognathic systems. Thorough systematic clinical examinations were performed by an ENT-specialist and a physician in dental medicine, aiming to discover whether the symptoms have solely arisen from the audio-vestibular system in the first place, or there are simultaneous connections with the dental occlusion. All patients were examined on a dynamic stabilometric platform PODATA (Chinesport, Italy), where dynamic posturography was done, under three different modalities – with eyes open/closed, teeth clenched/relaxed, head tilted left and right, for fixed amount of time – 20 sec. The total of 6 barosensors aid the clinician to do the examination, without the need of the platform to move. The posturographic platform possesses the ability to make photographic pictures of patient's feet, thanks to a system of LED-diodes, mirrors and HD-video cameras, and is no source of an ionizing radiation. As for the static posture, Global Postural system Leonardo PL0800, part of which is the PODATA platform, provides with the opportunity to make static assessment of patient's posture. Those assessments will be a part of an another study.

3. RESULTS

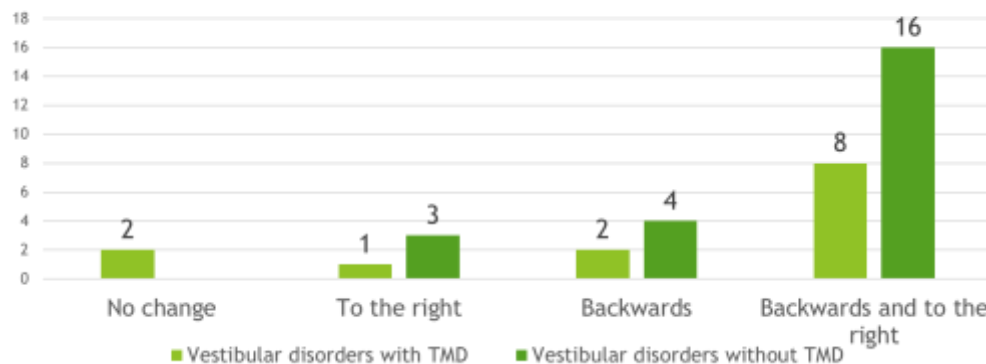
Patients were divided into 3 groups – patients with a temporomandibular disorder, patients with a TMD and a vestibular disorder, patients with a dental malocclusion. Patients who reported pain and noise from the temporomandibular joints, clear sign for a temporomandibular disorder (TMD), when examined with the posturography platform, shifted the center of gravity of the body more often backwards and to the right side (especially if the TMD was bilateral). On picture 1 the number of patients and the direction of displacement of their bodies' center of gravity (CoG) can be seen. (Pic. 1) Of the 40 tested patients, almost half (19) had a TMD diagnosed. Female patients were more affected than male. (12 female to 7 male patients with a TMD). More of the body's mass was shifted to the right foot and backwards.

Picture 1 – A diagram of the number of patients with a TMD who displace the center of gravity their bodies and the direction of displacement



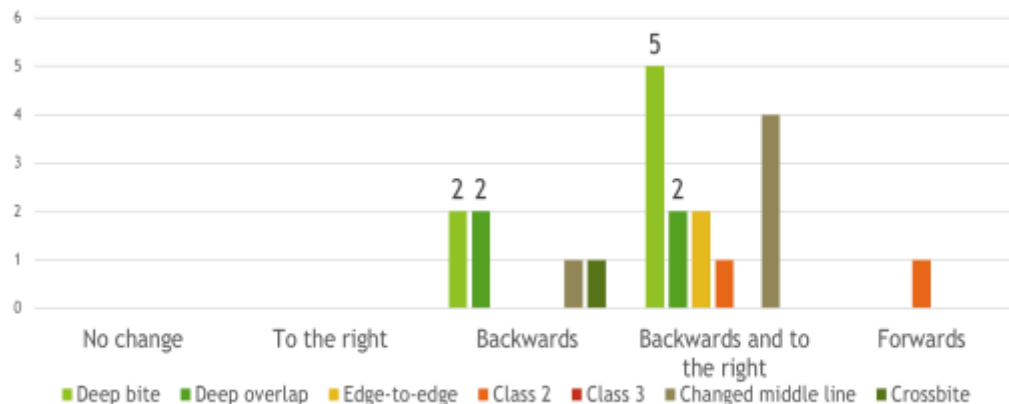
In patients who also had vestibular symptoms (dizziness, vertigo), with or without a disorder in the mandibular joints, the center of gravity of the body was more often shifted back and to the right as well. Of the 40 tested patients, 36 had a vestibular disorder, of which 13 had both – a TMD and a vestibular disorder (dizziness, vertigo), 23 had only a vestibular disorder, without a TMD. (Pic. 2)

Picture 2 – A diagram of the number of patients with a vestibular disorder in regard to the presence of a TMD and direction of displacement of the CoG



Most of the patients with the described displacement also had a malocclusion. Based on intraoral dental examination, cephalograms, orthopantomograms, and analysis, patients with Angle class 2 (distal bite), crossbite in the lateral area, laterognathia were diagnosed, the first being the most common in patients with a shift in the center of gravity. (Pic. 3) Of the 40 tested patients, 21 had a malocclusion.

Picture 3 – a diagram showing the direction of displacement of the CoG of patients with different malocclusions



In all studied patients, an increase in the length of the stabilogram curve above the reference values of 150 mm was found. A change in the feet - flat feet - was found in half of the patients, included in the study. Older patients displaced CoG more than younger.

All patients were prescribed treatment, according to their clinical case. Consults with a specialist in orthodontics was done as well.

4. DISCUSSIONS

Postural problems can worsen existing symptoms from other systems with a disorder. Establishing the direction of the displacement helps to establish the genesis of the disorder and directs the appropriate therapy, according to the specific clinical case. Scientific literature lacks data for the exact directions of the shift of the body mass when patient suffer from a vestibular disorder or a combination of disorders, affecting the proprioceptive, visual, vestibular and stomatognathic system. Older patients tend to displace CoG more than younger patients, consistent with the results of other studies. Connections between stomatognathic, vestibular and postural system have been proven, consistent with the results of other studies in the field. (3, 4, 5, 9, 10, 12, 13, 15)

5. CONCLUSIONS

Participating into multidisciplinary and interdisciplinary teams of specialists provides them with the opportunity to reach the correct diagnosis with better certainty. There is a connection between the stomatognathic, vestibular and postural system, visible from the results of the examinations.

ACKNOWLEDGEMENTS

The following study was able to be executed thanks to a project #20011, “Fund Nauka”, won by an interdisciplinary team of the Faculty of Dental medicine and University medical and dental center, Medical University “Prof. Dr. Paraskev Stoyanov” – Varna, Bulgaria. The authors of the study express their thankfulness to the academic management of the Faculty of Dental medicine and Medical University – Varna.

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