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Research Article

Assessment of Structural Body Imbalances in Patients with Temporomandibular Joint Dysfunction

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Abstract

Introduction: Temporomandibular joint dysfunction (TMJ) is the second most common disease of the musculoskeletal system, affecting up to 33% of people during their lifetime. Being the main cause of neodontogenic pain in the orofacial region, TMJ pathology requires the use of a preclinical examination. The multifactorial nature of the disease actualizes the study of the early symptoms of developing functional disorders. The TMJ algorithm should be applied already in the dentist's office, which will avoid unpredictable results of dental rehabilitation and attract other specialists to the complex therapy of the patient in time. There is a need for a more accurate understanding of the mutual influence of the structural imbalance of the body and the dental system, determining the primary disorder, which will help to develop a prevention system, as well as influence the sequence, volume and nature of the treatment.

Aim of the Study: The aim of the study is to identify the relationship between structural imbalances of the body and TMJ dysfunction.

Materials and Methods: A prospective study was conducted on 85 volunteers from University students at the Department of Orthopedic Dentistry of Omsk State Medical University from February to March 2020. During the processing of the clinical material, 7 people were eliminated in accordance with the exclusion criteria. All the subjects were assessed the state of the maxillary system, primarily the TMJ (using the short Hamburg test), and structural imbalances of the body (using the Notch Interfaces Inc. motion capture and reconstruction system). The presence and strength of the linear relationship of the phenomena was determined using the Pearson coefficient.

Results: According to the results of the Hamburg test, the functional norm was detected in only 12.5% of the surveyed, the majority of volunteers (85.9%) had TMJ dysfunction or a high risk of its development. Structural imbalances of the body were detected in 78.2% of cases. There is a highly significant positive relationship between functional TMJ disorders and pelvic hyperflexia ($p = 0.70$, $p < 0.05$). A positive weak association was observed between the risk of developing TMJ dysfunction (2 points according to the Hamburg test) with pelvic hyperflexia ($p = 0.29$, $p < 0.05$) and forward tilt of the head and neck (more than 5°) ($p = 0.24$, $p < 0.05$).

Conclusion: The study showed a strong positive relationship between pelvic hyperflexia and signs of TMJ dysfunction, a positive relationship between functional TMJ disorders and slopes of different parts of the spine. The potential reversibility of the detected disorders and the need for their timely detection and correction. This study is a pilot and will be continued in a broader format.

Keywords: Temporomandibular Joint Dysfunction; Interdisciplinary Approach; Motion Capture Technology

Introduction

Temporomandibular joint dysfunction (TMJ) is a common violation of the craniomandibular system, affecting up to 33% of people during their lifetime. The literature data on the prevalence are contradictory - from 21.5 to 50.5%, with a predominance of female persons [1-3]. A research team from the University of Jordan found

that out of 1,040 young people, 905 (87%) had at least one positive symptom or clinical sign of TMJ dysfunction [4]. Many studies and different authors indicate that TMJ pathology is the main cause of non-ontogenic pain in the orofacial region [5,6]. The peak incidence occurs at the age of 20 - 50 years, which is atypical for a degenerative disorder due to age. The disease affects the quality of life, sleep, psychological well-being, because of this there is anxiety, stress, a negative impact on social function, emotional health, energy level [7,8].

Researchers agree that the etiology of TMJ dysfunction is multifactorial. The multicomponent nature of the disorder, various clinical predictors of pathology, and an imbalance of the masticatory organ can be monitored for many years, long before the patient's complaints and discomfort arise, sufficient to seek professional help [9]. Psychological and emotional factors make a certain contribution to the development of functional TMJ disorders [10].

Timely diagnosis of TMJ disorders is hampered by the lack of comprehensive research principles and strategies. Patients can go from specialist to specialist for many years in search of pain relief in the head or neck area, because the role of the TMJ in the development of pain syndrome is rarely taken into account. The dysfunction also involves the autonomic nervous system, which leads to disorganization of the acts of breathing and swallowing, cardiac activity, headache [11]. By applying special diagnostic methods, the doctor can detect the disharmony of the lower jaw in just a few seconds and attract specialists from related fields in advance, providing an interdisciplinary approach to the diagnosis, prevention and treatment of diseases of the stomatognathic system [12].

An example of this is the combined use of orthodontic treatment and osteopathic correction, which has a greater clinical effectiveness compared to one orthodontic [13].

Clinical studies have demonstrated that structural imbalances of the body cause fascial stresses, including TMJ dysfunction [14,15]. At the same time, the latter may not bother the patient for a long time, since adaptation will occur at the expense of other regions of the body [2]. Therefore, any therapeutic measures in the orofacial region should be carried out taking into account the possible increase in the risk of developing disharmony in the craniomandibular system, including occlusive muscle dysfunction, chronic pain syndrome, disorders of adaptation to orthopedic structures and altered functional occlusion, which can cause secondary fascial stresses that can affect almost any part of the body [16]. Conversely, fascial tension caused by a structural imbalance in the pelvis, lumbar, thoracic or cervical spine can directly contribute to the disconnection of the TMJ [17]. There is a need for a closer study of the mutual influence of structural imbalances of the body and the maxillary system to determine the primary disorder, which will help to develop a system for the prevention of TMJ dysfunction, as well as to influence the sequence, volume and nature of the complex treatment of this pathology [18,19].

Aim of the Study

The aim of the study is to identify the relationship between structural imbalances of the body and TMJ dysfunction.

Materials and Methods

Type of study: Prospective.

The location and duration of the study: The study was conducted at the Department of Orthopedic Dentistry of Omsk State Medical University from February to March 2020.

Characteristics of the participants

The study involved 85 volunteers from university students.

Inclusion criteria: informed voluntary consent to the examination, young age (19 - 22 years).

* 9 - Criteria for non-inclusion: a history of TMJ operations, injuries and fractures in the orofacial region; serious concomitant pathology - malignant neoplasms, rheumatic and neurological problems; primary diseases of the spine, such as degenerative-dystrophic changes in the intervertebral discs and vertebrae; any diseases in the acute period.

Exclusion criteria: Non-attendance at the study and control examinations.

During the processing of the clinical material, 7 people were eliminated in accordance with the exclusion criteria. In the end, 78 students participated in the study - 353 men and 42 women.

Stages of the study: All the subjects were assessed the state of the maxillary system, primarily the TMJ, and structural imbalances of the body. To assess the state of the TMJ, a short Hamburg test

was used [20], which is considered a method of preliminary examination of the TMJ function and includes six questions:

- Is the opening of the mouth asymmetric?
- Is the opening of the mouth sharply limited or too large?
- Are intra-articular noises detected?
- Is the occlusive sound asynchronous?
- Is the palpation of the masticatory muscles painful?
- Is the eccentric occlusion of the teeth traumatic?

After receiving the test results (from 0 to 6 points, 1 point for a positive answer to each of the questions), you can assess the function of the TMJ: the functional norm is 0 - 1 points, the risk of developing dysfunction (risk group) is 2 points, TMJ dysfunction is 3 - 6 points. To study the biomechanics of the body and identify structural imbalances, Notch technology was used - a system for capturing and reconstructing movements (Notch Interfaces Inc.) [21].

The Notch sensor system, including an accelerometer, gyroscope and magnetometer, allows you to recreate movements in digital format through a mobile application based on the angles, acceleration, and speed of movement of body parts relative to each other (Figure 1 and 2).

Figure 1: Starting position for the examination. 5 Notch motion sensors are installed on the examined person

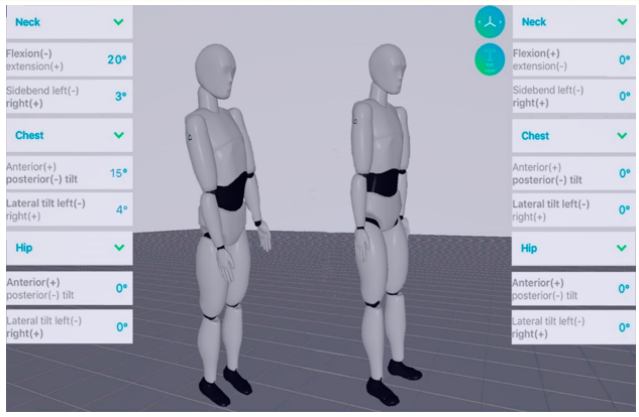

Figure 2: Work in the Notch Pioneer application - information from three sensors is displayed on the screen while the subject is examined in the usual postural pattern of a vertical pose (left) and standing at the support (right). Screenshot of a mobile device.

This technique was used to evaluate the usual postural pattern of vertical posture, namely, the location relative to the frontal and sagittal planes of the neck, chest and pelvis. Normally, these regions are on the same line, the deviation in the frontal plane does not exceed 5°, and in the sagittal plane-2°. According to the test results, structural imbalances were detected, namely, deviation from the midline in the frontal (flexion and extension) and sagittal (lateroflexion) planes.

Statistical processing: The presence and strength of the linear relationship of the phenomena were determined using the Pearson coefficient, the critical level of significance of the differences was $p < 0.05$.

Ethical expertise: The study was conducted in accordance with the Helsinki Declaration (adopted in June 1964, revised in October 2013) and approved by the Ethics Committee of the Omsk State Medical University. Informed consent was obtained from each participant of the study.

Results

78 volunteers aged 19 - 22 (35 men and 42 women) from students of Omsk State Medical University were examined. According to the results of the Hamburg test, the functional norm was registered in 12.5% of the examined patients, most of them had TMJ dysfunction (Table 1).

Test results	Number of people (%)
Functional norm (0 - 1 points)	11 (14,1)
The risk of developing dysfunction (2 points)	31 (39,7)
The presence of dysfunction (3 - 6 points)	36 (46,2)

Table 1: The distribution in the examined volunteers according to the results of the Hamburg test, abs. number (%).

The use of the Notch motion capture and reconstruction system revealed structural imbalances of the body in the usual postural pattern of vertical posture in 61 (78.2%) of the examined patients. Each of the analyzed groups (functional norm, risk of TMJ dysfunction, presence of TMJ dysfunction) was characterized by its predominant structural imbalances (Table 2).

Region	Flexion or extension (more than 5°)			Lateroflexia (more than 20°)		
	Functional norm	Risk of dysfunction	Dysfunction	Functional norm	Risk of developing dysfunction	Dysfunction
Neck	2 (2,6)	4 (5,1)	9 (11,5)	0	3 (3,9)	2 (2,6)
Thoracic	0	3 (3,9)	3 (3,9)	7 (9)	5 (6,4)	1 (1,3)
Pelvis	2 (2,6)	9 (11,5)	24 (30,8)	0	1 (1,3)	3 (3,9)

Table 2: The distribution in the observed patients according to structural imbalances of the body, abs. number (%).

To establish a link between all identified structural imbalances of the body and TMJ dysfunction, as well as the risk of its development, a correlation analysis was performed and the Pearson coefficient was calculated. It was found that there is a highly significant positive relationship between functional disorders of the TMJ (3 points or more according to the results of the Hamburg test) and pelvic hyperflexia (anterior pelvic tilt of more than 5°) ($p = 0.70$, $p < 0.05$). A positive weak association was observed between the risk of developing TMJ dysfunction (2 points according to the Hamburg test) with pelvic hyperflexia ($p = 0.29$, $p < 0.05$) and forward tilt of the head and neck (more than 5°) ($p = 0.24$, $p < 0.05$).

Discussion

The craniomandibular system should be considered not in isolation, but in a complex, together with the spine and the entire musculoskeletal system. The obtained data showed a high degree of positive correlation of functional disorders of the TMJ and pelvic hyperflexia, as well as a positive correlation of a high risk of functional disorders of the TMJ with imbalances of all parts of the spine, which makes a dentist think about interaction in this case with doctors of other specialties, primarily an osteopath.

TMJ dysfunction, despite its high prevalence in the examined patients, did not acquire an organic component, which may be due to the young age of the subjects, whose functional disorders have not yet led to structural changes.

It is necessary to increase the number of patients, improve the diagnostic algorithm, taking into account the expansion of the possibilities of examining patients with disorders of the maxillary or musculoskeletal system.

Conclusion

The study showed the presence of a strongly significant positive association between pelvic hyperflexia and signs of TMJ dysfunction, an average significant positive association between functional TMJ disorders and forward tilt of the head and neck. this indicates the potential reversibility of these violations and the need for their timely detection and correction. This study is a pilot and will be continued in a broader format.

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Conflicts of Interest

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

Bibliography

1. Ahmad SA., *et al*. "Low-level laser therapy in temporomandibular joint disorders: a systematic review". *The Journal of Medicine and Life* 14.2 (2021): 148-164.

2. Schiffman E., *et al*. "Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD Consortium Network and Orofacial Pain Special Interest Group". *Journal of Oral and Facial Pain and Headache* 28.1 (2014): 6-27.

3. National Institute of Dental and Craniofacial Research". *Facial Pain* (2020).

4. Ryalat S., *et al*. "Prevalence of Temporomandibular Joint Disorders Among Students of the University of Jordan". *Journal of Clinical Medicine Research* 1.3 (2009): 158-164.

5. McNeill C. "Management of temporomandibular disorders: Concepts and controversies". *Journal of Prosthetic Dentistry* 77.5 (1997): 510-522.

6. Khvatova VA and Sputnikov AA. "Temporomandibular joint diseases and treatment methods". *New in Dentistry* 1 (1998): 33-42.

7. Herpich CM., *et al*. "Immediate and short-term effects of phototherapy on pain, muscle activity, and joint mobility in women with temporomandibular disorder: a randomized, double-blind, placebo-controlled, clinical trial". *Disability and Rehabilitation* 40.19 (2017): 2318-2324.

8. Bachani L and Ashok L. "Conservative Management of Temporomandibular Disorders: A Review". *Acta Scientific Dental Sciences* 3.4 (2019): 99-109.

9. Balthazard P., *et al*. "Association of cervical spine signs and symptoms with temporomandibular disorders in adults. JBI Database System". Rev. Implement. Rep (2020): 1.

10. Xu GZ., *et al*. "Low-Level Laser Therapy for Temporomandibular Disorders: A Systematic Review with Meta-Analysis". *Pain Research and Management* (2018): 4230583.

11. Kobyakova G., *et al*. "Complex application of Vojta therapy and osteopathy in the treatment of children with consequences of perinatal lesions of the central nervous system". *Manual Therapy* 62.6 (2016): 21-29.

12. Amig JP. "Dentitionsystem. Dental concept. Osteopathic concept". St. Petersburg: Nevsky rakurs (2004): 240.

13. Milutka YA., *et al*. "Possibilities of osteopathic correction in complex therapy of temporomandibular joint dysfunction". *Russian Osteopathic Journal* 1.244-45 (2019): 43-50.

14. Klimko KA and Naumovich SA. "Gnatology in dentistry". *Modern Dentistry* 2 (2016): 9-13.

15. Gesslbauer C., *et al*. "Effectiveness of osteopathic manipulative treatment versus osteopathy in the cranial fi eld in temporomandibular disorders - a pilot study". *Disability and Rehabilitation* 40.6 (2016): 631-636.

16. Carlsson GE. "Dental occlusion: modern concepts and their application in implant prosthodontics". *Odontology* 97.1 (2009): 8-17.

17. Landusi JM. "Temporomandibular joints. Definition, dental and osteopathic treatment". SPb: Nevsky rakurs (2014): 276.

18. Ponomarev AV., *et al*. "Evaluation of the effectiveness of orthopedic treatment of temporomandibular joint dysfunction according to mathematical modeling". *Dentist* 1.28 (2018): 96-102.

19. Postnikov MA., *et al*. "Automated Analysis of X-Ray Images of the Temporomandibular Joint in Patients with Orthognathic Bite and Physiological Occlusion". *The Egyptian Journal of Radiology and Nuclear Medicine* 100.1 (2019): 6-14.

20. Ahlers MO and Jakstat HA. "Klinische Funktions analyse: interdisziplinares Vorgehen mil optimierten Befundbogen". Hamburg: Denta Concept (2000): 512.

21. Vabischevich AN and Voskov LS. "A wireless motion capture system based on a wireless sensor network platform and inertial sensors". *Science Works* 20.92 (2013): 200-210.

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