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Health-Oriented Approach in Orthodontic Treatment of Adults Patient: Clinical Case

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Abstract

Introduction: Adult patients undergoing orthodontic treatment usually show signs of unbalanced occlusion, which can lead to serious health problems. Any imbalance in the body requires increased energy input for adaptation. Over time, this can lead to maladaptation and the formation of pathology throughout the body. For this reason, the examination of such patients requires special attention and the treatment demands unconventional approaches.

Objective: Use of the principles of a health-oriented approach in the orthodontic treatment of adult patients with malocclusion

Methods: Using questionnaire data, clinical examination methods and superficial electromyography for diagnosis and quality control of orthodontic treatment

Results: Improvement in the general health of the patient after orthodontic treatment

Conclusions: The health-oriented approach is effective and preferable for orthodontic treatment of adult patients.

Keywords: Orthodontic Treatment; TMD; Occlusion; Electromyography; Dental Case Reports

Background

Orthodontic treatment of adult patients is always associated with certain difficulties. Most of these patients exhibit signs of temporomandibular joint dysfunction (TMD) and psychosomatic conditions, which can complicate orthodontic treatment and affect the stability of the final outcome. Such conditions include sleep disorders, nervous system pathologies, general somatization, and chronic pain. Therefore, the examination of these patients should encompass an assessment of all the aforementioned deviations [2].

Unfortunately, the classical approach to treatment does not take these factors into account, leading to complications during the treatment stages or resulting in relapse after its completion. One of the reasons for this oversight is that orthodontic treatment is traditionally performed during the adolescent period, when the anatomy of the teeth is fully intact. With aging, tooth wear progresses, and multiple occlusal contacts may be lost. This results in the development of muscle dysfunction, and consequently, joint dysfunction. Attempts to correct the established situation through orthodontic tooth alignment only exacerbate the original issue [3,4].

The neuromuscular approach is the most suitable method for treating such patients, as it is based on a deep understanding and knowledge of human anatomy and the physiology of the relevant processes.

Case Description

In 2021 a 33-year old women got orthodontic treatment to our clinic. She complained of: severe headaches 2-3 times a month, restriction of mouth opening, dizziness, ringing in the ears, bruxism day and night, pain in the facial area, increased sensitivity to cold and hot things, increased sensitivity to pressure, difficulty chewing, pain in the cervical region, sleep disturbance.

According to the medical and dentistry history patient has: allergies to antibiotics, pollen, food products, concussion, reflux, tonsilitis, decrease in BP. The patient visits the dentist regularly for professional hygiene and treatment of tooth decay. Extraction and implantation in the area of tooth 36. Satisfactory oral hygiene, cleans teeth twice a day. No previous orthodontic treatment and history of facial trauma.

The following clinical signs were noted during the examination of the patient: dry lips (sign of mouth type of breathing), displacement of the mandible to the left (sign of asymmetric loss of VDO), anterior position of the head with the head tilted backwards (sign of loss of VDO in the region of the masticatory teeth and also a sign of airway compression) (figure 1).

Figure 1: Extra-oral foto before treatment

Figure 2: Intra-oral foto before treatment

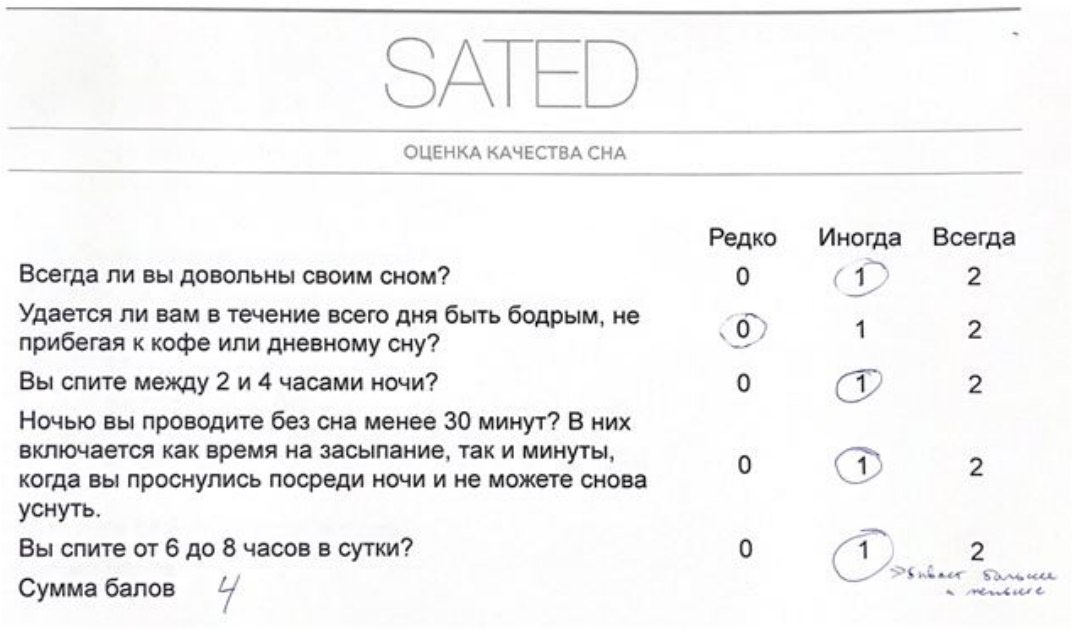
In order to make and clarify the diagnosis, as well as to plan treatment, the patient underwent:

- SATED sleep quality assessment
- Assessment of physical symptoms PHQ-15
- Assessment of the patient's psycho-emotional state PHQ-9, GAD-7
- Pain Drawing
- Myography
- CBCT

The SATED questionnaire assessed quality by screening the main sleep indicators:

- Satisfaction with sleep (level of satisfaction with one's sleep),
- Alertness during waking hours (ability to stay awake and not feel tired during the day),
- Timing of sleep (time of sleep),
- Efficiency (effectiveness of sleep)
- Duration (length of sleep).

Disruption of sleep quality impacts the overall state of the body, particularly causing changes in the functioning of the nervous system. This, in turn, leads to increased muscle tone in the masticatory muscles and is a contributing factor to bruxism, which results in the wear of teeth and the loss of occlusal contacts. At the time of the examination, the patient had an unsatisfactory sleep quality (Figure 3).



SATED

ОЦЕНКА КАЧЕСТВА СНА

	Редко	Иногда	Всегда
Всегда ли вы довольны своим сном?	0	1	2
Удается ли вам в течение всего дня быть бодрым, не прибегая к кофе или дневному сну?	0	1	2
Вы спите между 2 и 4 часами ночи?	0	1	2
Ночью вы проводите без сна менее 30 минут? В них включается как время на засыпание, так и минуты, когда вы проснулись посреди ночи и не можете снова уснуть.	0	1	2
Вы спите от 6 до 8 часов в сутки?	0	1	2

Сумма балов 4

Figure 3: Sleep quality assessment before treatment

In the evaluation of physical symptoms by PHQ-15, the patient had a high level of somatization, which indicates a decrease in the patient's adaptive potential.

At the time of the examination patient's psycho-emotional state (PHQ-9, GAD-7), she had a mild degree of depression and a moderate degree of anxiety. The conditions of the nervous system provide insights into the potential reactions of patients undergoing prolonged orthodontic treatment. Patients experiencing depression may demonstrate poorer oral hygiene practices and may not adhere to the recommendations given by their orthodontists. This non-compliance can lead to critical changes in the course of treatment, adversely affecting the overall outcome. Additionally, psychological factors such as anxiety, stress, and low motivation can further complicate the orthodontic process. Patients with these mental health challenges may struggle with the discomfort often associated with orthodontic procedures, leading to increased dissatisfaction and reluctance to attend necessary follow-up appointments.

The intricate relationship between emotional well-being and physical health underscores the importance of a comprehensive treatment approach. Orthodontists must not only focus on the mechanical aspects of tooth alignment but also consider the psychological state of their patients. This can involve interdisciplinary collaboration with mental health professionals to provide holistic care. By addressing both the emotional and physical dimensions of treatment, practitioners can improve patient compliance and enhance treatment stability, ultimately leading to better long-term dental outcomes.

Pain drawing shows that patient has more than 10 areas of pain on the body, which is considered as a severe level (Figure 4).

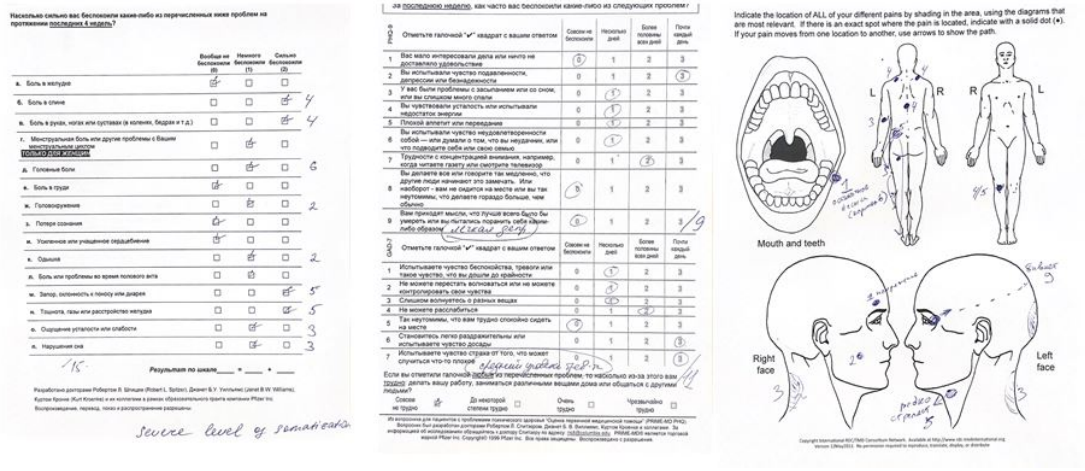


Figure 4: Health assessment before treatment

Myography of the masticatory muscles at rest with the eyes open and closed shows symmetry in the work of the temporal and masticatory muscles. There is prevalence of temporal muscles tonus over masticatory muscles that may indicate displacement of the lower jaw to the back and loss VDO. Myography of masticatory muscles in central occlusion shows improvement of the temporal and masticatory muscles tonus ratio (Figure 5). In a state of rest, the lower jaw is held in a stable position by the action of the masticatory muscles and ligaments, which largely determine its location. Proper interaction among the muscles, maxillofacial structures, and joints is a key factor in maintaining normal functionality and aesthetics of the dentofacial system. Ignoring muscle tone and its influence on the position of the lower jaw during orthodontic treatment can lead to serious consequences. One of the most common outcomes of not considering muscle balance is relapse, which may manifest as a return of teeth to their original position after the removal of braces or other orthodontic appliances. Relapse not only complicates the achievement of the planned treatment outcome but may also increase the need for repeat interventions. Furthermore, this oversight can contribute to the development of temporomandibular joint (TMJ) dysfunctions. These dysfunctions may present as pain, clicking during jaw movement, and limitations in mobility, which in turn negatively affect the patient's quality of life. It is crucial for orthodontists to take into account the individual characteristics of muscle tone and the activity of the masticatory muscles when planning treatment and selecting correction methods to ensure stable and long-lasting results.

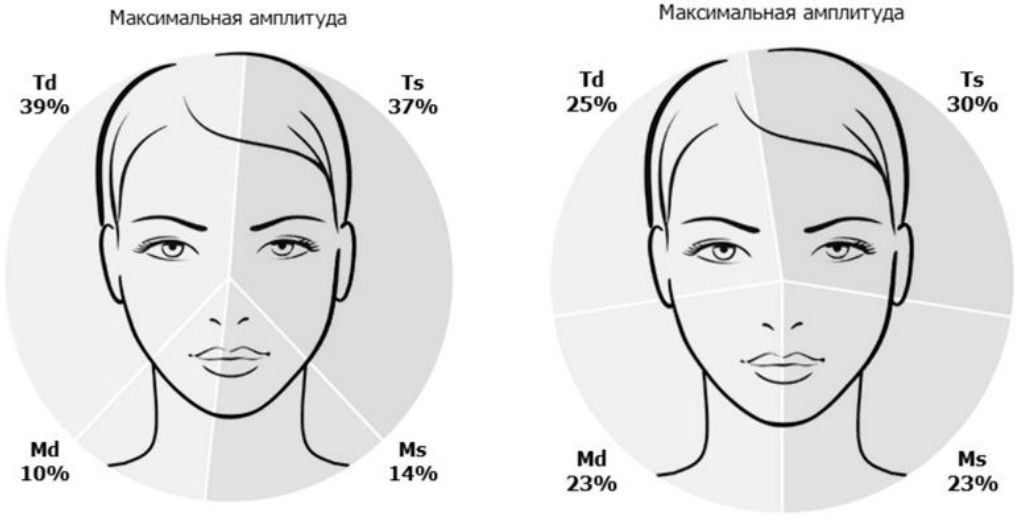


Figure 5: Myography before treatment

CBCT of the skull shows hyperlordosys of the cervical spine, which may indicate the presence of adaptation of respiratory function. Analysis of airway volume indicates narrowing of the upper airways (Figure 6) To assess their condition, volumetric analy-

sis of the airway space is utilized. A computer program enables multiple calculations of the airway width parameters along the upper respiratory tract and generates reports in the form of graphs and color visualizations. A reduction in airway volume is a predisposing factor for the development of sleep apnea [5].

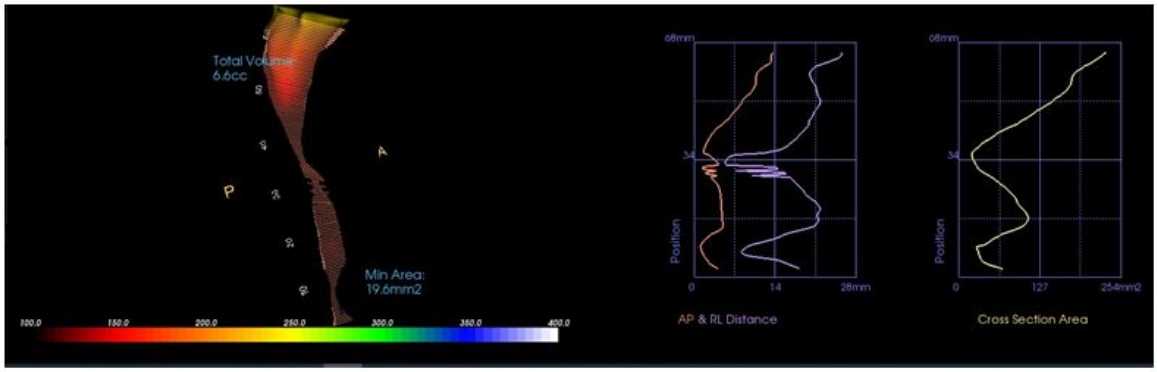


Figure 6: Airway assessment before treatment

Analysis of the state of the TMJ demonstrates adaptive changes in the area of the condyles and their posterior-upper position (Figure 7).

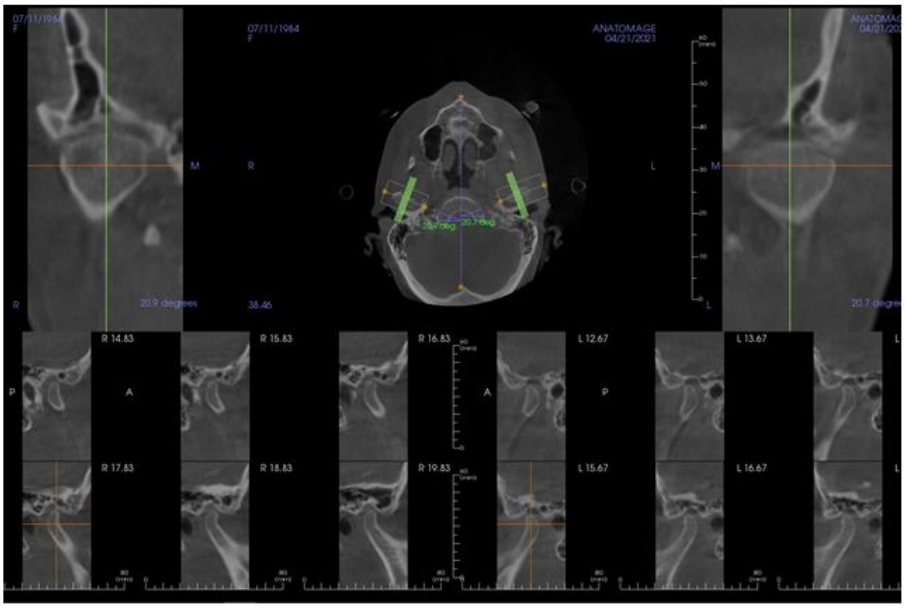


Figure 7: TMJ assessment before treatment

During the examination of the patient and analysis of diagnostic information, the following diagnoses were made:

- {K07.6} Temporomandibular joint disorders
- {K07.2} Anomalies of dental arch relationship
- {K07.3} Anomalies of tooth position

A problem list was drawn up:

- Incisor crowding on the upper jaw

- Protrusion of the incisors on the upper jaw
- Narrowing of the dentition
- Engle class 2 division 1
- Facets of wear on the upper and lower teeth
- Deformation of the Spey curve
- Tooth abrasion
- Compression of the upper airways
- Signs of mouth breathing
- Impaired muscle tone
- Signs of sleep disturbance
- Signs of psycho-emotional disorders
- Signs of chronic pain

According to the problem list treatment plan was drawn up:

- Consultation of a somnologist and psychotherapist
- Nutrition and Sleep normalization
- GOPex exercises
- Orthodontic treatment
- Determination of the neuromuscular position of the lower jaw
- Stabilization of the position of the lower jaw with an orthotic
- Prosthodontic treatment

Treatment Protocol

The patient was treated by Damon system braces with Densplay company arches (Figure 8). This initial treatment strategy was chosen to facilitate a smoother adaptation of the patient to the orthodontic appliance. Previous assessments indicated that the patient exhibited mild depression and moderate anxiety. In such a psycho-emotional state, the patient might have been unable to maintain proper care for her teeth and the orthodontic device.

Figure 8: Intra-oral foto after starting treatment.

After 2 month of treatment microimplant was placed in tooth 16 region (Figure 9).

Figure 9: Intra-oral foto after 2 month of treatment.

This orthodontic apparatus enabled isolated and controlled distal movement of the mesially inclined tooth 17. The chosen strategy aimed to minimize the negative impact of the movement of this tooth on the rest of the dental arch.

At that stage we place dental implant in the thooth 36 region. After that braces on the lower jaw was used (Figure 10).

Figure 10: Intra-oral foto after 6 month of treatment.

At next stage we remove microimplant an fixed temporary crown in tooth 36 region with bracket and omega loop for tooth 37 distalisation (Figure 11).

Figure 11: Intra-oral foto after 12 month of treatment

After that dental implant was placed in thooth 16 region (Figure 12).

Figure 12: Intra-oral foto after 18 month of treatment.

Treatment Results

After 23 months of treatment with braces, an optimal aesthetic result was achieved. Class II malocclusion according to Angle was corrected, and crowding and narrowing of the dental arches were resolved. The protrusion of the incisors in the upper jaw was eliminated, along with the correction of the Spee curve. However, there remains instability in the occlusal contacts and the position of the lower jaw, necessitating ongoing treatment and rational prosthetic rehabilitation of the dental arches. This procedure is quite labor-intensive and often requires significant investment from the patient, which can frequently pose a barrier to undertaking the prosthetic work. After a second consultation with the patient and after her refusal of a complex prosthetic restoration, a decision was made to partially restore the occlusal relationship with composite restorations. To ensure the stability of the final result, a bite registration in the neuromuscular position was performed using ultra-low-frequency transcutaneous electroneurostimulation for 60 minutes with subsequent registration of the obtained position. Subsequently, a composite tooth restoration was performed in the oral cavity using a direct method to ensure stabilization of the final position of the mandible (Figure 13).

Figure 13: Intraoral photographs after treatment.

The sleep quality assessment by SATED questionnaire shows improving of result after treatment (Figure 14).

SATED

ОЦЕНКА КАЧЕСТВА СНА

	Редко	Иногда	Всегда
Всегда ли вы довольны своим сном?	0	(1)	2
Удается ли вам в течение всего дня быть бодрым, не прибегая к кофе или дневному сну?	(0)	1	2
Вы спите между 2 и 4 часами ночи?	0	(1)	2
Ночью вы проводите без сна менее 30 минут? В них включается как время на засыпание, так и минуты, когда вы проснулись посреди ночи и не можете снова уснуть.	0	(1)	2
Вы спите от 6 до 8 часов в сутки?	0	(1)	2
Сумма балов 4			

Figure 14: Sleep quality assessment after treatment

In the evaluation of physical symptoms by PHQ-15, the patient had a decrease level of somatization, which indicates an increase of the patient's adaptive potential.

The PHQ-9, GAD-7 data after treatment shows improving of condition psycho-emotional state of the patient.

Pain drawing shows that patient has only 1 areas of pain on the body (Figure 15).

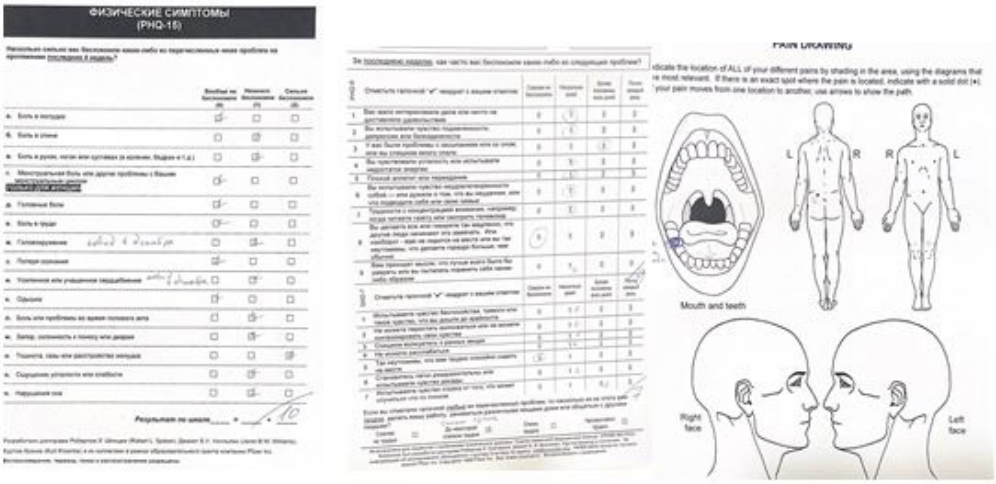


Figure 15: Health assessment after treatment

On control myography after orthodontic treatment. There was an improvement in muscle activity compared to the initial data. Symmetry and balanced activity of the temporal and masseter muscles were noted (Figure 16).

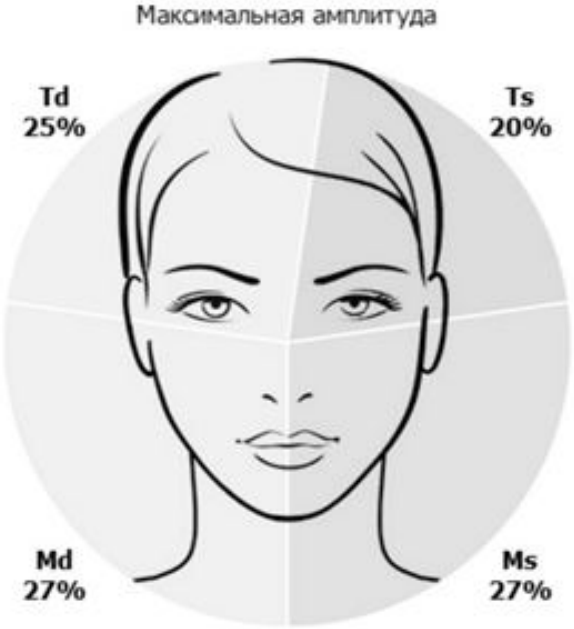


Figure 16: Myography after treatment

As a result of this treatment, the patient underwent a total rehabilitation. The following results were obtained (Figure 17):

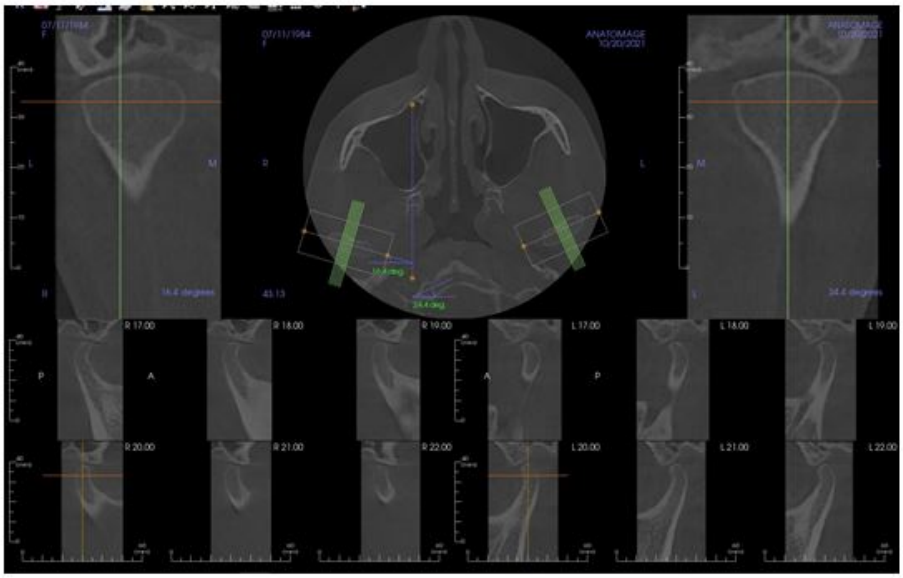


Figure 17: TMJ assessment after treatment

- Improving the facial profile
- Improved posture
- Normalized TMJ function
- Increased airway volume
- According to the patient, her general well-being has significantly improved

Discussion

The health-oriented approach means that the patient's treatment is based not on the classical criteria of orthodontic treatment quality, such as the Andrews occlusion keys, but on the harmonious muscle tone of the masticatory muscles as well as the airway condition. This approach helps to achieve more stable treatment results because it improves the body's adaptability [6].

Considering that the nervous system is responsible for the normal functioning of the muscular system, it is safe to say that any abnormalities in the nervous system lead to disorders in the muscular system and may be involved in the development of malocclusion. The central nervous system is very sensitive to sleep deprivation, so a disturbance in the quantity or quality of sleep will negatively affect the nervous system and muscle tone, including that of the masticatory muscles [7].

Sleep normalisation is therefore an important factor in optimising the position of the lower jaw and ensuring a good and stable treatment outcome. In the clinical case described here, this was achieved by the patient adhering to the sleep hygiene recommendations of the somnologist.

This has resulted in improved values in the post-treatment sleep score, as well as improved values in the post-treatment neurological evaluation (PHQ-9, GAD-7). Moreover, the normalisation of sleep and nervous activity had a favourable effect on the general somatisation of the body and a reduction in chronic pain areas [8].

The orthodontic work was able to expand the dental arches to provide more space for the tongue, and this also had a positive ef-

fect on the respiratory tract following orthodontic treatment [9].

Normalisation of the teeth positioning led to increase in VDO and normalisation of the mandibular position and muscle tone, which can be seen on myography, as well as the decompression of the articular discs in the TMJ area.

Treatment of the patient with the general health-oriented approach resulted in a good functional and aesthetic result [10].

Conclusion

The health-oriented approach is effective and preferable for orthodontic treatment of adult patients. Carefully collected diagnostic information prior to treatment avoids unwanted tooth displacement and mandibular misalignment. With complete diagnostic information, the clinician will always be able to find the right way to solve the clinical situation.

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