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IMPROVING THE COMPREHENSIVE DIAGNOSIS OF NEUROLOGICAL AND PSYCHOEMOTIONAL DISORDERS IN TEMPOROMANDIBULAR JOINT DYSFUNCTION AND TREATMENT BASED ON A NEUROLOGICAL APPROACH

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ANNOTATION

This study investigated the characteristics of the clinical-neurological symptom complex, the interrelationship between autonomic and psychoemotional disorders, and the efficacy of complex therapy based on a neurological approach in 40 patients with temporomandibular joint dysfunction (TMJD). All patients underwent detailed neurological, autonomic, and psychometric examination by a neurologist. The study results demonstrated that tension-type headache (95%), dizziness (70%), paresthesias in the facial area (55%), and autonomic dysfunction syndrome (90%) are the leading neurological syndromes in TMJD. A strong positive correlation was found between pain intensity and levels of anxiety (r=0.72) and depression (r=0.65). The developed differential neurological therapy algorithm (neurometabolic agents, autonomic correction, cognitive-behavioral therapy, and post-isometric relaxation) demonstrated statistically significant higher efficacy compared to the control group receiving only dental treatment, reducing pain syndrome by 2.1 points ($p<0.001$), decreasing anxiety levels by 32% ($p<0.01$), and restoring autonomic balance.

Keywords: temporomandibular joint dysfunction, neurological disorders, tension-type cephalalgia, psychoemotional state, autonomic dysfunction, complex treatment, neurological approach.

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СОВЕРШЕНСТВОВАНИЕ КОМПЛЕКСНОЙ ДИАГНОСТИКИ НЕВРОЛОГИЧЕСКИХ И ПСИХОЭМОЦИОНАЛЬНЫХ НАРУШЕНИЙ ПРИ ДИСФУНКЦИИ ВИСОЧНО-НИЖНЕЧЕЛЮСТНОГО СУСТАВА И ЛЕЧЕНИЕ НА ОСНОВЕ НЕВРОЛОГИЧЕСКОГО ПОДХОДА

АННОТАЦИЯ

В данном исследовании изучались особенности клинико-неврологического симптомокомплекса, взаимосвязь вегетативных и психоэмоциональных нарушений, а также эффективность комплексной терапии на основе неврологического подхода у 40 пациентов с дисфункцией височно-нижнечелюстного сустава (ДВНЧС). Всем пациентам было проведено детальное неврологическое, вегетативное и психометрическое обследование врачом-неврологом. Результаты исследования показали, что головная боль напряжения (95%), головокружение (70%), парестезии в области лица (55%) и синдром вегетативной дисфункции (90%) являются ведущими неврологическими синдромами при ДВНЧС. Выявлена сильная положительная корреляция между интенсивностью боли и уровнями тревоги (r=0,72) и депрессии (r=0,65). Разработанный дифференцированный алгоритм неврологической терапии (нейрометаболические средства, вегетативная коррекция, когнитивно-поведенческая терапия и постизометрическая релаксация) продемонстрировал статистически значимо более высокую эффективность по сравнению с контрольной группой, получавшей только стоматологическое лечение: снижение болевого синдрома на 2,1 балла ($p<0,001$), уменьшение уровня тревоги на 32% ($p<0,01$) и восстановление вегетативного баланса.

Ключевые слова: дисфункция височно-нижнечелюстного сустава, неврологические нарушения, головная боль напряжения, психоэмоциональное состояние, вегетативная дисфункция, комплексное лечение, неврологический подход.

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CHAKKA-PASTKI JAG‘ BO‘G‘IMI DISFUNKSIYASIDA NEVROLOGIK VA PSIXOEMOTSIONAL BUZILISHLARNI KOMPLEKS TASHXISLASH HAMDA NEVROLOGIK YONDASHUV ASOSIDA DAVOLASHNI TAKOMILLASHTIRISH

ANNOTATSIYA

Ushbu tadqiqotda chakka-pastki jag‘ bo‘g‘imi disfunksiyasi (ChPBJD) bo‘lgan 40 nafar bemorda klinik-nevrologik simptomokompleksning xususiyatlari, vegetativ va psixoemotsional buzilishlarning o‘zaro bog‘liqligi hamda nevrologik yondashuvga asoslangan kompleks terapiya samaradorligi o‘rganildi. Barcha bemorlar nevrolog tomonidan batafsil nevrologik, vegetativ va psixometrik tekshiruvdan o‘tkazildi. Tadqiqot natijalari shuni ko‘rsatdiki, ChPBJDda yetakchi nevrologik sindromlar sifatida kuchlanish tipidagi bosh og‘rig‘i (95%), bosh aylanishi (70%), yuz sohasidagi paresteziyalar (55%) va vegetativ disfunksiya sindromi (90%) namoyon bo‘ladi. Og‘riq intensivligi bilan xavotir (r=0,72) va depressiya (r=0,65) darajalari o‘rtasida kuchli ijobiy korrelyatsion bog‘liqlik aniqlandi. Ishlab chiqilgan differensial nevrologik terapiya algoritmi (neyrometabolik vositalar, vegetativ korreksiya, kognitiv-xulqiy terapiya va postizometrik relaksatsiya) faqat stomatologik davo olgan nazorat guruhiga nisbatan statistik jihatdan ishonchli yuqori samaradorlikni ko‘rsatdi: og‘riq sindromi 2,1 ballga kamaydi (p<0,001), xavotir darajasi 32% ga pasaydi (p<0,01) va vegetativ muvozanat tiklandi.

Kalit so‘zlar: chakka-pastki jag‘ bo‘g‘imi disfunksiyasi, nevrologik buzilishlar, kuchlanish tipidagi sefalgiya, psixoemotsional holat, vegetativ disfunksiya, kompleks davolash, nevrologik yondashuv.

1. INTRODUCTION

Temporomandibular joint dysfunction (TMJD) is one of the most complex and multifaceted intersection points of modern neurology and dentistry, characterized by a prevalence of 27-76% in the general population [1, 2]. The polyetiological nature of this pathology – the close interrelationship of occlusal disorders, postural imbalance, stress factors, and central nervous system dysfunction – significantly complicates the diagnostic and therapeutic process. In neurological practice, patients with TMJD are often treated for long periods with incorrect diagnoses without receiving adequate assistance. They receive symptomatic therapy under diagnoses such as "chronic tension-type headache," "cervicogenic cephalalgia," "vegetative-vascular dystonia," or "somatized depression," while the primary cause remains overlooked [3, 4].

Modern neurophysiological research is proving the inseparable link between TMJD and central nervous system function. In particular, excessive sensitization of the trigeminal system, increased central excitability, and limbic system dysfunction are recognized as the main neurological mechanisms of the pathological process [5]. Peripheral pain impulses (mainly from the masticatory muscles and joint capsule) affecting the trigeminal nuclei over a long period lead to a decrease in the threshold of neuronal excitability, i.e., central sensitization. This, in turn, manifests as increased pain (hyperalgesia), perception of non-painful stimuli as painful (allodynia), and the development of autonomic dysfunction [6].

Psychoemotional disorders hold a special place in TMJD. Numerous studies show that anxiety and depressive disorders are not only a consequence of chronic pain but also an important pathogenetic link [7]. Stress-induced muscle hypertonus (especially in the masticatory muscles) and nocturnal bruxism form a pathological cycle of "pain – muscle spasm – stress – pain." Therefore, the traditional approach based solely on dental treatment often proves insufficient, as it only affects the peripheral part of these complex neurosomatic mechanisms [8].

The aim of this research is to study the clinical-neurological characteristics of neurological and psychoemotional disorders in patients with TMJD, analyze their interrelationship, and evaluate the efficacy of a complex therapeutic algorithm based on a neurological approach.

2. Materials and methods

The study was conducted during 2024-2025 at the Dentistry Clinic of Tashkent State Medical University and the Republican Specialized Scientific-Practical Medical Center of Otorhinolaryngology and Head-Neck Diseases. Forty patients with various clinical forms of TMJD were recruited for the study. Of these, 29 were women (72.5%) and 11 were men (27.5%). The average age of patients was 34.2±7.1 years, with an age range from 18 to 55 years. All patients were initially diagnosed with TMJD by a dentist and referred for neurological examination. A control group of 20 practically healthy volunteers was included.

Inclusion criteria:

1. TMJD diagnosis confirmed clinically and radiologically (CT or MRI) by a dentist.
2. Disease duration of at least 3 months.
3. Presence of at least one neurological symptom (headache, dizziness, facial paresthesias, etc.).
4. Patient's consent to the recommended neurological treatment.

Exclusion criteria:

1. Organic brain pathologies (space-occupying lesions, demyelinating diseases, consequences of acute cerebrovascular accidents).
2. History of severe psychiatric illnesses (schizophrenia, bipolar affective disorder).
3. Use of psychoactive substances or anticonvulsants within the last 1 month.

The 40 patients were divided into two equal groups (n=20 each) by simple randomization method:

Group 1 (main, n=20): Received complex neurological therapy prescribed by a neurologist + dental correction (occlusal splint) as necessary. The neurological treatment complex included:

- Neurometabolic, muscle relaxant, and vasoactive therapy: Phenibut 100 mg once daily (30-day course), Tolperisone 150 mg 1 tablet twice daily (15 days), Vinpocetine 10 mg twice daily (30-day course), B-group vitamin complex (B1, B6, B12) parenteral 10 injections.
- Autonomic dysfunction correction: Magne B6 forte 1 tablet 3 times daily (for 2 months), Adaptol 500 mg twice daily (1 month) when indicated.
- Cognitive-behavioral therapy (CBT): once a week, total 10 sessions. During sessions, patients were taught pain management strategies, muscle relaxation techniques, and methods to increase stress resilience.
- Craniosacral therapy and post-isometric relaxation: through intervention on masticatory, neck, and facial muscles.

Group 2 (comparison, n=20): Received only standard dental treatment (occlusal splint insertion, selective grinding, myogymnastics exercises). Neurological therapy was not prescribed to this group.

Examination methods. All patients underwent a comprehensive clinical-neurological examination by a neurologist. The examination included the following methods:

1. Full neurological examination: function of cranial nerves (especially palpation of trigeminal nerve branch exit points – Valle’s points, corneal and mandibular reflexes), motor system, sensory system, balance and coordination tests, meningeal signs.
2. Pain syndrome assessment:
   - Visual Analog Scale (VAS).
   - McGill Pain Questionnaire (sensory and affective component assessment).
   - Palpatory identification and mapping of painful muscle trigger points.
3. Assessment of the autonomic nervous system:
   - Kerdo index.
   - Orthoclinostatic test.
   - Autonomic dystonia scale (questionnaire) according to A.M. Vein.
4. Psychometric tests:
   - Spielberger-Khanin scale (state and trait anxiety levels).
   - Beck Depression Inventory.
   - Somatization subscale of the SCL-90-R questionnaire.
   - SF-36 quality of life questionnaire.

Statistical processing was performed using the SPSS 23.0 software package. Parametric (Student's t-test) and non-parametric (Mann-Whitney U test) statistical methods were used to assess the reliability of differences between groups. Correlation analysis was performed using the Pearson coefficient. The significance level was accepted at $p<0.05$.

3. Results

3.1. General Clinical-Neurological Characteristics

Neurological symptoms of varying degrees were identified in all 40 patients included in the study. The results of the neurological examination are presented in the table below (see Table 1).

Table 1. Frequency of neurological symptoms in patients with TMJD (n=40)

Neurological symptoms and signs	Absolute number (n)	Percentage(%)
Tension-type headache	38	95,0
Non-systemic dizziness	28	70,0
Facial paresthesias	22	55,0
Tinnitus (noise in the ear)	19	47,5
Sleep disorders	33	82,5
Painful palpation of Valle's points	37	92,5
Increased mandibular reflex	18	45,0
Painful trigger points in masticatory muscles	40	100
Local hypertonus of facial and neck muscles	35	87,5
Autonomic stigmata (distal hyperhidrosis, red dermographism)	29	72,5

The most common symptom was tension-type headache, recorded in 95% of patients. The headache was mainly localized in the frontotemporal area and had a squeezing or pressing character. The pain was characterized by intensification towards evening and onset after prolonged static strain. Non-systemic dizziness was observed in 70% of patients, most of whom described it as "spinning inside the head," "a feeling of slight intoxication," or "unsteadiness." Facial paresthesias were mainly felt around the mouth, cheeks, and zygomatic areas, described by patients as sensations of "numbness" or "tingling."

3.2. Pain Syndrome Analysis

The average pain intensity according to VAS at the beginning of the study was 7.4±0.6 points in Group 1 and 7.2±0.5 points in Group 2 (no statistically significant difference between groups, $p>0.05$).

According to the McGill Pain Questionnaire, the average sensory component of pain was 14.3±1.8 points, and the affective component was 8.7±1.2 points. These indicators showed that not only the sensory but also the emotional perception of pain was at a high level. Painful trigger points in the masticatory muscles were identified on palpation in all patients, mainly located in the anterior and middle portions of the m. masseter and m. temporalis.

3.3. Autonomic Nervous System State

The analysis of the Kerdo index yielded the following results: out of 40 patients, sympathicotonia was recorded in 26 (65.0%), vagotonia in 10 (25.0%), and relative normotonia in 4 (10.0%). The predominance of sympathicotonia indicates a disturbance of autonomic balance against the background of chronic pain and psychoemotional strain.

The average score of autonomic dysfunction according to the A.M. Vein scale in TMJD patients was 42.6±2.8 points, which was almost 3 times higher than the 14.2±1.5 points in healthy volunteers ($p<0.001$). This proves that autonomic dysfunction syndrome in TMJD is not an incidental but a regular and integral part of the disease.

3.4. Psychoemotional Status

According to the Spielberger-Khanin scale, the high level of trait anxiety was 62.3±2.4 points in Group 1 and 60.1±2.8 points in Group 2 (control 38.4±1.9 points, $p<0.01$). State anxiety indicators were correspondingly high. The average score on the Beck Depression Inventory was 19.4±1.7, corresponding to mild to moderate levels of clinically significant depression. The average score on the SCL-90-R somatization subscale was 2.3±0.4 points (normal range 0.5-0.8 points).

Correlation analysis identified the following statistically significant relationships:

- Between pain intensity (VAS) and trait anxiety level: $r=0.72$ ($p<0.01$).
- Between pain intensity and depression level: $r=0.65$ ($p<0.01$).
- Between level of autonomic dysfunction (Vein scale) and level of somatization: $r=0.58$ ($p<0.05$).
- Between disease duration and depression depth: $r=0.41$ ($p<0.05$).

3.5. Treatment Results (Dynamics after 3 months of therapy)

Treatment based on the complex neurological approach showed the following results (see Table 2).

Table 2. Dynamics of clinical-neurological indicators before and after treatment

Indicator	Group 1 (main) before treatment	Group 1 after treatment	Group 2 (comp.) before treatment	Group 2 after treatment	p (between groups after treatment)
VAS, points	7,4±0,6	2,1±0,4	7,2±0,5	4,8±0,7	<0,001
Trait anxiety (Spielberger-Khanin), points	62,3±2,4	42,5±2,1	60,1±2,8	58,1±3,0	<0,01
Beck Depression Inventory, points	19,8±1,6	11,2±1,1	19,1±1,8	17,2±1,5	<0,01
Vein autonomic scale, points	42,6±2,8	26,4±2,2	41,9±3,1	38,5±2,9	<0,05

SF-36 "Psychological Health" component, points	31,5±2,3	48,2±2,5	32,1±2,4	35,6±2,6	<0,01

At the end of treatment, 18 patients (90.0%) in Group 1 reported significant improvement in their condition, while in Group 2 this indicator was only 12 patients (60.0%). Among neurological symptoms, the best dynamics were observed for tension-type headache (reduction from 95% to 25%, $p<0.001$), non-systemic dizziness (reduction from 70% to 15%, $p<0.001$), and sleep disorders (reduction from 82.5% to 30%, $p<0.001$).

Importantly, the reliable decrease in autonomic dysfunction indicators in Group 1 (from 42.6 to 26.4 points on the Vein scale, $p<0.001$) ensured long-term stable treatment outcomes. In Group 2, no significant positive dynamics were observed for this indicator (from 41.9 to 38.5 points, $p>0.05$).

4. Discussion

The results of the conducted study fully confirmed modern views that TMJD is not solely a pathology of the stomatognathic system but a complex, multicomponent neurosomatic dysfunction [9, 10]. The detection of neurological symptoms in the absolute majority of patients, especially tension-type headache in 95% of cases, indicates that the involvement of a neurologist is mandatory for this contingent.

The pathophysiological basis of neurological disorders in TMJD is the phenomenon of central sensitization. Constant peripheral pain impulses flow uninterruptedly from painful trigger points in the masticatory muscles and the joint capsule to the trigeminal nuclei. This leads to a decrease in the threshold of neuronal excitability, i.e., non-painful signals being perceived as painful (allodynia) and an increased response to painful stimuli (hyperalgesia) [6]. Clinically, this manifests as acute pain at Valle's points, palpatory tenderness of the masticatory muscles, and facial paresthesias.

Symptoms such as dizziness (in 70% of patients) and tinnitus (in 47.5% of patients) reflect the complex anatomical and functional connection between TMJD and the auditory and vestibular analyzers. Hypertonus in the masticatory muscles and incorrect occlusal relationships cause microvibrations transmitted to the pyramid of the temporal bone, affecting the receptor apparatus of the inner ear [11]. This mechanism, together with tension-type headache, forms a vestibulo-vegetative symptom complex.

One of the most important aspects identified in our study is the bidirectional pathogenetic relationship between pain and psychoemotional disorders. On one hand, chronic pain exacerbates anxiety and depression through the limbic system. On the other hand, a high level of trait anxiety leads to increased muscle tone and bruxism, worsening the pathological process in the joint. It is precisely this "pathological cycle" mechanism that explains the chronic course of the disease and its resistance to standard dental therapy.

Despite the fact that in Group 2 patients who received only dental treatment, pain intensity decreased from 7.2 to 4.8 points, the psychoemotional state (anxiety from 60.1 to 58.1) and autonomic dysfunction (Vein scale from 41.9 to 38.5) remained virtually unchanged. This preserves a high risk of disease recurrence. Therefore, therapy outcomes in TMJD should be evaluated not only by pain reduction but also by improvement in neurological and psychoemotional indicators.

The proposed neurological approach – the combined use of neurometabolic, vasoactive therapy, autonomic correction, and cognitive-behavioral therapy – is precisely targeted at these pathological mechanisms. The combined course of Phenibut and Vinpocetine serves to improve neurometabolism, synaptic plasticity, and microcirculation in the brain, reducing the level of central sensitization [12]. The long-term course of Magne B6, through its muscle relaxant and stress-protective effects, positively influences both pain and anxiety [13]. During cognitive-behavioral therapy sessions, patients were taught non-pharmacological strategies for pain management, muscle relaxation techniques, and methods to increase stress resilience, which led to the formation of long-term adaptive behavior [14].

The reliable decrease in autonomic dysfunction indicators in Group 1 (from 42.6 to 26.4 on the Vein scale) is particularly significant, as the restoration of autonomic balance reflects the normalization of central neurovegetative regulation and ensures stable treatment outcomes [15].

5. Conclusions

1. Neurological symptoms occur in 100% of cases in patients with TMJD. Among them, tension-type headache (95%), non-systemic dizziness (70%), facial paresthesias (55%), and autonomic dysfunction syndrome (90%) occupy leading positions. This symptom complex constitutes the neurological phenotype of TMJD and defines the leading role of the neurologist in the diagnostic and treatment process.
2. The strong correlation between pain syndrome intensity and psychoemotional disorders (anxiety: $r=0.72$; depression: $r=0.65$) and autonomic dysfunction ($r=0.58$) serves as a basis for interpreting TMJD as a chronic neurosomatic pain syndrome and necessitates the mandatory inclusion of psychocorrection and autonomic therapy in the treatment strategy.
3. The developed complex treatment algorithm based on a neurological approach (neurometabolic therapy + autonomic correction + cognitive-behavioral therapy + post-isometric relaxation) demonstrated statistically significantly higher efficacy compared to traditional dental treatment: it reduced pain from 7.4 to 2.1 points ($p<0.001$), decreased trait anxiety by 32% ($p<0.01$), reduced depression levels by 43% ($p<0.01$), and restored autonomic balance ($p<0.05$).

Practical recommendations

1. Every patient presenting with signs of TMJD must undergo a full clinical-neurological examination by a neurologist alongside a dental examination, with a comprehensive assessment of the autonomic nervous system and psychoemotional state.
2. It is recommended that the following neurological components be included in the treatment protocol for TMJD:
   - Neurometabolic and vasoactive agents (at least a 30-day course).
   - Autonomic correction (magnesium preparations, daytime tranquilizers when indicated).
   - Cognitive-behavioral therapy (1-2 times per week, total 10-12 sessions).
   - Regular post-isometric relaxation exercises for masticatory and neck muscles.
3. Dental treatment (occlusal splint, selective grinding) should be conducted precisely against the background of, and in parallel with, neurological therapy.

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