

## Temporomandibular disorders: perspective clinical usage of acupuncture

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### Abstract

**Background:** One of the oldest medical practices is acupuncture, which was developed for about 3 thousand years. It includes also methods of treatment for various diseases and disorders of the stomatognathic region. Currently, there is an increased interest for the usage of these alternative methods of treatment. Acupuncture methods are widespread worldwide and are endorsed by WHO. The use of alternative medicine methods in dental practice has more positive aspects than negative ones, attracting the attention of patients and doctors and even of countries with different economic levels of development. The most important indications of acupuncture in dentistry are: 1) glossodynia; 2) stomatodynia; 3) primary trigeminal neuralgia; 4) spasm/contracture of the masticatory muscles; 5) myogenous dysfunction of the temporomandibular joint; 6) salivary disorders. For the treatment of various pathologies in dentistry, various stimulation of acupuncture points is being used (needling, electro-puncture, laser-puncture, pressopuncture, thermo-puncture, magneto-puncture, etc.). Currently, there is ongoing research on defining differential indications for these methods, based on the highest efficiency for particular pathologies.

**Conclusions:** Currently, there is ongoing research on defining differential indications for these methods, based on the highest efficiency for particular pathologies. It is not concluded yet which acupuncture treatment is more efficient: the one based on the reflexogenic theory (local, regional, distal points) or the one based on Traditional Chinese Medicine (meridian theory, etc.). There are being developed complex treatment protocols for dental pathologies, with the inclusion of various acupuncture methods (magneto-puncture, laser-puncture, etc.).

**Key words:** acupuncture, moxibustion, zhen-jiu, temporomandibular disorders, myogenous disorders.

### Introduction

Throughout its history, humanity has shown a special interest in everything that could ensure it with a certain level of health. Much could not stand the test of practice and was lost in its history, and that which had a significant effect in the treatment of certain diseases was preserved in the memory of society and passed down from generation to generation. The latter includes acupuncture, the legendary history of which was founded in China and is perhaps the oldest existing practical knowledge in the field of medicine.

For about 3 thousand years, there already existed methods of treating diseases of the oral cavity and teeth in China – acupuncture, herbal medicine, methods of cleaning and restoration of teeth, etc. [1]. The history of using zhen-jiu therapy (acupuncture, moxibustion) for the treatment of dental diseases goes back many centuries. Ancient Chinese songs and odes, which mention various dental disorders in combination with other disorders and methods for their treatment [2], have survived to the present day. Acupuncture and moxibustion from Eastern countries began to spread more intensively in Europe since the 16<sup>th</sup> century, through missionaries [3]. In the '70-'90s of the last century, interest in these ancient methods of treating dental diseases, especially traditional in regard to Chinese acupuncture, has increased [4]. In the future, there a deep study of ancient sources of Chinese medicine will be required in order to integrate rich empirical experience into modern academic science.

Acupuncture methods are spread in European countries, despite the lack of fundamental knowledge in this area, attitudes to these methods are changing, innovative research is being conducted using a full scientific potential [5, 6, 7, 8, 9, 10]. Interest in alternative methods of treatment is also associated with the financial capabilities of patients. The use of alternative medicine methods in dental practice has more positive aspects than negative ones, attracting the attention of patients and doctors and even of countries with different economic levels of development [11]. At the same time, the lack of summarizing works based on Chinese fundamental primary sources, as well as the not always objective criticism of the therapeutic importance of acupuncture, due to insufficient knowledge of the conditions, standards and technologies of traditional Chinese medicine create certain distrust on the part of medical workers and patients for this multi-millennial therapy. Despite the fact that up to 80% of the world's population use alternative medicine methods, the attitude towards it by the official health care structures is wary, sometimes punishing [12].

In various countries, the methods of traditional Chinese medicine are used for the treatment and prevention of diseases. In accordance with CAMrella Pan-European Survey (2010-2012), acupuncture was used at least once in the past year by 2.8% of respondents from 29 countries (amounting to 6.2 million Europeans). An analysis of 348 patients with chronic pain syndromes from Finland, who were treated with acupuncture methods for a long period (up to 5 years)

revealed that the minimum course of acupuncture consisted of 5 sessions; 41% of patients received more than one course of treatment; and the intensity of pain on a visual-analogue scale decreased by 40% due to acupuncture [13].

Analysis of PubMed sources for the period 1978-2007 revealed that the methods of acupuncture are most often used for the treatment of musculoskeletal diseases (16.2% of all diseases), lesions of the nervous system (17.13%), psycho-emotional disorders (12.9%). These types of disorders are characteristic of many dental diseases [14]. In the US, the American Dental Association in 1958 included acupuncture in the methods of pain control [15].

When using the methods of acupuncture in dental practice, it is necessary to take into account the recommendations of WHO (2002) regarding four groups of diseases that can be treated with acupuncture and moxibustion:

- Diseases, symptoms and conditions for which control studies proved the effectiveness of acupuncture treatment;
- Diseases, symptoms and conditions for which the therapeutic effect of acupuncture has been demonstrated, but more research is needed;
- Diseases, symptoms and conditions for which the effect of acupuncture and moxibustion is not sufficiently confirmed, but which, nevertheless, can be treated with these methods, since other treatment methods are ineffective;
- Diseases, symptoms and conditions for which acupuncture is possible only in combination with instrumental monitoring and provided that a certified doctor performs acupuncture.

Publications of the late 20<sup>th</sup> century indicated that the disease's etiology and disorder is an important criterion for the use of acupuncture. The most important indications of acupuncture in dentistry were: 1) glossodynia; 2) stomatodynia; 3) primary trigeminal neuralgia; 4) spasm/contracture of the masticatory muscles; 5) myogenous dysfunction of the temporomandibular joint; 6) salivary disorders.

#### **Clinical evidence of acupuncture in functional disorders in the stomatognathic system**

As it is well known, along with various functional disorders of organs and systems, pain syndromes are the main indications for zhen-jiu therapy. In this sense, acupuncture is called pain therapy. When using it, it is necessary to identify the nature and role of the pain syndrome in the pathological process: whether it is purely psychogenic or due to morphological changes, is acute or chronic, etc. Before carrying out acupuncture, in all cases it is necessary to establish the final diagnosis of the underlying disease, find out the pathogenic role of pain impulses. Particularly, caution should be exercised in patients with primary pain syndromes and unspecified diagnoses.

In accordance with the multimodal concept of chronic pain therapy, acupuncture methods are recommended to be incorporated into modern comprehensive pain treatment and control programs [16]. In chronic pain, the effectiveness of acupuncture is higher under the following condi-

tions: 1) the ability to partially or fully control their disease; 2) young age; 3) a shorter period of chronic disease; 4) the absence of surgery for pain; 5) the number of acupuncture sessions held on average is above 8; 6) relatively good overall health [17].

Applying acupuncture to the treatment of bruxism based on the principles of Traditional Chinese Acupuncture has revealed to have positive therapeutic effects with the diminishing of pain and of the tonus of masticatory muscles [18].

In modern Chinese sources, for the treatment of pain in the masticatory muscles and bruxism, there are recommended the following first choice points: GI19, E5, E6, IG16, IG17, TR17, VB3, VB7, VB12, and VG26. The combination of the points of the meridians of the Liver (F1, F3), Gall Bladder (VB43, VB41) and Stomach (E5, E6, and E7) reduces the severity of bruxism [17].

In cases of temporomandibular joint (TMJ) dysfunction with chronic pain syndrome, patients willingly resort to alternative medicine (acupuncture, phytotherapy), as there is a rapid decrease in pain without side effects, as well as improved indices of quality of life [19]. Most patients (62.5%) with TMJ dysfunction desire and request alternative medicine methods, while they prefer manual methods (massage, acupuncture, chiropractic), and the vast majority of them (95.6%) combine these methods with other conventional treatment methods [20].

The greatest number of studies is devoted to TMJ dysfunction, which allowed us to identify the main indications of acupuncture for this disease: 1) early forms of dysfunction; 2) prevalence of functional disorders; 3) the prevalence of reversible disorders; 4) the presence of psycho-emotional disorders; 5) neuromuscular disorders; 6) combination with tension headache [21].

Acupuncture methods as minimally invasive ones (inserting needles into tissues, electro-acupuncture, etc.) and non-invasive ones (electro-puncture, laser-puncture, press-puncture, etc.) are used at various stages in the treatment of disorders of the TMJ area, in accordance with modern recommendations regarding the sequencing of treatment: 1) non-invasive methods; 2) minimally invasive methods; 3) invasive methods [22, 23, 24, 25, 26, 27]. Considering that many symptoms of TMJ dysfunction diminish or go away without any intervention, the treatment of this disease should be started with non-invasive methods. The choice of these methods (physiotherapy, relaxation techniques, behavioral therapy, psychological correction, psychotherapy, hypnosis, acupuncture, etc.) is a difficult task, since many of them do not differ significantly based on the effectiveness of treatment and there is no convincing scientific evidence of their effectiveness.

In the Ancient Chinese poem, *Xi Khun* (960-1279), there was recommended to exert on the *Lieque* point (P7) for unilateral or general headache, and in the "*Song of Acupuncture and moxibustion*" (1329) for unilateral and general headache with dizziness, the *Shenting* point (VG24) is recommended [2]. It has been established that dysfunction of the temporomandibular joint occurs more frequently in

patients with the traditional *Shao Yang* (TR/VB meridians) and *Shao Yin* (C/R meridians) syndromes [28].

In case of TMJ pathology, it is recommended to use the E6, E7, IG18, VG20, VB20, V10, GI4 points with the administering of one session per week (for 30 minutes) for a course of 6 weeks [29]. The authors have noted a decrease in pain and inflammatory processes, as well as an increase in the functional reserves of the muscles and joints. In patients with TMJ dysfunction, acupuncture caused a pronounced decrease in pain, improved temperature in the area of the TMJ and of the microcirculation – the overall effectiveness being 93.1% in a total number of 477 patients [30].

The effectiveness of acupuncture for TMJ disorders is 91% in acute pain syndromes and 70% in chronic pain syndromes [31]. In another study, the use of acupuncture has reduced the chronic pain in 53.3% of cases [32]. In myogenous dysfunctions, the insertion of acupuncture needles at the TR5, TR21, E6 points is effective in 91.7% of cases, and not effective in 4.1% of cases [33].

For the treatment of TMJ dysfunction, the most effective points that reduce pain and harmonize the masticatory muscles are GI4, E6, E7, E44, V2, VB14, VB20, VG18, VG19, F3, E36, VB34, R3. The effectiveness of these points was determined clinically and electromyographically [34]. In patients with myogenic dysfunction of the TMJ and pain syndrome under the influence of acupuncture, a complete cure was achieved in 46% of cases [35].

The use of local acupuncture points has reduced the pain intensity in 34% of patients with TMJ dysfunction; exertion on distal points has reduced pain in 31% of cases, and a combination of local and distal points has shown the same effect in 36% of cases [36]. Using the Pro-TMD Multi-protocol and self-assessment of TMJ dysfunction symptoms, before and after performing various acupuncture options, has revealed that the most effective are the local points (muscle, joint) and distal points, with a pronounced effect on the muscles of the joint [37].

A comparative analysis of the treatment of TMJ disorders using conventional treatment and acupuncture methods has revealed that in the latter case, the effectiveness of treatment was higher, the general condition improved in 85% of patients, the intensity of pain decreased by 75% [21]. Acupuncture in comparison with placebo in patients with TMJ dysfunction has decreased pain [38], without statistically significant changes in the range of motion of the mandible, but with a pronounced tendency of improving protrusion and retrusion. In a number of patients with disorders of the TMJ, acupuncture methods have been found to be more effective when compared with the use of indomethacin and vitamin B1 [38].

In the pathology of the TMJ, acupuncture has a positive, but short-term effect. Analysis of information in various databases (MEDLINE, EMBASE, CINAHL, CISCOP) for the period 1997-2008 has revealed that the vast majority of studies are on the short-term therapeutic effects of acupuncture methods in TMJ dysfunction, and in fact, there are no data on the long-term results of treatment [25], which

makes it difficult to assess the real value of the method [39]. A positive therapeutic result in patients with TMJ dysfunction after acupuncture was maintained for up to 12 months [40]. Analysis of the long-term results (after 18–20 years) of treating TMJ dysfunction using acupuncture and occlusal splint therapy revealed that patients respond positively in regard to the quality of treatment and advise it to other patients; headache treatment (at least once a week) affects 73% of women and 77% of men at the beginning of treatment and, respectively, 35% and 54% after 18–20 years; 87% of patients before treatment had pronounced symptoms of joint damage, and after 18-20 years – 38% of patients [41].

Experimentally in rats, a positive effect of acupuncture on the manifestations of TMJ arthritis was observed [42]. Acupuncture techniques are used in patients with arthrosis of the TMJ and with disc damage [43]. The use of laser in patients with TMJ arthrosis has reduced the severity of masticatory muscle spasm, which was most pronounced in cases of reduction of the pain syndrome [44].

The use of acupuncture in myogenous and arthrogenous (TMJ) pain has led to the elimination of pain in 46% of cases [35], in other studies – in 40% of cases [45]. The use of acupuncture in the pathology of the TMJ disc has caused an improvement in the general condition, a decrease in the intensity of pain, an increase in the range of lower jaw movements and an increase in the treatment satisfaction, but the condition and position of the disc did not change according to tomography [43].

Acupuncture techniques have been used successfully in women with TMJ dysfunction, which often is accompanied by migraine and other pain syndromes and tends to have chronic and frequent relapses. Acupuncture, in addition to reducing pain and having a positive effect on the function of the stomatognathic system in patients with TMJ disorders, has influenced the severity of comorbid disorders: has reduced tension headache [21], tinnitus [46], manifestations of depression and anxiety [32]. Acupuncture is used in patients with TMJ dysfunction in cases of marked chewing and swallowing disorders [47]. In the ancient song "The Magnificent Jasper Dragon" (1601), it is recommended that if there is difficulty in swallowing food, 7 moxibustion sessions should be conducted at the *Tanzhong* point (VC17) [2].

Among the methods of physio-puncture, electro-acupuncture is the most accessible. Electro-acupuncture at the E6, E7, IG19, VB3, GI4 points causes a decrease in disorders in patients with TMJ dysfunction, including myofascial pain syndromes, especially in cases with spasms of the external pterygoid muscle [48]. The use of high-frequency transcutaneous electrical stimulation (100 Hz) significantly reduced pain in patients with TMJ disorders, in patients with rheumatism, however, lower frequencies (2 Hz) were no different to placebo. Both frequencies (2 Hz and 100 Hz) did not cause a significant improvement in joint function [49].

New opportunities are revealed when using laser-puncture – over the past 50 years, more than 1000 books and monographs were published on the subject of laser therapy. In Russia, tens of thousands of devices are used for laser

treatment [50]. Acupuncture has a more pronounced effect in increasing the pain threshold during pain modeling (thermal stimuli) in comparison with laser puncture, but laser puncture was more effective than placebo [51].

The issues of adequate parameters for laser puncture (dose, wavelength, etc.) have not yet been resolved [52]. New generation lasers significantly increase the efficiency of treatment of dental diseases [52, 53, 54, 55]. The use of laser puncture reduced the severity of pain in 85% of patients with pathology of the temporomandibular joint, with no side effects [56].

Laser puncture significantly improves the condition of patients with TMJ disorders, that are resistant to other methods of treatment [57]. With TMJ dysfunction, the use of a laser over the entire joint surface caused a decrease in pain and has increased the range of lower jaw movements (opening the mouth before treatment – 29 mm, after treatment – 40) [52].

In patients with dysfunction of the TMJ, laser puncture with a combination of exertion on local and distant points caused the appearance of a stable, pain-free period after  $5.9 \pm 6.08$  procedures in acute pain syndromes and after  $16.21 \pm 17.98$  procedures in chronic pain syndromes; accordingly, the intensity of pain on a visual analogue scale decreased to  $0.3 \pm 0.67$  and  $0.47 \pm 0.84$  points [57]. The combination of laser puncture with occlusal splint therapy increases the effectiveness of treatment in chronic TMJ dysfunction. Using a laser for treating TMJ arthrosis breaks the following pathological vicious circle: impaired muscle tone – local ischemia – local metabolic disorders – pain – impaired joint function [52]. A promising area for treating TMJ disorders is thermal exposure on acupuncture points (thermos-puncture) – good results have been obtained using hot needling [58], combining moxibustion with *tuina* (Chinese massage and manual therapy) [59].

The generally accepted method of treating TMJ dysfunction is occlusal splint therapy, but this method also has many pros and cons [60]. Examination of the pain threshold at pressure in various areas (pre-auricular zone, masseter, temporal and trapezius muscles), analysis of mandible mobility degree and of mouth opening degree, before the treatment of TMJ dysfunction and after 30 days, has revealed that acupuncture is not inferior to occlusal splint therapy and can be used as an alternative method [61].

In patients with dysfunction of the TMJ, acupuncture caused an increase in the pain threshold and a decrease in subjective symptoms, approximately equal to the effect of the occlusal splint therapy. An analysis of publications for the period 1990-2015 (Cochrane Library, PubMed, Scopus, Web of Science) has revealed that acupuncture in patients with TMJ dysfunction is more effective than placebo and equates to occlusal splint therapy. The combination of auricular acupuncture with occlusal splint therapy for TMJ dysfunction causes the same reduction in disorders as occlusal splint therapy, however, in the first variant, the therapeutic effect occurred already in the first week of treatment [62].

In the process of treating TMJ disorders, acupuncture

causes immediate positive subjective changes in comparison with occlusal splint therapy, and after 12 months, positive changes are observed in 57% of patients who received acupuncture and in 68% of patients that have received occlusal splint therapy ( $p > 0.05$ ) [63]. Acupuncture has increased the analgesic effect in combination with occlusal splint therapy [38].

A comparative analysis of the effectiveness of acupuncture, occlusal splint therapy, and their combination has revealed that after 3 months there is an improvement in the condition, respectively in 87%, 77.3% and 91.3% of patients [64]. Acupuncture and occlusal splint therapy for TMJ dysfunction after 4 weeks of treatment have reduced the intensity of pain about the same and have increased the range of movement of the mandible (mouth opening), however, acupuncture more pronouncedly has increased the pain threshold on pressure, and occlusal splint therapy has improved the electromyographic parameters of the temporal muscles during rest; after 4 weeks of treatment, pain has decreased in 53.3% of those who received acupuncture vs. 60% of those that received splint therapy, reduction of depression, respectively, in 11.1% vs. 50% of cases; a decrease in signs of somatization (16.7% vs. 44.4%) [32].

The combination of occlusal splint therapy, acupuncture and pharmaco-puncture in patients with temporomandibular joint dysfunction caused a pronounced therapeutic effect in 85% of cases after the sixth treatment session [65].

The research continues for effective options for combining acupuncture with other non-pharmacological methods. With dysfunction of the temporomandibular joint, the use of magneto-puncture seems to be promising [66]. Acupuncture in combination with the usage of vacuum cans in patients with TMJ dysfunction has increased the effectiveness of treatment [67].

The combination of acupuncture at the distal points (GI4, F3) with the use of medicinal cans in the affected area has increased the effectiveness of the TMJ dysfunction treatment: visual analogue scale of pain before treatment  $5.39 \pm 0.24$  vs.  $2.13 \pm 0.47$  after treatment; craniomandibular index, respectively,  $0.27 \pm 0.02$  vs.  $0.04 \pm 0.01$ ; palpation index  $0.19 \pm 0.01$  vs.  $0.05 \pm 0.03$ ; the dysfunction index is  $0.33 \pm 0.04$  vs.  $0.06 \pm 0.02$  [68].

The combination of acupuncture with ultrasound physiotherapy has significantly increased the effectiveness of treatment in the TMJ pathology. Acupuncture combined with ultrasound therapy has reduced the spasm of the masticatory muscles and the dysfunction degree of the TMJ, but the use of ultrasound as a monotherapy was not effective. In experiments conducted on animals, it was found that exposing acupuncture points to an electromagnetic field of ultrahigh frequency and a power of 1–20 mWt causes changes in lower jaw movements and of the respiratory rate [69].

Other studies have shown that acupuncture was more effective for treating TMJ dysfunction compared to physiotherapy [38]. The combination of acupuncture with manual therapy has led to a significant reduction in pain and an increase in the range of lower jaw movements [70].

Three-component therapy of TMJ dysfunction using acupuncture (E6, E7, TR17, GI4), moxibustion of wormwood cigarettes at these points through 5-7 layers of gauze and, finally, conducting a finger massage with pressure and with a rotation of the thumb around the joint for 3-5 minutes has led to a pronounced positive result in all 45 patients that were observed [71].

Modern Chinese researchers are recommending a four-stage pressopuncture for TMJ dysfunction: 1) light-moderate pressure with the thumb on the TMJ area for about 10 minutes; 2) pressing for 5-10 min on local points TR21 and IG19 and for 1-3 min on the distal points TR3 and TR6; 3) with one hand of the doctor, maintaining the patient's jaw, while the patient is making rhythmic opening-closing movements of the mouth, and with the other hand pressing on the TMJ area; 4) stroking and rubbing the TMJ area and lower jaw to feel the heat in these areas [17].

In patients with TMJ dysfunction, pharmacopuncture at point E7 is effective on the affected side – 1 ml of dexamethasone (0.5 mg) and procaine hydrochloride (0.5%) are injected, only 1-2 treatments x 5 procedures, with an interval between injections of 3-5 days [33].

Despite the fact that most literature sources show good efficacy of acupuncture methods for TMJ dysfunction, better studies are now required to determine the place and role of these methods in complex therapy.

Acupuncture is effective for TMJ disorders, having a positive effect on various TMD pathology – pain in the joints, pain and muscle spasm, impaired mastication, headache, and others. Analysis of PubMed literature sources for the period of 1973-2004 revealed that acupuncture in patients with TMJ dysfunction has the most pronounced effect on the myogenous types [37].

The use of transcutaneous electrical stimulation in trigger points by dentists in patients with myogenous dysfunction resulted in a significant improvement in the condition and reduction of pain within 1 hour after the procedure [72].

In Traditional Chinese Acupuncture, there are used points that are painful during palpation or spontaneously painful points (*Ashi* points). The use of trigger points and areas increases the effectiveness of myofascial pain treatment, especially when combined with pharmacotherapy and physiotherapy [60, 73]. The use of trigger points for the treatment of myofascial pain is most effective in acute conditions – needling these points reduces pain and increases the range of motion [56, 74, 75, 76]. Good results were obtained when using hot needling to treat spasms of the facial muscles [77] – hot needles were inserted into the local *Ashi* points on the face and instantly removed; acupuncture in the regional distal points (VB20, VG20, VG24, E36, VB34) was performed for 30 minutes. The method proved to be more effective in comparison with conventional acupuncture.

The needling of trigger points located in the projection of the temporal and masticatory muscles causes a decrease in the severity of nocturnal bruxism starting from the first

week of treatment. If the needling of the trigger point cannot be executed, a self-treatment measure that may be applied is the ischemic compression of the trigger point by applying pressure with the thumb until slight pain appears, as the pain decreases, the pressure is to be increased (the compression process lasts for about 1 minute).

In modern neurostomatology, it is being studied the role of trigger points and areas in the diagnosis and treatment of disorders. In affected temporomandibular joints, acupuncture is most effective in cases of needle insertion into painful structures involved in the pathological process (joint capsule, periarticular connective tissue, masticatory muscles, especially the lateral pterygoid muscles).

Epidermal stimulation of trigger zones is also effective in eliminating chronic pain in TMJ dysfunction [78]. Chinese researchers use a treatment technique with effects on the distal points and *Ashi* points: TR3 or TR6 are needled first, then the patient is asked to perform various rhythmic movements with the lower jaw, then *Ashi* points are needled and finally *Ashi* points are burned. 10 sessions are required per treatment [17].

The use of trigger points for acupuncture has caused a pronounced decrease in the intensity of pain in TMJ dysfunction, without significant changes in the functional parameters of TMJ [75]. The introduction of needles into the trigger points of the lateral pterygoid muscle reduced the intensity of pain, the severity of inflammation and has increased the range of movements of the mandible [74]. Acupuncture is more effective compared to placebo for increasing the pain threshold in patients with TMJ dysfunction, especially when there are trigger points and trigger zones, but acupuncture in comparison with placebo, has not significantly changed the pain intensity and the degree of pain-free mandible mobility [79]. The effect on trigger zones in musicians with myogenous TMJ dysfunctions has caused a marked reduction in pain after 8 weeks of treatment [80].

Treatment of pain and spasm of the facial muscles is carried out taking into account their etiopathogenesis and clinical manifestations [81]. For the treatment of chronic pain in the masticatory muscles, it is recommended a combination of the first-choice methods (occlusal splint therapy, physiotherapy, pharmacopuncture, acupuncture) with patients counseling in regard to how they have to maintain their health [60, 82].

In the Ancient Chinese " *Song to Keep Up Your Sleeve*" (1529), at the bracing of the jaws there is recommended the *Lieque* (P7) point. In the Ancient Chinese sources, there are to be found recommendations for the various types of treatments for muscle spasms.

Acupuncture in spasms of facial muscles (main points – F3, VB20, TR17, RP6 in conjunction with symptomatic points) has caused in 17% of cases recovery (positive effect); in 24.5% – a significant improvement and in 7.5% of cases with no positive change [83]. The usage of pharmacopuncture (vitamin B12) in the VB34 significantly decreased the facial spasms – overall efficiency of 96.7% vs. 56.7% in the control group [82].

In the case of patients with bruxism, under the influence of acupuncture, it is possible to achieve an improvement of the tonicity of the masticatory muscles and to decrease severity of the concurrent disorders [18, 46, 84, 85, 86, 87]. In the treatment of muscle pain and muscle disorders, it is advocated to use different methods (acupuncture, electro-acupuncture, subcutaneous stimulation, etc.), the choice of which depends not only on the clinical manifestations, but also on the electromyographic indices of the affected muscles [88]. In the case of headaches caused by masticatory muscle dysfunctions, during the first four months of treatment, the treatment has caused a significant improvement in 57.2% of cases, an unstable effect in 9.5% and in 33.3% of the cases there was observed no discernable effect (acupuncture was made in the VB41 point, with needling at a depth of 10-15 mm with continuous manual stimulation for 15-20 minutes). At the same time, there was observed a significant improvement of the electromyographic indices of the masseter and temporal muscles.

One of the most promising methods is auriculo-puncture. There was developed a reflex-bruxism-regulating method, which consists of manual stimulation (massage/stretching/pressure) of the reflexogenic zones of the ears, that correspond to the projection of the stomatognathic system, in combination with the movements of the mandible in a certain rhythm: for three minutes, the jaws are sequentially braced for 5 seconds, with diminishing the intensity for 5 seconds, after which they are to be relaxed for 1-2 min, with a half-open mouth [60].

The use of this method significantly has reduced the number of night episodes of bruxism, their duration and intensity. In addition, the method improved the psycho-emotional state and has increased the resistance to stress. The combination of occlusal splint therapy and reflex-bruxism-regulatory method increased the number of patients with sustained remissions for 6 months. Auricular acupuncture improves the tonus of the masticatory muscles in patients with medulloblastoma, reduces the severity of bruxism in neurodegenerative diseases [84].

Laser-puncture is an effective treatment method for pain and spasm of the masticatory muscles [89]. The use of laser-puncture once a week (10 sessions in total) made it possible to reduce pain and improve the electromyographic indices of the masticatory muscles [90]. The use of a laser (4 J/cm<sup>2</sup>) for the purpose of deactivating trigger points and reducing pain in the masticatory muscles was not less effective than the method of administering 2% lidocaine at intervals of 48 and 72 hours [76]. Laser-puncture is successfully used to treat bruxism in children [87] – the method normalizes the activity of the masticatory muscles (based on electromyographic and gnatho-dynamometric data), reduces the reactivity to stress in children (the level of cortisol in the salivary fluid).

A promising method of treatment is electro-acupuncture in connection with a wide range of influencing factors (impulse type, intensity, frequency, duration, etc.). Electro-acupuncture with a frequency of 100 Hz significantly re-

duced the manifestations of muscle spasticity, and stimulation with a frequency of 2/15 Hz has reduced chronic pain at a higher level [91]. At the early stages of myofascial pain, it is effective to combine electro-acupuncture (points in the facial area in combination with the GI4 point) with massage techniques [48].

Various methods of acupuncture affect the main manifestations and pathogenic mechanisms of myogenous dysfunctions: they reduce muscle spasm [82, 83, 87, 89]; reduce muscle pain [18, 91]; reduce the severity and frequency of bruxism [84, 86, 87]; improve the electromyographic indices of the masseter and temporal muscles [40, 60]; improve the reflex processes of the regulation of masticatory muscles; improve the processes of vegetative regulation in the stomatognathic system [60]; normalize the stress-responsiveness and cortisol levels in the oral fluid [18, 85, 86, 87]; significantly reduce associated headaches in 57.2% of cases; reduce tinnitus in 87% of patients [46]; increase the duration of remission [60].

One of the tasks of modern medicine is the modernization of alternative medicine methods based on the creation of their scientific foundations [92], giving them a full and legal status, acupuncture methods should become part of predictive, preventive, personalized and integrative medicine [93].

## Conclusions

1. Acupuncture is having a continuously increasing reach in clinical practice worldwide, and is part of the WHO recommendations regarding treatment for dental diseases.
2. In most studies, it was established that acupuncture is more efficient than placebo, and that it is almost equal to conventional treatment in outcomes.
3. Currently, still it is not concluded which acupuncture treatment is more efficient in dental diseases: the one based on the reflexogenic theory (local, regional, distal points) or the one based on Traditional Chinese Medicine (meridian theory, etc.).
4. Currently, complex treatment protocols for dental pathologies are being developed, with the inclusion of various acupuncture methods (magneto-puncture, laser-puncture, etc.).

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