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RESEARCH ARTICLE

Characterisation of the Biomechanical Status of Patients with Temporomandibular Joint Dysfunction

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ABSTRACT

Temporomandibular joint pathology is very common in medical practice and is actually multidisciplinary. Rare publications on the multicomponent pathogenesis of this pathology determined the relevance of studying the peculiarities of the biomechanical status of patients with temporomandibular joint dysfunction (TMD). The obtained data allow to increase the effectiveness of treatment of this pathology, clarifying the indications for the use of osteopathic therapy. The temporomandibular joint (TMJ), being one of the most complex joints, plays an important role in the overall biomechanical balance of the body. Temporomandibular joint dysfunction is a general term for a group of musculoskeletal disorders accompanied by pain and/or dysfunction of the masticatory muscles, temporomandibular joints and related structures. It is a common type of non-stomatogenic orofacial pain in which patients may experience pain in the face/ cranial structures, TMJ, and limitations in mandibular movement. Patients with TMJ dysfunction often have concomitant somatic pathology. To describe the biomechanical status of patients with temporomandibular joint dysfunction and myofascial facial pain. The study was conducted at a clinical appointment at the M+Klinik Medical Centre. We examined 58 patients, aged from 18 to 75 years. The majority of those examined (79.9%) with temporomandibular disorders, masseter myalgia (MTMD) were women, men with MTMD made up 20.1%. Exclusion criteria were: head injuries at the time of the study; psychiatric and oncological diseases in the history; severe somatic pathology. Diagnostic measures were carried out in both groups of patients in the following order: collection of complaints and anamnesis; general dental examination: oral cavity examination, assessment of the condition of the dento-alveolar system, TMJ, masticatory muscles, external examination of cranio-facial structures; manual-muscular testing of TMJ and masticatory muscles with pain assessment on a visual analogue scale; osteopathic testing of cranial structures with determination of the pattern of spheno-basilar synchondrosis; teleradiography in lateral projection (Planmeca device) with cephalometric analysis "Sassouni Plus". At the initial treatment of the patient, all the obtained data, according to the protocol, were recorded in a specially developed "TMD patient code card. In assessing the biomechanical status of patients with TMD, characteristic clinical features were identified in this category of patients:

1. Complaints: tension headache (82.1%), non-systemic dizziness (64.3%), TMJ pain (71.4%), TMJ clicking (64.3%), limitation of mouth opening (92.9%), nocturnal clenching of teeth (78.6%), cervical spine pain (67.9%), nervousness, insomnia (67.9%), snoring (67.9%). 2. Internal (intraoral) signs of TMJ dysfunction: crowding of the lower anterior teeth (71.4%), narrowing of the dental arches (96.4%), deformation of the Spee plane (89.3%), pathological bite - 71.4%, tongue parafunction - 67.9%, deviation (deflexion) of the mandible - 85.7%. 3. External signs of TMJ dysfunction: shortened lower third of the face - 71.4%, facial profile (convex) - 67.9%, skeletal class 2 (<ANB) - 48%. 4. Manual muscle testing of the TMJ (pain on palpation of the muscle): masseter muscle right - 48.1%, temporalis muscle right - 59.3%, sternoclavicular-axillary muscle right - 74.1%, pain in the TMJ area on the right - 92.6%, bilaminar zone of the TMJ right - 96.3%, lateral wing muscle right - 88.9%, lateral wing muscle left - 77.8%. 5. Osteopathic testing of cranial structures: left-sided torsion of the spheno-basilar synchondrosis (SBS) - 28.6%, flexion pattern of SBS - 22%, extensional pattern of SBS - 22%. Cervical vertebrae dysfunction: C0-C1 - 57%, C2-C7 - 67%. On general osteopathic examination of a patient with TMD, there was a predominance of anterior lateral posture in the Barre vertical (63%). Determination of the biomechanical status of a patient with TMJ dysfunction is relevant at the clinical appointment of a dentist, otolaryngologist, maxillofacial surgeon, as it gives the opportunity to correctly determine the cause of TMJ dysfunction, participation in the pathogenesis of biomechanical disorders and make a forecast for future effective treatment of this category of patients.

INTRODUCTION

Temporomandibular disorders (TMD) is a general term that includes dysfunction of the masseter muscles, temporomandibular joints, and surrounding neuromuscular structures. In this type of disorder, the most common presentation is neodontogenic, secondary orofacial pain in the TMJ, face, and skull associated with muscle spasm[1]. Patients may complain of restricted jaw movement and TMJ sounds during mandibular movement. Associated painful and non-painful conditions are common among patients with TMD. TMD symptoms tend to be recurrent and are diagnosed as myalgia and arthalgia in 73% of cases. In a population-based study on TMD in adults aged 20-49 years, the mean duration of symptoms was 6 years [2].

TMD is the most common disorder of the craniomandibular system, affecting up to 33% of people during their lifetime. Studies by many authors indicate that TMJ pathology among diseases of the maxillofacial region ranks third after caries and periodontal diseases. Women are twice as often exposed to the disease, the peak of temporomandibular disorders is at the age of 20-40 years[3]. Few scientific studies have examined the multifactorial etiology of TMD[4]. A variety of clinical manifestations and predictors of TMJ dysfunction can be diagnosed prior to the onset of a person's painful condition, prompting the patient to seek specialist help. However, TMD is difficult to identify by clinicians, of different profiles due to the lack of information about this dysfunction[5]. Patients present to dentists, otolaryngologists, neurologists, maxillofacial surgeons with pain and limitation of TMJ function and for many years the problem of TMD goes unresolved. The dysfunction involves the autonomic nervous system, leading to disorganisation of the act of swallowing, breathing and cardiac activity[6]. By applying special diagnostic methods and determining the biomechanical status of the TMD patient, the physician can involve specialists from related fields and provide a multidisciplinary approach in the treatment and rehabilitation of TMD patients, which will enable these patients to improve their quality of life and get rid of pain.

According to the current definition provided by the International Federation of Orthopaedic Manipulative Physiotherapists (IFOMPT), manual therapy should be understood as "a specialised field dedicated to the treatment of neuro-muscular skeletal disorders, based on the clinical rationale and application of highly specialised treatments, including manual techniques and therapeutic exercises"[7].

Few clinical studies have demonstrated that structural imbalances of the body, cranio-mandibular system and TMJ dysfunction are interrelated and can cause myofascial tension in the masticatory muscles accompanied by painful symptoms in the orofacial region with limitation of TMJ function [8][9].

Our aim of this randomised controlled clinical trial was to determine the biomechanical status of TMD patients for timely and effective diagnosis and rehabilitation of TMJ dysfunction.

MATERIALS AND METHODS

This study was a randomised controlled clinical trial (RCT). Fifty-eight patients with TMD symptoms, aged 18 to 75 years, were selected among the patients who applied to M+Klinik Medical Centre. The majority of those studied (79.9%) were women. Patients with head injuries, persons with a history of oncological, psychiatric, or severe somatic diseases at the time of the study were excluded from the study.

Stages of the study

The clinical study was conducted in both groups of patients in the following order:

1. Collection of anamnesis.
2. general dental examination: examination of the oral cavity, assessment of the dento-alveolar system, TMJ, masticatory muscles, external examination of cranio-facial structures.
3. Manual palpatory testing of the TMJ
4. general osteopathic testing (determination of cranio-mandibular and postural status)
5. Objective examination of TMJ: teleradiography in lateral projection (Planmeca apparatus with cephalometric analysis Sassoni Plus).

All study data were recorded in a specially designed diagnostic code card of the TMD patient.

RESULTS AND THEIR DISCUSSION

Fifty-eight patients at clinical appointments at M+Klinik Medical Centre, aged 18 to 75 years, were examined. The majority of those examined (79.9%) with temporomandibular disorders, masseter myalgia (MTMD) were women, men with MTMD accounted for 20.1%.

When evaluating the complaints of patients with TMD, it was found that the duration of TMJ dysfunction occurrence for more than 3 months was more than 3 months in 89.9 % of the examined patients.

Collection of complaints of patients with TMD revealed that the predominant complaints are: Restriction of mouth opening - 92.9%, posture disturbance - 92.9%, tension headache - 82.1%, TMJ pain, difficulty in chewing - 71.4%, teeth clenching at night - 78.6%, teeth clenching during the day - 75%, cervical spine pain - 67.9%, non-systemic dizziness - 64,3%, nervousness, insomnia, snoring - 67.9%, clicking in the TMJ region - 64.3%, pain in the facial region - 57.1%, ringing (noise) in the ears - 39.3%, mobility and sensitivity of teeth - 14.3%, numbness (paresthesia) of fingers - 32.1%, pain in the projection of trigeminal nerve - 7.1% (Fig. 1).

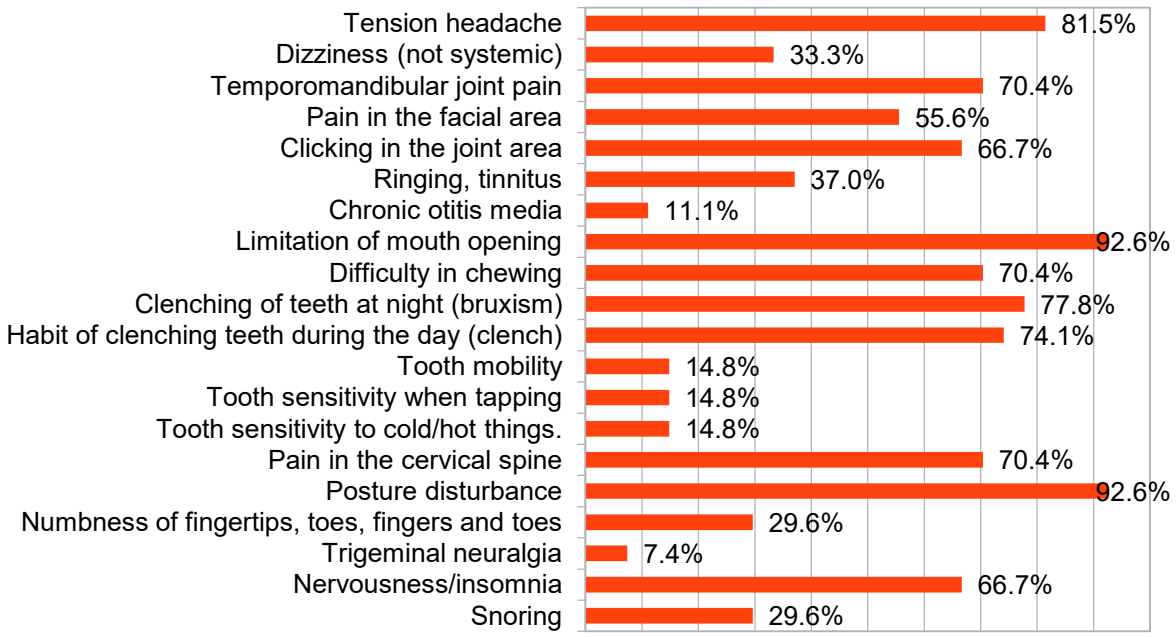

Figure 1: Patient complaints with temporomandibular

General dental examination revealed internal signs of TMJ dysfunction: 96% - narrowing of the dental arches, 89.9% - deformation of the Spee curve, narrow upper jaw, 85.7% - deviation of the lower jaw, 75% - wedge-shaped tooth defects, 71.4% - crowding of the lower front teeth, bite pathology, 67.9% - parafunction of the tongue, 60.7% - deformation of the front teeth, 21.4% - shortened tongue frenulum (Fig. 2).

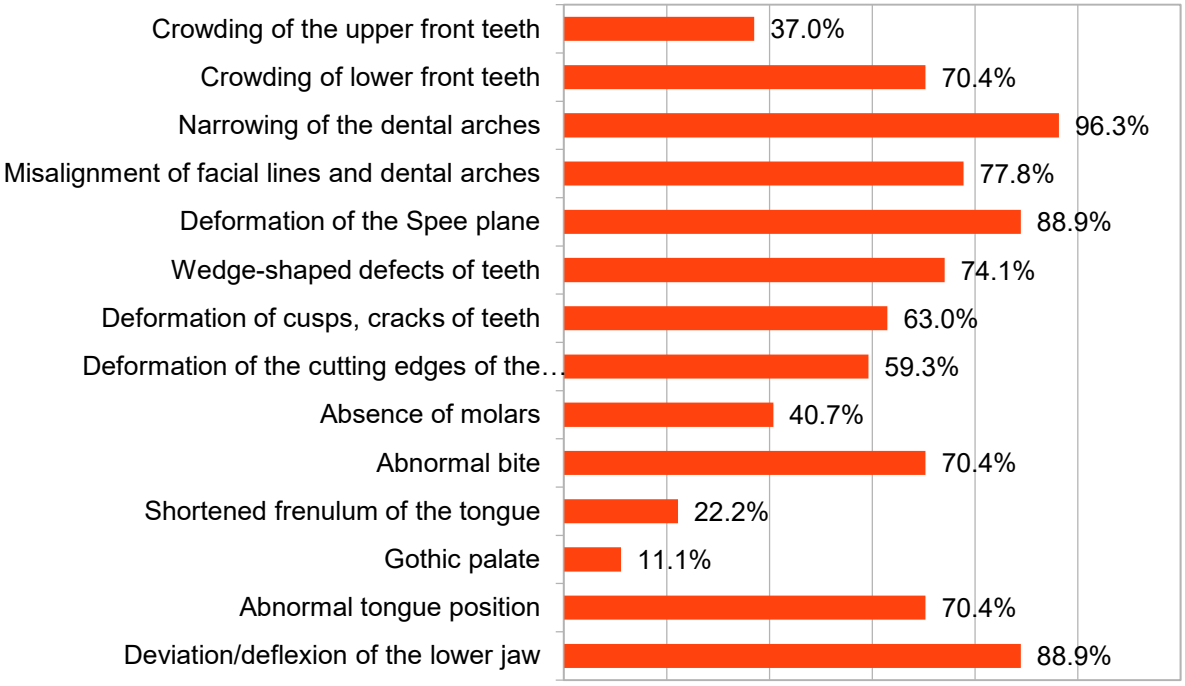

Figure 2: Internal signs of temporomandibular disorders

The external features of TMD were: tucked lower third of the face 70.4%, deep chin fold 63%, dry lips 29%, symmetrical face 3.7%, uncompressed lips at rest 3.7%, enlarged lower third of the face 7.4% (Figure 3).

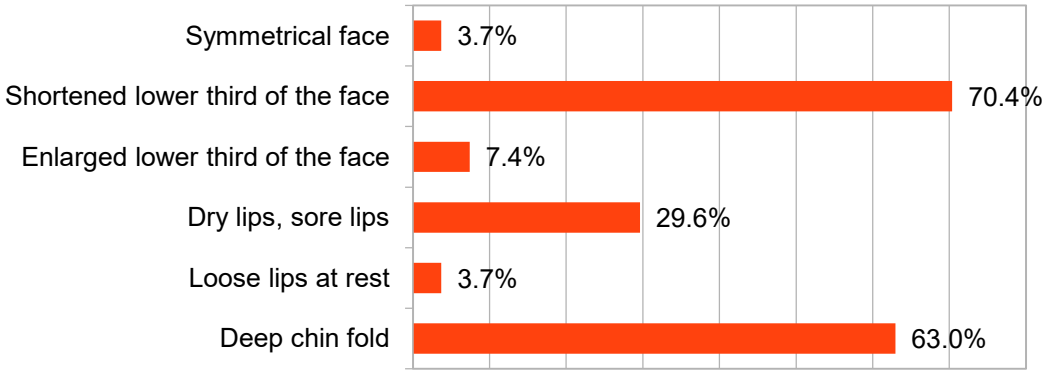

Figure 3: Internal signs of temporomandibular disorders

The analysis of profile TRG (Sassouni Plus) revealed the predominant skeletal class of teeth interlocking: class 2 (deep bite) - 48%, class 1 (neutral bite) - 44%, class 3 (reverse bite) - 7% (Fig.4).

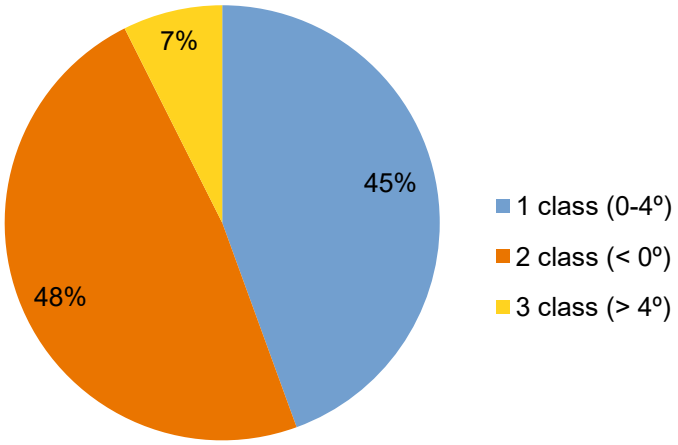

Figure 4: Analysis of profile telerentgenography

Analysis of the face in profile (angle of convexity of the face according to the points glabella - subnasale - pogonion): convex - 66.7%, straight - 25.9%, concave - 7.9% (Fig. 5).

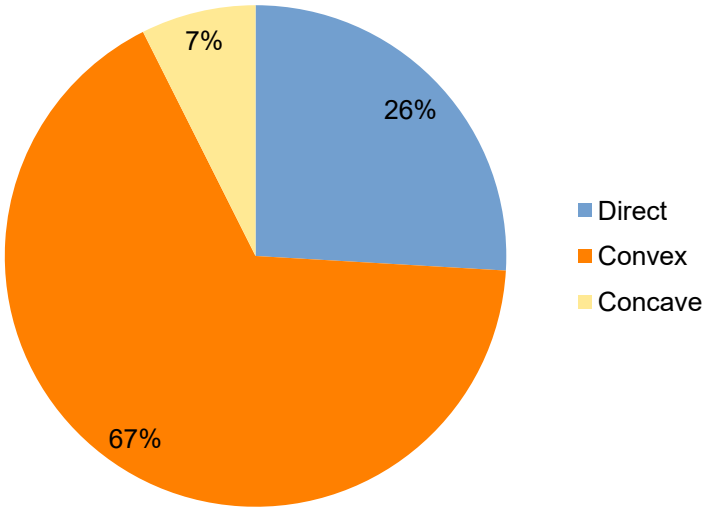

Figure 5: Analyzing the face in profile

Postural analysis (Barre's vertical): anterior-63%, normal-11.1%, posterior-7.4% (Fig. 6).

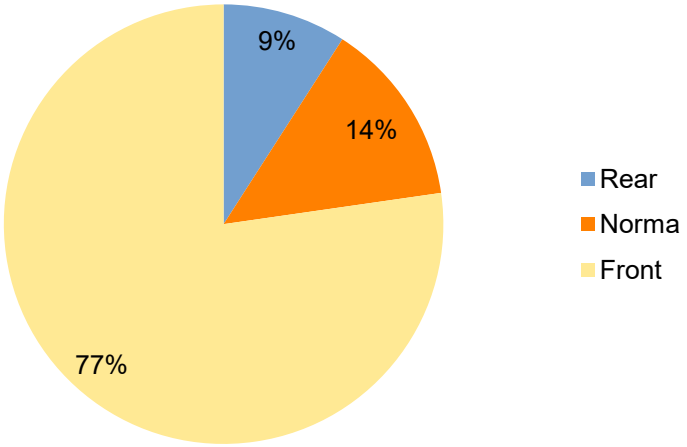

Figure 6: Types of posture in patients with TMJ dysfunction

Analysis of manual-muscular testing of the TMJ (palpation): pain in the lateral wing muscles: right - 88.9%, left - 77.9%; pain in the masseter muscles on the right - 51.9%, on the left - 59.1%; pain in the temporalis muscle on the left - 55.6%, on the right - 51.9%; pain in the sternoclavicular-papillary muscle on the left - 40.7%, on the right - 25.9%. Limitation of mouth opening - 59.3%, mandibular deviation - 74.1% (Fig. 7).

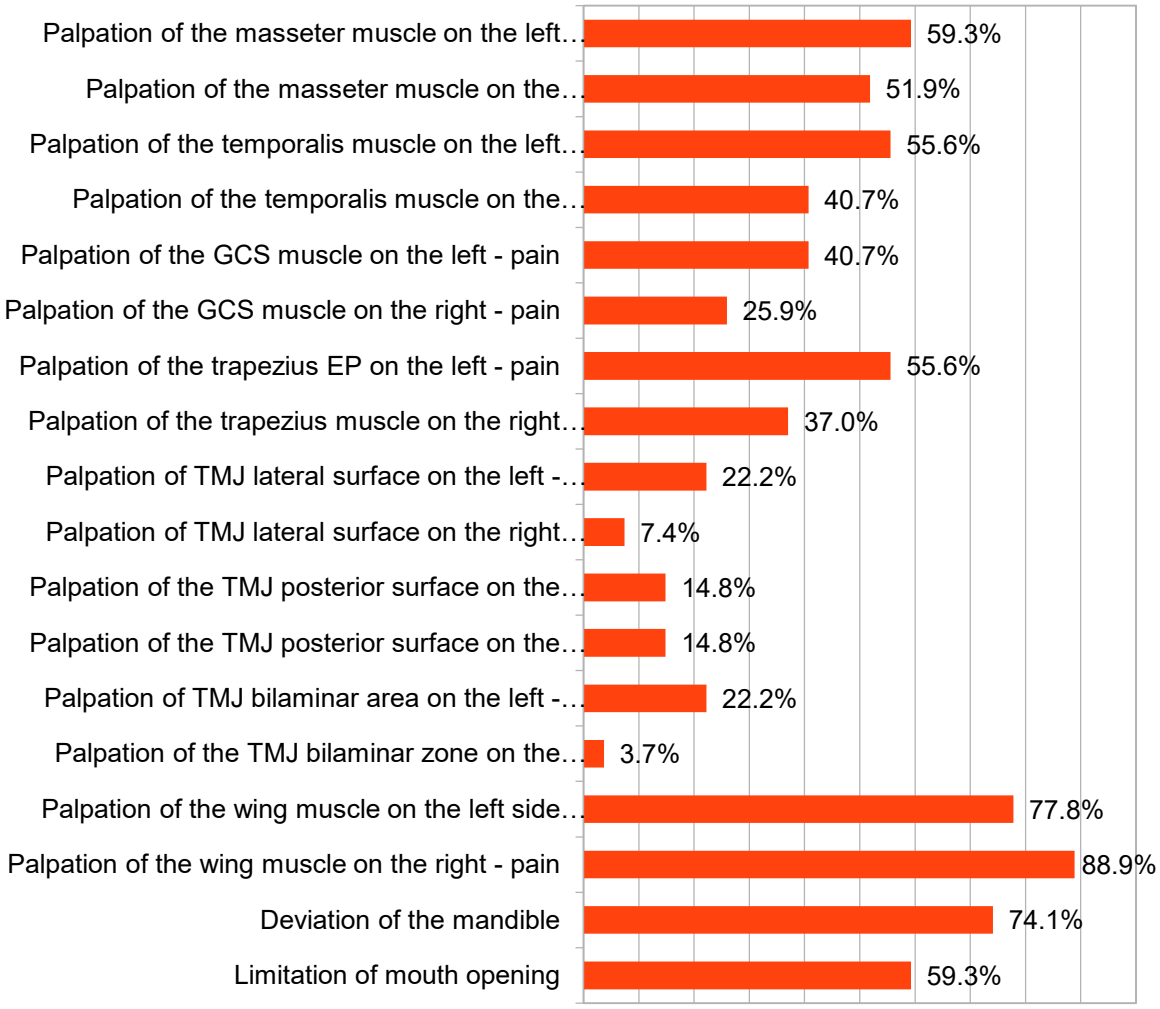

Figure 7: Results of manual muscle testing of the TMJ

General osteopathic testing revealed preobstructive dysfunction of the cervical spine (C0-C3) and laryngeal-pharyngeal complex (Fig. 8) and revealed a predominant pattern of spheno-basilar synchondrosis in patients with TMJ dysfunction (Fig. 9).

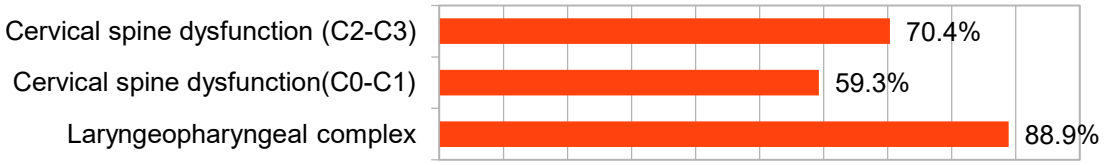

Figure 8: Characteristic osteopathic dysfunctions

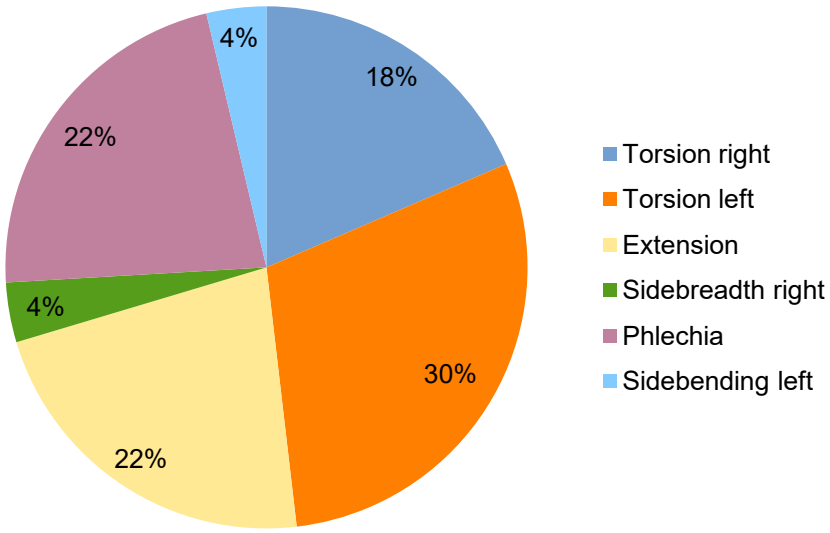

Figure 9: Pattern analysis of spheno-basilar synchondrosis

As a result of analysing the data, we concluded that the following markers predominate in the biomechanical status of TMD patients: restriction of mouth opening (92.6%), TMJ pain (70.4%), and nervousness (66.7%).

The internal signs of TMJ dysfunction were deformation of the Spee curve (88.9%), wedge-shaped tooth defects (74.1%), abnormal bite (70.4%), tongue parafunction (70.4%), and mandibular deviation (88.9%).

External signs of TMD (kephalometry) - shortened lower third of the face (70.4%), convex facial profile (66.7%), TRG skeletal class 2 (Barre vertical lateral posture - anterior (63%)).

General osteopathic testing revealed a predominant pattern of spheno-basilar synchondrosis - left torsion (30%); C2-C7 cervical spine dysfunction (70.4%) and laryngeal-pharyngeal complex dysfunction (88.9%).

Manual testing of the TMJ revealed a predominance of pain response during palpation of the lateral wing muscles: 88.9% on the right and 77.8% on the left.

CONCLUSIONS

The study revealed characteristic biomechanical disorders in patients with temporomandibular disorders. The obtained data allow adjusting therapeutic measures in a comprehensive interdisciplinary approach to the treatment of such patients. In the treatment of this category of patients it is necessary to include osteopathic diagnostics and correction of typical biomechanical disorders. The therapeutic algorithm should include elimination of pain in the masticatory muscles and limitation of TMJ movement, correction of cervical spine dysfunction, correction of tongue parafunction using osteopathic techniques of TMJ correction.

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