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CORRELATIONS BETWEEN FINDINGS OF OCCLUSAL AND MANUAL ANALYSIS IN TMD-PATIENTS

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SUMMARY

The aim of this study was to investigate and analyze the possible correlations between findings by manual functional analysis and clinical occlusal analysis in TMD-patients.

Material and methods: Material of this study are 111 TMD-patients selected after visual diagnostics, functional brief review under Ahlers Jakstatt, intraoral examination and taking periodontal status. In the period September 2014 - March 2016 all patients were subjected to manual functional analysis and clinical occlusal analysis. 17 people (10 women and 7 men) underwent imaging with cone-beam computed tomography.

Results: There were found many statistically significant correlations between tests of the structural analysis that indicate the relationships between findings.

Conclusion: The presence of statistically significant correlations between occlusal relationships, freedom in the centric and condition of the muscle complex of masticatory system and TMJ confirm the relationship between the state of occlusal components and TMD.

Key words: freedom in the centric, deep bite, TMD

Specialized literature abounds with epidemiological studies [1, 2, 3, 4], according to which, 50% to 70% of the general population have one or more symptoms of functional disorders of the masticatory muscles, temporomandibular joints (TMJs), teeth or periodontal ligaments. Depending on the population studied, methods applied and criteria set, subjective symptoms and complaints (reported by the patients) with frequency of 60%, or objective findings (of clinical functional examinations) with possible frequency of up to 90% have been observed [5].

Okeson [6] summarizes that according to data of epidemiological studies, at least one objective symptom of functional disorders of the masticatory system, e.g. pain on palpation of the masticatory muscles, has been clinically confirmed in 40% to 75% of the adult population. According to the scientific researches of Rugh et al. [7] and Gremillion et al. [8], 50% to 70% of the general populations have at least one symptom of functional disorders.

According to modern German scientific literature [9], the percentage of people suffering from craniomandibular disorders (CMDs) is even higher - 70% to 80% among the patients in Germany, with at least one clinical finding in 58% of the studied patients on average.

Last 10 years have marked a breakthrough in the scientific understanding of craniomandibular disorders and their relationships with the whole body. This gives grounds to Brocker [10] to conclude that 43% of the patients with orofacial pain have complaints and pain in five or more areas of the body.

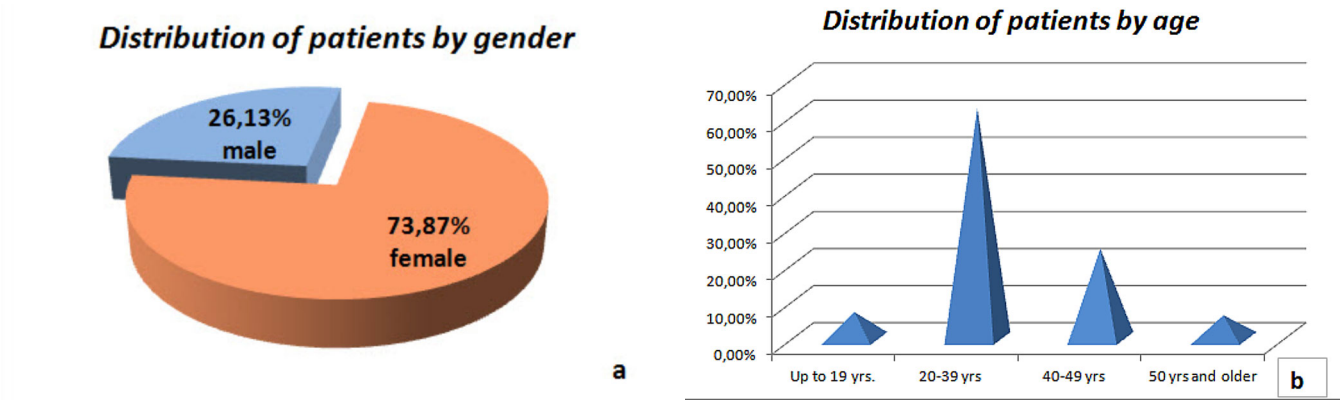
The signs and symptoms of CMDs frequently correlate; therefore, correct diagnosis of CMDs requires thorough knowledge of neurophysiology of pain [11, 12] and neuroanatomic convergencies [12, 13], and suggests an analytical diagnostic approach when interpreting the clinical findings of structural analysis tests.

The aim of this study was to investigate and analyze possible correlations between the findings of manual functional analysis and clinical occlusal analysis in patients with CMDs.

MATERIAL AND METHODS

The study included 111 patients with CMDs (82 women and 29 men) (Fig. 1 à, b), selected from five specialized dental practices (2 in Prosthetic dentistry, 1 in Orthodontics and 1 in Oral surgery), after taking the medical history and conducting visual diagnosis, brief functional examination according to Ahlers Jakstatt and intraoral examination.

Fig. 1a b.



In the period September 2014 - March 2016, all selected patients were subjected to manual functional analysis and clinical occlusal analysis, conducted by Dimova in conformity with the algorithm of AFDT at DGZMK [14]. The following findings were considered positive: presence of discomfort (+/-); mild pain (+), severe pain (++) or extremely severe pain (+++). In assessing the TMJ, positive findings included noises (crackling in the joint) during the tests for traction, translation and dynamic compression in the TMJ.

For assessing freedom in centric, the patients were asked to close slowly to the first interdental contact, to hold a few seconds in this position, and then to clench the teeth. The patients performed in triplicate these movements, to exercise them; then, clinical correlations between the jaws in centric relation (CR) and central occlusion (CO) were registered by using: Shimstock foil; blue articulation paper PROGRESS 100 ì; red articulation foil Bausch®Arti-Fol® 8 ì (Bausch /Dr. Jean Bausch GmbH & Co. KG) and bilateral colored markings in the premolar regions. The following were considered normal findings: presence of bilateral contacts in CR when swallowing; coincidence between CO and CR; path of 0.5-1 mm between the two positions, directed anteriorly along the sagittal plane.

17 patients (10 women and 7 men) were subjected to diagnostic imaging of the TMJ, by using cone-beam computed tomography.

The resulting examination findings were systematized and subjected to statistical processing with the package of applied programs for data analysis of epidemiological and clinical studies SPSS for Windows, version 16.00 (15/11/2007). Frequency analysis, cross-tabulation and graphical methods were used for data presentation; the method of c2-criteria (chi-square) or Fisher's exact (two-tail) test was used for identifying correlation between two qualitative variables.

RESULTS

The "Play in the joint" test, conducted as a part of the manual analysis, enabled the clinical diagnosis of the TMJ. Individual articular areas or the articular capsule were subjected to dosed pressure or traction, resulting in positive findings, observed in one or both TMJs (in 50.9% or 57 of the patients studied), which depended statistically significantly from the freedom in centric, documented in the occlusal analysis (P=0.013) (Table 1).

Table 1. Distribution of patients by findings of the tests for traction and translation, and freedom in centric

			Freedom in centric				
			CO and CRcoincide	***Sliding to the left***	***Sliding anteriorly***	***Sliding to the right***	***Total number***
Positive findings of the tests for traction and translation in the left TMJ	***Absent***	*Number*	20	50	8	9	87
		% by row	23.0%	57.5%	9.2%	10.3%	100.0%
		% by column	100.0%	75.8%	80.0%	60.0%	78.4%
	Present	*Number*	0	16	2	6	24
		% by row	.0%	66.7%	8.3%	25.0%	100.0%
		% by column	.0%	24.2%	20.0%	40.0%	21.6%
Total number		*Number*	20	66	10	15	111
		% by row	18.0%	59.5%	9.0%	13.5%	100.0%
		% by column	100.0%	100.0%	100.0%	100.0%	100.0%

It is noteworthy that in 23.0% of the patients studied, in whom the positions of CO and CR coincided, the tests for traction and translation of the joint were asymptomatic. In the other patients, who had positive findings of the tests when passing from CR to CO, only 8.3% (2 patients) slipped anteriorly the mandible, and 91.7% deviated the mandible to the left or to the right. These movements away from the sagittal plane are coercive and occlusally conditioned by the presence of leading facettes or blockages in the occluso-articulation relationships. The correlation between the presence of occluso-articulation disorders and the positive findings of the tests for traction and translation was also statistically significant (P=0.006).

Statistical analysis of the data has shown a significant correlation between the freedom in centric and the results obtained from the tests for abduction (P=0.001), adduction (P=0.001) and isometric mediotrusion (P=0.005). These results confirm the interdependence between the presented or obstructed freedom in centric and the relevant state of the muscle complex of the masticatory system and the TMJ, and refute the opinions of some authors [15, 16, 17] for a lack of causality between the occlusal components and CMDs. The lateral deviation, recorded on the teeth, most frequently corresponded to the deviation of the ipsilateral articular head in the lateral and dorsal direction. The reaction in the joint was the resultant of the extent and direction of the deviation, the duration of the influence and compensatory capabilities of the body. For example, among the studied patients with CMDs and sliding to the left when passing from CR to CO, 75.8% had no symptoms during the tests for traction and translation. However, 24.2% of them reacted with pain of various intensities. The correlation between the occluso-articulation disorders and the test results for traction and translation was statistically significant (P=0.006).

Statistically significant correlations were also found between the presence or absence of freedom in centric and the test results for passive compression (P=0.041), dynamic compression and translation of the TMJ (P<0.0001).

Tests for passive compression have shown provocation of pain in one or both TMJs in 63.4% (71) of the patients studied. These findings were found to depend statistically significantly from the presence of previous orthodontic treatments (P<0.0001), conducted prosthetic treatments (P=0.027), presence of parafunctions, such as bruxism and bruxomania (P=0.020). It should be borne in mind that the findings of the tests upgrade and enrich the data obtained from palpation of the TMJ. The presence of pain in the retral and retrolateral sections of the joint was examined in conjunction with the noises, observed in the joint. For example, evidence of crackling when opening or closing, manifested in the intermediate or terminal phase, and the presence of discomfort or pain of various intensity during the test for passive compression in the dorsal or dorsocranial direction, were indicative of a probable anterior disposition with reposition of the articular disc and chronic trauma of the bilaminar zone.

A factor of significance for the pathologies, observed in the study group, was the presence of deep bite (in 27.02% of cases) (Fig. 2a, b; Fig. 3a, b, c).

Fig. 2. Patient I.Z., aged 18 yrs. intraoral view – Angle's class II with overjet

Fig. 3. Patient A.K., aged 19 yrs. intraoral view – Angle's class II with crowding in the front, deep bite and extracted 16, 24 and 36

A significant correlation (P=0.001) between the presence of deep bite and arthrosis of the TMJ was also found (Fig. 4, Table 2).

Fig. 4. Patient À.S., aged 30 yrs. CBCT – osteo-arthrosis changes in the left TMJ

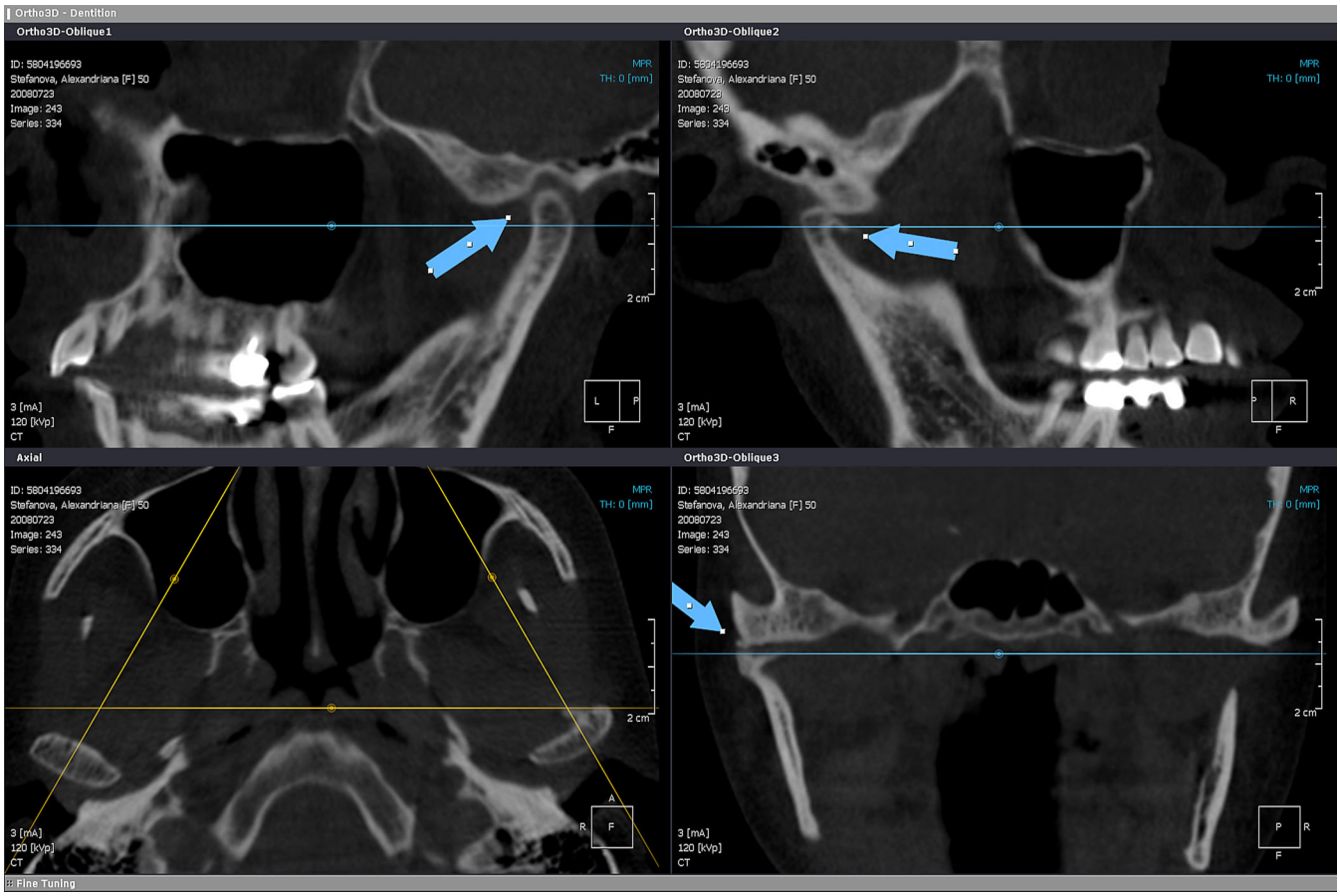


Table 2.

Distribution of patients by the presence of arthrosis in the TMJ and deep bite			Deep bite		Total number
			Absent	Present	
Arthrosis in the TMJ	Absent	*Number*	24	15	39
		% by row	61.5%	38.5%	100.0%
	Present	*Number*	2	15	17
		% by row	11.8%	88.2%	100.0%
Total number		*Number*	26	30	56
		% by row	46.4%	53.6%	100.0%

It is interesting that the presence of deep bite is significantly dependent (P<0.0001) from conducted prosthetic treatments. For example, prosthetically treated (77.6%) were approximately 3.5 times more than prosthetically naïve subjects (22.4%) among the patients with deep bite.

DISCUSSION

The analysis of the findings in the study group has shown a number of statistically significant correlations between the presence or absence of freedom in centric and the observed positive findings of the tests in the temporomandibular joints and masticatory muscles. The described correlations confirm a direct relationship between the occlusal components and other structures of the masticatory system and complement the conclusions of leading authors in the functional diagnosis of the masticatory system, from

Kobayashi and Hansson's experiments on animals in 1988 [18] to present researches of modern scholars [2, 9, 14].

The results confirm the need of modelling the occlusion in a way, protective against the TMJ. This means that in both central occlusion and articulation, the TMJ should not be influenced by retrusively acting forces that subject articular ligaments and the bilaminar zone to overload and subsequent damage, and produce hypertone in the masticatory muscles that resist these forces - m. pterygoideus lateralis, m. masseter pars superior and m. pterygoideus medialis. Examined with tests for isometric tension, these muscles react with pain, graded subjectively by the patients on the proposed scale.

Knowing and understanding of the described correlations is essential for the medical practice of professionals in General dentistry, Prosthetics and Orthodontics, since the nature of their clinical work involves changes in the occlusal relationships that result in functional effects on the structures of craniomandibular and craniocervical systems (Fig. 5 - 7).

Fig. 5. Patient M.P., aged 31 yrs. First clinical examination – traumatic deep bite, Angle's class II

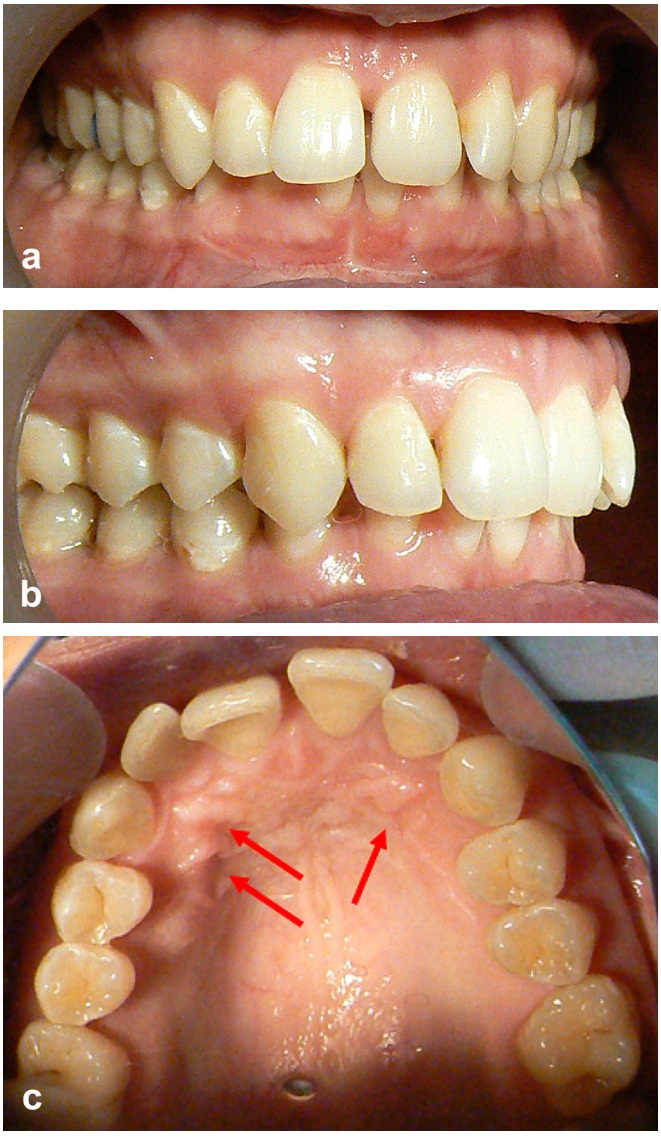


Fig. 6. Patient M.P., aged 31 yrs. Treatment with fixed appliances in the upper and lower jaw with intrusion of the upper front teeth

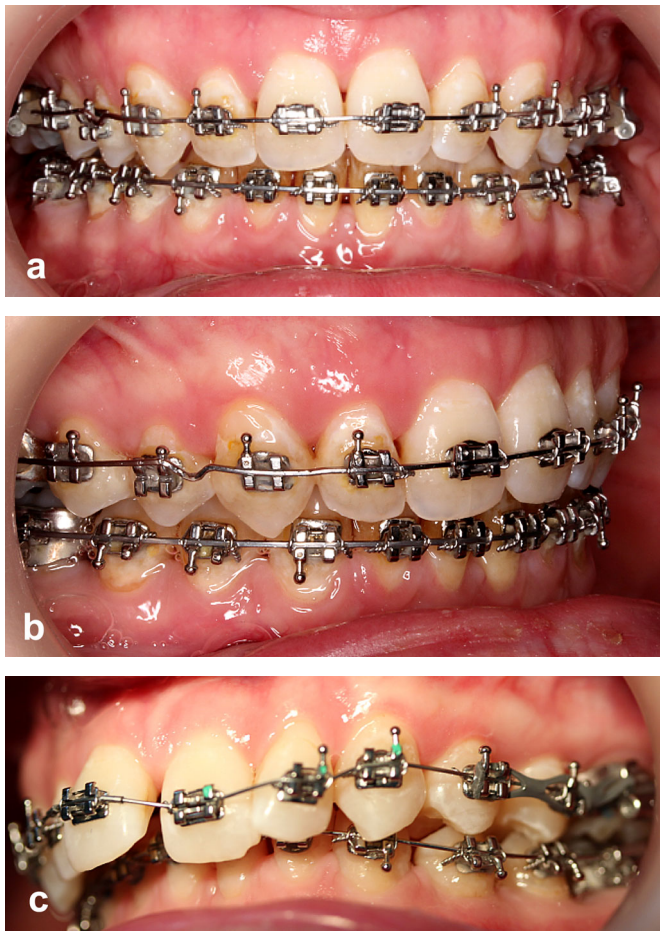


Fig. 7. Patient M.P., aged 31 yrs. Intraoral view after completion of the orthodontic treatment

CONCLUSION

Manual functional analysis of the masticatory system is a set of tests for isometric muscle tensions, tractions, translations and dynamic compressions of the TMJs that upgrade the evidence obtained from palpation of the structures of masticatory system.

The results, obtained from the manual analysis, should be considered in conjunction with the findings of clinical occlusal analysis. Such an analytical approach would allow a complete diagnosis of the masticatory system in the context of its functional unity and interdependence.

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