



Correlation analysis of craniomandibular index and gothic arch tracing in patients with craniomandibular disorders

Analiza korelacije kranio-mandibularnog indeksa i zapisa gotskog luka kod bolesnika sa kranio-mandibularnim disfunkcijama

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Abstract

Background/Aim. Complex etiology and symptomatology of craniomandibular dysfunction make the diagnosing and therapy of this disorder more difficult. The aim of this work was to assess the value of clinical and instrumental functional analyses in diagnosing of this type of disorders. **Methods.** In this study 200 subjects were examined, 15 with temporomandibular joint disorder. They were subjected to clinical functional analysis (Fricton-Shiffman) and instrumental functional analysis by using the method of gothic arch. The parameters of the gothic arch records were analyzed and subsequently compared among the subjects of the observed groups. **Results.** In the examined group of the population 7.5% of them were with craniomandibular dysfunction. The most frequent symptoms were sound in temporomandibular joint, painful sensitivity of the muscles on palpation and lateral turning of the lower jaw while opening the mouth. By analyzing the gothic arch records and comparing the obtained values between the observed groups it was assessed that: lateral and protrusion movements, lateral amplitude and the size of gothic arch were much bigger in the healthy subjects, and latero-lateral asymmetry was larger in the sick subjects. Latero-lateral dislocation of apex was recorded only in the sick subjects with average values of 0.22 ± 0.130 mm. The correlation between the values of Fricton-Shiffman craniomandibular index and the parameters of the gothic arch records and latero-lateral amplitude and dislocation of apex records were established by correlative statistical analysis. **Conclusion.** Functional analysis of orofacial system and instrumental analysis of lower jaw movements (gothic arch method) can be recommended as precise and simple methods in diagnosing craniomandibular dysfunctions.

Key words:
craniofacial abnormalities; mandible;
jaw abnormalities; jaw relation record; mobility
limitation; sensitivity and specificity; serbia.

Apstrakt

Uvod/Cilj. Složena etiologija i simptomatologija kranio-mandibularnih disfunkcija značajno otežavaju dijagnostiku i terapiju ovog poremećaja. Cilj rada bio je da se utvrdi validnost kliničke i instrumentalne funkcijske analize za dijagnostiku ove vrste poremećaja. **Metode.** U ovoj studiji pregledano je 200 ispitanika, kod 15 ustanovljena je kranio-mandibularna disfunkcija. Kontrolna grupa formirana je od 15 ispitanika bez znakova i simptoma kranio-mandibularne disfunkcije. I oboleli i zdravi ispitanici podvrgnuti su kliničkoj funkcijskoj analizi prema Fricton-Shiffman-u i instrumentalnoj funkcijskoj analizi metodom gotskog luka. Parametri zapisa gotskog luka analizirani su i naknadno upoređeni između ispitanika posmatranih grupa. **Rezultati.** U pregledanom delu populacije kranio-mandibularne disfunkcije bile su zastupljene kod 7,5% ispitanika. Simptomi za koje je utvrđena najveća učestalost bili su: zvuk u viličnom zglobu, bolna osetljivost mišića na palpaciju i lateralno skretanje donje vilice u toku otvaranja usta. Analizom zapisa gotskog luka i komparacijom dobijenih vrednosti između posmatranih grupa utvrđeno je da su lateralne i protruzione kretnje, laterolateralna amplituda i veličina gotskog luka značajno veće kod zdravih ispitanika, a da je laterolateralna asimetričnost veća kod obolelih ispitanika. Laterolateralna dislokacija apeksa registrovana je samo kod obolelih ispitanika sa prosečnom vrednošću $0,22 \pm 0,130$ mm. Korelacionom analizom utvrđena je međuzavisnost vrednosti kranio-mandibularnog indeksa prema Fricton-Shiffman-u i parametara zapisa gotskog luka, i to laterolateralne amplitude i dislokacije apeksa zapisa. **Zaključak.** Funkcijska analiza orofacijalnog sistema i instrumentalna analiza pokreta donje vilice (metoda gotskog luka) mogu se preporučiti kao precizne i jednostavne metode za dijagnostiku kranio-mandibularnih poremećaja.

Ključne reči:
kraniofacijalne anomalije; mandibula; vilice, anomalije;
vilice, odnosi; pokretljivost; osetljivost i specifičnost;
srbija.

Introduction

Orofacial system is a set of morphologically and functionally different tissues and organs integrated by means of a neuromuscular connection.

Disruption of the function of some of the orofacial system structures will lead to repercussion over the remaining components, which often results in dysfunction with a complex symptomatology. Symptoms that may appear are joint, dental and muscular in nature. A set of these symptoms has been consolidated under the name of craniomandibular disorders (CMD)^{1,2}.

By means of an epidemiological study it has been determined that 50%–75% of people in the course of life experience some of the transient symptoms of joint disease. About 33% have at least one symptom, *eg* pain in the face area or pain in the temporomandibular joint (TMJ). However, only 5% of patients seek medical assistance^{1, 3–19}. It was further established that the highest prevalence of the disease is evident in patients between 15 and 45 years of age. This disease is more common in women than in men whereas the ratio is 3 : 1 to 9 : 1^{1, 6, 15}.

The complex etiology and craniomandibular dysfunction symptoms significantly complicate diagnosis and treatment of this disease. Adequate approach, and systematic use of numerous recognized methods have become indispensable principles of modern diagnostic dysfunction.

An integral part in craniomandibular dysfunction diagnosis refers to clinical functional analysis. Clinical examination of orofacial structure has been simplified by means of a specially formulated questionnaire, which in addition to its diagnostic value, has a great significance in monitoring the incidence of this disorder as well as the representation of its signs and symptoms^{2,4}.

Within dysfunction diagnosis, in addition to clinical functional analysis, an instrumental functional analysis is often conducted. Nowadays, a wide variety of different instrumental methods for the registration of mandibular movements is available. A great part of these methods is based on the presentation of motion in the form of a mechanical tracing on a certain material. Transformation of kinetic movement in a static record is inevitably accompanied by a loss of precision. Nevertheless, these methods provide a simple overview of the muscle-joint system condition and facilitate the diagnosis of CMD. One of the methods of instrumental functional analysis is the intraoral gothic arch tracing. The gothic arch record and normal values of its individual parameters, compared to the values of the same parameters registered with affected subjects, *ie* the patients, represent the starting point for identifying joint disruptions. Therefore, the aim of this study was to determine the presence of CMD in the screened part of the population by means of Friction-Shiffman clinical functional analysis, and determine the severity of dysfunctional disorders (Craniomandibular Index) in patients; to compare features of the gothic arch record registered in the healthy subjects (control group) to the ones registered in the patients with craniomandibular disorders (experimental group), and to determine the

correlation of changes in the gothic arch record and the craniomandibular index values within the experimental group.

Methods

The first phase of the research included 200 randomly chosen subjects from the northern part of Kosovska Mitrovica. The present clinical trial was conducted in accordance with the principles of the Declaration of Helsinki and approved by the Ethical Committee of Kosovska Mitrovica.

The subjects were subjected to the Friction-Shiffman clinical functional analysis and craniomandibular index determination. This analysis includes: medical history, functional analysis of mandibular movement, sound detection in the temporomandibular joint, palpation of masticatory and neck muscles and palpation of temporomandibular joints. The results of the clinical functional analysis were expressed numerically (0 or 1) and the values were further used to calculate the craniomandibular index (CMI).

Functional analysis of the mandibular movement included testing of mouth opening and closing movements, laterotrusion and propulsion movements of the lower jaw. The results of functional analysis were registered in a specially formulated questionnaire and expressed in terms of numerical values. Positive findings indicating the presence of disorder were scored as 1, whereas negative findings indicating the absence of disorder and normal function of the orofacial system, were scored as 0. The sum of all points obtained by mandibular movement analysis is referred to as the Mandibular Mobility (MM).

Sound signals in TMJ may be registered in various stages of mandibular movement and are expressed in terms of a "click" or a crepitus. The presence of a sound signal was scored as 1, whereas the absence was scored as 0. Points obtained by joint sound signal recording were summed and referred to as the TMJ sound (TMJS).

Palpation of masticatory muscles was implemented as extraoral and intraoral palpation. Extraoral palpation implied examination of: *m. temporalis*, *m. masseter*, *m. pterygoideus medialis*. Intraoral palpation examination covered: *m. pterygoideus lateralis*, *m. pterygoideus medialis* and a lower insertion of the *m. temporalis*. Temporal muscle is palpated extraorally and intraorally. Intraoral palpation is performed by sliding a finger over anterior ramus up to the coronoid notch area, whereas extraoral one refers to the area of its attachment to the temporal bone. The muscle *pterygoideus medialis* is palpated bi-manually. Forefinger of one hand is used to palpate the inner part of mandible angulus, while the other one is used simultaneously for extraoral palpation of the same region. The muscle *pterygoideus lateralis* is quite inaccessible to palpation. Palpation is performed intraorally, placing the tip of the little finger inside the patient's mouth at the moment when he/she opens his/her mouth and moves the lower jaw to the side of the muscle being tested. It is recommended that a patient simultaneously moves the lower jaw upward while a therapist is palpating the region behind the tuber of the upper jaw. The points obtained by extraoral palpation of the muscles on both the left and the right side were

summed and the sum obtained is referred to as extraoral palpation (EP), whereas the sum of the points obtained by intraoral palpation is referred to as intraoral palpation (IP). Palpation of the neck muscles included *m. sternocleidomastoideus* and *m. trapezis*. The points were summed and referred to as the palpation of the neck muscles (PNM).

Palpation of the TMJ capsule included palpation of the upper, side and rear part of the capsule. Points obtained by palpation were summed and referred to as the TMJ capsule palpation (TMJCP).

Craniomandibular index has been obtained by means of dysfunction index (DI) [$DI = (+MM + TMJS + TMJCP) / 26$] and palpation index (PI) [$PI = (EP + IP + PNM) / 36$] by means of summing the obtained values of these indexes and dividing the sum by 2 [$CMI = (DI + PI) / 2$]. Craniomandibular index is a numerically expressed degree of disease providing a clear insight into the orofacial system condition. Normal values of this index range from 0 to 1.

The results of the Friction-Shiffman clinical functional analysis conducted in 15 out of 200 patients indicated that signs and symptoms attributed to CMD were registered accordingly, *ie* CMI in these patients was greater than 0. These

preceded by preliminary upper and lower jaw impression, model casting and their preparation (filling undercuts). The trays are made of autopolymerizing acrylic resins (Simgal).

A top tray covered the palatum, anterior cingulum and palatal surfaces of posterior teeth all the way to the equator, completing the palatal aspect of interdental space, which ensured its retention and stability during the registration process. The upper tray had an embedded casing placed in a position that is perpendicular to the occlusal plane. In addition, the casing was secured at the intersection points of the sagittal midline and the line connecting the mesial surface of maxillary first molars (Figure 1). A bottom tray covered the lingual part of the alveolar bone of the lower jaw, the lingual surface of lower front teeth, up to 1 mm, below the incisal edge, and the lingual cusps of lower side teeth. The lower acrylic tray was fixed to a metal plate parallel to the occlusal plane of the lower jaw (Figure 1). A layer of wax in color was applied onto the metal plate in order to make the tracing visible, whereas the threaded pin range was set up to provide teeth disocclusion of at least 2 mm.

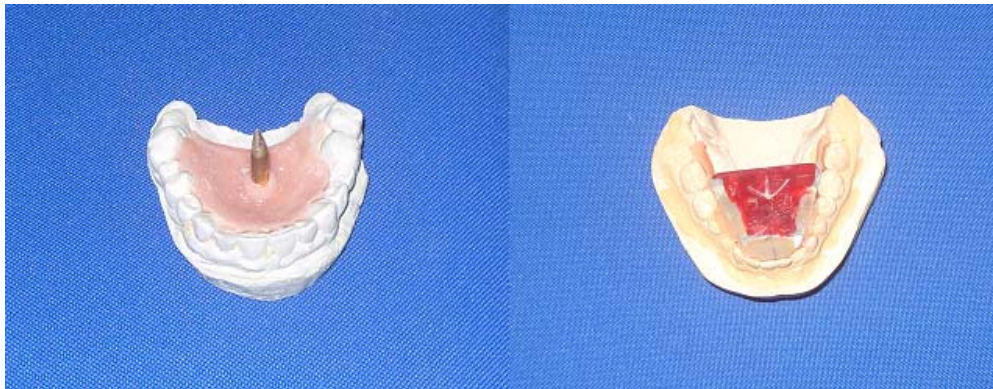


Fig. 1 – System for registration of the gothic arch

patients were not subjected to orthodontic and prosthetic treatment. They were assorted into the experimental group during further investigation. The control group was formed out of 15 patients who had no signs and symptoms of craniomandibular dysfunction. These patients had their dental arches preserved, stable intercuspal position and were not treated orthodontically.

The second phase of this study included registration of mandibular movements in horizontal plane by means of an intraoral method, applied to the patients assorted into the experimental and control group (Gothic Arch Method). Registration system we used implies a tracer consisting of a treaded pin and a flat metal contact plate fixed to individually crafted acrylic trays. The tracer consists of a metal casing and a screw with threads bolted to the casing. Top screw is conical with a slightly rounded tip enabling tracing on a metal plate upon mandibular movements. Owing to the threads, the threaded pin length can be controlled and adjusted, and therefore regulate the level of teeth disocclusion. The shape of the contact plate is trapezoidal, 32 mm wide. Production of acrylic trays was

The very registration process implied placing acrylic trays in their deposits in the mouth and bringing the lower jaw to the position of central relation by means of a bi-manual manipulation according to Dowson⁵. This method involves semi-lying position of patients with the head tilted back in order to prevent the mechanical protrusion of the lower jaw on manipulation. The therapist places his left and right hand fingers on the lower edge of the mandible, placing the thumbs on the chin of a patient. By means of light manipulation, the therapist moves the mandible up and down until it begins to rotate freely, and then he directs it downwards, backwards and upwards for the condyles to reach the highest position in the articulator fossae.

When the lower jaw gets into the central relation position, the threaded pin tip touches the contact plate enabling teeth disocclusion by its height (Figure 2). Then, a subject is required to advance the lower jaw forward as far as possible, and then backwards likewise. The movements are repeated several times. Upon registration of propulsion movements, the registration of lateral move-

ments is performed in exactly the same way. Namely, the subject advanced the lower jaw from the initial rest position moving it up as far as possible to one side and back, and then to the other side and back to the central relation position.



Fig. 2 – Gothic arch registration procedure

Analysis of the obtained results was carried out within a coordinate system (composed on a sheet of graph paper), which is defined by means of four reference points. The first point was located behind the contact point of the lower central incisors. The second point was located at the centerline of the angle, formed by the left and the right tracing arms. The third and the fourth points, at the endpoints of the record arms, were obtained by means of drawing a line on the left and the right side accordingly, right-angled to the respective vertical reference axis passing through the left, *ie* the right endpoint of the gothic arch tracing arms (Figure 3).

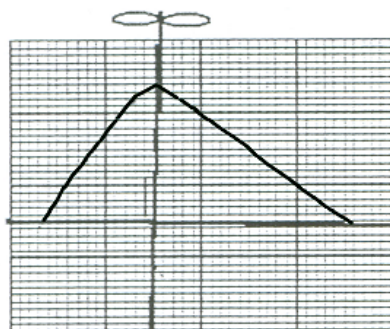


Fig. 3 – Formed coordinate system for measuring parameters of gothic arch

The parameters that were measured and subsequently compared among the subjects within the experimental and control groups imply: length of gothic arch tracing arms and average protrusive tracking length, total length of tracing record arms (lateral movement amplitudes), the difference in the length of record arms (laterolateral asymmetry), the angle formed by the left and the right arm of lateral movement records (gothic arch), discrepancy in the gothic arch apex in relation to the vertical reference coordinate system axis (laterolateral dislocation of the gothic arch apex) (Figure 4).

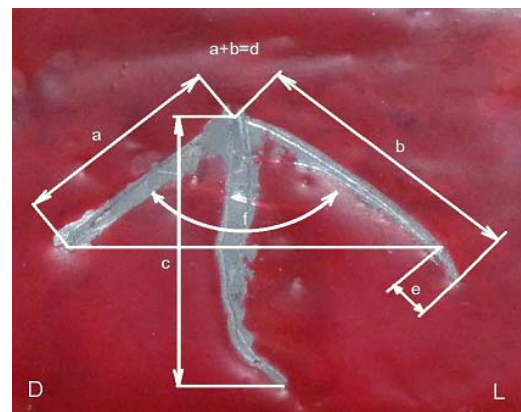
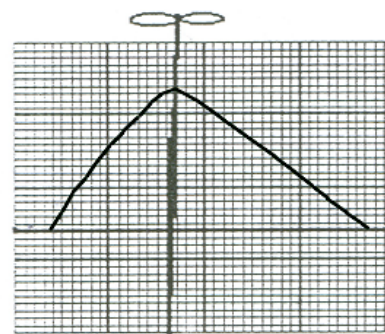


Fig. 4 – Gothic arch record parameters
 a – record length of the right lateral movement; b – record length of the left lateral movement;
 c – record length of the protrusion movement; a+b = d – lateral movement amplitude;
 e – laterolateral asymmetry; f – angle of the gothic arch record

Results

During this study, 200 subjects underwent the Friction-Shiffman clinical function analysis, with the results indicating dysfunctional disorders registered in 15 subjects, *ie* 7.5% of the treated population. The subjects with dysfunctional changes had their CMI determined, where the lowest index value was 0.04 and the highest 0.360. The average value of CMI in the patients was 0.177 ± 0.106 . Out of 15 subjects with signs and symptoms attributed to CMD, 9 subjects were female (60%) whereas the number of male subjects was 6 (40%). Average age of the experimental group subjects was 22.4 ± 6.8 years, whereas that of the control group ones implied 25.7 ± 4.0 years.



The functional analysis conducted thereby helped us collect and systematize the signs and symptoms of craniomandibular dysfunction in the examined patients. It was determined that symptoms of acoustic signals during mandibular movement, mandibular deflection to the affected side on mouth opening and muscle tenderness to palpation were the most common ones (Table 1).

The first characteristic of the gothic arch record examined referred to the records of the right and left lateral movements, registered in the groups of subjects undergoing

Table 1
Distribution of signs and symptoms of craniomandibular disorders (CMD)
in subjects of the experimental group (EG)

Symptoms and signs of CMD	EG	
	n	%
Limited mouth opening	6	40
Muscle sensitivity on palpation	10	66.6
Deviation of lower jaw during opening mouth	10	66.6
Joint sound	12	80
Skipping during opening mouth	1	6.6
Opening the mouth outside normal limits	2	13.3
Clinically apparent dislocation of condyle	1	6.6

* $p \leq 0.05$ (Student's *t*-test)

the trial. The obtained length values within right and left lateral movement records were analyzed and statistically compared (Table 2).

Using *t*-test for the purpose of making a comparison between the average length values within the right lateral movement record in the subjects of the studied groups ($t = -7.876$, $p = 0.001$) and the left lateral movements in the subjects of the studied groups ($t = -3.276$, $p = 0.003$), we found a statistically significant difference between the compared values. This would mean that the length values within right and left lateral movement records were significantly higher in the control group than they were in the experimental group.

Comparison of average length values of the protrusive records, obtained in the experimental and control group subjects ($t = -3.809$, $p = 0.001$) showed a statistically significant difference, *ie* average value of this parameter was significantly higher in the control group subjects (Table 3).

The total length of left and right lateral movement records represents the amplitude of laterolateral movements. Statistical analysis showed that there were significant differences in mean amplitude between the experimental and control group subjects ($t = -7.656$, $p = 0.00$), *ie* that the aver-

age length of laterolateral movements increased in the control group. The difference in the left and right lateral movement records of the experimental and control groups was represented by the lateral asymmetry. Statistical analysis showed that there was a significant difference in mean lateral asymmetry between the experimental and control groups ($t = 4.48$, $p = 0.001$). This shows that the average value of this parameter increased in the experimental group compared to the control group (Table 4).

The angle formed by the left and right laterotrusion movement records is known as the gothic arch. Statistical analysis showed significant difference in the size of the angle between the groups ($t = -2.160$, $p = 0.04$), *ie* the average value of the gothic arch in the control group was higher than the average value in the experimental group (Table 5).

Lateral dislocation of the gothic arch record apex was registered only in the experimental group, as left or right dislocation. Dislocation was measured in relation to vertical reference axis of the coordinate system. The average value of laterolateral dislocation of the apex record was 0.22 ± 0.13 mm (range : 0.05–0.5 mm).

Table 2
Record of the lateral movements in subjects examined

Subjects	Lateral movement (mm), $\bar{x} \pm SD$ (min–max)	
	right	left
Experimental group (n = 15)	8.27 ± 1.03 (7–10)	8.16 ± 2.8 (5–13)
Control group (n = 15)	$11.4 \pm 1.19^*$ (10–14)	$10.66 \pm 1.23^*$ (9–13)

* $p \leq 0.05$ (Student's *t*-test)

Table 3
Record of the protrusion movements in subjects examined

Subjects	Lateral movement (mm) $\bar{x} \pm SD$ (min–max)
Experimental group (n = 15)	8.93 ± 1.58 (7–12)
Control group (n = 15)	$11.06 \pm 1.49^*$ (8–14)

* $p \leq 0.05$ (Student's *t*-test)

Table 4
Lateral movement amplitudes (LLAm) and laterolateral asymmetry (LLAs)
in subjects examined

Subjects	LLAm (mm)	LLAs (mm)
	$\bar{x} \pm SD$ (min–max)	$\bar{x} \pm SD$ (min–max)
Experimental group (n = 15)	15.8 ± 2.65 (12–21)	2.8 ± 1.32 (0–4)
Control group (n = 15)	$22.2 \pm 1.86^*$ (19–25)	$1.07 \pm 0.7^*$ (0–2)

* $p \leq 0.05$ (Student's *t*-test)

Table 5
Gothic arch in subjects examined

Subjects	Gothic arch (°)
	$\bar{x} \pm SD$ (min-max)
Experimental group (n = 15)	10.6 ± 9.61 (91-125)
Control group (n = 15)	116.7 ± 15.4* (94-142)

* $p \leq 0.05$ (Student's *t*-test)

Table 6
Correlation between craniomandibular index (CMI) and parameters of the gothic arch record

CMI	LL asymetry	LL amplitude	Apex dyslocation
Value of correlation test	$r = -0.236$	$r = -0.586$	$r = -0.907$
Statistical significance (<i>p</i>)	> 0.05	< 0.05	< 0.05

LL – latero-lateral

Craniomandibular index is a numerically expressed degree of the orofacial system disease. By means of the Pearson correlation analysis we tried to determine how changes in the Gothic arch record traces within experimental group affect the value of the CMI and *vice versa*, how changing the value of CMI affects the values of the gothic arch record parameters. Values of certain parameters of the gothic arch record were tested in relation to the CMI value (Table 6).

It was determined that there was a correlation between the laterolateral amplitude and the CMI ($r = -0.586$, $p = 0.022$) indicating that the decline in value of laterolateral amplitude increases the value of CMI which is shown graphically (Figure 5).

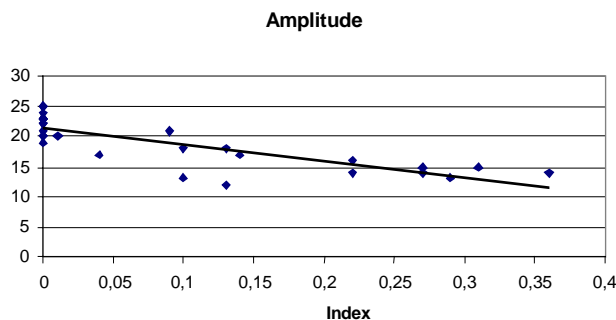


Fig. 5 – Correlation of lateral movement amplitude and craniomandibular index

It was also determined that there is a correlation between the CMI and the laterolateral dislocation of the gothic arch apex ($r = -0.907$, $p = 0.00$) indicating that the increase in the value of CMI increases the gothic arch apex dislocation (Figure 6).

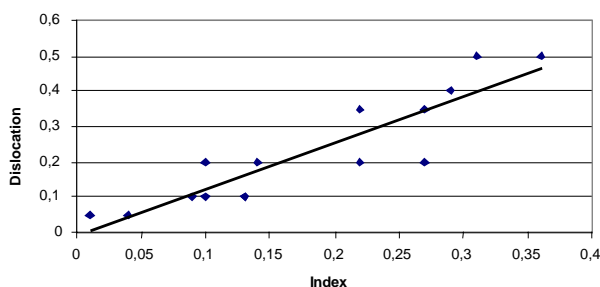


Fig. 6 – Correlation of apex records dislocation and craniomandibular index

Discussion

Craniomandibular dysfunctions stand for disturbances in the function of the orofacial system, multicausal etiology, acute and chronic pathogenesis. One of the persistent problems associated with this type of disorder is certainly its frequency. Our research revealed that dysfunctional disorders occurred in 7.5% of the population screened thereby. List et al.¹² found an identical incidence of CMD in one region of Sweden, whereas Schmitter et al.¹³ identified the frequency of 9.93% in the territory of Germany. The study by Dodić et al.¹⁴ indicates that, in the territory of Serbia, the frequency of CMD amounts to 15%. Reports of foreign studies are multifarious. Some studies suggest low prevalence of this disorder (5%)^{6-8, 11}, unlike the others that point to its extremely high frequency (50%)^{9, 10}.

Such contradictory data arising from a number of analogue studies can be explained by differences in the number of subjects covered by the study, different methods used for data collection, for evaluation of individual symptoms and the very characteristics of the screened population (socio-economic status, age and gender of the subjects involved).

The ratio in terms of gender in the patient group was 2.5 : 1 in favor of women. Similar epidemiological studies reported that this disease is more frequent in women than in men^{1, 6, 15, 16}. The mechanisms underlying sex differences in prevalence of craniomandibular dysfunctions are still unclear and likely to include physiological and psychosocial factors. Gender differences in the occurrence of muscle tenderness, as the dominant symptom of craniomandibular dysfunctions, can be partially explained by the impact of the female sex hormone estrogen which appears to alter the excitability on afferent fibers and sensory trigeminal neurons, which changes their excitation in conditions of harmful tissue stimulation^{17, 18}.

Clinical functional analysis showed that the most common symptoms of dysfunctional disorders imply: TMJS, palpable muscle tenderness and mandibular deformation on mouth opening. Gesch et al.¹⁰ and Dodić et al.¹⁴ also find a wide representation of these symptoms in patients with craniomandibular dysfunctions, while Cooper and Kleinberg¹⁹ assign headache to the dominant symptom class as well.

Changes in the gothic arch records in patients in relation to the same records in healthy subjects tend to be con-

firmed by differences in the values of some of its parameters. Data analysis showed a significant difference in the length values of the right and left lateral movement records between the experimental and control groups, *ie* the average value of this parameter was significantly higher in the control group. Similar results have been presented by other authors as well²⁰⁻²². These findings may be supported and explained by a condyle-disc joint complex derangement and muscle function disorder. Uncoordinated activity between condyle and *discus articularis* does not lead to serious mechanical obstructions in the joint, especially when it comes to *discus articularis anterior* dislocation with reduction. However, inadequate position of condyles in bilaminar zone of *discus articularis* causes pain and discomfort, which consequently can lead to muscle spasms, which inevitably leads to the reduction in the range of lateral movements. Besides, the inadequate function of condyle-disc complex may appear due to *discus articularis* dislocation without reduction, when lateral movement is limited due to a blockade in translational movement of the joint.

Dodić et al.²³, Nielsen et al.²⁴, Obrez and Stobler²⁵ point out that the difference in the length of lateral movements in subjects with and without dysfunctional disorder amounts to 3–5 mm on average.

Statistical analysis demonstrated a significant difference in the length values of protrusion movement records between experimental and control groups, with the average value amounting to 2 mm. Analogous studies conducted by various authors report similar results^{23, 25}. Nielsen et al.²⁴ do not come up with a statistically significant difference in the length values of protrusion movement records between subjects with and those without dysfunctions. He points out that “only subjects with muscle pain can demonstrate asymmetric laterotrusion with a protrusion projecting normal pathway”.

Laterolateral amplitude is also one of the characteristics of the gothic arch tracing record that may indicate the presence of dysfunctional disorders. Processing analysis data showed significant differences in mean amplitude of lateral movements between experimental and control group subjects, *ie* it was significantly higher in healthy subjects²⁶. Comparative analysis of average values of laterolateral asymmetry between the groups is statistically significant,

ie it indicates that the average value of this parameter increased in the experimental group compared to the control group. Okeson²⁷ and Peters and Gross²⁸ point out that the average value of the difference in the length of left and right lateral movement records in healthy subjects is less than 2 mm and also, that higher laterolateral asymmetry indicates the presence of dysfunctional disorders. The angle formed by the left and the right lateral movement records is called the ‘gothic arch’. By means of the statistical analysis we found that there were significant differences in the values of the gothic arch registered in the experimental and control groups, and that the average value of this parameter is significantly higher in healthy subjects.

Correlation analysis indicated that the parameters of apex dislocation and lateral amplitude change synchronously with alterations in values of CMI. Specifically, the analysis showed that increase in apex dislocation causes increase in the value of the CMI and *vice versa*. Statistical association points out to the fact that the decline in the value of lateral amplitude is followed by an increase in the value of CMI.

Conclusion

The application of Friction-Shiffman clinical functional analysis leads into the conclusion that the frequency of craniomandibular function incidence in the territory of the northern part of Kosovska Mitrovica amounts to 7.5%, and that a mild degree disorders have been registered accordingly.

The gothic arch record in patients showed a significant change in its parameters in comparison with the one registered in healthy subjects.

The degree of these changes in the Gothic arch records depends on the degree of dysfunctional disorder, *ie* CMI values. This indicates that these two stand for two mutually different methods of similar sensitivity in terms of identification of dysfunctional disorders, and that a combined approach can be used in the diagnostic protocol of this type of disorder. Therefore, the functional analysis of the orofacial system and the instrumental analysis of the mandibular movement (Gothic Arch Method) can be recommended as accurate and simple methods in craniomandibular disorder diagnosis.

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