

Fizjoterapeutyczna ocena czynności stawów skroniowo-żuchwowych wśród studentów Gdańskiego Uniwersytetu Medycznego

The physiotherapeutic estimation of the act of temporal-mandibular joints among students of Medical University of Gdańsk

**Maciej Krzyzanowski^(A,B,C,D,E,F,G), Rita Hansdorfer-Korzon^(E,F,G),
Elżbieta Rajkowska-Labon^(A,D,E,F)**

Zakład Fizjoterapii Gdańskiego Uniwersytetu Medycznego, Polska

Streszczenie:

Cel pracy. 1. Ocena czynności stawów skroniowo-żuchwowych wykazujących cechy dysfunkcji u studentów Gdańskiego Uniwersytetu Medycznego. 2. Analiza ilościowa występujących zaburzeń w stawach skroniowo-żuchwowych. 3. Wykazanie korelacji pomiędzy badanymi parametrami a analizowanymi dysfunkcjami w stawach skroniowo-żuchwowych

Materiał i metoda badań. Do badania zakwalifikowano 40 studentów w wieku 19 do 27 lat (21 kobiet oraz 19 mężczyzn) ze średnią wieku 23 lata. Zastosowano dobór nieprobabilistyczny. Na potrzeby pracy skonstruowano kartę badania pacjenta. Ocenie podlegały m.in. takie parametry jak: zakres ruchomości żuchwy, wskaźnik dyskinetyczny Rozencwaiga, ruch głowy stawowej podczas odwodzenia żuchwy, objaw akustyczny, wskaźnik bólu, obecność punktów spustowych, zakres ruchomości odcinka szyjnego kręgosłupa. Uzyskane wyniki poddano analizie statystycznej z użyciem programu Statistica 10.

Wyniki. Analiza badanych parametrów wykazała, że zaburzenia zakresu ruchomości, przynajmniej w jednym kierunku ruchu, występują wśród 87,5% (n=35) badanych. Wskaźnik dyskinetyczny Rozencwaiga potwierdził się u 37,5% (n=15). Asymetryczny ruch głów stawowych miał miejsce wśród 67,5% (n=27) badanych, a zaburzenia toru prowadzenia żuchwy oraz obecność objawu akustycznego wykazano u 80% (n=32) z 40 przebadanych osób. Pośród 57,5% (n=23) badanych stwierdzono obecność punktów spustowych w obrębie m. żwacza i m. skroniowego lub w jednym z nich. Dysfunkcja stawów s-ż koreluje m.in. z ograniczeniem zakresu ruchu w odcinku szyjnym, z objawami akustycznymi, obecnością parafunkcji.

Wnioski. Wśród studentów zaobserwowano znaczący procent występowania objawów dysfunkcji stawu s-ż. Zwrócono uwagę na wysoki odsetek osób uprawiających parafunkcje. Wykazano korelacje statystycznie istotne dla funkcji stawów s-ż.

Słowa kluczowe:

Staw skroniowo-żuchwowy, dysfunkcja, fizjoterapia

Abstract

Aim of the study. 1. Evaluating the activity of temporomandibular joints manifesting features of dysfunction in students of the Medical University Gdańsk, 2. Quantitative analysis of the disorders occurring in temporomandibular joints. 3. Proving the correlation between the investigated parameters and the analysed dysfunctions in temporomandibular joints

The materials and research method. For the examination, 40 students in the age of 19 to 27 years (21 women and 19 men) were classified, representing the average age of 23 years. For the needs of this study, a card of patient examination had been constructed. The evaluation covered, among others, such parameters as: the mobility range of the jaw, the Rozencwaig's dyskinesia index, the movement of the joint head during the jaw abduction, acoustic symptom, pain index, the presence of trigger points, the cervical spine mobility range. The obtained results were subjected to statistical analysis with the application of Statistica 10 software.

Results. Analysis of the investigated parameters revealed that dysfunctions of mobility range, at least in one direction, occur in 87,5% (n=35) of the examined persons. The Rozencwaig's dyskinesia index was proven in 37,5% (n=15). Asymmetric movement of the joints heads occurred in 67,5% (n=27) of the examined persons; and the disorders of the jaw guiding track and the presence of the acoustic symptom were revealed in 80% (n=32) out of the total 40 of the examined persons. Among 57,5% (n=23) of the examined, the presence of trigger points was revealed within the masseter and the temporalis muscles, or in one of them. Dysfunction of the temporomandibular joints correlates, among others, with a reduction of the mobility range in the cervical spine, with acoustic symptoms and presence of parafunctions.

Conclusions. A significant percentage of the temporomandibular joints dysfunctions was observed among students. Attention was attracted by the high percentage of people performing parafunctions. Correlations statistically significant for the temporomandibular joints were proven.

Key words:

temporomandibular joint, dysfunction, physiotherapy

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Introduction

In recent years, the knowledge about the human locomotor (musculoskeletal) system has experienced a significant development. Studies carried out by the researchers have contributed to the understanding of how important interdisciplinary analysis of its dysfunctions is. Also the disorders within the temporomandibular joint started to be perceived not only through the lens of its direct structures. More and more frequently it has been indicated that its correct functioning is influenced by disorders existing in distant areas of the body as well as by emotional conditions. The researchers point to the relationship occurring between the masticatory apparatus and the disorders within the individual segments of the spine, the pelvis or incorrect posture of the body [1]. In the specialist literature, a multi-factor etiology of the masticatory apparatus dysfunctions is emphasised. Thus, a cooperation of specialists from various fields of medicine, psychology and even biomechanics, kinesiology, physiology or physiotherapy seems necessary. The knowledge on relationships impacting the masticatory apparatus will allow for proper identification of the problem, and, in consequence, will facilitate choosing and executing the right treatment. From the statistical studies, it steams that more and more patients register in the outpatient clinics with complaints regarding dysfunctions of the masticatory system. The published studies state that symptoms of the masticatory apparatus dysfunctions appear in 60-80% of young people [2]. The necessity of implementing detailed diagnostics of this group of patients is confirmed by the fact that single symptoms of these disorders (e.g. the presence of jaw deviation, teeth wear) may turn into a painless set of symptoms (e.g. the presence of acoustic symptoms), and this, in due course in the future, into a painful form [3]. More and more frequently physiotherapists face the challenge of bringing help to patients with masticatory apparatus dysfunctions. Dentists are aware of the necessity of performing appropriate therapy and diagnostic tests covering not only the temporomandibular joint but also the spine and other elements of the musculoskeletal system which are in functional dependency with it. Using the physiotherapeutic skills, knowledge and tools in examining the temporomandibular joint confirms the importance of this part of diagnostics.

Material and methods

A group of 40 students was included in the study, aged 19 to 27 years (21 women and 19 men) with pain complaints and dysfunctions of the temporomandibular joint. The average age was 23 years. All participants expressed their consent to this examination. The students were chosen for the examination by using the non-probability sampling method. The examiner personally evaluated and selected the group which, in his/her opinion, met the criteria of the assumed research hypothesis. The following criteria of excluding from the study were assumed: congenital lesions within the temporomandibular joint, cleft palate, deformations of the facial skeleton, undergone injuries within the masticatory apparatus, rheumatic lesions, pregnancy, lack of dentist's intervention for the last 15 days, patient in the course of stomatological treatment.

The examinations were carried out by the same physiotherapist. The data were collected with a ruler with a millimetre scale, “tailor’s” measuring tape, aseptic gauze swab and visual evaluation [4,5,6]. The interview included questions related to: the location of pain and its grade acc. to VAS scale, factors intensifying the symptoms, when the pain started, pain radiation, presence of occlusal and non-occlusal parafunctions, occurring headaches, the frequency of experienced episodes of the joint dislocation and blocking, the presence of bruxism and an undergone orthodontic treatment. The results of the physical examination and interview were transferred to the examination card, developed on the basis of sources provided by specialist literature. The physical examination included the examination of mandibular range of motion, calculation of the Rozencwaig’s dyskinesia index enabling the specification of the predispositions facilitating the development of pain disorders in the masticatory apparatus, palpation evaluation of the joint head movements during the mandible abduction, visual evaluation of the mandible movement track during abduction and adduction, protrusion and retrusion movements; evaluation of the acoustic symptom occurrence during abduction, adduction and the jaw lateral movements; evaluation of pain occurrence during jaw active movements; palpation of the joint and the adjacent muscles: temporal, masseter, and sternocleidomastoid muscles. A compression test of the joint and a test of forced biting with use of gauze swab were performed. The auxiliary examinations performed taken in consideration the evaluation of spine movements range with the use of a “tailor’s” measuring tape.

The statistical study was based on non-parametric tests, related to the qualitative and ordinal variables, by adjusting the analysis to the goals set in this research study. For the needs of the statistical study, the level of significance $p = 0.05$ was assumed. Correlations and results of tests included in the study were considered statistically significant when their value p did not exceed the specified threshold $p < 0.05$. In case when $0.05 < p < 0.1$, the results “at the level of statistical tendency” were allowed. They have a lesser interpretative power, however they point to certain relationships and show the trends of changes. For the evaluation of the significance of differences between the groups of women and men, the Mann-Whitney U test was applied (non-parametric test for independent variables). For finding the statistically significant correlations of quantitative variable factors, the Chi2 test and its corrections were used: Fisher’s exact test, Chi2 with Yates’ correction depending on the number of observations and cells of contingency tables. In order to establish the dependency strength, Cramér’s V measure or Pearson’s correlation coefficient were used. As a rule for describing the results, a presentation of the test statistic value and the significance level responding to the type I error for this hypothesis were accepted. For performing the statistical analyses, software Statistica 10 was applied.

Results

On the basis of the performed research, it has been established that the disorders in the mobility range, in at least one direction, occur in 87.5% (n=35) of the examined persons. The Rozenecwaig's dyskinesia index calculated on this basis, being the ration of the mandible abduction range (mouth opening) to the sum of the protrusion movement of the mandible and its lateral movements, showed that 37.5% (n=15) of the examined have a certain degree of temporomandibular joint dyskinesia deviating from the norm. Asymmetric movement of the joint heads occurred in 67.5% (n=27) of the examined, and disorders of the mandibular movement track and the presence of the acoustic symptom were found in 80% (n=32) students. In 57.5% (n=23) of the examined, the presence of trigger points was found within the masseter and temporal muscles or in one of them. With the help of questions addressed to the examined, it was found that such activity as chewing, to the highest extent, intensifies pain symptoms. Juxtaposition of these results is presented in table No. 1.

Table 1. Percentage juxtaposition of the number of persons in whom the individual factors intensifying the pain symptoms within the masticatory apparatus occurred

Factors contributing the pain symptoms					
Chewing	Yawning	Stress	Low air temperature	Orthodontic treatment	Clenching teeth
(27.5%)	(7.5%)	(15%)	(7.5%)	(7.5%)	(7.5%)
n=11	n=3	n=6	n=3	n=3	n=3

74% (n=17) of the examined persons in whom the occurrence of pain symptoms was found reported that the first symptoms had appeared more than one year before, which may suggest chronicity of the occurring problem. Pain at palpation of the temporomandibular joint was reported by 22.5% (n=9) of the persons. A detailed interview performed among the students allowed for the statement that part of them have experienced the symptoms characteristic for the dysfunctions of individual chewing muscles. 65% (n=26) indicates the temporal muscle, and 50 % (n=20) the masseter muscle. A positive result of the compression test was found in 3 persons, and a positive outcome of forced biting test in 4 persons. 30% (n=12) of the examined reported experienced episode of blocking the temporomandibular joint in jaw adduction without the necessity of medical intervention. Below, the juxtaposition of pathological habits regarding the masticatory apparatus movements, so called parafunctions (occlusal and non-occlusal), is presented [Fig.1].

In the study, also the correlations occurring between the investigated parameters were examined, which are presented below:

1. Disorder of the jaw protrusion (forward) movement (range limitation or a range exceeding normal values) correlates with the range disorders (range limitation or a range exceeding normal values) of

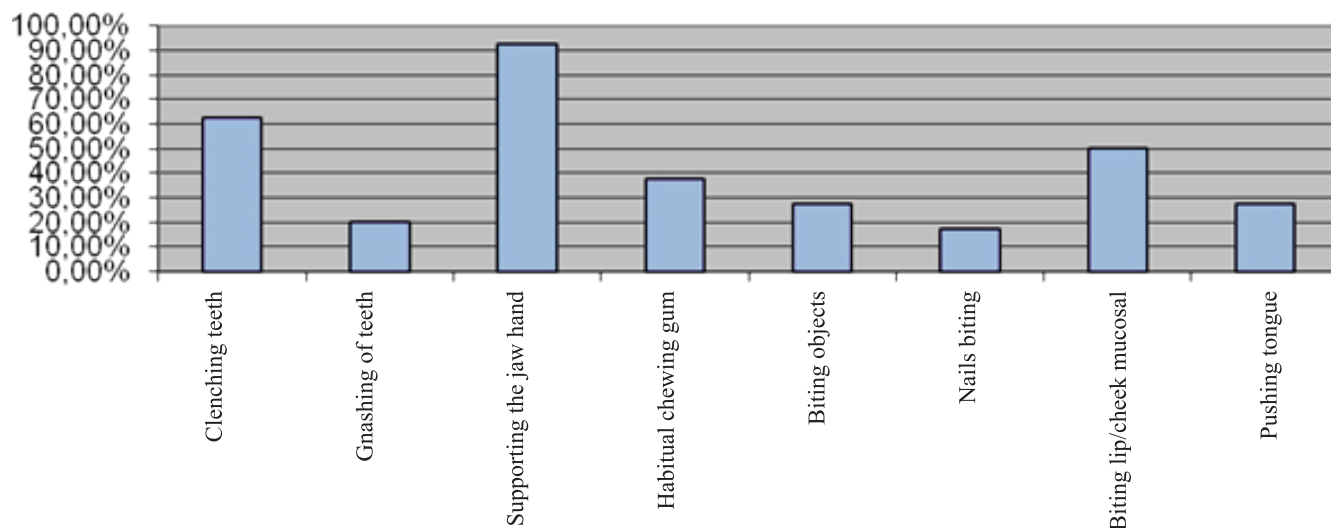


Fig. 1. Percentage juxtaposition of the occurrence of occlusal and non-occlusal parafunctions among the respondents

the head bending to the left. The correlation is statistically significant – results of the Fisher's exact test $p=0.00271$, the strength of dependency is significant $R=0.45$. The direction of dependency is positive.

2. The range of protrusion (forward) movement exceeding the normal value correlates with the occurrence of acoustic symptom during the mandible lateral movement to the right. The correlation is statistically significant – results of the Fisher's exact test $p=0.2940$, the strength of dependency is significant $R=0.37$. The direction of dependency is positive.

3. The left-side advance of the joint head during mouth opening correlates with the presence of acoustic symptoms in both temporomandibular joints during the mouth closing movement. The correlation is statistically significant – results of Yates Chi² test $\chi^2=5.17$, $df=1$, $p=0.02279$, the strength of dependency is significant $R=0.38$. The direction of dependency is positive.

4. The disorders of the joint head movements correlate with the presence of trigger points of the left masseter muscle. The correlation is statistically significant – results of Yates Chi² test $\chi^2=6.18$, $df=1$, $p=0.01298$, the strength of dependency is significant $R=0.41$. The direction of dependency is positive.

5. The presence of the occlusive parafunction in the form of clenching correlates with the disorders of the joint head movements. The correlation is statistically significant – results of the Fisher's exact test $p=0.00587$, the strength of dependency is significant $R=0.42$. The direction of dependency is positive.

6. A left-side deviation of the mandible during mouth closing correlates with the limitation of head rotation to the left. The correlation is statistically significant – results of the Fisher's exact test $p=0.01272$, the strength of dependency is significant $R=0.41$. The direction of dependency is positive.

7. A right-side deviation of the mandible during the protruding movement correlates with the experienced episodes of temporomandibular joint blockage. The correlation is statistically significant –

results of Yates χ^2 test $\chi^2=5.35$, $df=1$, $p=0.02069$, the strength of dependency is significant $R=0.41$. The direction of dependency is positive.

8. The disorder of the mandible track during mouth closing correlates with the presence of parafunctions (biting the lips/buccal mucosa). The correlation is statistically significant – results of Pearson's χ^2 test $\chi^2=4.92$, $df=1$, $p=0.02667$, the strength of dependency is significant $R=0.35$. The direction of dependency is positive.

Discussion

The disorders of the mobility range within the temporomandibular joint occurring in young persons, and the correlations related to them (correlation 1 and 2) confirm the fact that this age group requires individual approach in diagnostics and therapy. The measurements of the mobility range obtained in this study are comparable to the results of other researchers (Ćelić & co.), and the observed dependencies correspond to the results of Japanese researchers [7,8]. The authors of this paper, like authors of other reports, after taking the measurements with a ruler with a millimetre scale, assert the practicability of this method of measurement. In spite of young age, lack of structural changes in X-ray image, and pain, some singular symptoms, e.g. incorrect range of the joint movement, may lead in the future to the development of pain symptoms. [9]. The research performed by authors of this paper is convergent with other reports turning attention to the significance of adduction movement (mouth opening). Rozenca-wig proposed a formula specifying the predispositions for development of dysfunctions in the temporomandibular joint. [9,10]. Index computation makes a quick method of determining the degree of evolution in this joint. In the literature, though, there is no data comparing the results of investigations in this field. Symmetry of the moves mandible and the joints heads is one of the key elements evaluated in diagnosing the temporomandibular joint function. Its disorders may result from the incorrect mobility of the jaw, degenerative changes within the articular disc and numerous other causes. The examination of students at the aged 20-25 years performed by Sójka and Hędz-lek indicated the mandible deviation during the protrusion movement in 70% of examined persons [11]. These results are comparable with the data obtained among the students of Medical University of Gdańsk. Results concerning the frequency of the acoustic symptom occurrence are shaped in similar way. Examinations of students of various nationalities proved the acoustic symptom occurrence in 23% of the examined, and in this number in 27% of Poles [12]. Vicker's research on a group of 30 young and elderly persons indicated the occurrence of the discussed problem in 68% of respondents. The presented results show a different, but significant, percentage of young people who have developed the acoustic symptom. The cause of the percentage differences may be the lack of stress or a different way of managing it and related to it parafunctions (pathological motor habits), which are the main cause of acoustic symptoms. According to Zienkiewicz and Lis, clicking during movements within the temporomandibular joint may appear both in a healthy

joint or in a joint affected by a disease process. On the other hand, though, does not testify that there are no disorders in the joint [13]. The correlations indicated in this paper (correlation 3 and 5) may suggest that parafunctions, by loading the joint asymmetrically lead to asymmetrical movement of the joint heads, and this may, in turn, lead to the development of an acoustic symptom. The presented dependencies require further research, though, with a larger number of participants. Authors of this study have noted that in 57.5% (23/40) of the examined persons manifested the presence of trigger points in the temporal and masseter muscles, or in one of them. The study of Prośba-Mackiewicz and co. shows the presence of painful and tense temporal muscles in 35.5% of the respondents, while the research carried out by Mehr and co. indicated tenderness of the masseter muscles in 69% of Polish students [2, 12]. The revealed correlations between the movement disorders of the joint head and the presence of trigger points in the masseter muscle suggest a significant participation of the muscular system in the appearing dysfunctions (Correlation 4). Dependences, in the form of structural, muscular disorders and the presence of a stressogenic factor, become a vicious circle, which poses a serious problem potentially leading to disorders. Questions which in detail specify the symptoms corresponding to the individual muscles had been prepared on the basis of the information provided by Kleinrok [3]. According to the authors, they may make a supplement of the examination card and make the interview easier. Chewing, as one of the fundamental activities, may intensify ailments within the temporomandibular joint. This is proven by the results of this study and by the test with the use of chewing gum, carried out by Karibe and co., and by Gavish and co. [14, 15, 16]. In a percentage analysis of the elements which intensify the symptoms in the temporomandibular joint, the role of a psychogenetic factor is emphasised. The additional presence of parafunctions, as a reaction to stress, intensifies overloading of the masseter muscles and reduces the capabilities of adaptation to stressful situations, provoking the symptoms of dysfunction [17]. $\frac{3}{4}$ of the participants reported chronicity of the existing problem. They observed the first symptoms in the first years of learning at high school or at college, which may be connected to stressful situations occurring in this period. Another, also important, element of the research is recognising the appearance of the inflammatory condition, which manifests with pain in the rest (idle) position of the joint, and also during palpation of its structures. Juxtaposing the results with the studies of Mehr (14% of Polish students – pain at palpation) and of Sójka (36% of the persons – pain at palpation) indicate a different, but significant percentage of persons in whom pain occurs. [11, 12]. This testifies about a potential hazard of developing a dysfunction in the masticatory apparatus in students. The results of supplementary test of the joint structures compression and the test of forced biting with the use of a gauze swab show that there could be a possible irritation of the periarthicular structures. A negative result of the forced-biting test and the joint-compression test should not testify about the lack of dysfunction in the masticatory apparatus, because in most of the

examined students the presence of other symptoms was found along the negative result of the compression and forced-biting tests. The test is merely a supplementation of the patient examination. Parafunctions, as pathological motor habits, intensify the symptoms and prevent the improvement of patient's condition. Their location is one of the most essential elements of the conducted interview. The frequency of their occurrence provided in the literature varies within the limits of 80-87% [9, 17, 18, 19]. Similar results were noted by authors of this study. The harmfulness of performing the pathological motor habits in the form parafunctions is proven by the observed correlations (Correlation 5 and 8). The appearing episodes of dislocations and partial dislocations of the temporomandibular joint are relatively frequent. They disturb the correct functioning of the masticatory apparatus. According to the specialist literature, these disturbances appear more frequently in women, which is also confirmed by this study [20]. Among the 6 examined students, a dependence was observed between the occurrence of joint-blockage episodes and the right-side deviation during the mandible protrusion (Correlation 7). Blockages result most often from the excessive mobility of the mandible heads. Disorders of the jaw movement track may develop as a result of intra-articular disorders or asymmetrical work of muscles. The coexistence of these symptoms was noted in only 6 persons, and, because of this, the presented dependence requires additional research on a larger group of people. The relationships between the masticatory apparatus and other regions of the body, referred to in this paper, prove the necessity of thorough investigation. Kenneth A. Olson and Saito & co. indicate the necessity of performing tests of the spine as crucial in the supplementary diagnostics of the temporomandibular joint [21, 22]. Another correlation (correlation 1 and 6) shows the complexity of the biokinematic chain, a part of which is the temporomandibular joint. Saito & co. explain the correlations by an adaptive mechanism of the distant areas of the body to the reduction of overloads and minimisation of local pain symptoms. Some of the studies mention the significance of posture for the function of the analysed area [14]. Incorrect functioning of temporomandibular joints may project to other components of the musculoskeletal system, and thus restoring its biokinematic norm is as important as for the functioning of other peripheral joints.

Conclusions

1. Among the students of the Medical University of Gdańsk a significant percentage of persons was found with symptoms suggesting a dysfunction of the temporomandibular joint, including: disorders of mobility range, asymmetrical track of jaw guiding in active movement, acoustic symptom, asymmetrical movement of the joint heads, trigger points in the masseter and the temporal muscle, symptoms of an inflammatory condition of the joint, experienced episodes of blocking the temporomandibular joint.
2. Among the examined students, a high frequency of performed parafunctions was found. Their presence may testify a stressogenic factor present in their everyday lives.

3. After examining a 40-people group, correlations were noted confirming the complexity of the analysed problem. In the evaluation of the masticatory apparatus, the importance of examining the cervical spine in diagnosing the temporomandibular joint dysfunction was indicated.

4. The patient's examination card, created for the needs of the study, and the use of simple tools provide a fast, cheap and efficient method of evaluating the masticatory apparatus dysfunction.

5. Among the examined students, a low awareness of their own symptoms within the masticatory apparatus was noted, together with poor knowledge on the possibilities of therapy and cooperation of a physiotherapist with a dentist.

6. The performed research require confirmation on a larger population of people affected with a dysfunction of the temporomandibular joints.

corresponding author



Maciej Krzyżanowski

ul. Bursztynowa 7, 80-342 Gdańsk,

Tel.: +48 661461803,

email: fizjoterapia.mkrzyzanowski@gmail.com

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