

The Influence of Malocclusion on the Speed of Mastication

*Vesna Jankulovska¹, Evdokija Jankulovska², Gabriela Kjurchieva-Chuchkova³, Lidija Kanurkova⁴, Vaska Antevska⁵, Velevska Milena⁶, Petar Jankulovski⁷, Elena Petrova⁸, Igor Petrov⁹, Iva Manevska¹⁰

^{1,3,4,8,10}Department of orthodontics, Faculty of dentistry, Skopje, Macedonia

²Department of prosthodontics, Faculty of dentistry, Skopje, Macedonia

⁵Department of physiology, Faculty of medicine, Skopje, Macedonia

⁹Department of neurology, Faculty of medicine, Skopje, Macedonia

^{1,6,7}Private Dental Practice JANKULOVSKI, Skopje, Macedonia

Corresponding Author: *Vesna Jankulovska

Abstract:*Aim:* To evaluate the influence of the malocclusion on the functional state of the masticatory system.

Material and method: The examinations were conducted at the Institute of Medical and Experimental Physiology, Faculty of Medicine in Skopje. The study included 60 respondents (classified). The masticatory efficiency is determined by examining the biopotentials of the masseter muscles of the subjects. The mechanical efficacy is determined by the number of chewing cycles and the time of mastication. Walnuts with a precise weight of 2.5 grams were used as a test-food. **Results:** Results from the control group show that male respondents have a lower chewing rate compared to female respondents, that is, female respondents chew food with a higher number of chewing strokes in one second. The automatic habitual chewing rate in general for all examinees from the control group (class I malocclusion) is 1.20 chewing strokes / second. In Class II / 1, the number of chewing strokes in a second was higher for male respondents, compared to female respondents, which was not the case with the respondents the control group. The automatic habitual chewing rate in general for all subjects in the group of malocclusion II / 1 is 1.30 chew.strokes / second. In Class II / 2, the number of chewing strokes in a second is greater for male respondents, compared with female respondents, just like in the Angle class II / 1, which is not the case with the subjects from the control group. The automated habitual chewing rate in general for all subjects in the group of malocclusion II / 2 is 1.27 chew.strokes / second. **Conclusions:** Studies have confirmed that the classification of Angle's malocclusions according to the morphological characteristics also shows differences in the function of the masticatory system. In other words, it is confirmed that there are significant differences in masticatory performance between classes I, II / 1 and II / 2

Keywords: mastication, electromasticatiography, masticatory muscles, mastication speed

Date of Submission: 09-05-2018

Date of acceptance: 26-05-2018

I. Introduction

Mastication is defined as an act of chewing food, representing the initial stage of digestion, when food is rubbed on small particles to facilitate swallowing.

Mastication is an active process performed by rhythmic contractions of the masticatory muscles (m. temporalis, m. masseter, m. pterygoideus medialis et lateralis) and mimic muscles (m. orbicularis oris, m. incisivus, m. quadratus labii superior, m. risorius, m. depressor anguli oris, m. depressor labii inferioris, m. mentalis, m. buccinator).

Mastication consists of rhythmic and well-controlled separations and mergers of the maxillary and mandibular teeth. Each opening and closing movement of the mandible represents a mock stroke.

A. da Silva Andrade et al. in their trials calculated the automatic habitual chewing rate, expressed as a proportion of the duration of mastication and the frequency of chewing strokes.

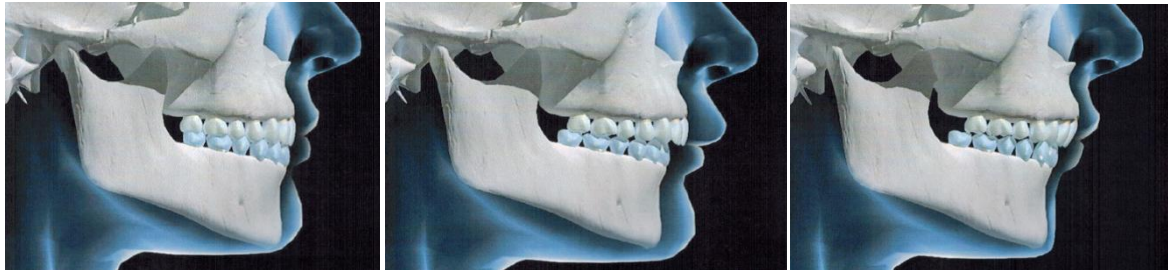
II. Aim Of Study

- To determine the masticatory efficacy by performing a specific mastication task in subjects with neutroocclusion and without any pathological changes to other components of the masticatory system (CONTROL GROUP). The average values from the test of the masticatory efficiency will represent the REFERENCE VALUES of the control group.
- To determine the masticatory effect in subjects with Angle Class II
- To determine the masticatory effect of individuals with grade 2 males class II

- To determine whether there are differences in the masticatory efficiency between the control group and the two examined groups (malocclusion class II /1 and malocclusion class II /2)

III. Materials And Methods

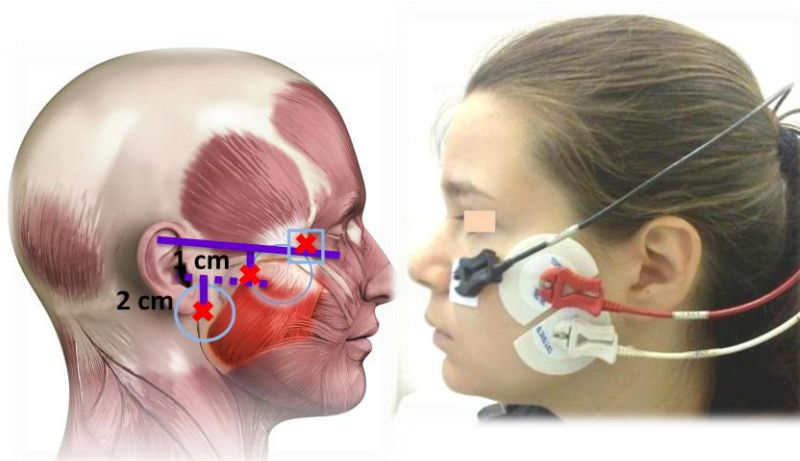
A total of 60 respondents were divided into 3 groups. The first group represents 20 subjects with natural dentition (excluding third molars) and preserved normal occlusion, and without pathological changes of other components of the mastication system (control group). The two remaining groups represent 40 respondents, ie 20 examinees with class II-1 malocclusion and 20 subjects with class II-2 malocclusion (Picture 1).



Picture 1

During the examination for determining the masticatory efficiency, the method ELECTROMYOGRAPHY was used (Picture 2).

It is a neurophysiological graphical method for registration of the bioelectric potentials of skeletal and smooth muscle. In this case, by using superficial bilateral electromyography, we registered the bioelectric potentials of the masticatory masseteric muscles. As a test food, we use a walnut with a specific weight (2.0 grams) because its consistency is of mean value (80-100 N).



Picture 2

The frequency of chewing cycles and the duration of mastication were also of interest to us for this study, because their relationship gives us the speed of mastication, also called automatic habitual chewing rate (according to A. da Silva Andrade, M. B. Duarte Gavião, G. Hauber Gameir and M. De Rossi).

IV. Results

Results from the control group show that male respondents have a lower chewing rate compared to female respondents, that is, female respondents chew food with a higher number of chewing strokes in one second (M: F = 1.16 chewing strokes / s < 1.22 chewing strokes / s). The automatic habitual chewing rate in general for all examinees from the control group (class I malocclusion) is 1.20 chewing strokes / second.

In Class II / 1, the number of chewing strokes in a second was higher for male respondents, compared to female respondents (1.36 chew.strokes/ s > 1.30 chew.strokes / s), which was not the case with the respondents the control group (1.16 chew.strokes / s < 1.22 chew.strokes / s). This shows that in this group of respondents the automatic habitual chewing rate is higher compared to the controls of the control group for both, male (1.36 chew.strokes / s > 1.16 chew.strokes / s) and female (1.30 chew.strokes / s > 1.23 chew.strokes / s).

The automatic habitual chewing rate in general for all subjects in the group of malocclusion II / 1 is 1.30 chew.strokes / second.

In Class II / 2, the number of chewing strokes in a second is greater for male respondents, compared with female respondents (1.31 chew.strokes / s > 1.24 chew.strokes / s), just like in the Angle class II / 1, which is not the case with the subjects from the control group. This shows that in this group of respondents the automatic habitual chewing rate is greater than the Angle class I for both, male subjects (1.31 chew.strokes / s > 1.16 chew.strokes / s) and female (1.24 chew.strokes / > 1.22 chew.strokes / s). The automated habitual chewing rate in general for all subjects in the group of malocclusion II / 2 is 1.27 chew.strokes / second (Table 1).

| Automatic Habitual Chewing Rate | | | |
|---------------------------------|----------------------|----------------------|----------------------|
| | Class I | Class II/1 | Class II/2 |
| males | 1.16 chew.strokes/s | 1.36 chew.strokes /s | 1.31 chew.strokes /s |
| females | 1.23 chew.strokes /s | 1.30 chew.strokes /s | 1.24 chew.strokes /s |
| generally | 1.20 chew.strokes /s | 1.30 chew.strokes /s | 1.27 chew.strokes /s |

Table 1

V. Conclusions

Tests have shown us that the automatic habitual chewing rate as a parameter has significant differences in all tests. This shows us that the speed of mastication varies considerably between genders and between classes of malocclusion.

If the respondents are not analyzed by gender, then the control group chews at the lowest speed (the smallest number of chewing strokes per second), and the II / 1 class chews at the highest speed (the highest number of chewing strokes per second). This means that the control group is chewing with the highest effectiveness, and its respondents need at least strokes to chew the test food, while the respondents with malocclusion II / 1 chew with the least effectiveness, and therefore they need more strokes in order to chew the test food.

Studies have confirmed that the classification of Angle's malocclusions according to the morphological characteristics also shows differences in the function of the masticatory system. In other words, it is confirmed that there are significant differences in masticatory performance between classes I, II / 1 and II / 2.

References

- [1]. Jankulovska E., "Chewing effect in subjects with natural dentition", Skopje, 1990
- [2]. Jankulovska E., "Anatomy and morphology of teeth and jaws", Skopje, 2001
- [3]. Jankulovska V., "Masticatory efficiency in subjects with class II division 1 and division 2", Skopje 2012
- [4]. Annicele da Silva Andrade, Maria Beatriz Duarte Gavião, Gustavo Hauber Gameiro, Moara De Rossi, Characteristics of masticatory muscles in children with unilateral posterior crossbite, Braz. oral res. vol.24 no.2, São Paulo, Apr./June 2010
- [5]. J. Li, T. Jiang, H. Feng, K. Wang, Z. Zhang, T. Ishikawa: The electromyographic activity of masseter and anterior temporalis during orofacial symptoms induced by experimental occlusal highspot, J Oral Rehab 36:79-87, 2008
- [6]. Posselt U. Physiology of occlusion and rehabilitation. Oxford:Blackwell, 1964:63.
- [7]. Peter H. Buschang. Masticatory Ability and Performance: The Effects of Mutilated and Maloccluded Dentitions, Texas A&M University System Health Science Center, Dallas, 2006
- [8]. Palomari ET, Vitti M, Tosello Dde O, Semprini M, Rodrigues AL. Electromyographic study of the masseter muscle in individuals with Class II malocclusion. Electromyogr Clin Neurophysiol. 2002 Mar;42(2):71-7.
- [9]. Jeryl D. English, P.H. Buschang, G.S. Throckmorton, Does malocclusion affect masticatory performance?, Angle Orthodontist, Vol 72, No 1, 2002

Vesna Jankulovska "The Influence of Malocclusion on the Speed of Mastication "IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 5, 2018, pp 44-46