IJIMM, Volume 2, Issue 11, 2024 ISSN: 2995-5319
http://medicaljournals.eu/index.php/IJIMM/issue/view/3

INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Electromyography of the Temporal and Masticatory Muscles in Different Functional States

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Summary: This study analyzes the electromyographic (EMG) activity of the temporalis and masticatory muscles during different functional states, namely chewing, clenching, speaking, and resting. EMG is considered the main diagnostic method for assessing muscle activity, and by recording the electrical signals of muscles, it allows to accurately describe their functional state. The research involves the study of important indicators such as changes in muscle activity and tension, asymmetric muscle function, fatigue and presence of spasms. The results demonstrate the importance of EMG analysis in the diagnosis and treatment of temporomandibular joint dysfunctions, masticatory disorders and muscle spasms. In this way, it is possible to determine muscle activity, diagnose dysfunctions and monitor treatment with the help of EMG.

Keywords: electromyography, central occlusion, Acp, ambidextrous, rhythm.

The purpose of the study. To evaluate the electromyographic activity of the muscles of the jaw and masticator in different functional states (for example, resting, chewing, clenching the teeth) and to study how the muscles work and what changes occur in stressful or pathological conditions. With this goal, a study is conducted to determine the activity and symmetry of muscles, the effect of muscle tension under stress, and the functional potential of muscles.

Research material and methods. Palpation of the temporalis and masticatory muscles was performed in all examined adolescents, and based on the obtained data, the correlation between the leading hand and the leading side of mastication was determined and compared. According to the results of muscle palpation, it was found that in 75.3% of adolescents, the movement points of the muscles of the temple and masticatory muscles correspond to the leading side of chewing, and in 24.7%, they are on the opposite sides (Fig. 1). Also, the leading action points of the teenagers corresponded to the leading hand in 76%. This situation proves the correlation between the leading side of chewing, the level of development and training of the learned muscles and the leading hand.

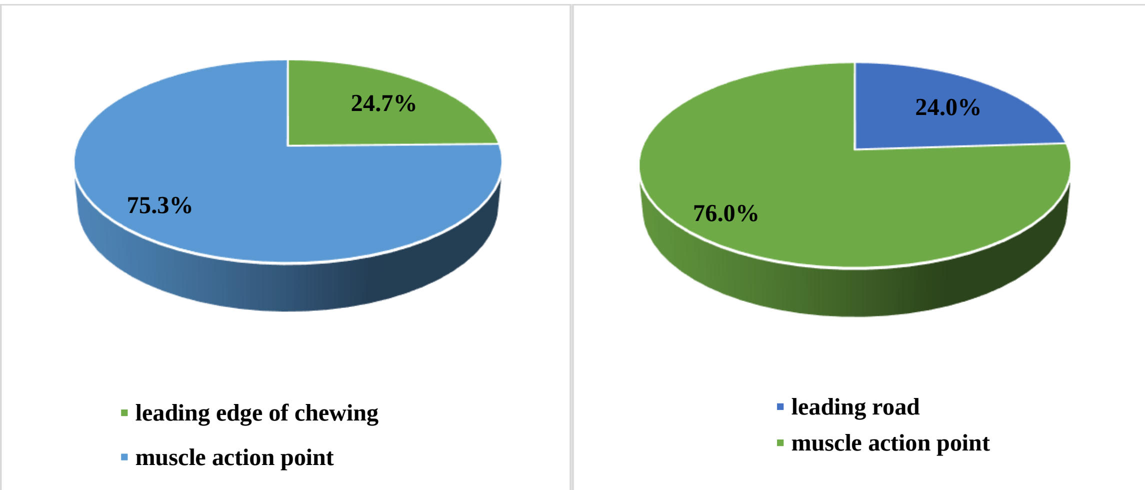

Figure 1. Alignment of the temporal and masticatory muscles with the leading side of mastication and the leading side of the hand

Research results. In restoring the period of chewing on both sides of the lower jaw, in the prevention of temporomandibular joint dysfunction and creating a complex treatment plan, as well as in the rational formation of the chewing surface of the prosthesis, the dentist in his practice considers the relationship between the dominant side of chewing with the working hand. will be able to take into account.

A between-group analysis was performed between adolescents until maximum contact of the tooth rows was achieved in the case of central occlusion (Table 1).

Table 1 The average amplitude of the muscles studied during the waiting period before reaching the maximum contact in the position of central occlusion of the dental rows of adolescents

Indicators	The average amplitude (Acp) of the muscles during the maximum contraction of the tooth rows in the central occlusion of the jaws, μV		
	right "leading" hand	left "leading" hand	ambidextrous
Left temporal muscle	210.32±1.95	217.67±2.08	224.22±2.15
Right temporal muscle	229.06±2.25	213.81±3.59	223 49±1 60
Left masseter muscle	265.82±2.15	257.21±2.11	251.66±1.78
Right masseter muscle	294.25±2.22	246.39±2.48	260.58±2.19

Note: the significance of the differences in the compared groups is $p<0.05$

In adolescents with the right "leading" hand, the average amplitude value of the Acp biopotential of the left temporal muscle was 210.32 ± 1.95 μV, when studying during the pause before reaching the maximum contact of the jaw in the position of the central occlusion of the adolescent. i.e. adolescents with left "leading" hand had 3.4% less than Acp value (217.67±2.08 μV) (Table 1). At the maximum tightening of the tooth row in the central occlusion of the jaws, the Acp value of the average amplitude of the biopotential of the left temporal muscle (224.22±2.15 μV) was 6.2% higher in comparison to the right and left "leading" handed adolescents and 2, It was found to be 9% higher. The Acp value of the right temporalis muscle during the maximum occlusion of the tooth rows in the central occlusion of the jaws was 229.06±2.25 μV in the "leading" right-handed adolescents, this indicator was "leading" left-handed 6.7% and 2.4%, respectively, as in handed and ambidextrous adolescents. The Acp value in ambidextrous adolescents is 223.49±1.60 μV, which is 4.3% higher than the Acp value in "dominant" left-handed adolescents.

When studied during the pause until maximum contact is reached in the position of central occlusion of the adolescent jaw, the average value of the amplitude of the biopotential of the left masseter muscle is 265.82±2.15 μV in "leading" right-handed adolescents. is 3.2% of the value of Acp compared to "leading" left-handers (257.21±2.11 μV) and ambidextrous adolescents were found to be higher by 5.3% (251.66±1.78 μV). It was found that the value of the amplitude frequency in ambidextrous adolescents is 2.2% lower than in "leading" left-handed adolescents.

The frequency value of the amplitude of the right masticatory muscle is 294.25±2.22 μV at the maximum occlusion of the jaws in right-handed teenagers in the case of central occlusion of the jaws, and this indicator is "leading" 16.3% and 11.4% higher than the Acp values of left-handed and ambidextrous adolescents, respectively. It was found that the value of Acp in "dominant" left-handed teenagers is 5.4% lower than in ambidextrous teenagers.

Intergroup analysis of average muscle biopotential amplitude values in adolescents under "tension" loads showed that, under "tension" loads, the amplitude frequency value of the left temporal muscle in "leading" right-handed adolescents was 189 ,93±1.12 μV, this value was found to be 1.5% and 21.8% higher than that of "leading" left-handed teenagers (Table 2). It was also found that the amplitude frequency value of "leading" left-handed teenagers is 20.6% higher than that of ambidextrous teenagers.

Table 2 "Tension" is the average amplitude of the studied muscles under loads

Indicators	Average muscle amplitude (Acp) in the state of "Tension" load, μV		
	"leading" right-handed teenagers	"leading" left-handed teenagers	ambidextrous teenagers
Left temporal muscle	189.93±1.12	187.05±0.85	148.61±1.22
Right temporal muscle	198.74±1.18	175.93±1.47	144.89±1.08
Left masseter muscle	209.80±2.26	229.66±1.15	234.07±1.87
Right masseter muscle	258.68±2.01	205.51±2.18	234.56±2.23

Note: the significance of the differences in the compared groups is $p<0.05$

In the "tension" load condition, the Acp of the right temporalis muscle of right-handed adolescents was 11.5% and 27.1% higher than that of left-handed and ambidextrous adolescents, respectively. higher than Also, in ambidextrous, the value of Acp in the state of "tension" load is 17.6% lower than in teenagers with the left "leading" hand.

Summary. At the end of our research, there is a conclusionAdolescents with the right "leading" hand have greater values of the average amplitudes of the masseter muscle and the temporalis muscle on the right side, which indicates the dominance of the right muscles over the left. This leads to a dense closure of the tooth rows with the usual side of chewing with a slight displacement of the lower jaw. At the same time, this thing is very inconvenient due to the improper distribution of the load on the teeth. Chewing is a highly coordinated neuromuscular function of our body, including fast, efficient movements that are one of the main factors that encourage continuous movement of the mandible and chewing load. It is distinguished by its rhythmicity and various forms of jaw movements, tongue and face tissues depending on the type, and the nature of the food taken also have an impact on this process.

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