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ORIGINAL ARTICLE

CHANGES IN ELECTROMYOGRAPHY TEST RESULTS OF PATIENTS WITH PATHOLOGICAL ABRASION OF TEETH. THE ROLE OF ANTERIOR TEETH IN THE PROCESS OF REHABILITATION

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ABSTRACT

Introduction: Abrasion of teeth significantly affects electromyography results. Analyzing electromyograms of patients who needs complex rehabilitation, it is necessary to note absence of dissociation of the structure, appearance of spontaneous activity in one of the muscles, presence of the prevailing chewing side, appearance of low-amplitude oscillations in biocurrents.

The aim: The purpose of this study was to determine the role of anterior teeth in the rehabilitation of patients with increased abrasion.

Material and methods: The experimental group involved patients (men and women) aged 20 to 59 years with increased abrasion of teeth I-III degrees. Patients were provided with all the necessary complexes of rehabilitation measures: direct restorations with composite materials using the adhesive system of the Vth generation (in case of light abrasion), indirect ceramic restorations (severe abrasion). All work was conducted in accordance with the Declaration of Helsinki (1964) and was approved by the Ethical Committee of the academy.

Results: Activity of the right masseter muscle was slightly higher than that of the left one (313.42 ± 97.96 ms. against 226.69 ± 35.39 ms. respectively). At the same time the resting time of the left and right masseter muscles slightly differs (300.57 ± 30.93 ms. and 307.96 ± 49.47 ms. respectively).

Conclusions: Rehabilitation of patients with increased abrasion using combined methods (direct composite restorations with the adhesive system of Vth generation and indirect ceramic restorations), give the possibility to restore the masticatory function (evidenced by an increase in the activity of right and leftmasseter muscle on 2%, a decrease in the rest phase on 20% almost and an increase in amplitude on 2.9%).

KEY WORDS: myography, tooth abrasion, dental restoration

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INTRODUCTION

The idea of the qualified treatment of patients with increased abrasion of teeth and the rehabilitation of masticatory function can appear only on the basis of data on the nature of the movements of masticatory muscles, their tone and bioelectric activity. Undoubtedly, the main occlusal load is taken by posterior teeth (premolars, molars). However, the efficacy of rehabilitation cannot be reviewed considering only lateral teeth.

Abrasion of teeth significantly affects electromyography results [1-3]. Analyzing electromyograms of patients who needs complex rehabilitation, it is necessary to note absence of dissociation of the structure, appearance of spontaneous activity in one of the muscles, presence of the prevailing chewing side, appearance of low-amplitude oscillations in biocurrents (Fig.1).

Treatment of patients with increased tooth abrasion requires a multidisciplinary and individual approach for each patient and demands the concerted efforts of several specialists. In order to succeed, rehabilitation measures cannot be carried out on isolated teeth, but should extend to dental arches, masticatory muscles, and temporomandibular joint. [4].

THE AIM

The purpose of this study was to determine the role of anterior teeth (central and lateral incisors, canines) in the rehabilitation of patients with increased abrasion. The data was represented by the electromyograms, which were recorded 6 months after the completion of the comprehensive treatment.

MATERIALS AND METHODS

The experimental group involved patients (men and women) aged 20 to 59 years with increased abrasion of teeth I-III degrees. Total number of participants was 25 people. Patients were provided with all the necessary complexes of rehabilitation measures: direct restorations with composite materials using the adhesive system of the Vth generation [5] (in case of light abrasion) (6), indirect ceramic restorations (severe abrasion) [7,8].

Clinically healthy individuals (men and women), without any sign of increased abrasion and periodontal disease, were included into the control group. Age of participants ranged from 20 to 59 years. Totally 25 people were included.

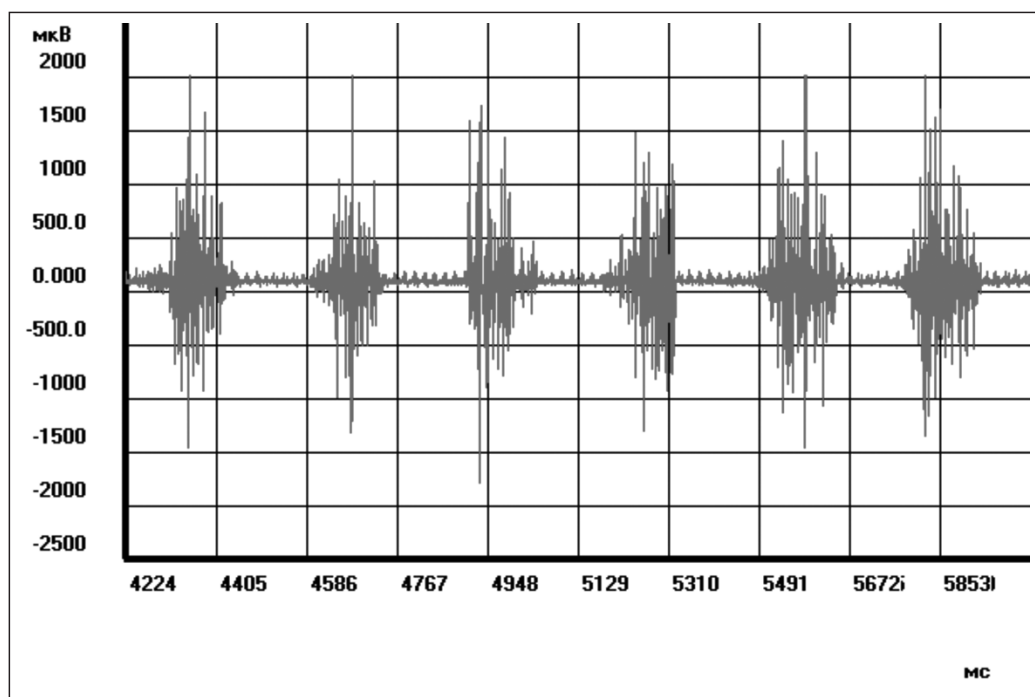


Figure 1. Fragment of an electromyogram of the left masseter muscle of the patient from the control group, 23 years old.

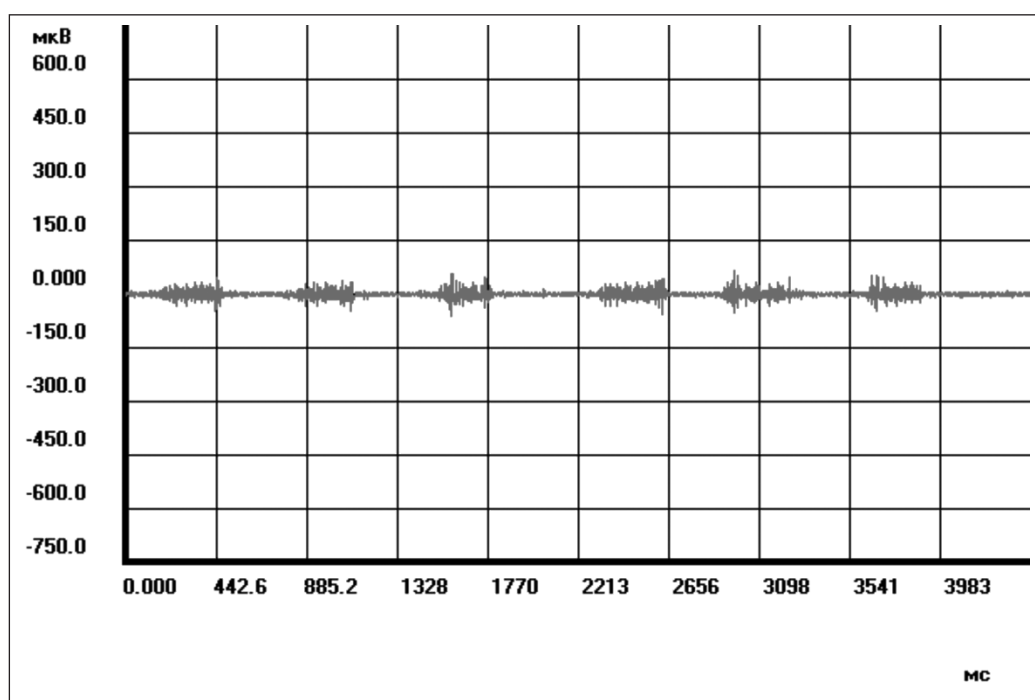


Figure 2. Fragment of an electromyogram of the left person's own masticatory muscle 47 years before treatment.

An electromyography was recorded from every participant of the study before the beginning of rehabilitation. For the patients of the experimental group the procedure was repeated 6 months after the completion of rehabilitation. During the electromyographic study the patients were offered to take a functional test “arbitrary chewing” [2,3]. Using the masticatory efficacy table, the portion of anterior teeth was determined [9,10].

RESULTS AND DISCUSSION

CONTROL GROUP

Analyzing the digital data of the electromyograms of the control group, we drew attention to the fact that the time of activity and rest time of both the left and right masseter muscles almost did not differ.

The activity of the left masseter muscle was 148.06 ± 4.95 milliseconds, while the right one was 135.98 ± 3.59 ms. The

Table I. Electromyography results

Group	Masseter muscles	Investigated parameters (M±m)			
		activity (ms.)	rest (ms.)	"K index"	amplitude (µV)
Control	left	148,06 ±4,95	152,37 ±4,71	0,98 ±0,03	207,58 ±3,38
	right	135,98 ±3,59	155,02 ±6,06	0,91 ±0,06	288,41 ±22,67
Experimental (before treatment)	left	226,69 ±35,39	300,57 ±30,93	0,64 ±0,063	284,67 ±34,21
	right	313,42 ±97,96	307,96 ±49,47	0,74 ±0,060	405,55 ±27,36
Experimental (6m. after treatment)	left	326,47 ±7,61	276,66 ±26,23	0,75 ±0,034	304,20 ±30,46
	right	225,11 ±19,15	230,73 29,19	0,74 ±0,060	405,55 ±27,36

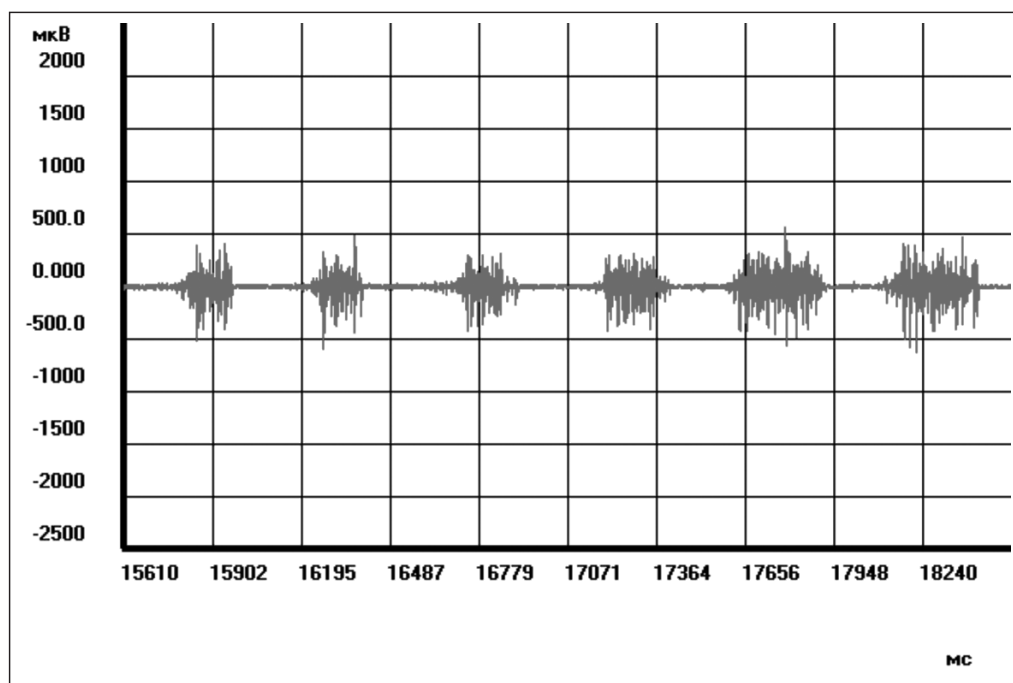


Figure 3. Fragment of the electromyogram of the right masseter muscle of the patient, 48 years old, 6 months after treatment.

resting time of the left chewing muscle was 152.37 ± 4.71 ms. and the right muscle was 155.02 ± 6.06 ms.

Notably that the coefficient of activity "K" for left and right masseter muscles is different and makes 0.98 ± 0.03 ms. and 0.91 ± 0.06 ms. respectively but this difference is not significant and indicates a lack of functional asymmetry. There is a significant difference in the indices of the amplitude of the left and right masseter muscles. The amplitude of the left masseter muscles is 207.58 ± 3.38 µV, while the right is only 288.41 ± 22.67 µV. This may indicate a more active movement of the right muscle compared to the left one.

EXPERIMENTAL GROUP BEFORE TREATMENT

Before conducting any treatment, the rates of electromyographic test are different from those results of

the control group. In our opinion, this fact indicates a decrease in masticatory efficacy due to the pathology of hard tissues of teeth and the decrease occlusion height (Fig. 2).

The results of electromyograms analysis of experimental group patients are presented in Table I.

It should be noted that the coefficient of chewing activity in the experimental group is much lower for the left muscle than for the right one (0.64 ± 0.063 and 0.74 ± 0.0660 respectively). The amplitude of the electromyogram amplitude of the left masseter muscle in the experimental group is 284.67 ± 34.21 µV, while the right one is 405.55 ± 27.36 µV.

Therefore, we suggest that the difference in electromyography rates of the experimental group is associated with a different degree of manifestation of increased

tooth abrasion, as well as a violation of the masticatory function.

EXPERIMENTAL GROUP (6 MONTHS RECALL)

Six months after rehabilitation of patients a clearer structure of electromyograms can be determined (Fig. 3).

The activity of the left and right masseter muscles of patients slightly increased compared to the data obtained prior to treatment. The activity of the left masseter muscle in the experimental group is 326.47 ± 7.61 ms., the activity of the right one is 225.11 ± 19.15 ms. (Tab. I).

The rest time of the left and right muscles slightly decreased comparing to the results obtained before the treatment, but the difference between the scores was not significant.

It should be noted that the amplitude of the electromyogram of the left masseter muscle increased in comparison with the results obtained before the treatment (304.20 ± 30.46 μ V) while the amplitude of the right muscle remained unchanged (405.55 ± 27.36 μ V).

THE ROLE OF FRONTAL TEETH IN RESTORING THE MASTICATORY FUNCTION

According to Agapov's table the following percents are assigned to the anterior teeth: central incisors - 2, lateral incisors - 1, and canines - 3. [2,3] Total portion of anterior teeth on both jaws makes 24%.

Grace to the data obtained from the control group we can conclude that during the execution of chewing movements muscles are capable to perform an instantaneous active inclusion into action and to the same rapid transition to a state of rest. From the obtained data it is obvious that muscles do not play the equal role in the act of mastication. There is a difference in functional asymmetry.

The data gained from the patients of the experimental group demonstrates the difference between of the left and right sides. Thus, the activity of the right masseter muscle is slightly higher than that of the left one (313.42 ± 97.96 ms. against 226.69 ± 35.39 ms. respectively). At the same time the resting time of the left and right masseter muscles slightly differs (300.57 ± 30.93 ms. and 307.96 ± 49.47 ms. respectively).

According to the analyzed data the percentage part of anterior teeth in masticatory function rehabilitation makes 24%.

CONCLUSIONS

During the study, it was found that the rehabilitation of patients with increased abrasion using combined methods (direct composite restorations with the adhesive system of Vth generation and indirect ceramic restorations), give the possibility to achieve certain results, namely: not only to restore the shape of lost teeth, but also to restore the masticatory function (evidenced by an increase in the activity of right and left masseter muscle on 2%, a decrease

in the rest phase on 20% almost and an increase in amplitude on 2.9%).

Masticatory pressure spread evenly over the whole tooth arch. Electromyography data confirms that a local approach or incomplete/partial restoration of dentition can negatively affect the effectiveness of masticatory function efficacy. Particularly, in the case of exclusion of anterior teeth from the treatment plan, the potential effectiveness of restoration of masticatory function decreases on 24%.

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Conflict of interest:

The Authors declare no conflict of interest.

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