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# EVALUATION OF MASTICATORY FUNCTION IN PATIENTS WITH MAXILLARY DEFECTS AFTER RESECTION PERFORMED IN CONNECTION WITH THE CONSEQUENCES OF COVID-19 AFTER ORTHOPEDIC PROSTHETICS

**Davron N. Xabilov**

Assistant of the Department of Faculty Orthopedic Dentistry of the Tashkent State Dental Institute, Tashkent, Uzbekistan
E-mail: Khabilov1994@bk.ru

## ABSTRACT

The article deals with the problem of restoring masticatory function in patients with maxillary defects resulting from resection performed due to complications of COVID-19. The relevance of the study is determined by the need to develop effective approaches to rehabilitation of this category of patients suffering from a significant deterioration in the quality of life. Evaluation methods include clinical studies, instrumental tests, and subjective indicators that allow us to identify the dynamics of functional changes before and after prosthetics. The results of the study demonstrate an improvement in chewing efficiency, restoration of the symmetry of the chewing load and an increase in the level of comfort of patients. The data obtained emphasize the importance of orthopedic prosthetics in the comprehensive rehabilitation of patients with maxillary defects after resection associated with the consequences of COVID-19. The work is of practical value for specialists involved in restoring the functional and aesthetic characteristics of the oral cavity.

**Key words:** COVID-19, maxillary defects, rehabilitation, removable dentures.

## INTRODUCTION

In 2019, the world faced a previously unknown highly contagious respiratory viral infection COVID-19, which is dangerous with severe complications and rapid spread around the world. Despite numerous studies conducted in various countries of the world, progress in the treatment of COVID-19 and its complications, the search for markers of complications and adverse outcomes, and determining the tactics of administration of patients with post-covid syndrome remain an urgent problem to this day [1, 6].

Currently, COVID-19 poses a serious and urgent threat to the global population. Angiotensin-converting enzyme 2 (ACE2) is known as a target receptor for SARS-CoV-2, which is found even on the epithelial surfaces of the oral mucosa, especially on the taste buds. Based on the data of researchers, it is known that coronavirus infection manifests itself in the oral cavity in the form of ulcers, erosions, vesicles, papules and petechiae. Loss of taste is one of the first oral symptoms in COVID-19. In turn, due to reduced immunity, the oral cavity becomes an optimal place for various strains of microorganisms to live, which in turn disrupts the balance of the oral microbiocenosis. [2,3]

Currently, there is insufficient information in the literature about the most appropriate tactics of orthopedic treatment, the results of which would suit both the doctor and the patient. There are many difficulties and nuances for successful rehabilitation of patients with this pathology, here the attending orthopedic dentist can help determine the quality of life of patients in these study groups. The **aim of the study** is to study the effectiveness of orthopedic treatment in patients with acquired defects and deformities of the upper jaw caused by acute purulent-inflammatory disease due to Covid-19 [4].

## MATERIALS AND METHODS OF RESEARCH

The study was conducted in the period from 2019 to 2024 at the Department and clinic of the Tashkent State Dental Institute. Orthopedic treatment was performed for 40 patients with deformities and defects of the maxillofacial region caused by purulent-inflammatory disease of the upper jaw, which developed against the background of Covid-19 virus infection, who needed orthopedic treatment after surgery of the maxillofacial region, including 27 men and 13 women aged 40 to 75 years old.

The patients ' diagnosis of SARS-CoV-2 S-RDB (Covid-19) virus infection was confirmed by ELISA and IHL.

The study patients (40 people) were divided into 2 groups:

- group 1 consisted of 20 patients with total resection of the upper jaw
- group 2 consisted of 20 patients with partial resection of the upper jaw

20 patients with intact teeth (40-65 years old)were selected for the control group without somatic pathologies. Clinical observations were carried out on the basis of the Department of Orthopedic Dentistry of TSSI.

Based on the analysis of modern methods for evaluating the effectiveness of chewing, we decided to conduct chewing tests in patients from both groups at the 1-month and 6-month stages of using permanent removable dentures. For a more accurate assessment of food breakdown, we used artificial materials, while natural products were used to assess the functional effectiveness of chewing. In our opinion, all the necessary criteria are met by a widely available and well-known hard cheese, which, due to its organoleptic properties, is suitable for evaluating chewing activity.

For the chewing test, we used cylinders made of alginate material (Fig. 1) and hard cheese as test samples. Both are widely used in practical healthcare, do not cause allergies, and allow patients with complete removable dentures to chew their food comfortably. In both tests, the volume of the test material was 2 cm.

**Figure 1-Alginate impression mass cylinders for evaluation of mechanical chewing function**

The initial functional chewing test consisted of three main steps:

1. Prepare a portion of the test material with a precisely defined volume and particle size.

2. Chewing the prepared portion using a predetermined number of chewing movements (20).

3. Conducting a granulometric analysis of the chewed material with subsequent mathematical processing of the results.

Preparation of the test material at the first stage was carried out as follows: the alginate mass was mixed until a uniform consistency was obtained, then placed in a hollow cylinder for 2-3 minutes to completely solidify. After solidification, the material was removed and cut into cylinders with a diameter of 10 mm and a height of 13 mm.

In the second stage of the chewing test, the patient chewed (crushed) two cylinders of test material. Each patient chewed voluntarily, following their natural mode of chewing (one-sided or uniform). They were asked to perform 20 chewing movements in a normal rhythm to break down the test material. After chewing, the crushed material was removed from the mouth by repeatedly rinsing with water.

The patient then spat out the water containing the chewed particles into a glass container, the contents of which were poured onto the top screen of a special sieve. The device was placed under running water to help smaller particles pass through the lower sieves.

The sieving device consists of a set of 12 sieves with round holes. The diameter of each screen is 125 mm, and they are arranged in order of decreasing hole size, with the difference in size of each screen being √2. The opening diameter of the smallest screen is 0.25 mm (lower screen), and the largest is 15 mm (upper screen). The sieves are inserted into each other, forming a column with a distance between the lattice plates of 30 mm.

The sieves were removed from the column one by one under running water, starting with the top screen (the one with the largest openings). This allowed smaller particles to pass through the lower sieves, aided by water pressure. Each washed screen was set aside for subsequent counting of the remaining particles on it. This process was repeated for each screen.

The third stage of the chewing test, called "sieve analysis", included analysis of the crushed test material and mathematical processing of the results. The particles remaining on each screen were carefully transferred with a brush to individual pieces of filter paper to dry. After drying, the particles were placed in separate graduated tubes filled with water to a certain and stable level (10.0 ml) in each tube. This allowed us to estimate the volume of particles on each screen by measuring the volume of displaced water. With a light tap on the bottom of each tube, the particles settled, which made it possible to clearly determine the water level in each tube.

The increase in the water level in each tube caused by the addition of crushed particles of the test material corresponded to their volume (these were the particles remaining on the corresponding screen after washing). The particle volume was determined by dividing the total volume of water in the test tube by 2, depending on the diameter of the screen opening (the screen diameters varied by a factor of 2). The calculated particle volumes of each size were then used in the formula to determine the average diameter of the crushed particles of the test material.

$$d=10^3\times\sqrt{6V/\pi}$$

where V is the volume of particles of each standard size (ml);

d is the average particle diameter of each particle size (defined as the arithmetic mean of the diameters of the screen holes that limit this particle size) (mm).

During the second functional chewing test, the patient was asked to chew a 2 cm3 portion of a standard food product (cheese) with a randomly selected chewing side, stopping just before swallowing. The time and number of chewing movements performed before swallowing were recorded.

## RESULTS AND DISCUSSION

The effectiveness of chewing was evaluated in patients of both groups 1 and 6 months after the installation of permanent dentures. The mechanical function of chewing was evaluated using non-food material (alginate). This analysis allowed us to track changes in chewing quality over time in both groups. The main group (patients with dental prostheses supported by implants) showed significantly better grinding of the test material, with an average particle diameter of (4.86 ± 0.45) mm compared to the comparison group (5.63 ± 0.91) mm ($p < 0.05$). These differences persisted even after 6 months of denture use (Table 1).

**Table 1-Results of evaluation of mechanical chewing function**

| Patient group | Terms of use of the | Average particle diameter of |
|---|---|---|
| Main group | 1 month | 4.86 ± 0.45 |
| | 6 months | 4.48 ± 0.37 |
| Comparison group | 1 month | 5.63 ± 0.91 |
| | 6 months | 5.69 ± 0.83 |

During the food chewing test, the functional aspect of the chewing process was evaluated by measuring the time of ingestion and the number of chewing movements required to form a food lump. This assessment was performed in patients of both groups after 1 and 6 months of using the prosthesis. The results are presented in table 2.

**Table 2-Changes in the number of chewing cycles and time to ingestion of food after the chewing sample**

| Patient group | Main | | group Comparison | |
|---|---|---|---|---|
| Group Duration of use of prostheses | 1 month | 6 months | 1 month | 6 months |
| Number of chewing movements | 43,90 ± 3,10 | 41,00 ± 3,02 | 43,20 ± 3,10 | 40,60 ± 2,42 |
| Time until the act of swallowing begins (in seconds) | 35,50 ± 2,30 | 32,20 ± 2,00 | 34,70 ± 2,10 | 31,20 ± 1,80 |

The results of the study of the functional aspect of the chewing process indicate that the patients of the main group chewed the material more effectively than the patients of the comparison group. A comparative analysis of the main indicators of masticatory function in both groups showed that the use of implants as an additional support significantly increases the effectiveness of chewing compared to traditional methods of prosthetics.

## CONCLUSION

Evaluation of chewing function in patients after orthopedic treatment is not only of diagnostic value, but can also be used to evaluate the effectiveness of prosthetics performed. If there are indicators in the results obtained below the norm after orthopedic treatment, you should pay attention to the choice of orthopedic design.

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