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Employment of functional tests in multivariable modeling of plastic dentures in patients with complete absence of teeth

Abstract: Orthopedic treatment of patients with full anodontia with complete removable plastic dentures is performed in 85% of cases. Fixation and stabilization of complete removable plastic dentures is achieved in symmetrical correspondence between the structures of dental arches with anatomical and functional characteristics of masticatory-facial system. According to several authors, approximately 37% of patients are not satisfied with fixation and stabilization of complete removable plastic dentures and 26% do not use them at all. Such defects can be eliminated by functional tests.

Functional tests, or test-criteria for comprehensive quality evaluation of denture design, concern the following areas:

- adjustment of dentures to individual anatomical and functional features of masticatory apparatus in patients with anodontia;

- accuracy of pronunciation restoration, i. e. clarity and sonority during speech;

- effect of fixation and stabilization of dentures on edentulous jaws during speech and occlusion disconnection for the size of a lump of food.

Keywords: test-criteria, functional tests, function, fixation, stabilization, plastic denture.

Complete absence of teeth in the jaws is caused by the same reasons as partial loss. Triggers particularly include complications of periodontal diseases, specific inflammatory processes, functional overload of teeth et cetera [3,5,9,14].

Complete loss of teeth leads to topographical changes in the relation of oral tissues. Therefore, examination of patients with anodontia is characterized by certain specificity. Success of orthopedic treatment requires thorough evaluation of clinical

features of edentulous mouth. Special attention should be given to mucosa, bone framework, namely alveolar processes and alveolar gum tissues, jaw bones and hard palate [13,15]..

To provide successful orthopedic treatment of patients with complete absence of teeth both orthopedists and dental technicians must possess in-depth knowledge of anatomical and physiological characteristics of the oral cavity in this type of abnormality [6,12,16].

Clinical understanding of the mechanism of progeny in old age, proper interpretation of the findings, compliance with ethics (as complete loss of teeth is not always observed in the elderly) enable orthopedists to choose correct treatment strategy and determine rational design of complete removable dentures [1,7,10].

Improved fixation and stabilization of plastic dentures can be achieved by concordant adjustment of dentures taking into account individual anatomical and functional features of the masticatory apparatus. Insertion of artificial teeth and dental plate modeling are associated with causal factors of insufficient fixation and stabilization, which can be eliminated by functional tests. [2,4,8,11].

Purpose of the study: to improve functional tests in orthopedic patients.

Materials and methods:

The study comprised 84 patients (34 male and 50 female patients) with complete anodontia using complete removable plastic dentures, who underwent examination to determine the place of articulation of tip of the tongue with teeth, relation of front teeth during functional conversational tests, monitoring pronunciation clarity, relation of group of front teeth to the vertical plane during functioning, occlusion disconnection for the size of a lump of food during biting (Fig. 1a).

Based on our research, we primarily defined and assessed five signs-criteria of functional conversational tests: concerning the relation of front teeth of upper and lower jaws and tongue during speech. These signs-criteria can help orthopedists design dental arches with relations providing functional restoration of biting, chewing, swallowing and clarity and loudness of pronunciation with adequate fixation and stabilization of dental plates in the denture-bearing area.

• First test-criterion – the upper teeth protrude above the lower ones and incisal edges are located mostly in the same horizontal plane (Fig.1b).

• Second test-criterion – during speech the upper surface of the tip of the tongue mostly contacts with sub-palatal surface of the upper front teeth and partially with the alveolar process in this area, and its lower surface is at the level of incisal edges of the upper teeth (Fig.1c).

• Third test-criterion – if the front teeth are disconnected for the size of a lump of food (up to 20 mm), their edges are in the same vertical plane (Fig.1d).

• Fourth test-criterion – pronunciation is clear and loud.

• Fifth test-criterion – disconnection of lateral teeth (up to 2-3 mm) in functional rest position of the mandible.

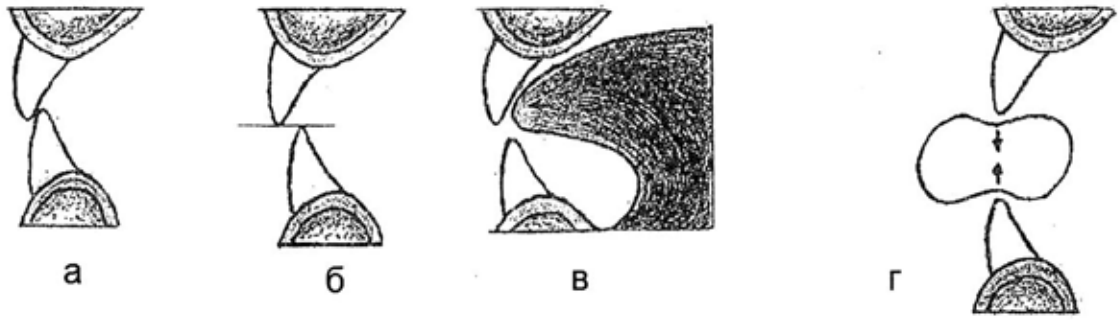

Fig. 1. Tests-criteria in fabrication of dentures

Tests-criteria, corresponding to the norms of jaw relation during conversational tests, were determined at the following clinical stages:

- determination of the central relation of edentulous jaws;
- evaluation of the denture design;
- insertion of the ready-to-use denture to the denture-bearing area;
- control examination of the quality of removable dentures.

Moreover, the study implied simultaneous correction of the relevant occlusal rims or wax dental plates, dental arch structures or fabricated dentures.

Results and their discussion.

The study involved observation of 92 secondary care patients, of whom 28 (15 male and 13 female) were dissatisfied with their complete dentures due to insufficient fixation and stabilization, and who apart from these defects relating to the design of the front sections of the dental arch, reported significant mobility of dentures during

functional occlusions. Furthermore, this multiple contact of artificial teeth was observed in the central anterior and lateral occlusions. This prompted us to study the relations of dental plate surfaces adjacent to the denture-bearing areas precisely in those patients whose dentures shifted from the dental-bearing area during functional occlusions, namely 28 patients. Thus, we studied the relationship between multiple contact of artificial teeth and the fitting of dental plate surfaces to the denture-bearing area which tends to decrease during functional occlusions.

Table 1

Standard test-criteria of functional tests

Nest No.	Test-criteria name and evaluation	Normal range signs
1	Relation of the front teeth during speech	The upper front teeth protrude above the lower ones and their incisal points are in the same horizontal plane
2	Relation of the front teeth in biting	Incisal points are in the same vertical plane
3	The place of articulation of the tip of the tongue during speech	The tip of the tongue mainly contacts with sub-palatal surfaces of the upper teeth and partially with alveolar process in this area
4	Clarity and volume of pronunciation	Clear, loud pronunciation
5	Disconnection of the lateral teeth in physiological rest of the mandible	The teeth are disconnected by 2-3 mm

Conclusions

1. The above mentioned tests-criteria are reference points which helped to fabricate complete dentures at clinical and laboratory stages of treatment.

2. Employment of tests-criteria of functional tests eliminated causal factors of insufficient fixation and stabilization.

They allow to create conditions for improved fixation and stabilization of complete dentures and to eliminate defects in denture design, which can be potentially productive in practical implementation.

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