



MODAL ANALYSIS OF COMPLETE NON-REMOVABLE DENTURES BASED ON IMPLANTS IN THE UPPER JAW

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Abstract

Modal analysis is a method of calculating and visualizing the deformation of dynamic properties of structures and is a vibration analysis that examines natural frequency, modal shape and damping coefficient. Understanding the natural frequency and vibration characteristics of the modal shape helps to improve the constructive design. The development of dentures capable of reducing the adverse effects on implants, their suprastructures and surrounding tissues will improve long-term treatment results.

Tooth loss due to caries, periodontitis, injuries, or congenital absence of teeth due to pathology – all this is a serious violation of the ego of the body as a whole. No matter how many teeth a person has lost, he should think carefully about what kind of recovery method to choose for him. This should be done as soon as possible, before the condition of the oral cavity begins to deteriorate rapidly. He needs to understand that the absence of at least one tooth entails many aesthetic and physical difficulties. The bone tissue will gradually pass into the category of defective, destroyed. To prevent this from happening, you should resort to non-removable prosthetics with implants on the entire jaw.

Over the many years of the existence of dental science, an unlimited range of molar replacement technologies has appeared. Fortunately, the improvement and growth of scientific and technical techniques gave impetus to the development of an unsurpassed, perfect solution to the problem of tooth loss. Thus, with the help of prosthetics, you can easily return to a comfortable, happy life.





Advantages of non-removable prosthetics on full-jaw implants

Initially, it should be said that non-removable prosthetics on implants is considered the most popular, comfortable, elegant option for recreating docked molars.

The undeniable advantages of non-removable prosthetics on implants:

- replacement of absolutely any number of teeth (from one to all);
- long-term installation with delayed loading;
- Instant prosthetics with immediate loading;
- reliable fixation in the oral cavity;
- compactness;
- there is no malfunction of the articulation apparatus;
- there is no pressure on the mucous membrane;
- there is no overlap of taste buds;
- distribution of chewing load;
- the admission of eating all kinds of food;
- no displacement, deformation, permanent corrections, breakdowns, inconveniences.

Disadvantages of non-removable prosthetics on implants for the entire jaw

Considering all the advantages, we were able to find only one significant disadvantage — a relatively high price (but remember that you give such a large amount for peace of mind, confidence in the future).

Indications for permanent prosthetics on implants for the entire jaw

- total tooth loss, especially with a reduced height of the alveolar processes;
- rejection of removable dentures due to increased sensitivity.

Absolute contraindications to non-removable prosthetics on implants for the entire jaw:

- diseases of the hematopoietic organs and blood inclusive;
- congenital or acquired diseases of the central nervous system;
- Oncology;
- HIV, AIDS;
- tuberculosis;
- Type I diabetes;
- Bruxism;
- chronic inflammatory diseases of the mucous membrane;
- dermatosis, scleroderma.

Relative contraindications to non-removable prosthetics on full-jaw implants:

- poor oral hygiene;
- gingivitis;
- periodontitis;





- malocclusion;
- defects, bone atrophy;
- smoking, alcoholism, drug addiction;
- pregnancy.

The identification of contraindications and indications occurs during the initial examination, examination, radiography, computed tomography, etc.

Preparation of the patient for permanent prosthetics on implants for the entire jaw:

- inspection;
- measures for the successful implementation of the procedure;
- oral hygiene in the dentist's office.

Clinical and laboratory stages of manufacturing a non-removable prosthesis based on implants for the entire jaw:

- impressions from both jaws, the ebb of models;
- spoons are made to obtain an impression;
- they store spoons, get an impression, determine the central occlusion;
- cast a working model;
- select and mill abutments;
- model the frame of the prosthesis;
- the frame is being processed;
- select the shade of the cladding, apply it;
- provision of the prosthesis at the clinic.

Goal

The purpose of this study was to compare the vibration characteristics of complete non-removable dentures in the upper jaw area with support for 4/6 implants and a screw type of fixation.

Materials and Methods

The study involved 16 patients aged 57-78 years (average age was 67.8 years) with complete adentia in the upper jaw area. The dentition was restored using dentures supported by 4 (9 patients) or 6 (7 patients) implants and a screw type of fixation. All patients received dental implants (NobelSpeedy Groovy, Brånemark System Mk III or Mk IV, Nobel Biocare, Kloten, Switzerland), titanium abutments (Multi-unit Abutment Plus CC, Nobel Biocare) and temporary restorations (temporary caps Multi-unit, Nobel Biocare). As final restorations, dentures with implant support and screw fixation type (Nobel Procera, Nobel Biocare) were manufactured and installed A percussion hammer (Dytran 5800-SL, Dytran Instruments Inc., Chatsworth,





California, USA) was used to study vibration. The response at each measurement point was determined using a laser-Doppler vibrometer. Modality indicators were recorded in the area of each denture crown. The comparison of modal forms at each natural frequency and the number of vectors in the opposite phase was carried out.

Results

The average natural frequencies in the groups of dentures supported by 4/6 implants were 697 and 781 Hz, respectively. There were no statistically significant differences in the average values of DAR (damping coefficient) between the groups of dentures supported by 4 and 6 implants, 8.2–1.7% and 6.6–1.7%, respectively. The average values of MDP (maximum displacement) of fixed dentures were significantly lower in the group with support for 6 implants (10.3–3.3 mm) than in the group with support for 4 implants (20.3–9.1 mm). The average number of vectors in the antiphase was significantly lower for the group with dentures supported by 6 implants compared to the group with dentures supported by 4 implants.

Conclusions

According to the results of the study, dentures with support for 6 implants have less adverse vibration than dentures with support for 4 implants. The use of modal analysis can contribute to future design developments of dental prostheses on implants.

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