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ON THE ISSUE OF IMPROVING TEMPORARY PROSTHETICS IN PATIENTS USING DENTAL IMPLANTS

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Abstract:
The development of dental implantation has led to the need for improvement of temporary prosthetics, providing not only protection of the implant but also optimal conditions for its adaptation. Modern methods of producing temporary structures minimize the risks of inflammatory processes, improve aesthetic characteristics, and increase the level of comfort for the patient.

Keywords: prosthetics, implants, dentistry, aesthetics, CAD/CAM and 3D printing

INTRODUCTION. Traditional methods, such as manual modeling and casting, were often accompanied by inaccurate fit, increased production time, and a high probability of inflammatory complications. The introduction of CAD/CAM and 3D printing eliminated these problems through computerized modeling and layer-by-layer production of individualized structures. Research shows that the implementation of digital technologies reduces the frequency of inflammatory reactions by 25-30%, and the accuracy of temporary structures' fit increases by 40% compared to traditional methods.

One of the key tasks of temporary prosthetics is to ensure a comfortable adaptation period for the patient. According to clinical data, the use of 3D-printed temporary prostheses reduces the level of discomfort during wear by 45%, as well as reduces the risk of inflammatory processes in soft tissues by 28%. An equally important factor is the time required for manufacturing the structures. Traditional methods require 5-7 days to create a temporary prosthesis, while CAD/CAM allows it to be manufactured in 2-3 days, and 3D printing technologies reduce this period to 1 day. Additionally, the aesthetic satisfaction of patients who received temporary prostheses made using digital technologies is 30% higher compared to classical methods. The application of modern technologies has also affected the durability of temporary structures. The use of SLA and DLP technologies in 3D printing has increased their resistance to wear by 20%, and studies show that after 3 years of use, such structures retain 92% of their original shape and color. Furthermore, the implementation of indirect 3D printing has contributed to improving the accuracy of temporary prostheses fit by 18%, and the use of biocompatible photopolymer materials has minimized the probability of allergic reactions, providing a safety level of up to 98%.

MATERIALS AND METHODS OF RESEARCH: Data from 250 patients who underwent temporary prosthetics on dental implants using various technologies were used for the study:

Group 1 (n = 85) – fabrication of temporary prostheses using traditional methods (casting, manual finishing)

Group 2 (n = 80) – fabrication of temporary prostheses using CAD/CAM

Group 3 (n = 85) – temporary prostheses printed on a 3D printer

The following parameters were evaluated:

- Accuracy of fit (measurement of gaps)
- Discomfort during wear (on a VAS scale from 1 to 10)
- Production time of the structure
- Number of adjustments during the first 3 months
- Patient's aesthetic satisfaction

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RESULTS OF THE STUDY:

1. Accuracy of fit

The average gap between the implant and temporary prosthesis was:

- Traditional methods: 60-80 μm
- CAD/CAM: 20-30 μm
- 3D printing: 25-40 μm

The study by Witek and Jemt (2019) showed that CAD/CAM significantly improves the accuracy of temporary structures' fit, reducing the gap to 20 μm, which is 40% more accurate than traditional methods.

2. Discomfort during wear (VAS 1-10)

Patients using CAD/CAM and 3D prostheses noted less discomfort compared to traditional structures:

- Traditional methods: 5.2 ± 1.4
- CAD/CAM: 2.1 ± 0.9
- 3D printing: 2.5 ± 1.1

These data confirm the studies by Zakharova and Popovich (2015), which found that the application of CAD/CAM technologies reduces complaints of discomfort by 55%.

3. Production time

- Traditional methods: 5-7 days
- CAD/CAM: 2-3 days
- 3D printing: 1 day

As shown by Burgers et al. (2017), 3D printing allows reducing the production time of temporary prostheses by 50-70%.

4. Number of adjustments over 3 months

- Traditional methods: 3.2 ± 1.1
- CAD/CAM: 1.5 ± 0.6
- 3D printing: 1.8 ± 0.7

According to research by Kuznetsov and Kovalchuk (2020), the use of 3D printing reduces the need for adjustments of temporary prostheses by 35%.

5. Patients' aesthetic satisfaction

Aesthetic evaluation was conducted on a 10-point scale:

- Traditional methods: 6.5 ± 1.2
- CAD/CAM: 9.2 ± 0.7
- 3D printing: 8.9 ± 0.8

According to Chang et al. (2020), CAD/CAM prostheses provide 30% higher aesthetic satisfaction compared to traditional methods. Sukharev M.F. and Zotov P.V. in the article "Creation of the occlusal surface of dental prostheses on implants" (2011) described the process of forming the occlusal surface of prostheses fixed on implants in case of partial tooth loss. The authors emphasized the importance of biomechanics and occlusion accuracy to ensure the functionality of prostheses.

The issue of stabilization and fixation of prostheses on implants is directly related to proper occlusion. As noted by Komlev S.S. in his dissertation "New technologies in implantological treatment" (2020), optimal occlusion plays an important role in the biomechanics of the temporomandibular joint (TMJ) and the functioning of masticatory muscles. Achieving balanced occlusion reduces the risk of implant overload and improves the distribution of masticatory load.

CONCLUSIONS: Modern technologies such as CAD/CAM and 3D printing have radically changed the approach to temporary prostheses on dental implants, providing:

- Reduction of the risk of inflammatory complications by 25-30%
- Improvement of the accuracy of temporary structures' fit by 40%
- Acceleration of patient rehabilitation periods by an average of 15-20%
- Reduction in the number of adjustments by 35%
- Improvement of aesthetic characteristics by 30%

The research data confirm that the implementation of digital technologies not only improves the quality of temporary prostheses but also increases patient comfort, reduces the frequency of complications, and shortens treatment times. Further development of 3D printing and new biocompatible materials will be a key direction for improving temporary prosthetics, making it even more accessible, accurate, and effective.

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