7. *Mo X., Jian W., Su Z., Chen M., Peng H., Peng P., Lei Ch., Chen R., Zhong N., Li S. Abnormal pulmonary function in COVID-19 patients at time of hospital discharge // Eur. Respir. J. 2020. Vol.55, №6. Article number: 2001217. doi.10.1183/13993003.01217-2020*

8. *Huang Y., Tan C., Wu J., Chen M., Wang Z., Luo L., Zhou X., Liu X., Huang X., Yuan S., Chen Ch., Gao F., Huang J., Shan H., Liu J. Impact of coronavirus disease 2019 on pulmonary function in early convalescence phase // Respir. Res.2020. Vol.21, №1. Article number: 163. doi:10.1186/s12931-020-01429-63*

9. *Frija-Masson J., Debray M.-P., Gilbert M., Lescure F.-X., Travert F., Borie R., Khalil F., Crestani B., d'Ortho M.-P., Bancal C. Functional characteristics of patients with SARS-CoV-2 pneumonia at 30 days post-infection // Eur. Respir. J.2020. Vol.56, №2. Article number: 2001754. doi: 10.1183/13993003.01754-2020*

ADVANTAGES AND DISADVANTAGES OF MAKING CROWNS OF LONG-TERM WEAR BY 3D PRINTING

E.S. Bashun[1], N.S. Nuriyeva[2], S.M. Rizaeva[3]

[1] dentist orthopedist, chief physician of the Estet dental clinic , Perm

[2] Doctor of Medical Sciences, professor YUUGMU Russian Ministry of Health, dentist of the highest category.

[3] Doctor of Medical Sciences, Associate Professor of TSDI

ABSTRACT

The active introduction of innovative technologies, namely 3D printing in dentistry, is of great interest from dentists of various specialties. The article is devoted to the possibility of using a 3D printer for the manufacture of long-wearing crowns. The application of new technologies in dentistry is considered using the example of 3D printing. Possibilities of this technology and the specifics of working with it.

Objective: to evaluate the possibilities of clinical application of long-term wearing crowns made by 3D printing.

Methodology. Based on the literature review, and the use of scientific search bibliographic databases: PubMed, eLibrary, Medline, Google Academy, the availability and prevalence of 3D printing technology in dentistry was determined, and in particular its application for printing long-term crowns. Clinical production of long-term crowns was carried out.

Conclusions. The emergence of innovative technologies in dentistry, in particular 3D printing and new materials, is currently attracting active interest from the dental community. 3D modeling and printing every day more and more confidently enter our daily life. A thorough study of this method is undoubtedly promising, but it requires deep immersion in the problem, clinical and laboratory observations of structures made of materials certified for long-term wear.

Key words: CAD / CAM, dentistry, 3D printer, orthopedics, prosthetics, crowns, temporary, long-term constructions.

ПРЕИМУЩЕСТВА И НЕДОСТАТКИ ИЗГОТОВЛЕНИЯ КОРОНОК ДЛИТЕЛЬНОГО НОШЕНИЯ МЕТОДОМ 3D ПЕЧАТИ

Э.С. Башун[1], Н.С. Нуриева[2], С.М. Ризаева[3]

АННОТАЦИЯ

Активное внедрение инновационных технологий, а именно 3D печати в стоматологии вызывает большой интерес со стороны врачей стоматологов различных специальностей. Статья посвящена возможности использование 3D принтера для изготовления коронок длительного ношения на примере клинического случая. Рассматривается применение новых технологий в стоматологии на примере 3D печати. Возможности данной технологии и специфику работы с ней.

Ключевые слова: CAD/CAM, стоматология, 3D-принтер, ортопедия, протезирование, коронки, временные, долговременные конструкции.

Introduction: the modern stage of industrialization is characterized by a huge spread of computer technologies that affect all areas of activity, including medicine in general and dentistry in particular [1]. Until recently, none of the dental specialists thought about 3D modeling, virtual analyzers and digital biomechanical models. And now they are already used in various branches of the medical industry. Dentistry, as one of the leading areas of medicine, is in the forefront of digitalization,

virtual planning and computer manufacturing, including 3D printing [2,3]. Dentists, orthopedists, orthodontists and dental technicians began to use 3D printing and scanning, which made it possible to speed up the manufacture of prostheses, crowns, aligners and reduce the number of errors associated with the human factor and the analog approach. The first attempts to create an automated complex for modeling and creating crowns were undertaken by Hensson Internetional (1971). In that year, experiments were carried out on holographic scanning of the oral cavity, which was later used to make a prosthesis. François Duret analyzed the results, laying the groundwork for further research. However, despite this, it was only in 1983 that the first prototype of a workable system was created. The first crown created with this system was manufactured and clinically tested and delivered only in 1985. Currently, there are various representatives of digital systems on the dental market: scanners, and virtual programs, modelers, milling cutters and 3D printers: "3Shape", "Maestro 3d OrthoStudio", "Avantis 3d" ... However, the materials used in 3D printing, until recently , had only temporary certification, and therefore could be used for a limited time. Currently, materials for 3D printing appear on the dental market, with the possibility of long-term use.

Objective: to evaluate the possibilities of clinical application of long-term wearing crowns made by 3D printing.

Materials and methods: now the manufacture of crowns using the 3D printing method includes several stages: scanning the tooth stump, modeling the crown in a virtual modeler, printing the crown on a 3D printer. Scanning or taking an impression is performed by a dentist, after which the impression of the dentition is driven into the software, where the dentition is adjusted [4,5]. Next, it is printed on a 3 D printer. Conventionally, the whole process of creating a crown in a 3D printer can be divided into 3 stages: 1. Three-dimensional model of the crown. The virtual model of the dentition and the stump of the tooth is created either manually by a dental technician (in one of the modeling systems, for example exocad), or automatically using scanning technologies (Omnicam, 3Shape) 2. Division of the model into layers - layers, to simplify the printing process, are made sufficiently thin (less than 100 micrometers), in addition, such a layer thickness allows you to make the edges of the object smooth 3. Print An object divided into a set of layers is loaded into a 3D printer, which creates (prints) the object layer by layer. It should be remembered that different 3D printing technologies use different materials to build an object. In order to determine the possibilities of clinical application of 3D-printed long-wearing crowns. We have carried out the manufacture of provisional structures for long-term wearing for a patient with the destruction of the coronal part of the teeth, in the lateral part, which is undergoing therapeutic (endodontic) treatment. (Figure 1) In the work, a Formlabs 3 3D printer was used, and the photopoiymer Resin for Form 3B material

Figure 1. 3D printed crown made of photopoiymer Resin for Form 3B for long-term wear

Results and Discussion: Currently, there is an increasing influence of 3D visualization and modeling on all aspects of dentistry. Precise and complex geometric shapes can be made using digital data. With the help of 3-D printing from various materials, you can achieve a solution to a particular problem. The production of long-term crowns using the method of digital modeling and 3D printing allows to achieve high accuracy of the fit of the structure, significantly reduces the manufacturing time of such structures, and also significantly reduces the time spent by the dentist and dental technician. At the same time, this method still requires careful study and observation of structures for a long time, as well as the skill of virtual modeling by dental specialists.

Литература/References

1. *Аддиктивные технологии как технологическая инновация [Электронный ресурс]. Режим доступа: http://ekonomika.snauka. ru/2018/01/15666 дата обращения (25.03.2019).*
2. *Будущее в 3D: как технологии меняют наше представление о медицине [Электронный ресурс]. Режим доступа: https://www.m24.ru/articles/nauka/02112016/120896?utm_ source=CopyBuf?utm_sourc e=CopyBuf дата обращения (26.03.2019).*
3. *3D-печать в стоматологии на примере NextDent [Электронный ресурс]. Режим доступа: https://habr.com/ru/company/top3dshop/blog/399271/ дата обращения (03.04.2019).*
4. *Д.Ю. Дьяченко, С.В. Гаврикова, Д.В. Михальченко, А.В. Михальченко Применение 3D-печати в стоматологии для изготовления провизорных ортопедических конструкций // Электронный научно-образовательный Вестник. – 2015. - том 17 (23)*
5. *Наумович С.С. Cad/cam системы в стоматологии: современное состояние и перспективы развития / С.С. Наумович, А.Н. Разоренов // Современная стоматология. - 2016. - No 4 (65). - С. 2.*
6. *Dawood, A., Marti, M. B., Sauret-Jackson, V., Darwood, A. 3D Printing in Dentistry / A. Dawood, M. B. Marti, V. Sauret-Jackson, A. Darwood // British Dental Journal. – 2015. - Vol. 219 (11). - P. 521-525.*

7. *Helena, N. C., Benjamin, M. Wu. Recent advances in 3D printing of biomaterials / N. C. Helena, M. Wu. Benjamin // Journal of Biological Engineering. – 2015. - Vol. 9. – P. 4 - 9.*

8. *Liu, Q., Leu, M. C., Schmitt, S. M. Rapid prototyping in dentistry: technology and application / Q. Liu, M. C. Leu, S. M. Schmitt // Int J Adv Manuf Technol. – 2016. – Vol. 29. – P. 317 - 325.*

9. *Noort, R. The future of dental devices is digital / R. Noort // Dent Mater. – 2017. – Vol. 28. – P. 3 - 12.*

10. *Subburaj, K., Nair, C., Rajesh, S., Meshram, S. M., Ravi, B. Rapid development of auricular prosthesis using CAD and rapid prototyping technologies / K. Subburaj, C. Nair, S. Rajesh, S. M. Meshram, B. Ravi // Int J Oral Maxillofac Surg. – 2017. – Vol. 36 (10). – P. 938 - 943.*

11. *Zein, I., Hutmacher, D. W., Tan, K. C., Teoh, S. H. Fused deposition modeling of novel scaffold architectures for tissue engineering applications / I. Zein, D. W. Hutmacher, K. C. Tan, S. H. Teoh // Biomaterials. – 2020. – Vol. 23. – P. 1169 - 1185.*

PREDICTING THE LIFE OF A DENTAL IMPLANT USING MATHEMATICAL MODELING METHOD

M.T. Safarov[1], S.A. Asemova[2]

[1] Associate professor of the Department of Prosthetic Dentistry

[2] Master student of the Department of Prosthetic Dentistry

ABSTRACT

Today, dental implantology is considered one of the most optimal solutions to the problem of toothlessness, the most convenient method for treating partial restoration of the dentition or dentition of edentulous jaws without damaging the adjacent teeth (8,12,19). Predicting the life of dental implants is an important issue in developing a treatment plan for a successful implantation (1,7). For this, we have created a program that uses mathematical methods and statistics of implanted patients. The program is based on the most important factors related to the longevity of dental implants, the tissues surrounding the implant and the patient's general health as well as lifestyle. In fact, the success of dental implants depends on more than 50 factors, and the selection of the most important ones is a very important aspect when developing a program. In this regard, we used the method of expert analysis. The program is designed for access by implantologists and orthopedic dentists and is consistent with the results of worldwide experiments conducted in recent years.