



CODEN [USA]: IAJPBB

ISSN : 2349-7750

INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

SJIF Impact Factor: 7.187

<https://doi.org/10.5281/zenodo.5155684>
Online at: <http://www.iajps.com>

Research Article

A NEW APPROACH IN THE DIAGNOSTICS AND TREATMENT OF DENTOALVEOLAR ANOMALIES IN ORTHOPEDIC DENTISTRY

¹Samusenkov V.O., ¹Asaeva D.F., ¹Potapov A.K., ¹Dzabaeva L.D., ¹Ampilova K.E.

¹FSAEI of HE I.M. Sechenov Moscow Medical State University (Sechenov University), Russia,
Moscow, 119991, St. Trubetskaya, 8\2.

¹Department of orthopedic dentistry

Samusenkov V.O.- PhD, Associate Professor of the Department of Orthopedic Dentistry I.M.Sechenov
Moscow Medical State University (Sechenov University), (croc@bk.ru) , (+79164158663),
(<https://orcid.org/0000-0001-6266-0555>)

Asaeva D.F. - Student of Institute of Dentistry I.M. Sechenov Moscow Medical State University
(Sechenov University), (danielle.asaeva2512@gmail.com), (+79099020145),
(<https://orcid.org/0000-0002-6287-4411>)

Potapov A.K. - Student of Institute of Dentistry I.M. Sechenov Moscow Medical State University
(Sechenov University), (white08k@gmail.com), (+79036409931), (<https://orcid.org/0000-0002-5416-9093>)

Dzabaeva L.D - Student of Institute of Dentistry I.M. Sechenov Moscow Medical State University
(Sechenov University), (lanadzabaeva@gmail.com), (+79160903003), (<https://orcid.org/0000-0002-0229-5872>)

Ampilova K.E. - Student of Institute of Dentistry I.M. Sechenov Moscow Medical State University
(Sechenov University), (am.ksenia08@gmail.com), (+79969750181), (<https://orcid.org/0000-0001-9215-7846>)

Article Received: July 2021

Accepted: July 2021

Published: August 2021

Abstract:

*Dentistry is one of the most progressive fields in medicine. It does not stop developing in all directions. The requirements of society and patients for the quality of the manipulations are constantly growing, and they can be satisfied due to the achievements of technological progress. Modern digital technologies have initiated a real breakthrough opening the great choice of opportunities. **Aim:** To study and explore the work and advantages of the latest modern technologies used in orthopedic dentistry. **Material and methods:** Numerous literature sources (both electronic and in paper form) published over the past 10 years on this topic have been studied.*

***Results:** The analysis has shown that modern technologies in dentistry open up many possibilities for both doctor and patient. In particular, CAD/CAM systems allow orthopedic constructions to be produced more accurately, quickly and anatomically. **Conclusions:** Digital technologies are intensively being introduced into practice, providing effective methods of diagnosis and treatment.*

***Keywords:** Modern digital technologies, CAD/CAM systems, orthopedic dentistry, ultrasound technologies, laser technologies*

Corresponding author:**Asaeva Daniel Feliksovna,***Student of Institute of Dentistry I.M. Sechenov Moscow Medical State University (Sechenov University),**Danielle.asaeva2512@gmail.com**+79099020145**FSAEI of HE I.M. Sechenov Moscow Medical State University (Sechenov University), Russia, Moscow, 119991, St. Trubetskaya, 8\2.*

Please cite this article in press Asaeva Daniel Feliksovna et al., A New Approach In The Diagnostics And Treatment Of Dentoalveolar Anomalies In Orthopedic Dentistry., Indo Am. J. P. Sci, 2021; 08(08).

INTRODUCTION:

Dentistry is one of the most progressive fields in medicine. It does not stop developing in all directions. The requirements of society and patients for the quality of the manipulations are constantly growing, and they can be satisfied due to the achievements of technological progress. Modern digital technologies have initiated a real breakthrough opening the great choice of opportunities. Digital dentistry which has become an essential part of the practice is widely used on every stage of diagnostics and treatment. This is due to the possibility of reducing the stages of prosthetics and consumption of materials. It also allows the construction to be much more accurate and faster. However, a specialist who is not trained to work with fundamentally new technologies can harm the patient.

Aim

The purpose of this work is to get acquainted with the latest developments in the field of preparation of teeth in the process of orthopedic treatment of patients, as well as to study innovations in the manufacture of orthopedic constructions.

This topic is relevant due to the fact that modern digital technologies are mostly used in orthopedic dentistry because of its ergonomics, efficiency, and the use of new aesthetic and durable materials with a high level of processing.

MATERIAL AND METHODS:

We made a systematic literature search, including the analysis of scientific articles, dissertations, using the following electronic databases: Cyberleninka, PubMed and Cochrane. A search was made in paper sources of educational and scientific literature.

RESULT AND DISCUSSION:

Digital technologies are used at all stages of

diagnostics and treatment, the most popular are CAD/CAM systems (Computer Assisted Designing/Computer Assisted Manufacturing). They are classified as open and closed.

Open systems are systems that allow us to replace any of the modules with a similar one from another manufacturer. Also, the systems can be divided according to the method of obtaining optical scanning into a medical - intraoral method and extraoral (laboratory), scanning from plaster models [1]. CAD/CAM systems are also subdivided according to the manufacturing method into subtractive - milling method and additive - add method.

CAD/CAM systems include:

1. Scanner - a device that allows us to convert a real view into a virtual 3D model of teeth.
2. Computer with structural modeling software.
3. A milling machine which transforms digital data into a finished orthopedic construction.

The first stage is scanning; the doctor uses an intraoral scanner to obtain a digital impression that is important for patients with a pronounced gag reflex. One of the tasks of this stage is the accuracy of measuring the virtual model to natural size. Then the doctor, using a special computer simulation program (CAD-module), corrects the virtual restoration, demonstrating it to the patient on the monitor screen. The modeling process usually takes up to 15 minutes for the one tooth.

The next stage is milling (CAM-module). A ceramic or plastic block, fixed in a milling machine, grinds the modeled restoration under water cooling. The process takes 15-30 minutes, depending on the size of the structure. Further the doctor makes a fitting of the construction, checks it for color and occlusion, fixes

it according to the protocol with dual-cure resin cement. The final stage is the polishing of the restoration.

CAD/CAM technology, used in dental restorations, has achieved great popularity in modern dentistry due to its accuracy and minimization of the number of visits of the patient. Throughout the entire manufacturing process, each subsequent stage will add to the accumulated inaccuracies [2,3]. Modern scanners only slightly change the requirements for the preparation of teeth, since regardless of the quality of the preparation, the accuracy of the resulting digital model will be high [4]. The revealed decrease in accuracy with different taper was taken to be insignificant. However, as the taper angle increases, the size of the statistical error increases. It is recommended to scan only after the final formation of the ledge, since it was the stage that caused the largest percentage of digital modeling errors [5]. Successful restorative treatment requires precise preparation of the prepared teeth. In a clinical setting, in the narrow space of the oral cavity, this is hampered by "dead" zones and other visual deviations, errors in the orientation of the doctor's hands. Nowadays laser technologies are highly developed.

These lasers can be divided into carbon dioxide, solid-state pulsed and erbium. Carbon dioxide is mainly used in operations on soft tissues for their dissection. It is not used for preparation due to the pathogenic effect on the pulp tissue. The solid-state pulsed Nd:YAG laser destroys dentin microstructure, but has clear exposure time limits. When exposed for more than 10 seconds, irreversible changes in the pulp, damage to nerve fibers and bleeding are observed [6]. Erbium YAG laser produces micro-explosions and vaporization of the dentine mineral component. This technology is completely safe. This technique avoids the formation of scratches and chips. The action of the laser has an antiseptic effect, minimizing the risk of infection. The basic principle of non-contact during laser preparation reflects the positive perception of this technique by patients, mainly due to the lack of sound of rotary instruments and pain. Among the disadvantages are the need for high professional training of a doctor, the cost of equipment and, accordingly, treatment.

Ultrasound technologies are widely used in orthopedic dentistry. Abrasive attachments are used directly for preparation, which allow achieving accurate and minimally traumatic preparation of hard tissues [7]. These attachments were created to complete the preparation of the tooth crown in

aesthetically significant areas. Their amplitude and frequency of movements make it possible to form a surface similar to that obtained when using rotary tools. They eliminate the risk of injury to the gingival edge and subsequent bleeding. Most often, the working part of the nozzle has a diamond coating. The coating can be of different abrasiveness, which makes it possible to use each nozzle in a specialized way. There are attachments for forming a subgingival ledge for non-removable restorations and final processing of hard tissues for veneers, forming the texture of the surface of hard tissues and removing roughness to simplify the removal of the impression. The advantages of this technology include ease of use, high biological and functional integration of restorations, minimally invasive action, precision of manipulations, low tactile sensitivity [8,9].

An important aspect of preparation is the cooling of the hard tissues of the tooth and the pulp chamber. Most modern tips have holes for the supply of water and air, designed to spray coolant on the surface of the prepared hard tissues, minimizing temperature damage to the pulp. Current studies have claimed that the number of these holes directly affects the quality of cooling. However, the difference in efficiency is statistically insignificant [2,10]. Physical phenomena that cause the movement of water under the action of a rotary tool do not significantly affect the processes of heat exchange between the liquid and the hard tissues of the tooth.

A robotic system was developed, the main principle of which is the manipulation of laser beams with ultrashort pulses based on data obtained, as a result of, cone-beam computed tomography and ultrasound [3,5]. The result of the operation of such a system was deviations from the model by only 0.0096 ± 0.0108 mm. The development of a fully automated dental preparation based on laser preparation is being carried out. The experiment is carried out not in a clinical setting, but on extracted teeth. Using a 3D CAD/CAM scanner, digital models of teeth were created, and the order of preparation was determined. The hard tissues were subjected to repeated dissection and subsequent scanning. In this way, it became possible to obtain a complete 3D morphology of the teeth being prepared. On average, the preparation of one tooth in the system took 17 minutes. The relative shape error was 0.05-0.17 mm, the occlusal surface error was 0.097 mm, and the taper error was approximately 1.0° [4].

CONCLUSION:

Taking everything into account, having examined

trading data, it is possible to conclude that digital technologies are being actively and productively implemented providing with effective methods of diagnosis and treatment. In a particular moment these technologies develop modern orthopedic dentistry in the form of mutual assistance based on autonomous computer modeling and production of industry-wide structures as CAD/CAM systems.

Advantages of digital dentistry:

- 1) The highest level of aesthetics, resource-efficiency, accuracy and operational purity.
- 2) The data preservation in a digitized format makes it easy to reproduce construction in the case of failure.
- 3) Beyond orthopedic design there is always an option for manufacturing of aligners that are necessary for orthodontic treatment and templates used in surgical implantation.
- 4) The monitoring of thickness and spaces for cement employed in a carcass.
- 5) The economy of working time, space and means.
- 6) It allows patients to get rid of procedure requiring collecting of reprints.

One of the most important circumstances ensuring high-quality dentist assistance to be provided is timely preparation of future specialists well possessing IT-skills.

REFERENCES:

1. Castillo Oyagüe R, Sánchez-Jorge MI, Sánchez Turrión A. Influence of CAD/CAM scanning method and tooth-preparation design on the vertical misfit of zirconia crown copings. *Am J Dent.* 2010;23(6):341-346.;
2. Liang S, Yuan F. High-accuracy digital model design for full crown tooth preparation. *Int J Comput Dent.* 2019;22(4):331-342.;
3. Samedova D. A., Kochneva A. A. Preparation of hard tissues of teeth using a laser // *BMIK.* 2015. №11.;
4. Prosthetics with metal-free structures: textbook.-method. manual / S. A. Naumovich [et al.]. - Minsk :BSMU, 2011 -- 36 p;
5. Chan, D. C., Chung, A. K., Haines, J., Yau, E. H. & Kuo, C. C. The accuracy of optical scanning: influence of convergence and die preparation. *Operative dentistry* 36, 486-491, doi: 10.2341/10-067-L (2011).;
6. Shnip E. V., Naumovich S. A., 2016. Influence of modern preparation methods on the condition of dentaltissues in orthopedic// *Modern dentistry*;
7. Shnip Evgeny Vasilyevich, Naumovich Semyon

Antonovich The use of ultrasound technologies in orthopedicdentistry // *Modern dentistry.* 2016. №1 (62).;

- 8n. Chua H, Choi JJE, Ramani RS, Ganjigatti R, Waddell JN. The cooling efficiency of different dental high- speed handpiece coolant port designs. *Heliyon.* 2019;5(8):e02185. Published 2019 Aug 26. doi:10.1016/j.heliyon.2019.e02185.;
9. Yuan F, Wang Y, Zhang Y, Sun Y, Wang D, Lyu P. An automatic tooth preparation technique: A preliminary study. *Sci Rep.* 2016;6:25281. Published 2016 Apr 29. doi:10.1038/srep25281.;
10. Alammari MR, Abdelnabi MH, Swelem AA. Effect of total occlusal convergence on fit and fracture resistance of zirconia-reinforced lithium silicate crowns. *Clin Cosmet Investig Dent.* 2018;11:1-8. Published 2018 Dec 31. doi:10.2147/CCIDE.S193326.