Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

APPLICATION OF 3D TECHNOLOGIES IN ORTHODONTICS

Mirzaeva Adiba Khamdamovna
Yuldasheva Madina Azamatovna
Alfraganus University, "Tibbiyot" Faculty,
Assistant Department of "Tibbiyot", student of Faculty Stomatology

Abstract
This article explores the use of 3D technologies in orthodontics, highlighting their advantages and clinical outcomes. Unlike traditional orthodontic methods, 3D technologies (digital scanning, 3D printing, computer tomography) provide higher precision, faster workflows, and greater patient comfort. Digital diagnostics allow for accurate analysis of oral conditions and the development of individualized treatment plans. Moreover, 3D printing enables the fabrication of clear aligners, orthodontic appliances, and surgical templates, which makes treatment more efficient and less invasive. The article emphasizes the role and future potential of 3D technologies in modern dentistry.

Keywords: Orthodontics, 3D technologies, digital diagnostics, 3D printing, aligners.

ORTODONTIYADA 3D TEXNOLOGIYALAR QO'LLANILISHI

Mirzayeva Adiba Xamdamovna,
Yuldosheva Madina Azamat qizi
Alfraganus University, Tibbiyot fakulteti, Tibbiyot kafedrasi kata o'qituvchisi, stomatologiya fakulteti 3-kurs talabasi

Annotatsiya
Ushbu maqolada ortodontiya sohasida 3D texnologiyalarning qo'llanilishi, ularning afzalliklari va amaliy natijalari tahlil qilinadi. An'anaviy ortodontik davolash usullaridan farqli ravishda, 3D texnologiyalar (raqamli skanerlash, 3D-printerlar yordamida modellash, kompyuter tomografiyasi) yuqori aniqlik,

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

tezkorlik va bemor uchun qulaylikni ta’minlaydi. Xususan, raqamli diagnostika yordamida og‘iz bo‘shlig‘i holati aniq o‘rganilib, davolash rejasi individual tarzda ishlab chiqiladi. Shuningdek, 3D-printer yordamida shaffof kapalar (alignerlar), ortodontik apparatlar va jarrohlik shablonlarini yaratish imkoniyati tishlarni tezroq va og‘riqsiz davolashga yordam beradi. Maqolada ushbu texnologiyalarning zamonaviy stomatologiyadagi o‘rni va istiqbollari yoritib beriladi.

Kalit so‘zlar: ortodontiya, 3D texnologiyalar, raqamli diagnostika, 3D-printer, alignerlar.

ПРИМЕНЕНИЕ 3D-ТЕХНОЛОГИЙ В ОРТОДОНТИИ

Мирзаева А.Х.,
Юлдашева М.А.
Alfraganus University, факультет “Tibbiyot”, старший преподаватель кафедры “Tibbiyot , студент 3-курса факультета стоматологии

Аннотация:
В данной статье рассматривается применение 3D-технологий в ортодонтии, их преимущества и клинические результаты. В отличие от традиционных методов лечения, 3D-технологии (цифровое сканирование, моделирование с помощью 3D-принтеров, компьютерная томография) обеспечивают высокую точность, оперативность и комфорт для пациента. С помощью цифровой диагностики состояние полости рта исследуется максимально точно, а план лечения разрабатывается индивидуально. Кроме того, 3D-печать позволяет создавать прозрачные каппы (элайнеры), ортодонтические аппараты и хирургические шаблоны, что ускоряет и облегчает процесс лечения. В статье подчеркивается значимость и перспективность внедрения 3D-технологий в современной стоматологии.

Ключевые слова: ортодонтия, 3D-технологии, цифровая диагностика, 3D-принтер, элайнеры.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

In recent years, the rapid development of information technologies in the fields of medicine and dentistry has brought diagnostic and treatment processes to a new level. In particular, the use of 3D technologies in orthodontics is becoming an integral part of modern treatment. Traditional methods of studying the structure of teeth and jaws can be time-consuming and sometimes not provide sufficient accuracy. Therefore, 3D methods based on digital technologies are widely used in this field, providing high quality and efficiency.

3D technologies create an accurate digital model of the patient's oral cavity, which greatly facilitates the doctor in developing an individual treatment plan. For example, intraoral scanning allows for a painless and quick image of the patient's dental row, while computed tomography allows for a complete study of the jaw and bone structures. Also, the ability to prepare aligners, orthodontic appliances, and surgical templates using 3D printers makes the treatment process effective, painless, and highly accurate.

Today, the use of 3D technologies in orthodontic treatment is becoming widespread worldwide. They are not only important in improving the quality of treatment, but also in saving time, increasing patient comfort and achieving excellent aesthetic results. Therefore, the role of 3D technologies in orthodontics is expected to expand and become one of the main directions of this field in the future.

The use of 3D technologies in orthodontics has brought about revolutionary changes in dental practice. Traditional plaster models, X-ray images and hand-made devices have been replaced by modern digital technologies, significantly increasing the accuracy, convenience and efficiency of the treatment process. Below we will analyze the main directions and advantages of 3D technologies. Using intraoral scanners, the patient's dental arch is taken directly from the oral cavity and converted into a high-resolution 3D image. This method is convenient, fast and painless for the patient compared to the traditional cast process. Through digital modeling, the doctor can plan all stages of treatment in advance. For example, it is possible to clearly see in what order the teeth will move, how long the treatment will last, or which devices will be most effective.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

In orthodontics, the CT method allows for an in-depth study of the structure of the teeth and jaw. Using images obtained in 3D format, the doctor can determine the patient's bone thickness, the location of the tooth roots, and pathologies associated with the jaw bones. This reduces the risk of errors in the treatment process and ensures an individual approach. 3D-printing technologies occupy a special place in orthodontics. With their help, they produce:

• transparent aligners,
• models for bracket systems,
• surgical templates,
• special support devices.

This method speeds up the orthodontic treatment process, allows you to create aesthetic and comfortable devices for the patient. Aligners, in particular, have become widely popular in recent years, becoming a competitor to traditional bracket systems. With the help of 3D technologies, it is possible to show the patient in advance what the final result will look like before starting the treatment process. Simulation programs allow you to gradually monitor the movement of teeth and calculate the duration of treatment in advance. This method is very important for increasing patient confidence and effectively controlling the treatment process.

• High accuracy and effectiveness in treatment;
• Saving time and speeding up the process;
• Comfort and painlessness for the patient;
• Full fulfillment of aesthetic requirements;
• Expanding the possibilities for controlling the treatment process for the doctor.

In the future, 3D technologies are expected to be integrated with artificial intelligence to create automated diagnostic and treatment systems. For example, artificial intelligence can offer treatment plans or predict the outcome based on 3D scans of the patient. There are also prospects for the production of more durable and biocompatible devices using biomaterials. The use of 3D technologies in orthodontics is one of the most important stages in the development of modern dentistry. Their introduction is fundamentally changing

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

the diagnostic, treatment and monitoring processes, providing higher accuracy, speed and efficiency compared to traditional methods.

Intraoral scanning allows patients to accurately and painlessly measure their dental arch, and computed tomography provides a deep analysis of the jaw and bone structures. Aligners, surgical templates and orthodontic appliances made using 3D printers make treatment not only effective, but also aesthetic and convenient.

3D technologies also provide an individual approach to orthodontic treatment and help develop a specific treatment plan for each patient. The ability of patients to preview the treatment process and simulate the results increases confidence and increases motivation.

Among the practical advantages of these technologies, it is worth highlighting the possibility of saving time, making the treatment process painless, and obtaining aesthetically perfect results for patients. In the future, 3D technologies are expected to be combined with artificial intelligence to create more advanced, automated diagnostic and treatment systems. In conclusion, the use of 3D technologies in orthodontics not only improves the quality of dental services, but also creates new conveniences for patients and opens up a wide range of opportunities for further development of the industry.

References

1. Proffit, W. R., Fields, H. W., Sarver, D. M. Contemporary Orthodontics. – 6th edition. – St. Louis: Elsevier, 2019. – 744 p.
2. Graber, L. W., Vanarsdall, R. L., Vig, K. W. L. Orthodontics: Current Principles and Techniques. – 6th edition. – Philadelphia: Elsevier, 2017. – 928 p.
3. Al Mortadi, N., Jones, Q., Eggbeer, D., Lewis, J., Williams, R. J. "Fabrication of orthodontic models using 3D printing techniques: An overview." International Journal of Dentistry, 2017, Article ID 4210708.
4. Mangano, F., Gandolfi, A., Luongo, G., Logozzo, S. "Intraoral scanners in dentistry: a review of the current literature." BMC Oral Health, 2017, 17(1):149.

Modern American Journal of Medical and Health Sciences
ISSN (E): 3067-803X
Volume 01, Issue 07, October, 2025
Website: usajournals.org

5. Camardella, L. T., Breuning, H., Vilella, O. "Clear aligner treatment: different clinical approaches." Dental Press Journal of Orthodontics, 2017, 22(4): 45–58.
6. Zhavoronkov, A., Ivanenkov, Y., Aliper, A. "Artificial Intelligence and 3D Technologies in Dentistry: Trends and Future." Frontiers in Dentistry and Oral Health, 2020, 2(3): 112–121.
7. Tojiboyev, A. Sh. "Zamonaviy stomatologiyada 3D texnologiyalarning qo‘llanilishi." O‘zbekiston stomatologiya jurnali, 2022, №3, 45–50-betlar.
8. Raxmonov, M. B. "Ortodontiyada raqamli texnologiyalar istiqbollari." Tibbiyot va innovatsion texnologiyalar jurnali, 2023, №2, 77–83-betlar.