

Augmented Reality & Virtual Reality: A New Chapter In Dentistry

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The dimensions of various dental subspecialties have changed as a result of recent technological breakthroughs in the field of dentistry. Innovations have been implemented to significantly strengthen dental education & clinical applications of dentistry. Such innovations include augmented reality (AR) & virtual reality (VR), which have been developed & researched to advance dental field. In the area of computing and technology, anything is considered "virtual" if it appears to exist despite not existing. Software is utilized in dentistry to mimic dentofacial features in real-time. A complex yet comprehensive virtual experience also simulates functionality of these anatomical structures.


As clinical information obtained can be directly visible to patient, connecting real world with digital world, AR primarily intends to advance clinical practice in field of dentistry. Main application of AR in dentistry is the enhancement of reality using digital information. This enables efficient communication between patients and dental surgeons using images, videos, & three-dimensional models. Although AR is interactive technology, it differs from VR in that users interact with a 3D environment that has been registered using basic imaging techniques while working on an integral image of patient's teeth or other anatomical structures. As a result, AR augments physical elements with virtual elements.

Utilizing cutting-edge technology and specialized software, VR creates a digital, three-dimensional world that stimulates the senses of the user through artificially generated feedback and experiences. As a result, VR is identical to physical reality since it enables users to participate in virtual realities that are tied to it. In contrast to VR, which is system-controlled, AR allows users to regulate their presence in real world.

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Second, whereas AR may be utilized with a smartphone, VR requires a headset device. Additionally, whereas AR can enrich both the actual and the virtual worlds, VR can only augment fictional reality. Virtual reality is alienated into 3 categories: immersive virtual reality, non-immersive virtual reality, & semi-immersive virtual reality, depending on level of user immersion.

There are applications for AR and VR, including a prospective position in several dental specialties. In comparison to conventional methods, 3D real-time computer simulations have been used to educate and teach dentistry to students. These simulators enable instructors to show treatment methods while aiming to improve the student's manual dexterity and accuracy. Additionally, during the unprecedented COVID times, AR & VR are shown to be a boon for educating & training students.

Placement of dental implants, craniofacial surgery, & orthognathic surgery are main uses of AR in oral and maxillofacial surgery. In comparison to the block anaesthetic used alone, the application of AR in the inferior alveolar block anaesthesia can increase its effectiveness, precision, and accuracy. The AR-guided navigation tools in orthognathic surgery offer real surgical images, virtual surgical planning, and assist in examining the patient's anatomical structures. Mandibular angle split osteotomy is crucial surgical procedure in orthognathic surgery. The application of AR has also been investigated in distraction osteogenesis, and it was shown that AR was more precise than conventional approaches in correctly locating the osteotomy planes.

Virtual reality is used in pediatric dentistry as one of the cutting-edge methods to lower anxiety & stress levels of young patients. In-vivo exposure therapy (IVET) & virtual reality exposure therapy (VRET) are two methods for managing anxiety. VRET is a relatively new method that uses computer-generated visuals to simulate patient's concerns in terms of fear so they can feel them without actually experiencing them, which helps patients feel less anxious.

Numerous implant-related procedures have been greatly enhanced by usage of AR technology. Contrary to the conventional methods, the AR surgical navigation technology aids in the surgeon's focus primarily on the location of implant placement, offering only valuable data & thus cutting down on the cost and duration of the procedure. This aids the surgeon in precisely locating and positioning the dental implants. With the aid of VR, patients can receive comprehensive information about the dental implant procedure, which helps them mentally prepare.

Contrary to participants who used traditional technology, those who employed AR technology showed an enhancement in their knowledge & skills in restorative dentistry and endodontics. Without using live test subjects, the students can receive realistic simulations to practice & enhance their clinical skills. In endodontics, accurate identification of root canals has been made possible through AR technology.

Cephalometry, a significant diagnostic tool for analysis and treatment planning in orthodontics, makes for an ideal radiographic assessment. Uniqueness of AR is that registration of virtual objects occurs in actual environment, permitting user to see 3D virtual objects superimposed over it. These factors make AR technology a boon for the medical and dental fields as intricate internal body components can be realistically replicated in 3D format, creating excellent tool for learning cephalometrics. Decreased lab stage procedure time and increased bracket placement accuracy are a result of the AR-assisted bracket navigation system.

Conclusion

Dental surgeons can gain from recent technologies that are being developed as the area of dentistry is emerging quickly. These technologies could provide better visualization potential, shorter operating times, improved patient consultation, and hopeful treatment outcomes. It has been discovered that AR & VR technologies are useful resources for clinical practise in the areas of dental implantology, pediatric

and preventive dentistry, oral & maxillofacial surgery, orthodontics, restorative dentistry, & endodontics. Future research should concentrate on creating technological standards with fine quality data & creating AR/VR tools for a dental practice that have been scientifically validated.

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