



**ORIGINAL RESEARCH PAPER**

**Oral Pathology**

**DIGITAL DENTISTRY – A REVIEW**

**KEY WORDS:** Digital dentistry, Computer-Aided Design and Computer-Aided Manufacturing, CBCT, and caries detection.

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**ABSTRACT** Digital Dentistry is a new technology in the dental field that will improve patients' treatment options in the future. It makes digital dental equipment for cosmetic use and implants in dentistry. The practise and potential future of a dentist will be determined by whether or not they accept modern technology. The phrase "digital dentistry" is a wide name that refers to any dental technology including the use of hardware and software that is computer-based technology. The objective is to enable dental professionals to deliver care utilizing computer-assisted tools. This article's reviews the investigation ideas of digital dentistry, its merits and demerits, and to offer claims and observations about particular aspects of digital dentistry that are supported by research. The knowledge is of not only the dentist but also the whole dental staffs are crucial to the success of introducing new technology in the dentistry.

**INTRODUCTION**  
 Dental equipment or apparatus that uses digital or computer-based components rather than more antiquated mechanical or electrical processes is referred to as digital dentistry. The use of computer-aided dentistry streamlines numerous procedures and eliminates many manual steps that can now be replaced by automated system. By using a microscope to examine stained specimen on a glass slide, a human pathologist can diagnose pathology. The variations among pathologist demonstrates the necessity of computer-aided diagnosis, which enables pathologists to concentrate more on cases that are challenging to diagnose rather than sorting through benign tissue. As compared to dentistry 30 or even 10 years ago, it is quite amazing how much has changed. Technology will increase practise management's effectiveness. A dynamic clinical tool as well as helpful in cosmetic and aesthetic research would be software that can readily relate photographic images and aesthetic and cosmetic metrics. (2) Simplified human-computer interactions have resulted in significant progress in virtual reality (VR)-based dental training. On the other hand, CAD/CAM of prosthesis and dental appliance is now extensively utilised throughout the world and is dependent on the knowledge of not only the dentist but also the entire dental team. (3) Computer assisted design is a technique that allows users to develop intricately detailed products that can be examined from several perspectives (CAD). These advancements have made it possible for CAD/CAM to be used in a range of other industries, such as the medical and dentistry disciplines. (4) Dentistry has found particular utility for CAD/CAM because it enables the creation of personalized restorations and prosthesis for individual patients without the use of conventional analogue dental laboratory techniques. (5)

- Digital technology in dentistry**
- CAD/CAM and intraoral imaging - controlled by both the laboratory and the clinician
  - Detection of caries
  - Lasers
  - Implant dentistry with computer assistance, including the creation of surgical guides.
  - Intraoral and extra oral digital radiography, including cone beam computed tomography (CBCT)
  - Extra oral and intraoral radiography

- Practice and patient record management - Including digital patient education (6)

Dental professionals are willing to adopt tried-and-true digital technology into their practices in order to provide cutting-edge dental care in a timely manner in a more effective, efficient, and comfortable manner.

**CAD CAM**  
 We are now able to create and construct 3D models using computer numerical control (CNC) equipment that are based on virtual prototypes thanks to the advancements in information technology(7). In the process known as computer aided design, computers can now be utilized to produce precisely detailed projects that can be evaluated from several angles (CAD) to take place a computer-aided manufacturing (CAM) procedure has been devised using virtual objects and CAD. Dentistry has found CAD/CAM to be very helpful for fabricating personalized, patient-specific restorations and prosthetics without the use of conventional analogue dental laboratory techniques. We are now able to create and construct 3D models using computer numerical control (CNC) equipment that are based on virtual prototypes advancements in information technology. Computers may now be used to create finely detailed projects that can be accessed from various viewpoints thanks to the technique known as computer aided design (CAD). (8)

**The detection of caries**  
 Due to their fast availability and very minimal radiation exposure, digital radiographs are useful for detecting dental problems like caries and for dental operations. Digital intraoral radiography systems appear to be just as accurate as the currently available dental films for the detection of caries. With 5–10% false positive rates, occlusal lesions into dentine can be detected with relatively high sensitivity (0.6–0.8).Dentine radiolucency is known to be a reliable indicator of demineralization. In clinical practice, direct digital intraoral radiography devices are in use, and the number of dentists to adopt digital radiography is steadily rising. (9, 10, 11)

**Analysis and diagnosis of occlusion**  
 The use of digital techniques will result in significant changes to dentistry and dental lab technology. The practical idea of

utilizing digital technology for motion and functional diagnosis and treatment are important. There will be a dramatic increase in standardized practices. When the lower jaw (mandible) and upper jaw (maxilla) come together, the teeth are in a position known as occlusion, which describes their alignment and how they meet. The corrective actions required to balance the functional dynamics of occlusion are determined through analysis. (12, 13)

Implant dentistry with computer assistance, including the creation of surgical guides Implant planning CAD software is used to create precise computer-assisted implant surgical guidelines by processing data from CBCT, intra-oral scanners, and diagnostic casts. The use of CT combined with implant planning software produced useful data. Local anatomical restrictions such concavities and bone density, as well as precise inspection of the osseous topography, may all be easily assessed. The use of CT combined with implant planning software produced useful data. Furthermore, the location of proposed implants was made possible by the existence of a scanographic guide with a radiopaque representation of teeth. Preoperative assessment led to a predictable surgical phase. The surgical guidance for the CAD/CAM system was used to help put all 8 implants precisely as planned. At the time of operation, there was no need to change the location, angulations, or implant diameter. (14, 15, 16)

**Laser**

One of the most promising methods for resolving numerous issues with casting alloys is the creation of metallic frameworks using selective laser melting technology. Layer-by-layer addition is a process that uses heat produced by computer-controlled laser radiation to reinforce specific and subsequent layers of powder material, one on top of the other, to create 3D items. Only erbium family lasers can ensure satisfactory tooth excavation results to, minimising sensitivity and discomfort following surgery, also offering minimally invasive dentistry, the advantages associated to laser applications on hard and soft tissue as well as on the exposed pulp. The complete treatment, including these lasers can be used in pulpotomy, pulpectomy, or coagulation of the exposed pulp are used to prepare and finish the tooth margin. (15, 17, 18)

**Radiography in dentistry**

The use of computer-aided diagnosis in clinical dentistry will become standard procedure. It is critical right now to pinpoint clinical issues where technology can help the dentist most with better diagnosis and treatment planning. These amounts are far less than what can be seen by just comparing the before and after radiographs visually. Before a certain therapy is carried out, a radiographic image is produced. Another image is created at some point following the treatment. Pixel-by-pixel analysis is used to compare the two digital images. While evaluating a digital panorama system, it is important to weigh the price of the sensor, the time required to record the image data, and the file size. In either scenario, the technique is comparable to traditional panoramic radiography, but film-based imaging's receptor, processing, display, and storage are different. (19, 20)

**CONCLUSION**

Digital dentistry is not just fancy marketing speak; it offers a great return on investment and increases dentists' satisfaction of their work, and better patient care can all be achieved when properly implemented and thoroughly trained. Dentistry's future is now. Decades behind it takes another ten years to embrace or use these innovative dental techniques. Choose the areas that will best support the practice, choose products and technologies with knowledge, get educated and trained well for future.

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