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Short Communication

RVG - First Digital Step in Dentistry

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Dental imaging was introduced in dentistry in 1987 by Dr. Francois Mugnon with his RVG system(Radiovisiography) in Europe by the French company Trophy Radiologie. In the last few years it seems to be one of the newest tools in technology which aims to make the process of dental imaging a lot easier and efficient. Instead of the traditional film or film-screen based combination, this new technique uses electronic sensors to capture the penetration that will digitize the impulses which are generated electronically. This is followed by a diagnostic image which is almost instantaneously produced on the monitor. The basic armamentarium necessary to acquire a digital image are [1-3].

- **X-RAY machine:** Most digital systems use conventional dental units as an x-ray radiation source due to its compatibility.
- **Electronic intraoral sensor**: A small radiographic detector that is placed intraorally and is used for capturing the image radiographically. This image is then further sent to the computer for processing. It may be either wired with 8 to 35feet fibre optic cable or wireless. Currently three types of sensor technologies exist such as CCD(charge coupled device),CMOS(complementary metal oxide semiconductor/ active pixel sensor),CID(charge injection device).

Computer

used for digitization and storage of information from the sensor. The overall time taken for the sensor to process and finally present the image on the screen is about 0.5 to 120 seconds.

Principle: Digital radiography works on the basic principle of capturing of images using a specialized sensor, further breaking of it into electronic pieces such as pixels and followed by presentation of image on the screen and store it safely for any record purposes. The sensor is used for receiving analog information and with the help of analog-to-digital convertor (ADC) it id further converted to a digital version. It is formed from a series of elements termed pixels which are assigned discrete gray values for every element. Storage of images is undertaken with the help of specialized softwares. It also provides us with the option of further editing it or enhancing the resolution for diagnostic purposes.

There are currently 3 types available:

- **Direct digital radiography:** This system uses a sensor which has its wiring attached to the computer directly. Examples of these kinds of sensors are CCD or CMOS.
- **Indirect digital radiography:** This is a completely wireless system. For example, photostimulable phosphor plate(PSP) or laser beam scanning would be used to further produce the image.
- **Optically scanned digital radiography:** In this system a complete radiograph would be scanned and it will also be digitally displayed. It works similar to scanning of normal documents.

Advantages

One of the biggest advantages is superior gray-scale resolution of 256 colours of gray in comparison with only 16 to 25 shades of gray as compared to a conventional film. This property allows the user to make changes to the contrast and density of the image and leads to enhancement of its features and a more detailed display. radiation exposure to individuals has been noted to be reduced by

75%. It comes up with added features like options to colour them or even enlarge the images which are great features. It requires less time to process images efficiently and subsequently is of value to any clinician in terms of finance and also professionally. Storage of radiographs Images are stored in a small hard drive in the computer. It saves a lot of space in the computer along with ease of transmission. to other offices. After initial set up cost, everything in the long run is a financial saver, it eliminates the need for purchasing conventional films, costly processing solutions and equipments. Dark room is no longer needed and makes this radiography technique environment friendly.

Disadvantages

Major disadvantage with digitalization is the cost involved in purchasing and setting up an armamentarium. Individuals also need to be trained in order to be able to use the machine properly and effectively with all safety measures in place. Sensors are also very thick and inflexible. There have been instances of patient discomfort due to that and also pharyngeal reflexes problem noted in many patients. The sensors need to be covered in disposable plastic sheets before placing it in patients' mouths for adequate infection protocol. There also seems to be potential misuse of diagnostic images for frauds and insurance claims.

Clinical importance

One of the major implications for digital radiography are in implant surgeries. During implant placement the major inconvenience of asepsis and time wastage can be avoided in total. The clinician no longer will have to wait for images to be processed in order to move ahead with surgery. this overall enhances efficiency and speed when it comes to major procedures.

Its use also has been visibly seen in endodontics. While taking multiple radiographs to determine the working length, a second image can be very easily taken without even removing the sensor from the mouth of the patient. Thus it makes the process easy for the clinician.

Future applications

- **PACS (Picture archiving and communication systems):** Is a newer technology developed to provide storage of images and easy access to it in an economical way from multiple avenues. In this process electronically generated images and reports are transmitted via PACS or via film jackets. The universal format for storage of PACS images and their transfer is through DICOM (Digital Imaging and Communication in Medicine). It has a future potential of being combined with all the available web technologies and to help in interpretation of images and safe and easy access to data on a larger scale.
- **Teleradiography:** The transmission of images taken for patients radiographically like x-rays, CTs and MRI and their transfer from one location to another. It helps with sharing information and enhancement of knowledge between different radiologista and physicians in the world. Teleradiography is an excellent way to help clinicians deliver timely and best care to patients without their need to be present at the location.

Figure 1

Figure 2: Wired and wireless intraoral sensors.

Figure 3

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