Dental Digital Radiography

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group B

Dental digital radiography

DIGITAL IMAGES TODAY PROVIDES ENHANCED RADIATION SAFETY LEVELS AND IMPROVED DIAGNOSTIC PERFORMANCE .IT ALSO FACILITATES MORE TIME TO DEVOTE IN CARE OF DENTAL PATIENTS.

Basic Descriptive Terminology

- **Digital radiography**1987 ni decudortni metsys gnigami sselmlfi a si by Dr. francis Mouyen.
- Digital radiograph uses electronic fo daetsni **rosnes film**

Radiograph Versus Digital Image

- A radiograph is a 2 dimentional view of a 3 dimentional object
- With digetal radiography (imaging) no film is utilized so the term radiograph is not used
- In degital imaging the term **digital image** na ot srefer dna hpargoidar fo daetsni desu si fo desopmoc egami**pixels** . (tnemele erutcip)
- **Pixel**.neercs eht no detneserper erutcip a fo tnemele elballortnoc tsellams eht si
- **Analog image**.mlfi lanoitnevnoc no desu si
- **Digital Image** ro/dna shpargoidar eht no deweiv si tahw ebircsced ot desu won si .segami latiged

Advantages Of Digital Imaging

- **Superior gray scale resolution.**degital imaging uses up to **256 or mor shades** of gray. This advantage is criticle because diagnosis is often based on contrast discrimenation on the other hand conventional dental film only has **16 to25 shadws** of gray. It has less ability in capturing great detail or resolution.
- **Lower Cost and Effective Patient Aducation Tool.**
- **Reduced exposure to radiation.**it's about 50 to 90% less than conventional radiolography because in the conventional radiography the film is not as sensetive to eneargy beam x-ray.
- **Inceased speed image viewing.**image can be viewd withen moments after exposer while exposed film had to under go costly and later environmental impact caused by chemical processing.
- **Computer manipulation.**it's useful to modify contrast, colour, size of image as well as the vesibility of the structures.
- **Easy and quick image transfer.**digetal image may be easily tranfered between institutions or offices simply to avoid additional exposer to the patient.
- **Inhancement of diagnostic image.**

DISADVANTAGES OF DIGITAL RADIOGRAPHY

- **Cost.** digital radiographic system is expensive and the sensors are initially expensive but over the time they are less expensive than film based radiology
- **Infection control.** Digital sensor is a reusable device that cannot withstand the heat of the autoclave.
- **Sensor size or dimentions.**
- **Legal issues.** Always keep non-enhanced originals saved on computer prior to digital image enhanced for discovery.
- **Patients comfort.** The sensors are thick and rigid so they are uncomfortable for some patients.

ANALOG

- Silver halide crystals
- Random arrangement on the film

DIGITAL

- Pixel-the digital equivalent of a silver halide crystal, but in an ordered arrangement
- 307,200 pixels on a sensor
- Produce a sort of "electronic" latent image

Digital Subtraction

A benefit of using Dental Digital Radiography is the enhancements that the software allows for diagnostic purposes

Digital Image

Radiopaque (white areas) with outer area radiolucent (black or dark gray)

Digital Image
Bite-wing Image

Radiopaque (white areas) as first image and as normal image view

Bite-wing Image

Digital Subtraction

Bite-Wing Image

This digital image has the Digital Subtraction enhancement done after image stored on the computer software. It reverses the shades of gray for diagnostic purposes. Radiopaque (normally white images are now looking translucent (dark or gray)

USES OF DIGITAL IMAGING

- Detect lesions, diseases, conditions.
- Informations during root canal procedure and implants.
- Evaluate growth and development.
- Changes secondary to caries, trauma, periodontal diseases.
- Progress of treatment.

Equipment

- X-radiation source
- Sensor
  - Intaoral : CCD, CMOS, CID
  - Extraoral : PSP plates
- Computer

X-Radiation Source

- Most digital radiographs systems use a conventional dental x-ray unit as the x-ray radiation source
- The x-ray unit timer must be adapted to allow exposures in a time frame of 1/100 of a second

Intraoral Sensor

- A small detector that is placed in the mouth of the patient and used to capture the radiographic image.
- **Wired**
  - The imaging sensor is linked by fiber optic cable to a computer
- **Wireless**
  - The imaging sensor is not linked by cable

Types of digital sensors

1. Charge-coupled device (CCD)
2. Complimentary metal oxide Semiconducture/active pixel sensor (CMOS/APS)
3. Charged injection device (CID)
4. Photostimulable phosphor plates (PSP)

1-CCD

- one of the most common digital sensors used in dental digital imaging.
- The CCD is a sensor that contain a silicon chip with an electric circuit into it.
- The silicon chip is sensitive to x radiation.
- The electrons that compose the silicon CCD are arranged in "blocks" (pixels).
- A pixel is the digital equivalent to the silver halide crystal.
- Unlike the silver halide crystal contained in the film emulsion, which is randomly distributed, the pixel arrangement is ordered.
- The sensor will contain 307,200 pixels each pixel is linked to specific area on the computer screen.
- As the x-ray photons come in to contact with the sensor, this produces an electronic charge that is connected to specific area on the computer screen.

CMOS Sensor

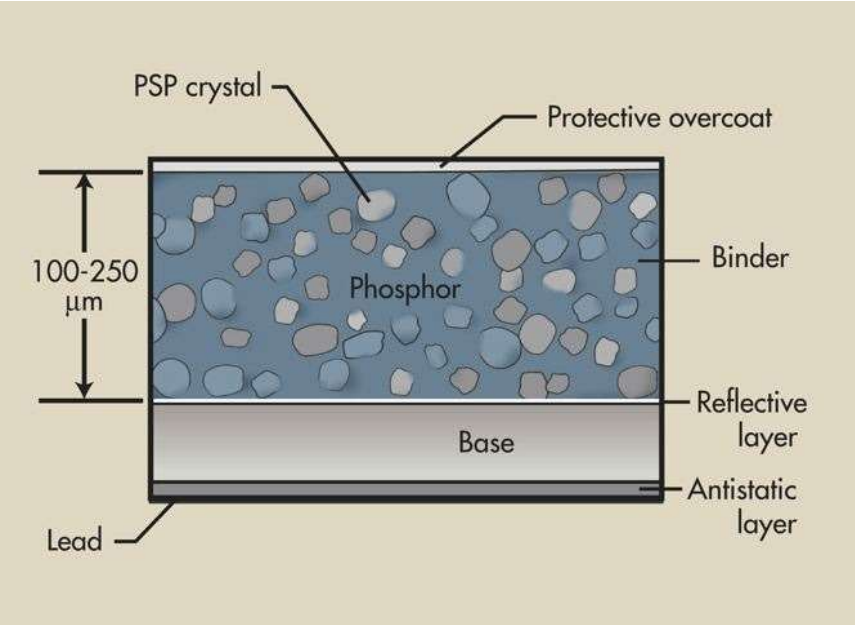
- the CMOS differs from the CCD in way that the pixels are read by the computer.
- They claim 25% greater resolution than CCD technology.
- The CMOS sensor is also less costly to produce and the sensor has greater durability.

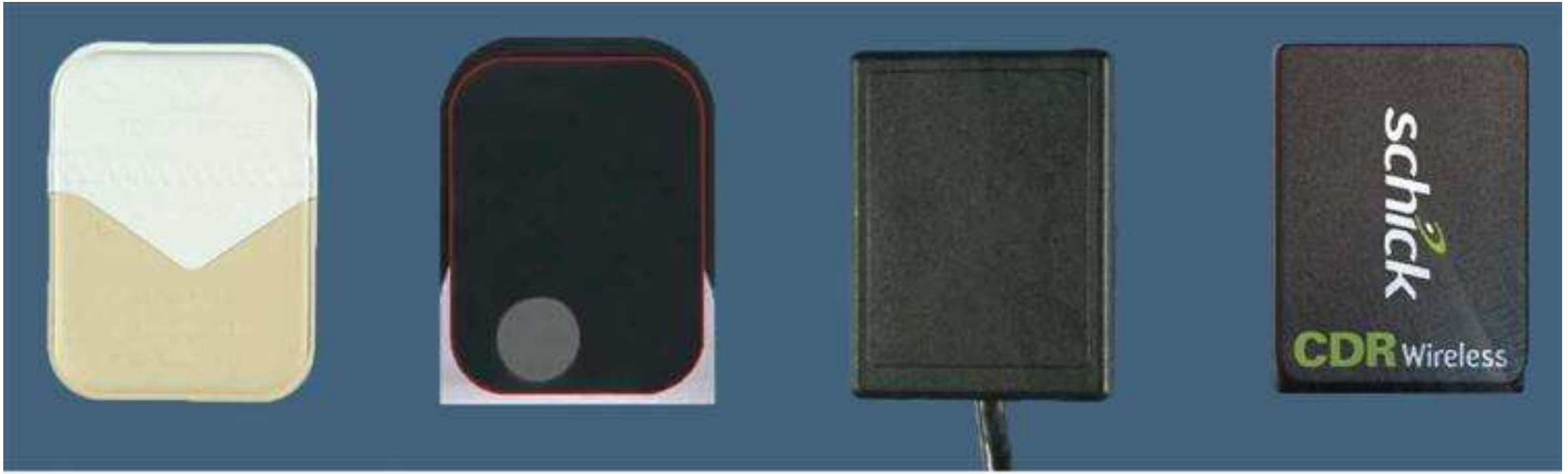
CID Sensor

- A silicon-based solid-state imaging receptor much like the CCD, but it is different structurally
- No computer is required to process the image

PSP plates

- Also known as storage phosphor plates (SPP), image plates or computed radiography.
- Flexable, wireless, indirect receptor.
- Available in the same sizes of intraoral films.





A- No. 2 film

B-No. 2 PSP plate

C-No.2 CCD sensor

D-No.2 CMOS wireless sensor

TYPES OF DIGITAL RADIOGRAPHY

1. **DIRECT DIGITAL IMAGING.** Uses sensor placed and exposed just like film, sensors transmits the image to computer and then viewed on monitor.
2. **INDIRECT DIGITAL IMAGING.** Is when we obtain an image that was scanned from an existing film. it's converted into digital form by using a CCD camera. It utilizes a reusable plate in place of the film after X-Ray exposure the plate is placed in a special scanner where the latent image is retrieved point by point and digitalized using laser light scanning.

DIRECT

- Sensor is placed in the mouth and exposed to x-ray
- Sensor captures image and transmits to computer monitor
- Image appears within seconds.

INDIRECT

- Scanning in the traditional radiograph
- This method is inferior because the resulting image is a "copy" of the original that was scanned

❖What does the computer do in digital radiograph??

1. The computer stores the incoming electronic signal.
2. It also converts the signal into a shade of grey that is viewed on the computer monitor.
3. Each pixel is represented in the computer by location and color level of the grey.
4. The pixel can create 256 shades of grey, but the human eye can only perceive 32 shades of grey.

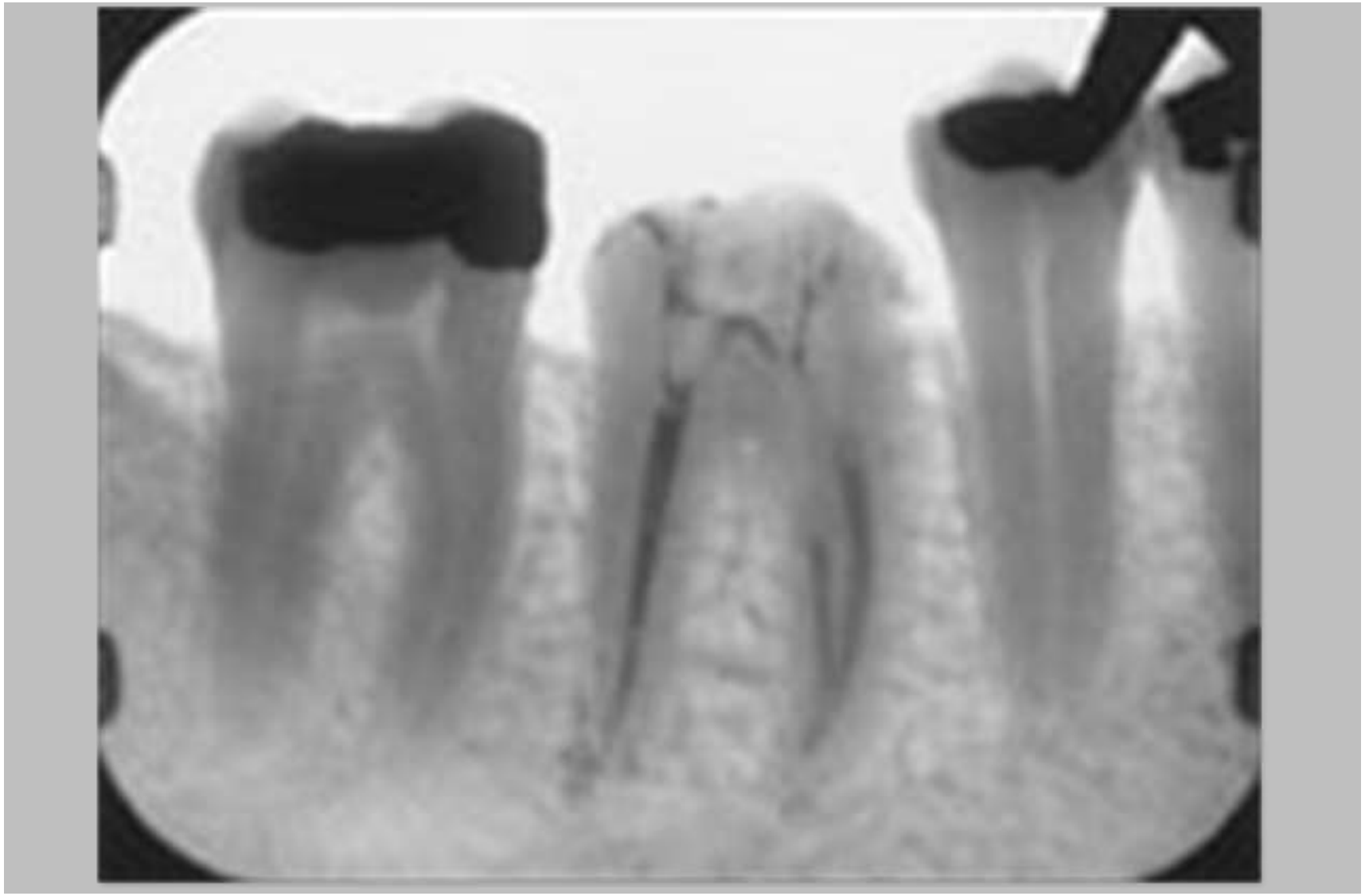
Other Features Of Digital Imaging

- Subtraction
- Magnification
- measurement

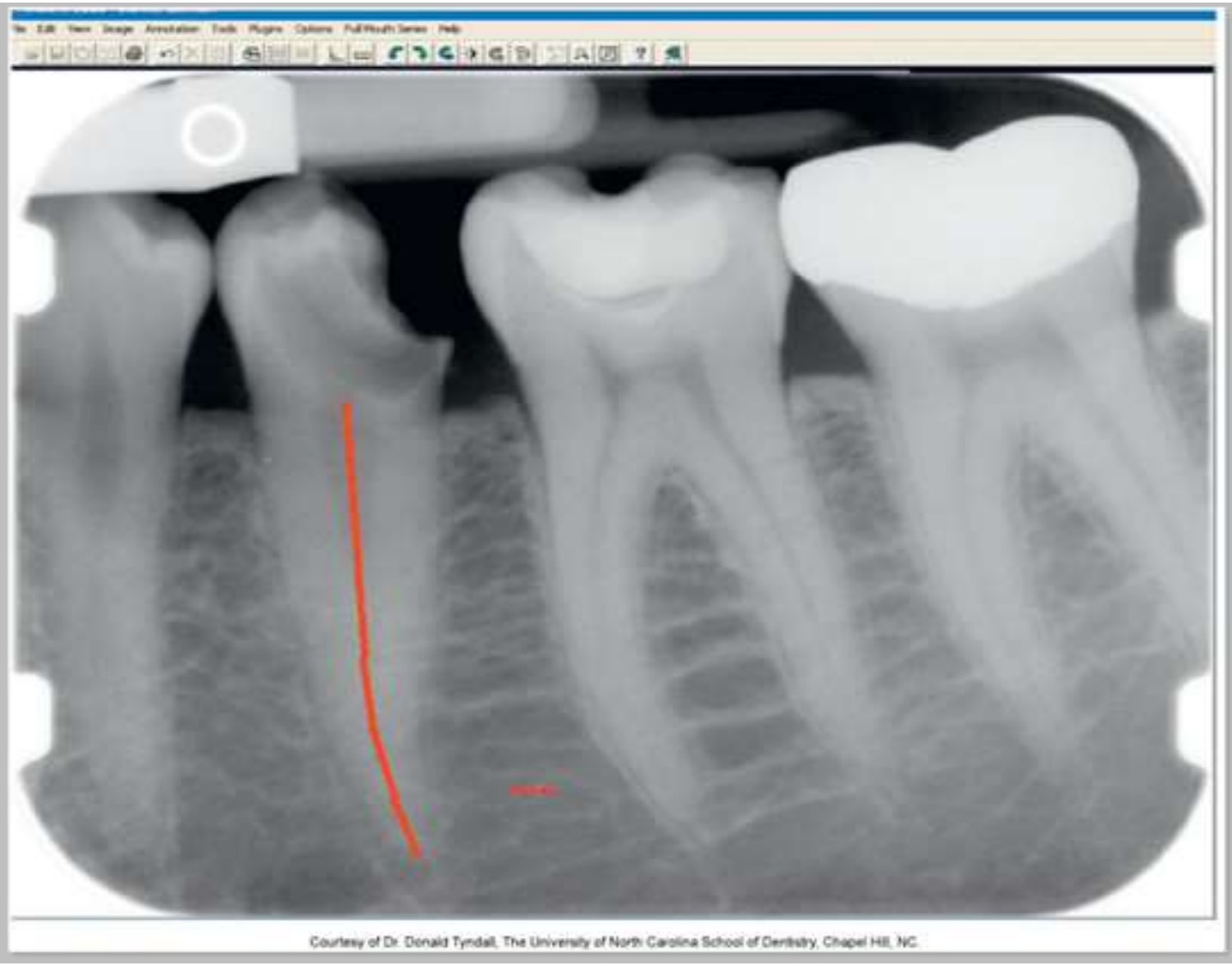
Digital Subtraction

- With digital subtraction, the gray scale is reversed so that radiolucent image (normally black), appear white and radiopaque image (normally white) appear black.
- Digital subtraction helps to eliminate distracting background information.
- This feature permits the operator to remove all anatomic structures that have not changed between radiographic examination to facilitate changes in diagnostic information.

Digital Subtraction



Measurement



Magnification