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**QUESTION NO 01**

**TEN ADVANTAGES OF DIGITAL RADIOGRAPHY OVER SCREEN-FILM RADIOGRAPHY.**

**ANSWER**

**ADVANTAGES OF DIGITAL RADIOGRAPHY:**

Digital Radiography is a way or modern method of capturing or obtaining a digitized image of the internal structures. And which we will be able to display it on a monitor.

The images use electronic signals and a capturing device instead of a photographic film. DR allows images of the x-rays more accurately and instantly as compared to the screen-film radiography.

It is a great development in the medical imaging which have improved the outcomes and enhanced the patient or client interactions.

**ADVANTAGES:**

1. **Darkroom:**

Digital Radiography does not require any dark room or chemicals to produces image on the radiograph. The hazardous chemicals were used in the screen-film radiography. Skipping this chemical and darkroom step, the DR is a now a safer for the technologist and also for the environment too.

1. **Fewer Retakes:**

As we know that the screen-film radiography takes a very long time in order to provide a radiograph or image. Each radiograph can only be demonstrated by the technologist or radiologist when it comes out from the processor. But in DR, every image can be demonstrated or viewed immediately after doing the examination.

Because of this immediate access to the radiograph, allows the technician to check the exposure factors and to check if the patient whose x-ray is taken, is positioned correctly or not.

1. **Decreased Radiation Exposure:**

As said earlier, the DR allows fewer retakes. So, these fewer retakes than the screen-film radiography allows the patient to get a decreased dose of radiation as compared to the screen-film radiography.

The DR sensors are very much responsive than the film, because of its sensitivity, less radiations are required to produce an image and patient get a lower dose of radiations.

1. **Image/Radiograph Sharing:**

A digital radiograph can be easily sent through any medium like e-mail, internet messenger or through hard drives without any form of degradations in it.

1. **Post Enhancement:**

A technologist cannot change anything with the resultant image but in DR, the images can be enhanced after the exposure made and it will not show any degradations also on the radiograph.

A technologist can change the brightness, contrast etc, to make the structures on the radiograph clear.

1. **No More Big Files:**

Images from the Screen-Film radiography were stored into big files or in hard copies. organizing them was quite difficult.

But in DR, this method has truly eliminated the recording of images on papers or in files. You can store the digital images on a database and anyone who have access to that database can easily download or share the images.

1. **Image Quality:**

The clarity of a radiograph is one of the key point. Getting the highest image quality is not possible with the screen-film radiography. Image quality can be affected by the patient movement itself or any technical issue. If we talk about the zooming, it is also not possible with the film.

But with DR and its image processing algorithm, the radiologist can get the best results of bones in image and the overlapping soft tissues.

1. **X-Rays Enhancement:**

DR let you control or change the exposure of the image in the real time. So, this feature allows the technologist to brighter the image or darker as demanded.

1. **Time Saving:**

Using DR, you can save lots of time and can increase your productivity faster. The Screen-Film Radiography uses the way of processing the image in a darkroom and exposing it to the hazard's chemicals. But the DR is not such a method who use darkroom and chemicals. The processing speed of the image in DR is much faster the Screen-Film Radiography which save lots of time and increases your productivity rate.

1. **Easy to Use:**

DR is much simpler to understand as compared to the Screen-Film Radiography. You do not have to take training that much if you decide to learn DR. Small amount of training and you are good to go, you can become familiar with the DR with small amount of training.

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**QUESTION NO 02**

**DIFFERENCE BETWEEN DIRECT AND INDIRECT DIGITAL RADIOGRAPHY.**

**ANSWER**

**DIGITAL RADIOGRAPHY:**

It is a form of radiography; this modality uses plates which are sensitive to the x-ray in order to capture the created data during examination. This data is then transferred to a computer fir further processing or enhancement.

**DIRECT DIGITAL RADIOGRAPHY:**

1. The name "Direct" is given because of the technique this uses.
2. The direct digital radiography uses a technique which directly converts the absorbed x-rays from the patient into an electrical signals or charge with no intermediate step.
3. Technique uses a semi-conductor known as Amorphous Selenium (a-Se).
4. Capturing element is the Amorphous Selenium (a-Se).
5. Collecting Element is the TFT (Thin Film Transistor).
6. The x-ray photons create electron-hole pair in Amorphous Selenium.
7. As the holes made are replaced by the electrons the charge in the layer of selenium is read by the TFT array.
8. Direct DR do not use any scintillation phosphor.

**IN-DIRECT DIGITAL RADIOGRAPHY:**

1. Named as "In-Direct" because of the technique it uses.
2. It converts the incident x-rays into light first and then the light is converted into an electrical charge
3. This technique does not convert the x-rays directly into an electrical charge like the Direct DR.
4. A scintillator is used which is made up of "Caesium Iodide".
5. Two collecting devices are available in in-direct digital radiography that are, Fibre Coupled CCD and Thin Film Transistors (TFT).
6. The Capturing element in in-direct DR is "Caesium iodide".
7. The Coupling element in in-direct DR is "Fibre Optics".
8. Provide better Spatial Resolution.

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**QUESTION NO 03**

**WHY IS FILL FACTOR IMPORTANT?**

**ANSWER**

**FILL FACTOR:**

The fill factor is the total percent of area in image receptor that can detect the incoming x-rays and is sensitive to the x-ray beam and allows the conversion of the incident x-rays into light.

**IMPORTANCE:**

As we know that the fill factor is region or area on a pixel that is sensitive to the incident x-ray beam. So, it means that it takes part in the conversion of that incoming x-ray beam into a light which is then transferred to the collector with the help of a coupling device.

About 80% of the pixel have fill factor, so that 80% takes part in the conversion and the remains which is 20% only, do not take part in forming the resultant image or radiograph.

Now having a small pixel size means reduced fill factor and reduced signal strength too. In this scenario the x-ray intensity would be increased to overcome the reduction of the fill factor in a pixel and to strengthen the signal too. Now here a fact revealed that an increase in the fill factor can lowers the radiation dose of the patient.

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**QUESTION NO 04**

**What are the consequences of producing flat panel digital image receptor with smaller pixel size?**

**ANSWER**

**Noisy image** is the resultant image with a flat panel digital image receptor with smaller pixel sizes is used for the examination.

As the size of pixel gets smaller, it directly affects the final image quality on the radiograph. Noise is we can say the fluctuation or disturbance in the optical density of a radiograph.

Small pixel size results in production of **QUANTUM NOISE.** Scattering of the x-rays also plays a role in image noise.

Quantum noise appears on the radiograph when very few x-ray photons are received by the receptor after the attenuation by the organs.

The lower the number of attenuated photons, the higher will be the image noise.

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**QUESTION NO 05**

**FEATURES OF STORAGE PHOSPHOR IMAGING PLATE.**

**ANSWER**

The Storage Phosphor in the imaging plates is the alternative to the two-dimensional x-ray detectors in conventional.

It absorbs the ionizing x-rays, and then the electrons and holes are generated and then they are captured locally in order to form a latent image. The data which is stored in the Phosphor is then read out by a laser HeNe.

**FEATURES:**

Following are the relevant features of Storage Phosphor Imaging Plate.

1. It is a form of Direct Digital Imaging.
2. A wired digital radiographic System.
3. Uses fibre optics to transfer the data.
4. Stores in Metastable electrons.
5. Electrically and Mechanically Stable.
6. Increases the intensity of the directed x-rays and releases the light in excessive amount.
7. It was demonstrated, Phosphor crystals morphology have a significant impact on its performance.

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