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Program Bs- Radiology

viva Cr & dr

Semester 4th Final

Submitted To Main - Maheen Gull

Date 10-07-2020

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Q1:→ What is the digital Subtraction angiography? Explain:→?

Ans Digital Subtraction angiography:→

Subtraction angiography was first described in 1935 and in English Sources in 1962 as a manual technique.

Images are produced using Contrast medium by Subtracting a "Pre-Contrast image" or mask from the Subsequent images, once the Contrast medium has been introduced into a structure. Hance the term "digital Subtraction Angiography".

Def:→

The digital Subtraction angiography is a fluoroscopy technique used in interventional radiology to clearly visualize blood vessels in a bony or dense soft tissue environment.

"Purpose of DSA":→

The main purpose of the digital Subtraction angiography is of producing pictures of internal structures by introducing dye into the Circulatory System that Show up on x-ray film when tissue is exposed with x-rays. Digital Subtraction angiography Can makes two digital pictures of the tissue. The first is made before the dye is introduced. The second is made after the Dye is injected, and that's why it is different from the traditional angiography. A Computer then will removes, or Subtract Certain Structure in first picture from those in the second picture. This leave an angigram that Show only blood vessel and omits Sorrounding or background tissues.

"DSA" is used to detect the blood clots, tumor, and other blockages in the vessels.
Also use to check the health of blood vessel after coronary artery bypass.

Risk Factors:-

Digital Subtraction angiography is not a risk-free procedure. Those who are allergic to iodine will having allergic reaction to the Contrast medium. This reaction may serve and leads to Cause difficulty in breathing, Sudden drop in blood pressure, loss of Consciosness, tissue swelling and other Symptoms of anaphylactic shock. people with Kidney problem the dye will Cause extra burden on the Kidney functioning that's why inform your doctor before the procedure.

Description:- During this procedure (DSA) the individual lies on the table. The electrodes are placed on the Chest to monitor the heart health throughout the procedure. Befor the dye is injected the x-ray of the area is taken.

Anesthetic will be injected on the skin near the site of dye introduces. The dye is inserted to the blood vessel through a thin tube.

Additional x-ray pictures are taken to show blood vessel. The Computer Subtracts structures in the first picture from the second picture and leaving an uncluttered picture of blood vessel of interest. Digital Subtraction angiography takes little time about 30 minutes.

Patient Preparation:→

↳ Digital Subtraction angiography need no Special preparation.

↳ Specific instruction will be given by the physician, if other procedures are to be performed with Digital Subtraction angiography.

After the Procedure/Aftcare:→

↳ To prevent bleeding the patient need to lies for about Six hours after the procedure.

↳ During the rest time the patient will be asked for Complications.

↳ An overnight Stay in hospital may be necessary in some Cases.

Q2:→ What are the Common artifacts in DR? How will you avoid them?

Ans **Artifacts:→** An artifact is a structure or an appearance that is not normally present on the radiograph and is produced by artifical means.

OR Any undesirable objects, structures recorded on the radiography image cause degraded image quality

Common Artifacts in DR & How to Avoid them:→

There are various artifacts in DR which are given below.

① **Loose Cone Artifacts:→**

The appearence of loose Cone artifact are white edges.

Cause:→ Cone has fallen out of the x-ray tube port and is blocking the

Collimator from opening.
Aviod:→ Remove the Collimator and re-attach the Cone to the tube port.

② Bar Code Artifact:→
The Bar Cod appear on Screen.
Cause:→ It is caused by the failure in a data module or the detector.
Avioding:→ perform bad pixel Calibration, if Calibration fails then replace the detector.

③ Noisy Detector power supply Artifacts:→
This artifact appears like vertical lines, which are Symmetrical around the center of the image.
cause:→ It is caused by the noisy detector power supply.
Avioding:→ This artifact are avioded by replacing the power supply.

④ Poor Collimation Artifact:→
The appearence of this artifact is unsharp images.
Cause:→ The poor Collimation artifact are caused due to improper Collimation.
Avioding:→ It is avioded through proper Collimation in accordance with Cassate size and body part.

⑤ Double Exposure Artifacts:→
The appearence of such artifact as Duplication of Images.
Cause:→ It is caused due to two subsequent exposure on same imaging plate.
Avoiding:→ It will be avioded through proper knowledge of using x-ray equipments.

⑥ Exposure through Back of Cassatte:→
It appearance as like various pattrens of Image according to Cassatte design.
Cause:→ Due to poor basic knowledge of Construction of Cassatte.

Avoiding:→ It will be ~~avoided~~ avioded through proper education of radiographers in handling of Cassatte.

⑦ Dust Artifacts:→

The appearence is Focal radiopacities.

Cause:→ Due to Dust particles wedged over Imaging plate.

Avoiding:→ With regular cleaning of Imging plate with proper cleaner.

⑧ Light Bulb Artifacts:→

Appear Darkening of lower and outer portions of an Image.

Cause:→ High exposure.

Avoiding:→ It is avioded through to reduce back scatter by lowering the KV or proper collimation.

⑨ Scratches Artifacts:→

Kink marks on the image appear.

Cause:→ It is caused due to mishandling of imaging plate during cleaning process.

Avoiding:→ It is avioded when the Cassatte and image plates should be handled with care.

Q3. What are the disadvantages of DR?

Ans The digital Radiography having Certain Disadvantages which are given below.

- One of the main disadvantage of digital radiography is the high Start of Cost.
- Images need to be processed almost immediatly as any delay will results in loss of image information due to trapped electrons returning to a lower energy state.
- underexposure will gives us a graing appearence, overexposure is automatically Corrected by imaging Software so there is a tendency to overexposure to ensure a good quality image.

- Sensors can be bulky for patients.
- Need a Computer and network.
- There would be technical difficulties with equipment.
- Requires adequate infection Control protocols.
- Can Cause permenent demage to living cells and tissue.
- Cause genetic mutation.
- It can also lead to Cancer.
- Concern with rapidly advancing technology and Compatibility in the future.
- Panoramic and Cephalometric units are more expensive than Similar film units.
- Integration of radiographic Software into practice Software can be difficult.
- Lack of hard copy without additional equipment.
- The larger the images the more storage space are required.

- The CCD Sensor has of unknown life expectancy.
- The CCD cannot be Sterilized.
- Hard Copy images fade with time.
- Decreased Resolution.
- Poor Spatial resolution.
- The Sensor is bulky in size.
- Initial Cost is high compared with traditional radiography.
- Sensor Cannot be Sterilized by heat so it must be covered Completly by a disposable plastic sleeve to prevent cross-contamination b/w patients.
- Technology Changes: System may become obsolete and no longer has support.
- Lack of information and set up of automatic exposure control.
- problems with interconnectivity.

All the above mentioned are the disadvantages of digital radiography

Q4:→ Compare the image quality of Screen film radiography and DR, which one is Superior?

Ans Image quality differences:→

If we want to discuss the image quality differences b/w the "SFR" and "DR", there is a small difference in the both System resulting image quality and diagnosting quality. Some of these difference are given below.

① Screen Film Radiography:→

② The Screen film radiography has higher Spatial resolution that of digital. But due to poor maintance of equipment and operator or technologist error, the image quality may be lower.

(b) We may gets a low gray images, if we try for getting high Contrast image.

(c) Image quality also Suffer due to Some factors like type of film used, the exposure factor and more importantly the processing of the radiograph.

(d) In screen film radiography the image quality Suffer because this system has low dynamic range.

(e) The Exposure factors need to be set Carefully otherwise you would get extremely bad image quality.

(F) The image quality is also Suffers from the dust, scratches, film fogging and mark on the film, and all these factor would be controlled by operator.

② Digital Radiography Image quality:→

ⓐ In the imaging system, the digital radiography is the advanced technological revolution.

ⓑ As Compared to Screen film radiography it has lower Spatial resolution, But it Can manage the final image quality better than the screen film.

ⓒ The digital radiography has independent relationship b/w the latitude and Contrast unlike the Screen film radiography which results in giving high Contrast image.

ⓓ It results in higher image quality because the digital radiography having quite higher dynamic range.

ⓔ The Exposure factors have less affect on the final latitude and contrast of image.

(F) Loss of ~~in~~ information occurs due to severe overexposure and this resulting in lower Image quality.

(o) Under exposure can results in grainy and mottled image due to number of photons and hance the image quality is suffered.

"B" (Is Screen Film Radiograph OR/Digital Radiography is Superior?)

↳ To use digital radiography to its best potiental!

↳ Digital radiography can be valuble and affordable imaging technique that can offers some advantages over conventional radiography.

↳ The digital radiology has superior accuracy to traditional radiographic exposures.

Q5:- What are the differences between image receptor used in Conventional radiography and digital radiography?

Ans

Conventional Radiology:-

Just like the other modilities of radiography it has also a x-ray Source which emit x-rays and a receptor which recieves Capture the x-ray which exist the patient-

C Image Receptor of Convention Radiography

It Consist of the following parts.

A ① Radiographic Film

B ② Intensifying Screen.

These two are used as an image receptors in the Conventional radiography, but there are Some procedures

or cases in which there is no use of intensifying screen, and the film is exposed to the radiation.

(A) Radiographic Film:→
It require tight quality Control.
It has following parts.
① Base ② Emulsion
③ Adhesive layer ④ Gelatin layer.

Base:→ Also known by foundation of radiographic film. It is made of up polyester.
↳ provides rigid structure to the film, it is flexible.

Emulsion:→ The emulsion is known by the heart of the radiographic film.
↳ It is the material with which the light or x-ray photons strikes and the formation of latent image occur on emulsion.

Adhesive layer:→ The adhesive layer is present between the emulsion and base of the film and act as a glue b/w the emulsion and base.

Gelatin layer:→ The gelatin is a protective layer on the emulsion, and protects the emulsion from scratches, Contamination etc.

(2)B Intensifying Screen:→ The intensifying screens are thin Sheets, or layers of fluorsent material, they are kept in the x-ray Cassatte with the radiographic film.

It produce large number of photon when the light strikes with it.

Layers:→

① Base ② Reflecting layer

③ phosphor:→ Conversion of x-ray photon to visible light occur here.

Digital Image Receptors:

↳ The digital image receptor is the device that intercepts the x-ray beam after it has passed through the patients body, produces an image in digital form.

↳ It replaces the Cassatte Containg intensyifying Screen and film that is used in Conventional film Screen radiography.

↳ The work based on Certain technologies like Solid State technology and photostimulable phospher (PSP) plate technology.

↳ The digital image receptor is in the form of a matrix of individual pixel elements.

↳ When a pixel area is exposed by x-rays beam, x-ray photons

are absorbed and energy is produces an electrical signal.

↳ This signal is in the form of analogue data that is then converted into a digital number and stored as one pixel an image.

↳ There are three types of Solid state sensor are used, - Charge Couple device "CCD", Complementary metal oxide and thin film transistor.

↳ PSP Consist of phosphor Coated on top of a plate in which latent image is formed after x-ray exposure.

↳ Latent image is then Converted to a digital image by a scanning device through stimulation by laser light.

↳ on the basis of the notion that image formation is temporarily stored

within the phosphor, it is referred to as Storage phosphor.

↳ Digital radiography receptor includes "direct" and "indirect" receptor.

↳ The direct digital receptor Communicates with the Computer through an electronic Cable.

↳ The indirect receptor require a Scanning Step.

All the above mentioned are about the Digital radiographic image receptor.