

(1)

NAME = MARIA BANGASH
ID NO = 15237
ASSIGNMENT = CR & DR.
SUBMITTED TO = MAM MAHEEN
DATE = 8/7/2020

Q1 what is digital subtraction angiography?
Explain?

ANGIO:

means blood vessel & angiography
is the radiological study of blood vessel
in the body after the introduction of
iodinated contrast media.

SUBTRACTION:

It is simply a technique by which
bone structures images are subtracted
or canceled out from a film of bones
plus opacified vessels, leaving an
unobscured image of the vessels.

DSA:

The acquisition of digital fluoroscopic
images combined with injection of
contrast material and real-time subtraction
of pre- and post contrast images
to perform angiography is referred
to as digital subtraction angiography.

(2)

4: Indications is

Diagnostic

- Non traumatic subarachnoid hemorrhage (SAH)
- Arterial dissection or laceration
- Aneurysm
- Pseudoaneurysm
- Thrombosis
- Arterio-venous malformation
- Arterio-venous fistula
- Tumor vascularity

Therapeutic

- Embolisation
- Stenting
- Thrombolysis
- Thrombectomy

* Contra Indications is

- No absolute contraindication.
- Poor renal reserve.
- Deranged coagulogram.
- Allergic to contrast media.

* Contrast media is

- Blood vessels are not normally seen in an x-ray image because of low tissue contrast.
- To increase image contrast agents which are dense fluids with elements of high atomic numbers such as iodine are injected into a blood

(3)

vessel during angiography. Because of its higher density and high atomic number iodine absorbs photons more than blood and tissue.

- This creates detailed images of the blood vessels in real time.
- The first contrast media used for intravascular injection were called high-osmolar contrast media (HOCM).
- HOCM had osmolality seven to eight times higher than plasma. This high osmolality caused adverse effects such as pain, endothelial damage, thrombosis and increased pressure in the pulmonary circulation.
- Low-osmolar contrast media (LOCM) were first developed in the 1970 and these helped to reduce these side effects.
- One of the major risks of modern iodine contrast media is an allergic reaction to iodine.
- Non-ionic iso-osmolar contrast media.
- 30-40% dilution with normal saline.
- Some of diluted contrast media is enough to do a standard cerebral angiogram with total 8 projections.
- Approx 5-8 ml diluted contrast injection.

(4)

4. Materials Used:

- Catheters
- Arterial sheath
- Medicant
- Guidewires
- Contrast
- Connector / 100 cm. tubing
- Surgical blade
- Saline
- Disposable Syringes.
- Local anesthetic
- Heparin
- Surgical gloves.
- Elastoplast.

* PREPARATION:

- Appointment time
- Nil orally 4-6 hrs
- on trolley
- in hospital gown
- Groin shave
- Records
- PTI
- Should be well hydrated.
- Should void before procedure.
- Peripheral pulses marked.
- I.V line in place
- Informed consent must.

* PROCEDURE:

- Gaining arterial access.
- Selective arterial catheterization.
- Image acquisition.
- closure of arterial access.
- post processing
- Hard copy.
- During angiography, Patients may be sedated to reduce anxiety.

(5)

- Their heart rate and rhythm, breathing and oxygen saturation are monitored throughout the procedure.
- Patient clean draped.
- A local anesthetic is usually used in the area where the catheter is to be inserted most commonly the femoral artery.
- First, a small incision given, medical is inserted into the artery fluoroscopy is used to guide the needle to the proper position.
- The needle is then removed after placing guide wire in the artery and vascular sheath is inserted over the guide wire. The catheter is then inserted along the guide wire through the sheath.
- When the catheter is in the correct position, the wire is pulled out and dye is injected through the catheter.
- Images are acquired during contrast injection. injections can be made directly into the artery of interest.
- Complications from an arteriogram are very rare but there is some risk. Most problems that occur can be detected at the time of the procedure or immediately after the procedure. The artery may be injured at the puncture site or along the artery where the catheter is passed.

6

Complications:

- 0.16% major complication rate.
- Local complications: hematoma, vessel laceration, dissection, pseudoaneurysm, AV fistula.
- Systemic complications: Contrast reaction, fever, sepsis, dehydration, death.
- CNS complications: aggravation of preexisting complaints, neurological deficit.

Post Procedure Care:

- After the catheter is removed compression is applied to the puncture site. The patient is asked for bed rest for a minimum of 4 hrs.
- During rest patient is monitored and vital signs like peripheral pulse like distal to puncture are regularly.
- The extremity is also checked for warmth, color; numbness to ensure circulation has not been disrupted.

Q2 What are common artifacts in DR?
How will you avoid them?

IMAGE RECEPTOR ARTIFACTS:

- Digital image receptors can suffer from rough handling, scratches and dust.
- Artifacts produced by dust can be corrected easily with proper cleaning.

(7)

unless the dust is internal to the optics of a Computed radiography imaging system.

- Scratches or a substantial malfunction of pixels likely will require replacement of the image receptor.
- Digital radiographic image receptors have unique artifacts associated with pixel failure.
- Environmental radiation can contribute to ghost artifacts.
- The appearance of ghost images occurs because of incomplete erasure of a previous image on a CR IP.
- Usually, all such artifacts can be corrected by additional signal erasure techniques.
- If a CR IP has not been used for 24 hours it should be erased again before use.
- When completely erased IP is processed the resultant image should be uniform and artifact free.
- Rough handling or faulty construction of a digital IP can result in artifacts.

(8)

• SOFTWARE ARTIFACTS:

- Digital radiographic images are obtained as raw data sets.
- As such, these images are ready "For processing".
- For-processing images are manipulated into "For presentation" image that the radiologic technologist can use per QC and for interpretation by the radiologist.

Preprocessing artifacts:

- A single pixel or a single row or column normally will not interfere with diagnosis.
- Correction algorithms specific to each type of digital image receptor use interpolation technique to assign digital values to each dead pixel, row or column. Interpolation is the mathematical process of assigning a value to a dead pixel based on the recorded values of adjacent pixels.
- Irradiation of a digital radiographic image receptor by the raw x-ray beam may show variations over the image producing an irregular pattern that could interfere with diagnosis.
- With this irregular pattern, a pre-processing manipulation known as

(9)

flat fielding is performed, resulting in a uniform response to a uniform X-ray beam.

- Flat fielding is a software correction that is performed to equalize the response of each pixel to a uniform X-ray beam.

Object ARTIFACTS:

- Object artifacts can arise from the technician errors in patient positioning, X-ray beam collimation and histogram selection.
- Backscatter radiation also can be troublesome because of the sensitivity of the digital radiographic image receptor.
- If a lot of scattering material is present behind the image receptor, backscatter radiation can cause a phantom image. If this type of artifact is discovered, the back side of the image receptor should be shielded to reduce backscatter X-rays.

Collimation and Partition:

- If the X-ray exposure field is not properly collimated, sized and positioned, exposure field recognition errors may occur.
- The result is very dark or very light or very noisy images.
- Automatic radiation field recognition is essential for artifact-free images.

- Collimation of the projected area X-ray beam is important for patient radiation dose reduction and for improved image contrast in screen-film radiography.
- In DR, proper collimation has the added value of defining the image histogram. If improperly collimated the histogram can be improperly analyzed resulting in an artifact.

ALIGNMENT:

- Alignment of the exposure field on the IP is important in the same way and for the same reason as collimation.
- When an image field such is not oriented with the size and dimensions of the IP image artifacts can appear.

Q3 What are the disadvantages of Digital radiography?

DISADVANTAGES OF DR:

- Poorer spatial resolution.
- Artifacts due to the imaging plate, image processing algorithms etc.
- Non-availability of post-processing functions.
- Increased sensitivity to scattered radiation.
- More expensive than screen-film.

(11)

Radiography.

- Lack of familiarity to radiologists & radiographers.
- Requires adequate infection control protocols.
- Initial cost of system & cost for replacement equipment.
- Discomfort of sensors due to bulkiness and interference of cord.
- Must have appropriate lighting for interpretation.
- Technical difficulties with equipment.
- Concern with rapidly advancing technology and compatibility in the future.
- Ease of retakes "preferred" image density and smaller dimension of direct digital sensors can result in higher levels of radiation exposure.

(12)

Q4) Compare the image quality of screen film radiography and DR, which one is superior?

IMAGE QUALITY DIFFERENCE

Compare the image quality of both system, there is a small difference in both system given below.

SCREEN FILM RADIOGRAPHY

1. Talking about screen film, the system has higher spatial resolution compared to digital. But the image quality may get lower due to the poor maintenance of equipment and operator or technologist errors.
2. Image quality also suffers due to some factors like type of film used, the exposure factor and the processing of radiograph.
3. If we try to get a high contrast image then we may get a low gray scale image. Because of the inverse relationship between latitude and contrast.
4. Exposure factor needs to be set carefully otherwise you would get extreme bad image quality.

Image quality reduction due to operator
Film fogging, dust and scratches also interfere with the image quality of radiograph. This can be controlled by the operator.

DIGITAL RADIOGRAPHY:

- 1 Because of less dependent on the exposure factors, digital system can give a high quality image.
- 2 The dynamic range of the digital system are quite higher if we compare it with screen film, which results in higher image quality.
- 3 Exposure factors have less affect on the final latitude and contrast of image.
- 4 Because of the its dynamic range the system itself allow the technologist to set a wide range of exposure techniques.
- 5 As image quality suffer due to the poor maintenance of equipment in screen film radiography but in digital system the scenario is totally opposite. The digital radiography is less dependent on the exposure settings and maintenance.

Image quality reduction by operator:

- Film fogging can occur if the image plate is not erased properly.
- Debris, hair or any other small things in the CR cassette, can cause artifacts.

Q5. What are the difference between image receptors used in conventional radiography and digital radiography?

Digital image receptor

1. The digital receptor is the device that intercepts the X-ray beam. After it has passed through the patient's body and produces an image in digital form.

2. The radiation response of digital image receptor is greater than screen film (400).

3. It has high sensitivity for radiation.

4. It has much wider dynamic range.

5. It converts the image into digital form.

6. ~~It is~~

6. It is pixel limited.

Conventional image Receptor

• The conventional image receptor the cassette containing intensifying screen and film.

• The radiation response of conventional image receptor is small than digital image receptor.

• It has low sensitivity for radiation.

• It has limited dynamic range.

• It can not convert the image into digital form.

• It does not have pixel.

(15)

- | | | |
|----|--|---|
| 7. | The digital image response is linear | • The screen film receptor response is curve. |
| 8 | It is small in size | • It is large in size. |
| 9 | It absorb more X-rays | • It absorb less X-rays. |
| 10 | It has four decades of radiation response. | • It has three decades of radiation response |
| 11 | The image receptor in DR is charged electronic device. | • The image receptor of conventional film. Screen is photosensitive phosphor plate. |