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Q1 :-

=> Parts of Digital Flurscopy Imaging System.

(1) x-ray tube
(2) Spectral Shaping filter.
(3) aka Collimator.
(4) Anti-scatter Grid.
(5) Image Receptor
(6) Imaging processing Computer
(7) Display Divice.

Necessory Component

mluded:-

(a) High voltage Generator

(b) patient support device.

(c) Hardware to allow
x-ray positioning
Source assembly

(d) Image receptor assembly
relative to patient.

⇒ x-ray Source

→ High voltage generator and x-ray tube used in mostly fluoroscopy system. & Similar design and Construction.

to tube used for general radiographic application.

→ for special purpose. rooms such as those used for cardiovascular imaging.

→ Extra heat capacity is needed.

→ Rapid succession to visualize opacified vessels.

→ These runs are often interspresed with fluoroscopic imaging in a diagnostic or interventional procedure

Result in high demand on x-ray tube.

→ focal spot size in fluoroscopic tube. can be small as 0.3mm.

→ High Spatial Resolution is required.

→ Low radiation output can be tolerated.

→ High power is needed.

(2) Beam filteration

→ It is common for fluoroscopic imaging system is equiped with beam handling filter like the

B/10 the x-ray tube exit port and collimator.
→ Add aluminum / copper filtration can reduced risk. dose at patient's entrance surface.
while can keep produce spectral shape. that is ideal matched with Barium or iodide K-edge for high contrast in anatomy ~~by~~ interest.
Insertion of Als added filtration in beam path may be user selectable. providing the operator with

The flexibility switch blw low and high dose. mode as condition

(3) Collimation :-

→ Shutter that limit that limit the geomatic extent of x-ray field. are present in all x-ray equipment.

→ It may be circular or rectangular in shape.

→ matchy the shape of IR

→ when the operator selected a field of view

Collimator blade position automatically move under motor control. to be just a bit larger than visible field.

→ when SID change. Collimator blade adjust the field view ~~to~~ and minimize "spillover" radiation outside the visible area.

(4) Patient table and Pad :-

→ Patient table ~~and~~ must provide strength to support patient and → minimal radiation absorption

(5) Anti-Scatter Grid

→ a Standard Component
in fluoroscopic system.

→ Since large percentage
of fluoroscopic examination

are performed in high
Scatter radiation such
as abdominal region,

→ typical grid ratios
range from 6:1 to 10:1.

→ Grid may be Circular
(XR11 system) or rectangular
(FPD system) and or
often removable by the
operator.

(6) Image Receptor

Image receptor x-ray imaging intensifier an electronic device convert x-rays beam intensity pattern.

→ Image Receptor flat panel ~~Receptor~~ Detector. (FPD)):-

→ In recent year fluoroscopic system which XRII and vedio camera Replaced by FPD. assembly. when flat panel x-ray detector first appear. in radiography.

=> Image Display

→ Fluoroscopy required high quality video display. That allows user to appreciate fine detail and subtle contrast.

→ Modern system feature high resolution flat panel LCD and high contrast ratios.

→ These display should be calibrated to standard luminance response function.

→ Ensure that widest range of gray level are visible.

→ Digonal high definition display supporting upto 24 different vedios input Source that can arrange in various ways on a Sinjle large display monitor.

Q2

Ans: Primary factors of Radiographic Exposure.

(1) Milliamperes (MA)

→ Control radiographic density:

→ Control quantity of x-ray produced.

→ Controll by adjusting the filament heat

→ Quantity of exposure is directly proportional to MA.

→ Change in MA effect

Rate of exposure.

→ Number of photon produced per second of exposure.

→ Change in MA will alter the quantity of exposure ~~FR~~. to IR.

→ Increase in MA will increase quantity of exposure.

→ MA double the quantity of exposure also double.

→.

(2) Exposure time

→ Controls radiographic Density.

→ Controll quantity of x-ray produced.

→ Controlled by adjusting the timer in x-ray circuit.

→ Controls duration of exposure.

→ Quantity of exposure is directly proportional to exposure time.

e.g. If exposure time is doubled the dose of patient is double.

(3) Kilovolts (kvp)

→ Controls radiographic Contrast.

→ Controls quantity and quality of x-ray beam.

→ Increased kvp result in increased quality of photons.

→ Increased kvp result in increased penetration of body parts.

→ kvp also effect on quantity of exposure to IR.

→ Doubling kvp result four time more photons.

photons being emitted.

→ Kvp used affect density.

→ Kvp should not be used to controls radiographic density.

(4) Source - Image Receptor ~~Density~~ Distance.

(SID):-

→ Affects the density of x-ray beam.

→ Affects the intensity of x-ray beam.

→ Quantity of exposure is inversely proportional to

Square of distance.

→ Each dimension of radiation field is proportional to SFD.

→ Therefore the field area is proportional to square of SFD and the radiation intensity is inversely proportional to the square of SFD.

Q No 3

Ans:- Four Imaging Quality factors:-

1. Optical Density

→ The degree of blackening of finished radiograph

→ OD has a numerical value varies blw complete black and clear.

→ complete black means no light transmit. Through radiograph and is equal to 3 or greater.

→ Where clear is less than 0.2.

→ At an OD of 2 only one percent light of viewbox passes.

→ Here two types of image produced.

too dark or too light.

→ too dark high OD.

→ too light low OD.

→ or overexposure and underexposure.

→ the OD can be Controlled by controlling mAs and STD.

So achieve proper image proper SID and mAs value maintain for better OD.

(2) Contrast.

→ to visualize the anatomy is the function of contrast.

→ The Difference in OD of adjustment anatomy is called contrast.

→ Contrast refers to quality of image. KVp is the major factor used in controlling radiographic contrast.

→ Contrast measure in Gray scale.

→ Gray scale degree refers to OD.

→ High Contrast produced low gray scale.

→ low contrast produced high gray scale.

(3) Image Detail

→ Image detail describes the sharpness of apearance of small structrad on radiograph.

→ With proper detail even small pts are visible on image.

→ Sharpness of image detail best measures by spatial resolution.

(4) Distortion :-

⇒ The fourth quality of image is distortion which refers to the mispresentation of object size and shape on radiograph.

→ Bk of x-ray tube positioning patient vibration taking more time during

(6)

examinatain and IR placement.

— xx — xx —

Q4

Ans:- Image intensified

→ An x-ray image intensifier Convert the transmitted x-ray into a brightened visible light

→ It convert x-ray photon into light photon.

⇒ Components :-

→ An image intensifier consist of following Components.

→ An input window.

→ An output phosphor

→ photocathode.

→ Sivaal electrostatic Signals.

→ An Accelerating anode.

→ Protective Vaccume.

→ Input window :-

(*) The input side of image intensifier.

(*) usually has a Convex shape.

→ made of aluminium. (Z = 13)

→ The convex shape not only minize the patient distance but also give the image intensified. better mechanical strength.

=> Output phosphor :-

→ It convert the transmitted x-ray into fluorescent light photon.

→ It is made of aluminium coated with phosphor layer. intermediate coupling layer and finally the photocathode.

→ Spatial resolution and x-ray absorption depend on thickness of input phosphor.

=> photocathode :-

Conversion of light photon into electron.

xx xx

Ans:- Q No 5

(a) :- Advantages of flat pannel image Receptor:-

(1) Distortion free.

(2) Constant image quality over the entire image.

(3) Improved contrast resolution over the entire image

(4) High DQE at all radiation level.

(5) Rectangular image area coupled to similar image

image monitor.

(6) unaffected by external magnetic field.

(b) (c1) properties and uses :-

(1) Read Noise =

→ The level of noise present in a "no" exposure" readout of electron.

→ use zero second Bias or zero exposure to measure.

→ 3 - 10 electron. per pixel per read are typical today.

(2) Dark current :-

→ Thermal noise

→ strong function of temperature

(3) Linearity :→ Relationship

b/w photon in and out.

→ in-out related by

gain of CCD.

→ Depend on CCD and A/D.

XX = Δy