

P-9 ①

Q1) What are the major differences between CT scan and MRI scan?

Major Differences Between

CT Scan & MRI Scan

CT Scan

MRI Scan

Definition =

Magnetic Resonance

An X-ray image

imaging is a

made using a

medical imaging

form of tomography

technique used in

in which a computer

radiology to form

controls the motion

pictures of the

of the X-ray source

anatomy and the

and detectors,

Physiological Processes of

Processes the

the body. MRI

data, and produce image scanners are

(2)

Strong magnetic fields, magnetic field gradients, and radio waves to generate images of the organs in the

body

CT scans are less expensive

MRI are more expensive

CT scan use X-rays

MRI use radio waves, but it produce more detailed images

CT scans are quick, painless, and noninvasive

MRI scans are not invasive, but they are noisy, take more time and may cause claustrophobia.

No safety issues

MRI scanner may cause a safety issue due to its strong magnets.

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Assignment: CT Procedures
And Clinical
Practice

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Department: Radiology

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The major computer
parts of CT scan
are the X-ray
tube, the detector
that generates and
detects X-rays and
all the support
parts related
to the patient,
including the patient
support, the
positioning couch,
the mechanical
supports and the
scanner housing.

A computed tomography
(CT) scan combines
a series of X-ray
images taken
from different
angles around your
body and
uses computer
processing to create
cross-sectional
images of the
bones, blood
vessels and
soft tissues inside
your body.

The major computer
parts of an MRI
are the main
magnets, the shim
coil, the
gradient system
and the RF
system.

Magnetic resonance
imaging (MRI) is a
noninvasive test
used to diagnose
medical conditions.

MRI uses a
powerful magnetic
field, radio waves
and a computer
to produce detailed
pictures of
internal body
structures. MRI
does not use
radiation.

Procedure:

During a certain period of time a patient is placed in a tunnel. The machine does not feel the patient and does not breathe. During the a series of very MRI scans, the from different angles to a computer, which repetitive tapping by are combined together and to create images after hours of sleep at you might be now seen just capturing of the body. have those images to help block nothing. Not the noise. You may be asked to hold your breath for some time.

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Advantages: ⁶

- Determining what surgeries are necessary
• Reducing the need for exploratory surgeries.
 - Improving cancer diagnosis and treatment.
 - Guiding treatment of common conditions such as injury, cardiac disease and stroke.
- MRI does not involve radiation.
- "MRI Contrast" agent is less likely to produce an allergic reaction than iodine based substances are used for X-rays and CT scans. MRI gives extremely clear detailed images of soft tissue structures.

Major Differences

Between Single and Multislice Single Slice CT

Slice CT

CT's

Multislice CT

The Single Slice CT scan had an X-ray source and a single detector. Data acquisition involved moving both the tube and detector across the scanning plane to acquire a series of transmission measurements.

In the early 1990s the development of multi-slice scanners with 4-slice scanners and 0.5 second scan times being state of the art by the end of the century.

→ The Single Slice CT scan had an X-ray source and a single detector.

→ The Multi Slice CT is special because multiple detectors are placed next to each other so the CT can collect multiple slice data at the same time.

→ Data acquisition involved moving both the tube and detector across the scanning

plane to acquire a series of measurements

All data collected through a 180 degree rotation

In single slice detector many detectors rotate around patient

Single row in z direction

slice thickness determined by collimation

A single slice CT uses x-ray in a single detector

The scanner takes around 10 minutes to do a scan. A conventional single slice to do a scan.

Multi-slice scanners mean that it take less time to complete a CT scan.

Additionally, the amount of radiation is reduced.

The new multi-slice scanners capable of producing 132, 160 and 64 imagers have been announced

The multi-slice computed tomography or CT has better diagnostic ability than the traditional

single slice CT. In a multi-slice CT, several detectors are closely placed to gather multiple layers of data in one go.

In single slice of the emission of radiation is very high it cause more harmful rays

In some cases of a single slice, the disease remain undiagnosed if it is early stage due to low image quality. Later on, what the difficulties are aggravated, the patient is referred for high-quality scan and sometimes so much time is lost that the disease go untreatable.

In the way, the MCT has a very high capacity to detect problems which are also the reason for that popularity in recent times. It is not only high in quality, it also saves money and time.

The multi scanners can do the job within a few seconds and even more efficiently.

It produces less harmful radiation than why a multi-slice scan is favoured for children.

Sometimes it gives us but a single image and then the scan is repeated as a result the patient gets a high dose of radiation

Not invasive Angiography can only be done on MCT.

- 3D images of the bones, rib cage, spine etc can be obtained in multi slice CT scan which results in better assessment of the fractures and gives better images for the surgeon to operate upon the patient.

It has been found in multiple studies that multislice CT leads to less repeatability in only one scan. This avoids unnecessary cost and radiation to the patient.

② What are General protocols for performing CT Contrast studies?

General Protocols for performing CT Contrast Studies:-

Introduction:
Computed Tomography (CT) of the body uses sophisticated X-ray technology to help detect a variety of disease and conditions. CT scanning is fast, painless, noninvasive and accurate. In emergency cases, it can reveal internal injuries and bleeding quickly enough to

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help save lives.

Preparation of Patient:-

The patient should wear comfortable, loose-fitting clothing for exam. Patient may need to wear a gown during the procedure. Metal objects, including jewelry, eyeglasses, dentures and hairpins, may affect the CT images. Leave them at home or remove them prior to exam. Patients may be asked to remove hearing aids and removable dental work.

Women will be asked to remove bras containing metal underwire. The physician should

(13) (13)

Give of all the medicines
taken by the patient and
if have any allergies. If
patient have a known allergy
to contrast material, the doctor
may prescribe medicine to
reduce the risk of an
allergic reaction.

Procedure:-

CT scan works
like other X-ray exams.
Different body parts absorb
X-rays in different
amounts.

This difference allows the
doctor to distinguish body
parts from one another
on an X-ray or CT
image. A special electronic
captures the image.
Bones appear white on the

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X-ray. Soft tissue, such as the heart or liver, shows up in shades of gray. Air appears black. With CT scanning is

Several x-ray beams and electronic x-ray detectors rotate around patient. These measure the amount of radiation being absorbed throughout the body.

Sometimes, the exam table will move during the scan, so

that the x-ray beam follows a

spiral path. A special computer

programme process the large volume of data to create

three dimensional cross-sections

Images of patient body.
These images are then
displayed on a monitor.

Contrast used:- Iodine based
and Gadolinium-based. Iodine

based contrast materials
injected into a vein are used
to enhance X-ray and CT
images. Gadolinium used for
MR.

Scan Time:- Actual scan times
vary from a few seconds to
several minutes. If no oral
contrast is required, the
examination will take about
15 to 30 minutes, including

(16)

(15)

the time for intravenous
preparation and interview.

CT Contrast Stay In Body Systems

Kidney function will normal
gadolinium of bladder is removed
from the patient body in
the urine within
24 hours.

Q4) Which 3D reconstruction
techniques are commonly
used in musculoskeletal

CT imaging ?

Introduction:-

Although Magnetic
Resonance Imaging is the
modality of choice for imaging
the musculoskeletal systems,

Spiral CT remains a viable

(17) (17)

Alternative: Spiral CT is better,
less expensive, early available
and has the potential to
evaluate a wide range of
musculoskeletal diseases, thus
making it an important
diagnostic tool. The availability
of new algorithms and
better computer generated
software for multi planar and
3-D image reconstruction has
further enhanced the
importance of Spiral CT
in musculoskeletal imaging.
The use of 3D reconstruction
of Spiral CT in the

(12) (18)
musculoskeletal system of
memorandum advantage to patients
in whom CT is desired to
define the presence and
extent of congenital anomalies,
traumatic injury, tumor, infection
and inflammation.

Material And Method:-

A total of 60 3-D spiral CT
imaging studies of the musculo-
skeletal system were carried
out at the CT Scan Center
of a large service hospital,
during a six month period
from June 2002 to November
2002 on patients ranging

(19)

(19)

a few months to 68
years of age. The various
anatomic regions studied using
3-D Spiral CT. To achieve
best results with accurate
illustration of the musculoskeletal
anatomy and pathology.
Examination techniques need to
be optimized. Post operative
evaluation of the musculoskeletal
system is an important of
3D-CT imaging.

25) What is the function
of "Surestart" in CT imaging
Sure Start The use
state of the CT helical

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CT Scanner allows for

wide field examination of larger regions of the body.

Due to the small examination

area optimum utilization of the invaluable contrast

medium value is of extreme importance. The Sure Start

function gives this a very simple way

planning the individual seen

delay on the Aquilion by

using the Sure Start value

tracking tool. The Selected

Seat is placed just above

the origin of the Colony

(21) (24)

Attenuation is chosen to
stop the scan at the
optimal time by monitoring
the arrival of the
contrast bolus in a region
of interest placed in a
descending aorta. Important
landmarks in the plane are
the sternum anteriorly and
the descending aorta
posteriorly. The ROI in the
descending aorta is
used to monitor the
increase in $\text{HU} \rightarrow$ HU
 HU (HU) after
initiation of contrast
injection.

(22) Scan Range: (28)

Once planning is obtained on the 6th Taskbar to the left of the end of the spiral scan, identify the lateral direction of the heart, and place the Sure Scan. The Sure Scan position is placed just above the origins of the Coronary Arteries, using the left atrial appendage for orientation. The scan ends just below the heart, and can be stopped manually.

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(23)

The Sun is

placed at the start of

the spiral scan by

positioning the active line

exactly over the upper

boundary of the scan

as illustrated. Careful

timing of the scan

is essential for

achieving an optimal

result while minimizing

light exposure.

"The End"