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Bs • Radiology 6<sup>th</sup> Semester

COURSE TITLE : Computed tomography procedures  
& clinical practice

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## \* QUESTION

## ANSWERS:-

Q1. Write the patient positioning and examination protocols for the CT procedures. Advice for tarsal coalition-

\* Ans: Tarsal coalition represents abnormal fusion between two or more tarsal bone- and is a frequent cause of foot and ankle pain. Congenital tarsal coalition is a diagnosis that is often overlooked in a young patient who's first present with foot and ankle pain. Coalition of all type may be initially detected at Computed tomography (CT) or (MRI).

\* CT- MUSCULOSKELETAL -ANKLES-

\* INDICATIONS :-

Tarsal coalition, talus or calcaneal pathology, ankle joint pathology, loose bodies

\* Patient preparation:

Supine/Feet First, ankle of interest at centre of FOV, other leg bent up

\* Ankle / Foot immobilized-

\* Patient positioning:

\* CT of the ankle and hindfoot should be performed in both coronal (perpendicular to the ankle joint and long axis of foot)

↳ Axial (Parallel to the ankle joint and long axis of foot) planes-

↳ Both feet should be positioned symmetrically in the gantry and should be imaged simultaneously.

↳ The coronal image may be obtained in a plane perpendicular to the plantar surface of the foot, or as describe by wechsler at el (19) in a plane perpendicular to the plane of the subtalar joint

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### \* Imaging Protocols

\* Scan slice thickness : 0.5mm x64

\* Pitch : Detail (1-105)

\* kV : 120

\* mA : 100

\* Rotation time : 0.5s

### \* SCAN RANGE

Start : Above ankle joint

End : Below calcaneum

Plane : Straight gantry

### \* Image Reconstruction

2/2 mm : Bone sharp

Volume : Bone sharp

Volume for 3D : Soft tissue standard

### \* Reformatting

	<u>Coronal</u>	<u>Sagittal</u>
Plane	true coronal	True sagittal
Start	posterior to calcaneum	lateral to fibula
End	Anterior to navicular	Medial to fibula
Thickness	2mm	2mm
spacing-	2mm	2mm

\* QUESTION NO 2

Patient of age 45 years has complaint of anosmia, which CT procedure is performed in such case explain the complete protocol for that examination.

\* Ans- Anosmia is the loss of the sense of smell. It may be temporary or permanent.

↳ Causes of Anosmia

- \* Nasal congestion from cold
- \* Allergy
- \* Sinus infection
- \* Poor air quality

\* CT Procedure:-

CT- Head and Neck - Sinuses:-

\* Indication-

Sinusitis, Polyps, post nasal drip, nasal bones, anosmia

If clinical indication is anosmia reconstruct 5/5 mm axial sections soft tissue standard, and be sure to check anterior cranial fossa for lesions.

\* Patient preparation

Supine / Head first, taking care to position head symmetrically

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Always ask if patient has previous surgery and when it was performed-

### \* Imaging Protocols

Scan slice thickness : 0.5mm x64

Pitch : Detail

kvp : 120

mA : 150

Rotation time : 0.5s

### \* Scan Range

Start : Below maxillary sinuses

end : Above frontal sinuses

Plane : Parallel to hard palate

### \* Image Reconstruction

5/5mm : Sharp bone

volume : sharp bone

### \* Reformatting

#### \* Multiview

#### Coronal

#### \* Sagittal

Plane

Perpen to hard plate

perpen to hard plate

Start

Anterior to frontal

Med wall of left orb

End

Posterior to sphenoid

Med wall of right orbit

Thickness

2mm

2mm

spacing

2mm

2mm

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Q38- A patient was present with the exacerbated chronic lower back pain. Identify the CT examination performed and explain the complete protocol for that examination.

\* Ans: CT MUSCULOSKELETAL - LUMBAR SPINE

\* Indications

low back pain (LBP) - sciatica - femoral neuralgia, spinal canal stenosis.

\* Patient Preparation

Supine / feet first - sponge under knees can be scanned in lateral decubitus or prone position if unable to lie supine.

\* Imaging Protocol

(Lumbar spine 3mm (0.5mm))

(Lrg lumbar spine 3mm (0.5mm))

Scan slice thickness : 0.5mm x64

Pitch : Detail

kV : 135

mA : Exposure 3D High quality

Rotation time : 1.0s (1.5s)

\* Scan Range

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- \* levels specified, otherwise
- \* Routine L2-S1
- \* If patient < 30 y.o then L3-S1 unless specific symptoms @ L2-3
- \* Start : Above pedicle of L2
- \* End : Below S1 (increase scan range to obtain sufficient data for MPRS for L5-S1 disc)

### \* Image Reconstruction

3/3 mm @ spine thoracic-lumber

3/3 mm @ Bone standard

volume @ ~~Bone~~ spine thoracic lumber

### \* Reformatting

Use spine Programme in MPR.

Q4: Which CT angiography procedure should be performed for investigation coronary artery disease (CAD) Explain the complete protocol for that CTA?

#### \* Ans: CTA - Cardiac:

A coronary computed tomography angiogram CTA uses advanced CT technology along with intravenous (IV) contrast material (dye) to obtain high resolution 3D picture of the moving heart and great vessels.

CTA is also called multi-slice computed tomography (MSCT), cardiac CT or CTA - cardiac - CTA is a non-invasive test that uses special X-rays to focus on the coronary arteries

#### \* Indications:

Investigation of CAD assessment of coronary stents

#### \* Patient Positioning / Step

supine / Feet first  
ECG dots placed on chest 2cm above head

#### \* Imaging Protocol:

Scan slice thickness	:	0.5mm x 64
Pitch	:	Determined by <sup>512</sup> Cardio™
kV	:	120
mA	:	400
Rotation time	:	Determine by <sup>512</sup> Cardio



## \* Scan Range :

Start : Carina

End : Below apex of heart

Plane : Straight gantry

## \* Contrast

Single-phase contrast injection protocol

Phase 1 : XX ml 45 ml/s

Phase 2 (saline) : 50 ml 45 ml/s

$$XX = (\text{scan time} + 10) \times \text{injection rate}$$

Start on descending aorta at level

Pulmonary trunk.

Trigger at 180 HU.

## \* Image Reconstruction

Use ImageXact to determine the optimal phase for motion-free images

Volume : Cardiac CTA

1: In which circumstances is liver triphasic examination performed? What is the general protocol for liver triphasic examination?

## Triphasic CT Scans:

Triphasic CT scan is a good non-invasive tool and can be used as first line imaging modality for differentiating benign and malignant focal liver lesions. Benign lesions like haemangioma can be reliably differentiated from malignant liver lesion, therefore unnecessary biopsies can be avoided.

## Reason For CT Scan of Liver:

A CT scan of liver and biliary tract may be performed to assess the liver and/or gallbladder and their related structures for tumors and other lesions, injuries, bleeding, infections, abscesses, unexplained abdominal pain, obstructions or other conditions, particularly when another type of examination and ultrasound is not conclusive.

A CT scan of the

(2)

Liver may be used to distinguish between obstructive and non-obstructive jaundice. Another use of CT scans of liver and biliary tract is to provide guidance for biopsies and/or aspiration of tissue from liver or gallbladder.

There may be other reasons for your doctor to recommend a CT scan of the liver and biliary tract.

## CT Body - Liver (Hypervascular) :-

### Indications:-

Rule out/follow up liver for hypervascular metastases from the following.

1. Primary liver tumors.
2. Renal cell carcinoma, leiomyosarcoma, thyroid tumors, carcinoid and other neuroendocrine tumors.
3. Melanoma and breast (may be hypovascular)
4. Pancreatic islet cell tumors, GIST (gastrointestinal stromal cell tumor).

### Patient Preparation:-

(3)

4-hour fast  
Positive oral contrast 60/45/30/15 min prior, remainder immediately prior to scan

H<sub>2</sub>O may be suitable alternative (750 mL 30 min prior, 250 mL immediately prior to scan)

Supine/Feet First

Imaging Protocol: [2 phase Liver 5mm (0.5mm)]  
[Lrg 2 phase Liver 5mm (1mm)]

Scan slice Thickness	0.5mm x 64 (1mm x 32)
Pitch	standard
kV	120
mA	Exposure 3D standard
Rotation Time	0.5 s (0.75s)

## Scan Range

	Arterial Phase	Portal Venous Phase
Start	Top of higher hemidiaphragm	Top of higher hemidiaphragm
End plane	Iliac crest Straight gantry	Below ischium Straight gantry

## Contrast:

Volume	70-120 mL (depending on patient's weight)
Rate	4 mL/s
Delay	1 <sup>st</sup> start 1 <sup>st</sup> , 180 HU in abdominal aorta + 10s portal, venous 6s fixed delay.

# Image Reconstruction:

5/5 mm		Body standard	Axial.
Volume		Body standard	Volume.

# Reformatting:

## Multiview

Start  
end  
Thickness  
Spacing

## Coronal

Posterior  
Anterior  
4mm  
4mm

## Sagittal.

Left  
Right  
4mm  
4mm

Hypovascular:

## Indication

Rule out / up liver for hypovascular metastases from the following

- Primary adenocarcinoma in digestive tract - (esophagus, stomach, colon, and rectum), Pancreas or Lung -
- Squamous cell carcinoma (head and neck and)
- Lymphoma.

\* Patient Preparation:

- 4 hr fast

- Positive oral contrast 60/45/30/15 min prior, remainder immediately prior to scan

H<sub>2</sub>O may be suitable alternative (750ml 30 min prior, 250ml immediately prior to scan -

\* Imaging Protocols

Scan slice thickness : 0.5mm x 64

Pitch : Standard

kV : 120

mA : 30 Standard

Rotation time : 0.5 (0.75s)

\* Scan Ranges

Start		Above higher hemidiaphragm
End		Below ischiem
Plane		Straight gantry

\* Contrast

Volume		: 70-120 ml
Rate		: 2-4 ml/s
Delay		: 65-70s

\* Image Reconstruction

S/S mm		: Body standard Axial
Volume		: Body standard volume

\* Reformatting

<u>Multiseries</u>	<u>Coronal</u>	<u>Sagittal</u>
Start	Posterior	left
End	Anterior	Right
Thickness	4mm	4mm
spacing	4mm	4mm

Notes

Triphasic CT scan is good non-invasive tool and be used as first line imaging modality for differentiating benign and malignant focal liver lesion. Benign lesion like haemangioma can be reliable differentiated from malignant liver therefore unnecessary biopsy can be avoided if is also useful for hypovascular lesion which can be easily missed on routine CT scanning.