

✿ PartI <骨骼肌肉系統造影作業>

# Whole body bone scan

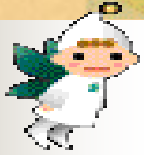
高雄醫學大學醫研所畢業；義守大學資工所博士畢業；慈惠醫專,樹人醫專兼任講師

**Speaker: Chang-Ching, Yu**

高雄榮總核醫部 俞長青

**2016.08.18.**





# 本章學習重點



**MDP**

**Tc-99m**

**Image Dis 6hrs**

**LEGP**

1.放射性同位素,半衰期 2.核醫藥物 3.準直儀

核醫藥物代謝途徑?

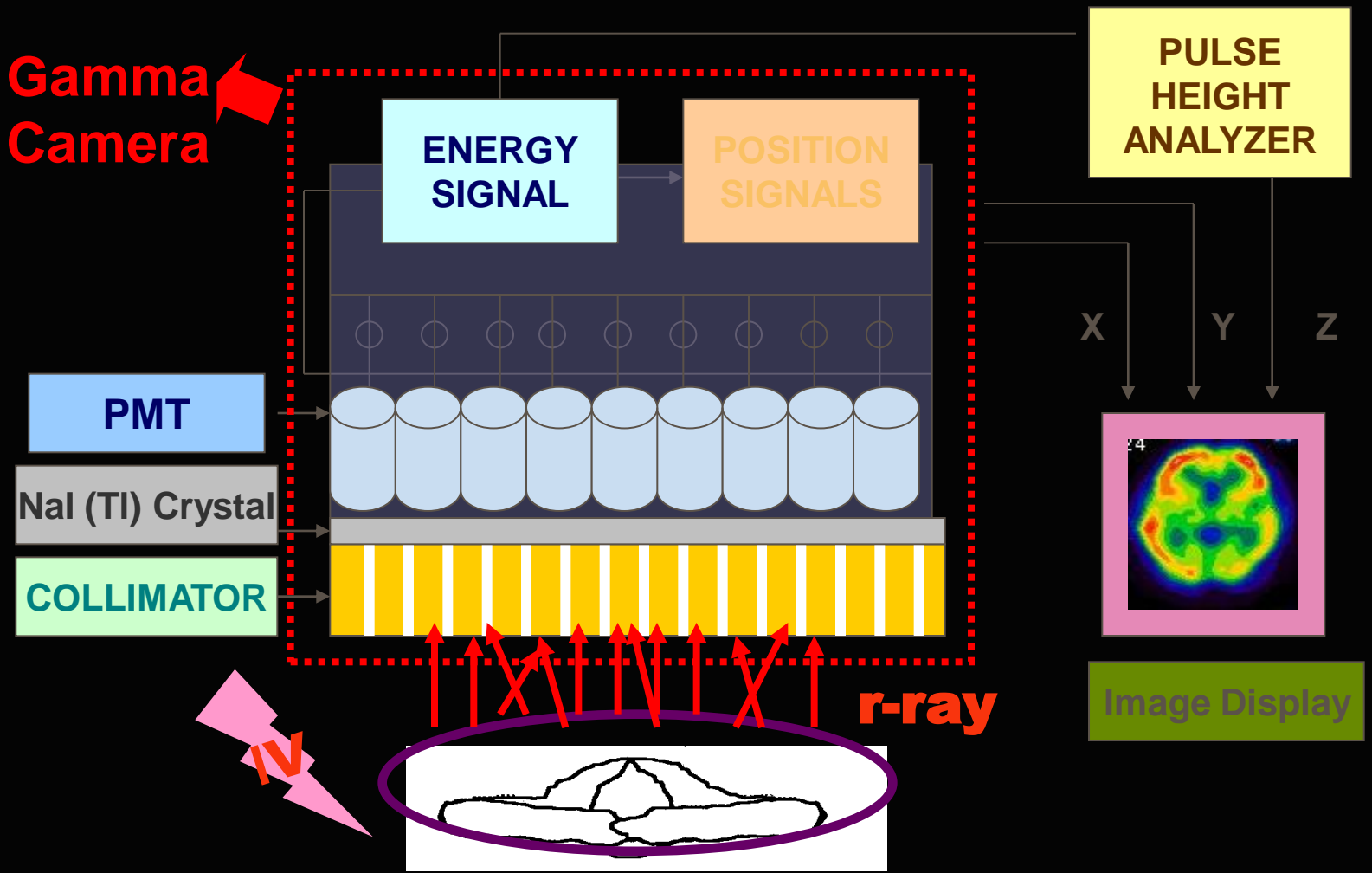
## ■ Whole Body Bone Scan +static

1.原理 2.正常與異常影像呈現 3.Note 4.值得一提

## ■ Bone scan SPECT/CT Survey

1.適應症 2.造影條件 3.Note





**Overview of the Components of  $\gamma$ -Camera**



# Introduction

- 核醫是指以**口服** ,**IV** ,植入放射藥物進入人體被**r-camera**偵測而形成**image** ,來得到器官功能性的訊息。放射藥品通常沒有藥理作用。因為在大多數的例子中,他們被用在**示蹤劑 (tracer)** ,用在許多檢查上,像**骨骼** ,**心臟** ,**中樞神經** ,**腎臟** ,**肝臟**等。



- **核醫骨骼掃描(WBBS)**是大部分核子醫學科最主要的檢查項目之一,對於偵測骨骼病變是一項非侵犯性且高靈敏度的好方法,而且可以對全身骨骼作一次篩檢,能夠早期發現無症狀的骨骼病變,這對**骨骼轉移**或全身性骨骼疾病極為重要。





# Radiopharmaceutical

- 核醫骨骼掃描使用的示蹤劑, 目前以鎝-99m MDP (**Tc-99m MDP**) 最為常用, 靜脈注射三小時以上, 再用加馬攝影機 (**gamma camera**) 進行全身性掃描, 此時約有  $1/2$  的示蹤劑與骨骼的無機晶體吸附而沉積在骨骼內, 其餘大部分經尿排出體外, 因此可使骨骼顯像。





# Purpose

- (1) 診斷輕微骨折；
- (2) 偵測及追蹤癌症骨骼轉移；
- (3) 協助診斷骨髓炎；
- (4) 協助診斷人工關節鬆動及感染；
- (5) 檢查全身性骨骼關節疾病，  
例如副甲狀腺亢進症，類風濕性關節炎；
- (6) 檢查其他骨骼關節疾病等等。



磷酸鹽  
離子

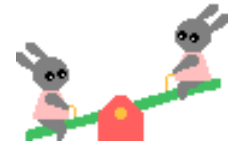
## ■ Tc-99m MDP在骨骼的聚集量主要受到二個因素影響：

Ca<sup>+</sup>

P

### (一)骨骼的代謝狀況：

骨骼代謝旺盛處,如新骨修復或骨骼生長中心,皆會明顯增加示蹤劑與骨骼的吸附(**hot spots**);





## (二) 骨骼的血流供應：

- 血管增生或局部血流增加,亦會造成示蹤劑聚集增加；反之骨骼代謝遲緩或血流被阻斷則會表現出放射活性**缺損區 (cold spots)**°



# Whole body bone scan

## ■ Indication (臨床應用)

- (1) 衡量病人 **骨髓炎** 之可能性
- (2) **肺癌**、**乳癌** 手術前之評估
- (3) 追蹤其治療後追蹤其效果
- (4) **壓力型骨折 (Stress fracture)**  
之診斷
- (5) **骨骼缺血性壞死** 之診斷 (AVN)
- (6) 放射線治療範圍之策劃



# Tc-99m MDP Whole Body Bone Scan

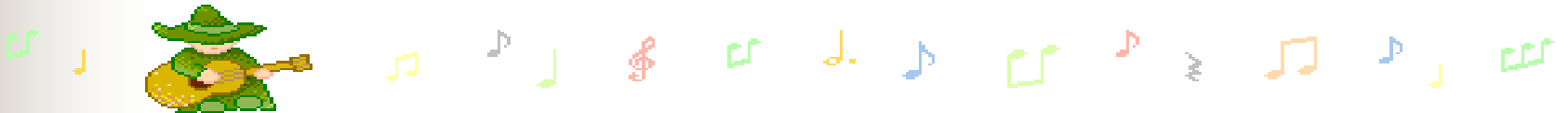


- 經過臨床醫師的評估，懷疑或確認患有骨頭關節的問題，因此安排核醫骨骼掃描。
- 若有懷孕的可能，暫時不宜進行核醫骨骼掃描。



# Methods

- 1. 請病患**解小便**,清除身上金屬物品
- 2. **平躺固定束腹帶**,設定掃描範圍,正面(**ANT**)與背面(**POST**)都做全身性掃描(**WBBS**)。
- 3. 掃完全身後,等待閱片問診,加照**static**或**SPECT/CT**。
- 4. 檢查時間約**30mins**。



# ■ 造影條件:(LEGP)



- Collimator:**LEAP,LEHR**(低能量、高解析度)
- Energy window:**140KeV±15%**
- Whole body:**20cm/min**
- Static:skull,foot,thigh:**300k**  
chest,spine,pelvis:**500k**
- SPECT/CT:**30s/frame×64**
- Examination time:**30mins**





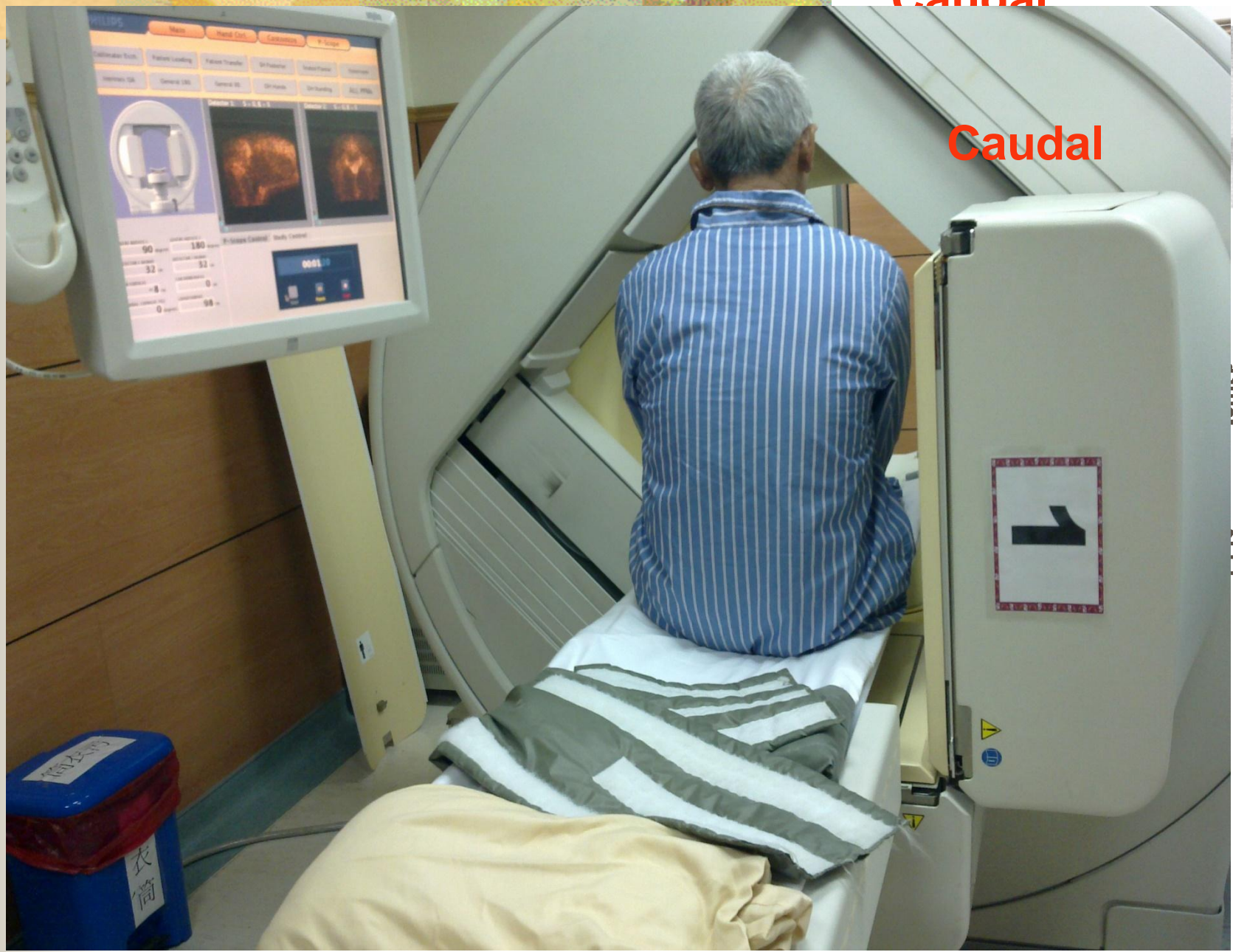
## ■ 檢查步驟：

1. 檢查部份依照全身骨骼掃描後,醫師決定斷層攝影部位。
2. 病患平躺,若檢查頭部需要頭架固定。在其他身體部位檢查時亦需以綁帶固定。若照胸部兩手臂上舉置於頭上。
3. 檢查 **detector** 是否水平,設定床的高度調整 **detector** 使其儘量接近病人,但以不碰到東西為原則。
4. 檢視掃描軌跡是否有阻礙物,吩咐病患檢查當中不能移動。



Caudal

Caudal



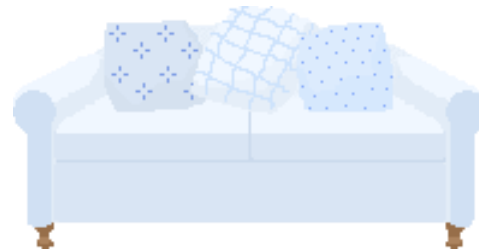
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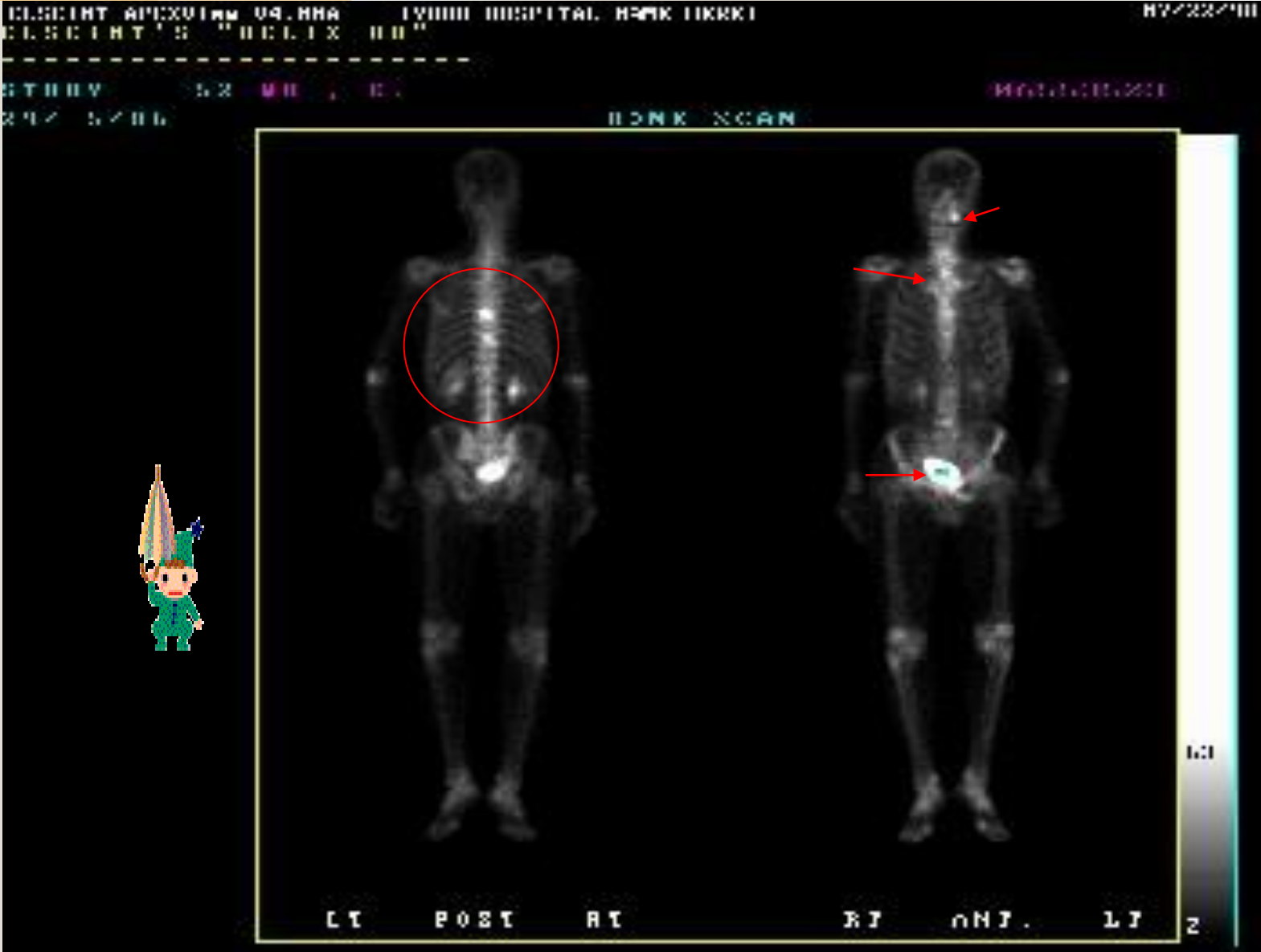
# Image Display

- **1. 正常骨骼造影: normal bone scan** 具有對稱性及均勻性鼻額區, **sternum, spine, pelvis** 及關節處具有較高 **uptake**<sup>o</sup>
- **2. 異常骨骼造影:** 呈現不對稱 **uptake**, 異常骨骼可以活性增加 [**熱區 (hot spot)**] 或 [**冷區 (cold spot)**] 呈現, 前者包括炎症, 腫瘤侵犯, 外傷, 代謝疾病, 後者包括缺血, 壞死, 癌病轉移或放射線治療後等<sup>o</sup>

 **Tc-99m MDP** 解離會在  
甲狀腺, 胃及唾液腺有活性



# Whole body bone scan(WBBS)



# Bone scan static display





# Note



- **1.**接受核醫骨骼掃描時，建議於注射後多**喝水**，以促進核醫藥物的排泄。
- **2.**須注意避免**尿液**污染到衣褲及皮膚。
- **3.**攝影過程應保持不動，以避免影像模糊。其他則無特別之注意事項，並且罕見有過敏等副作用。



# Whole body bone scan with metastasis

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Display / Analysis

Display Analysis Curve View MPE

Display Parameters      Name: WANG CHUN LIANG  
ID: 6487305

**萬箭穿心?!**

PATIENT NAME : WANG CHUN LIANG      INSTITUTE : UGHS HA DEPT. MS11  
PATIENT ID : 6487305      PROTOCOL : WHOLE BODY BONE DUAL INTENSITY DISPLAY  
BIRTH DATE : 06-JAN-1942      ACQ. DATE : 26-AUG-2004

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# TC-MDP BONE SPECT/CT

- 檢查準備事項：
- 若檢查骨盆腔病變,病患先小便,若有**BPH**者最好能導尿。
- 放射製劑種類劑量：
- **20 mCi, Tc-99m-MDP**
- 病患姿勢: **supine**

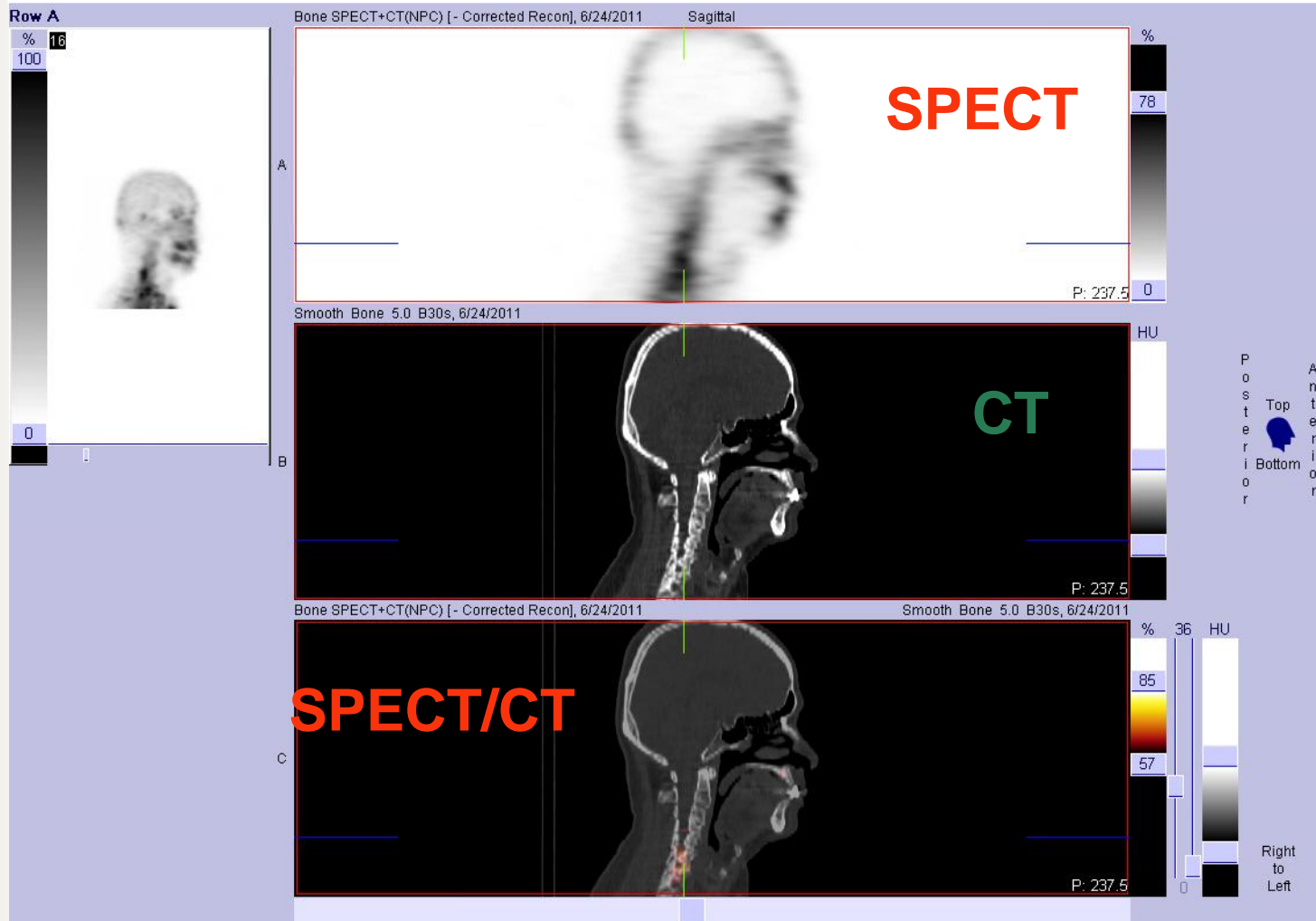


- **SPECT/CT影像處理：** 
- 利用**Symbia T** 分析,選擇 **Processing Protocols** 程式中的**TOMO processing**程式作 **SPECT/CT image**之 **Transverse, Sagittal, Coronal view**三個切面分析°



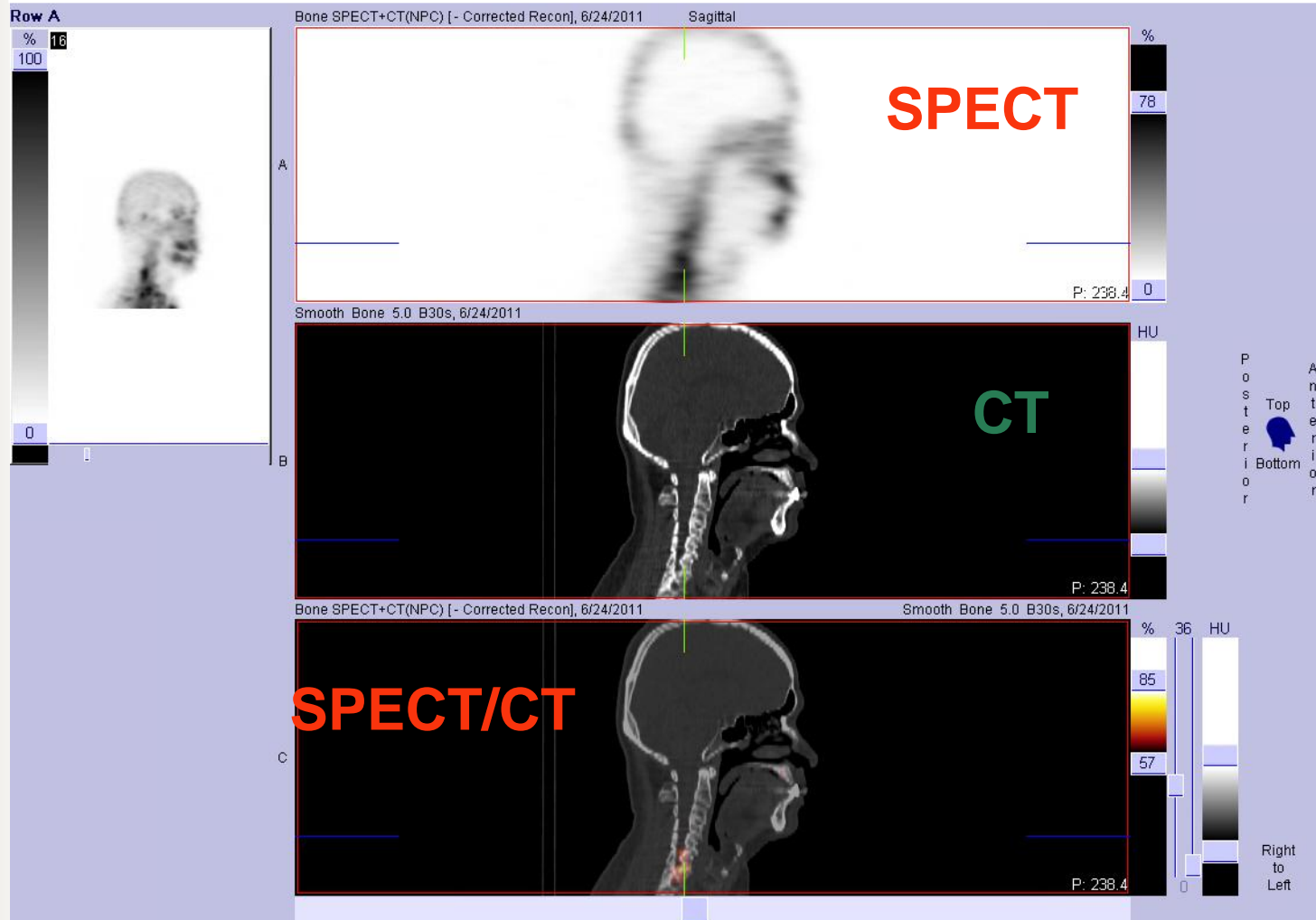


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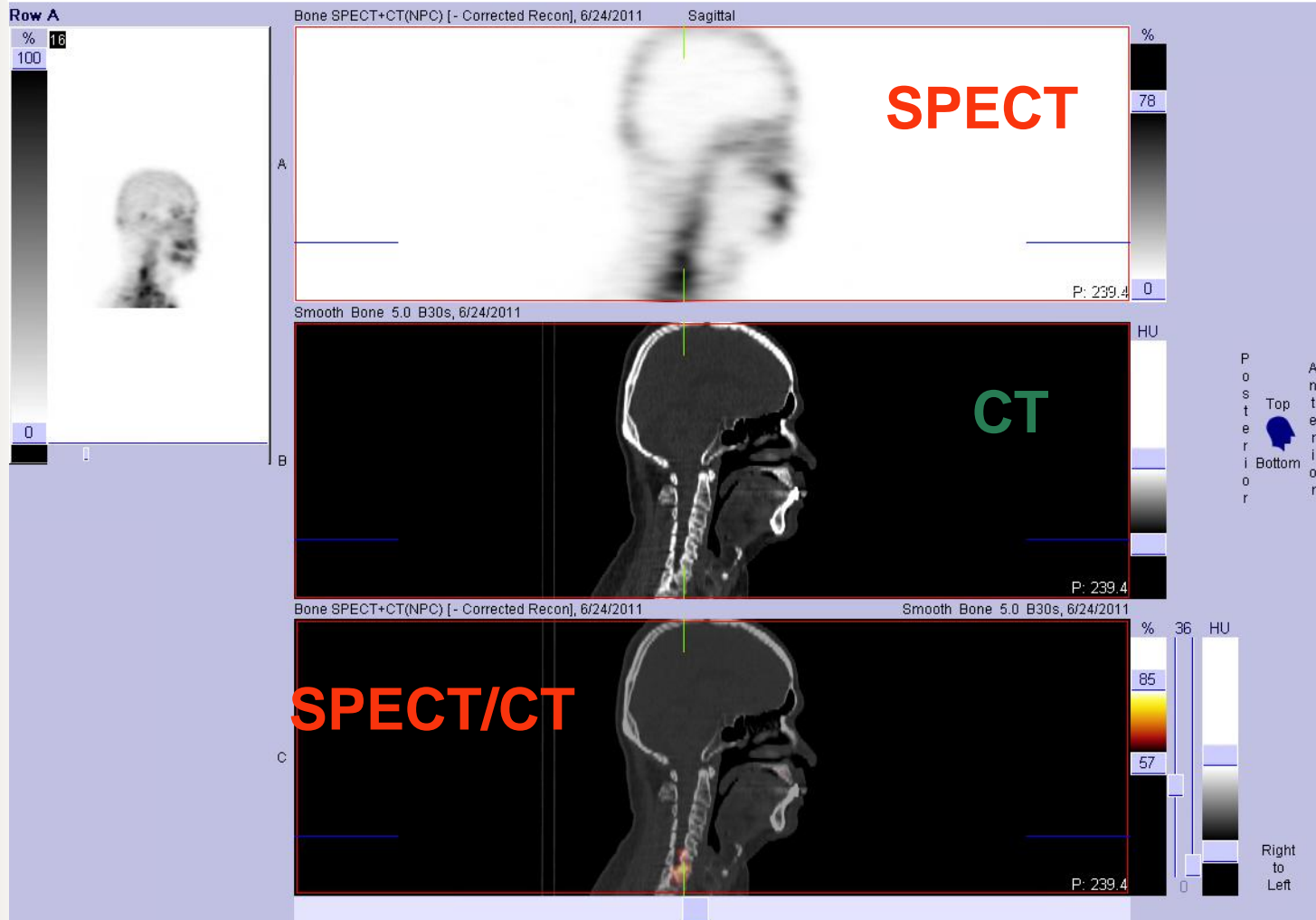




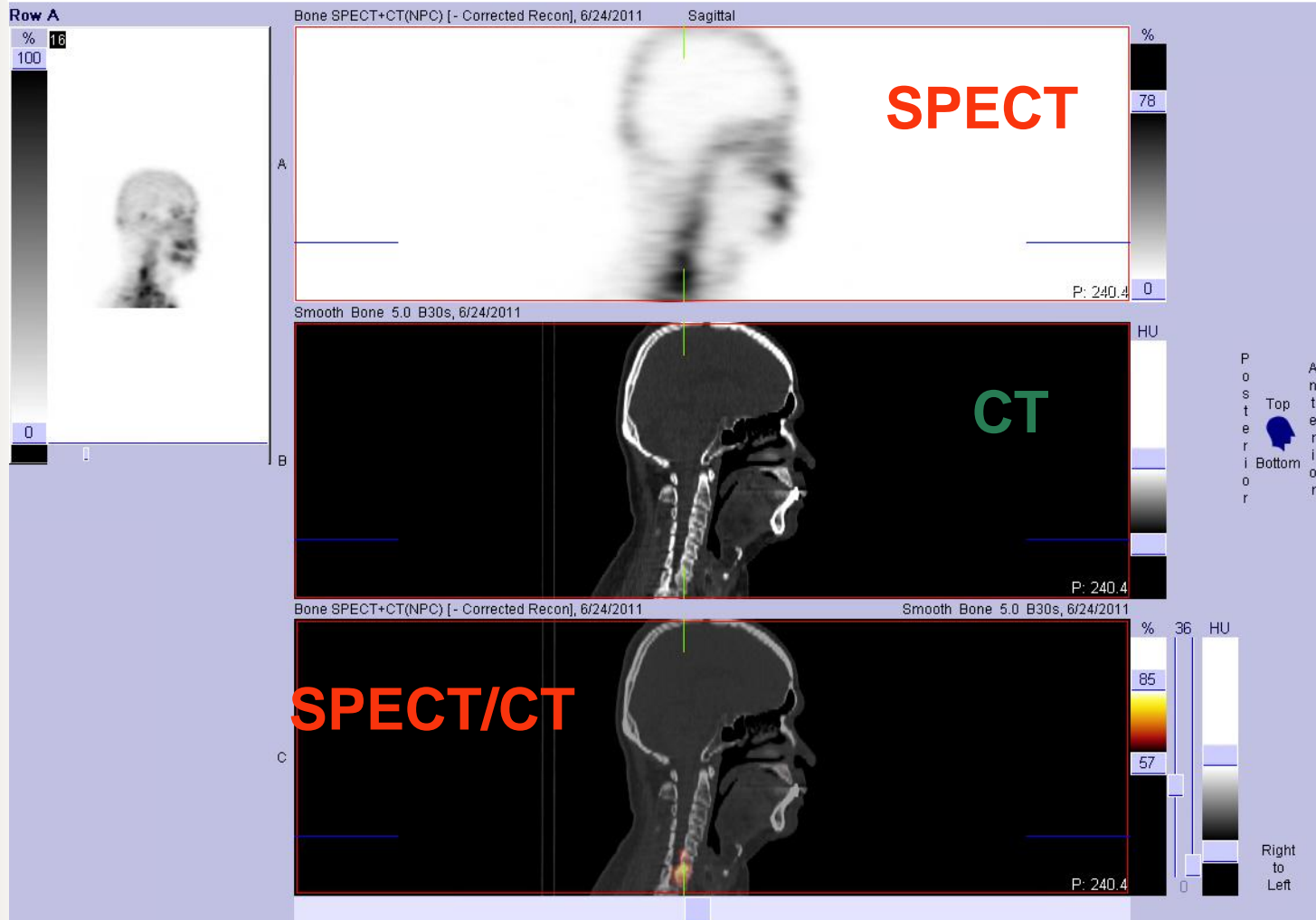
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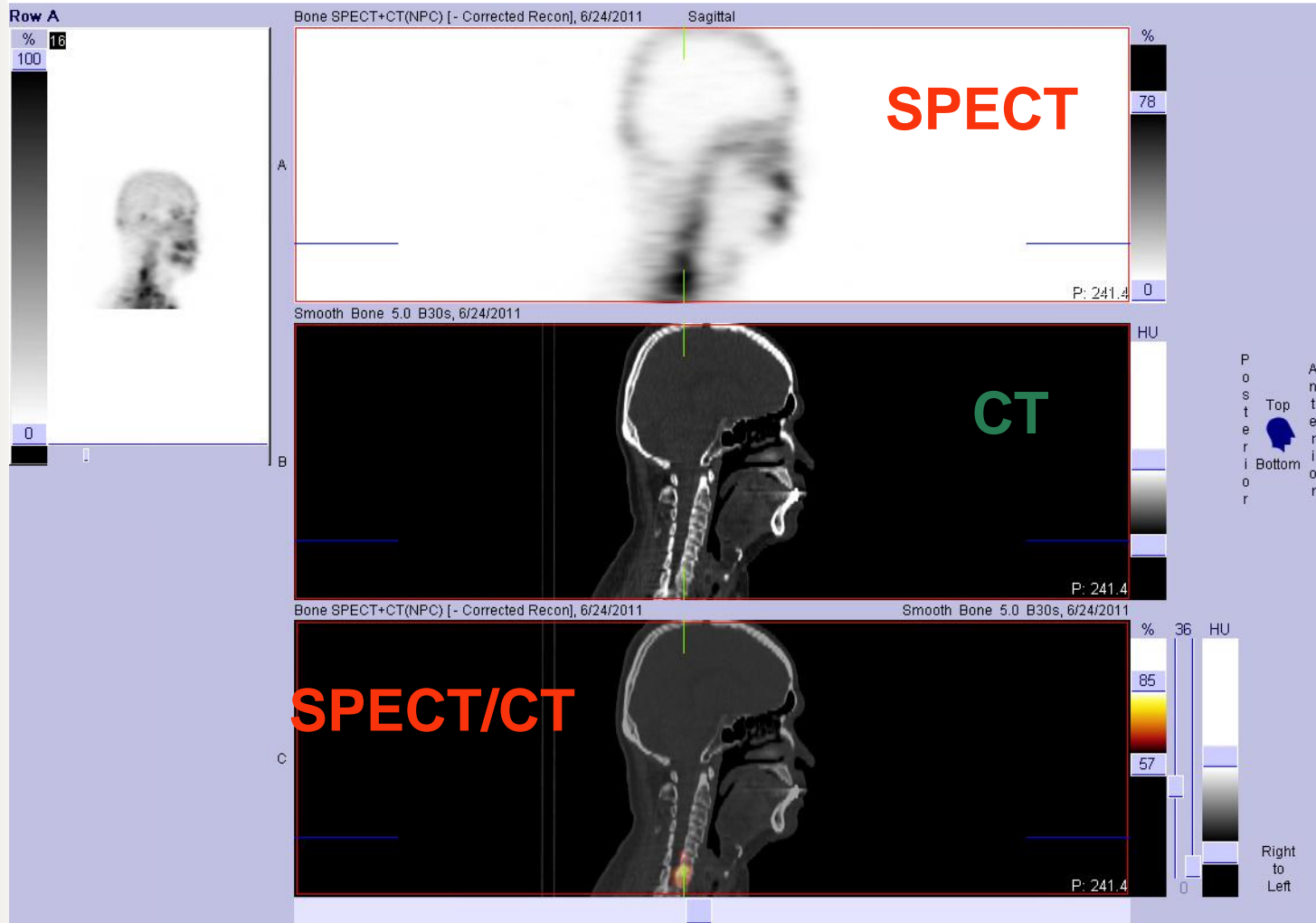
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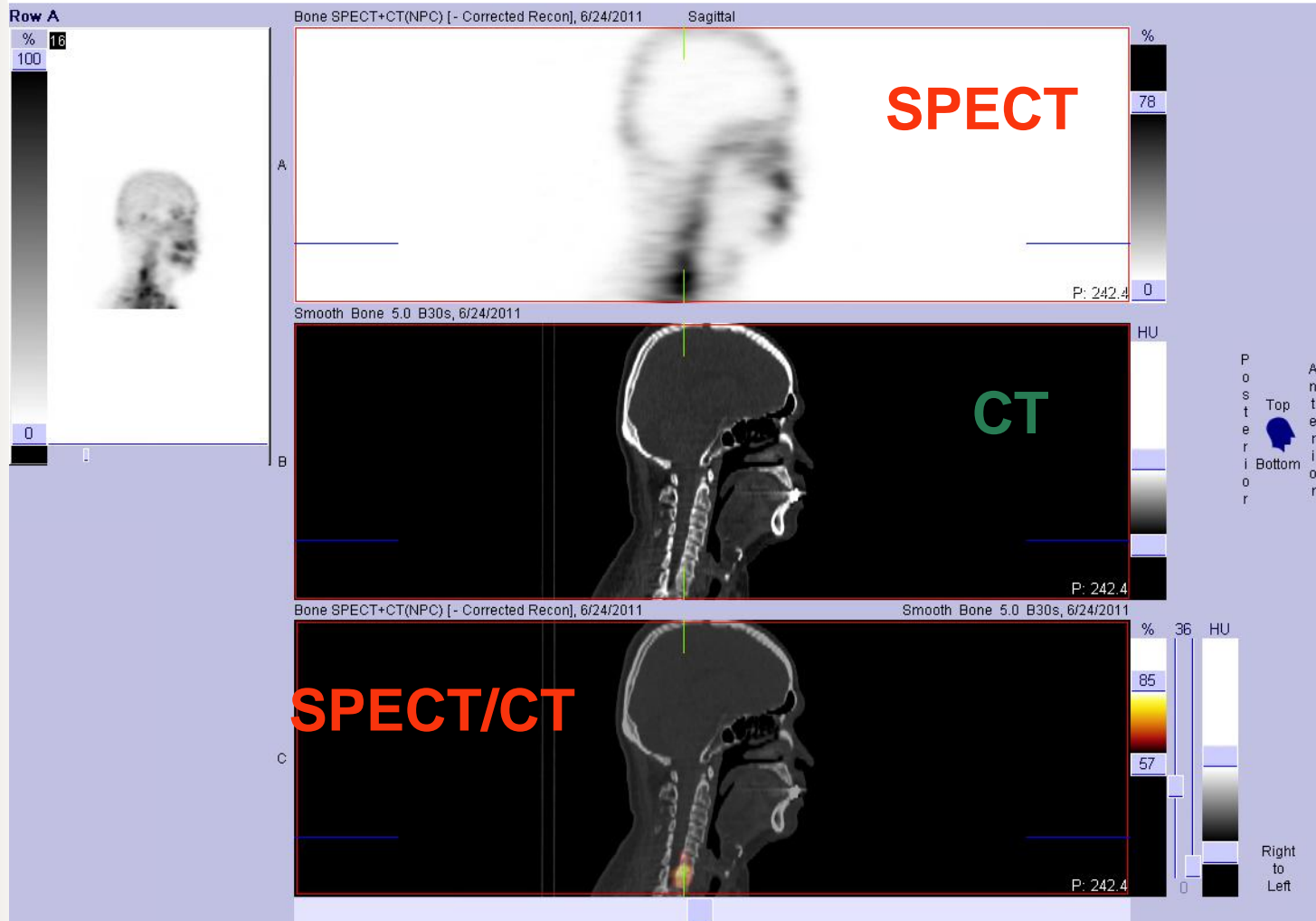


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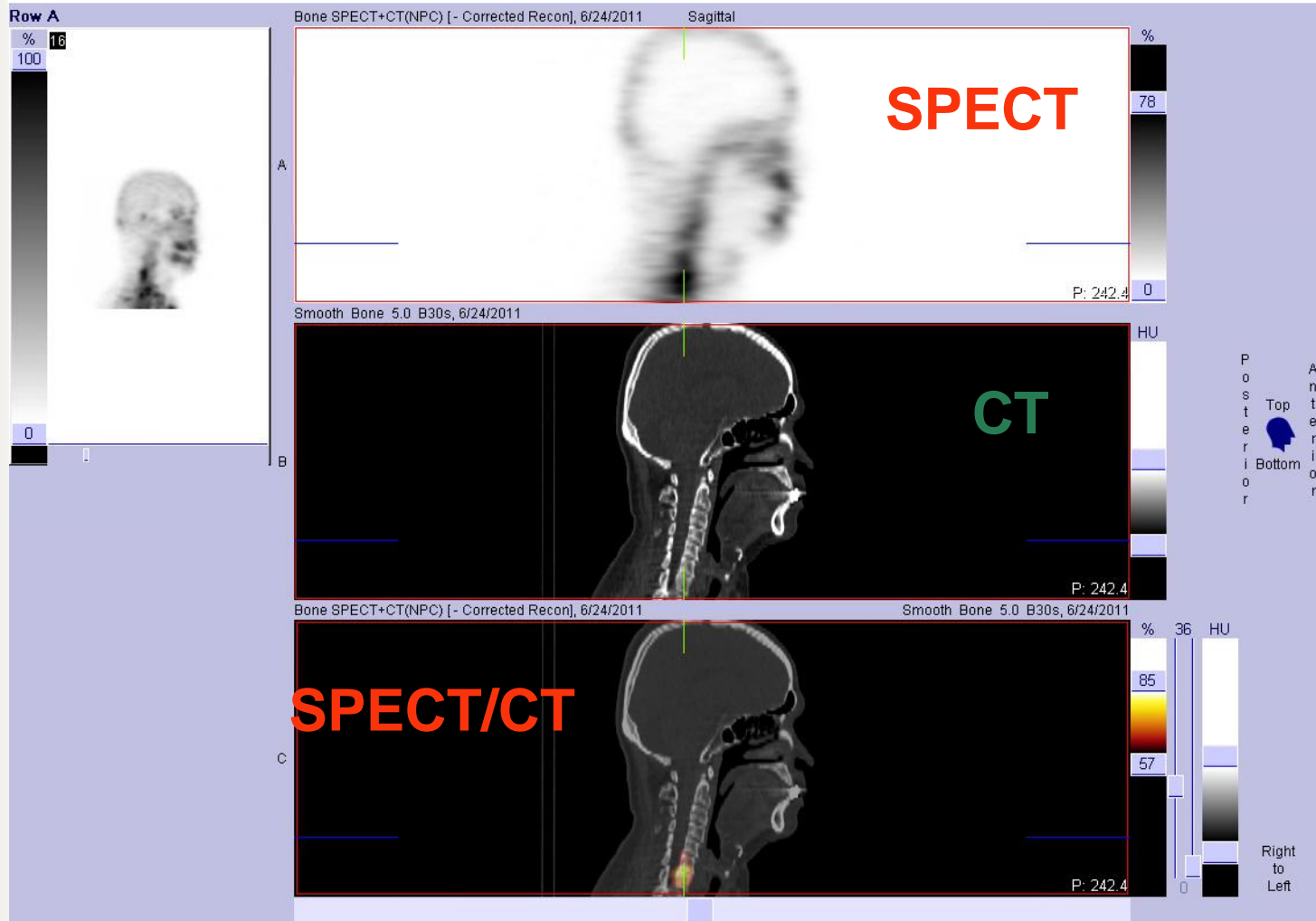




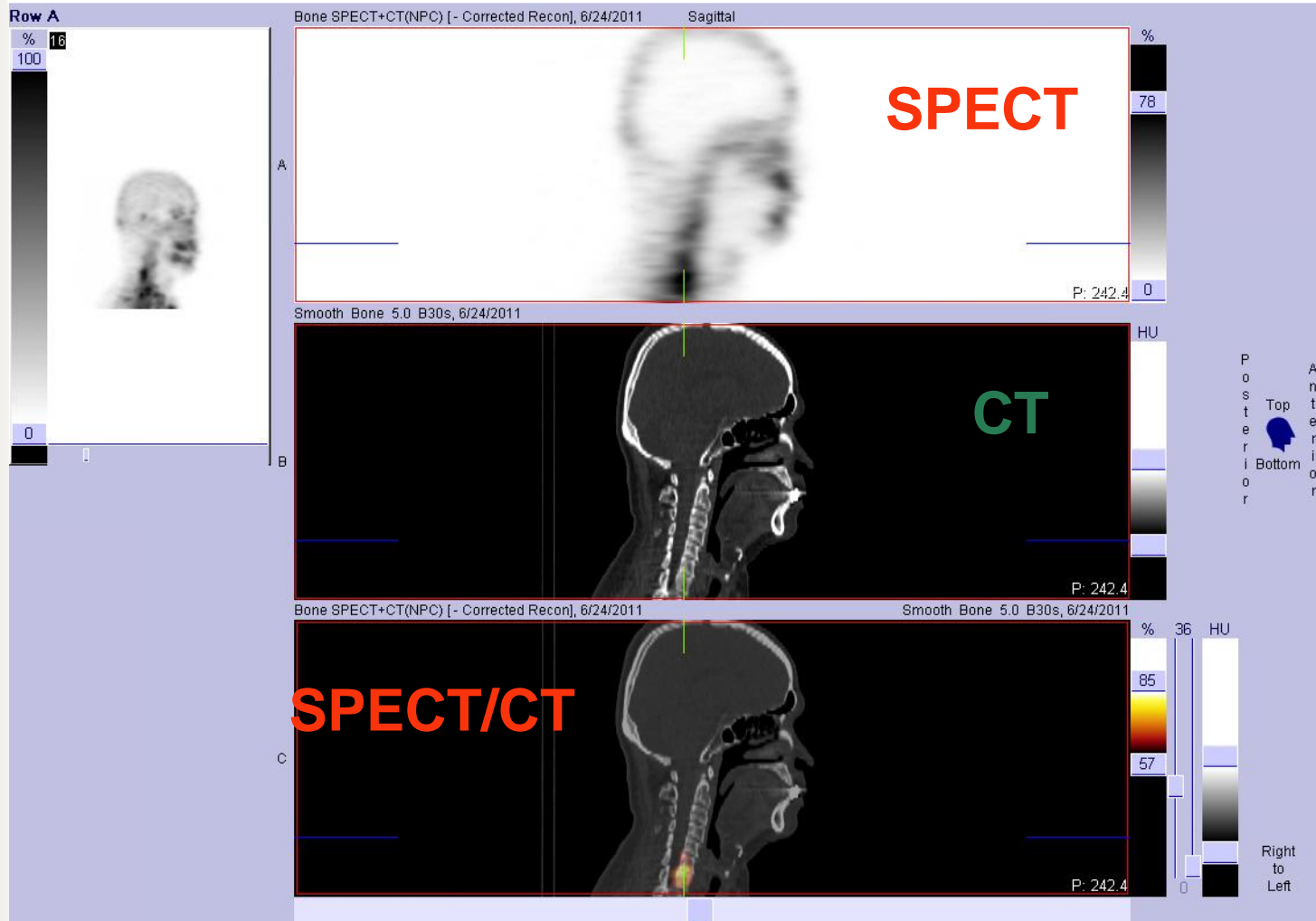
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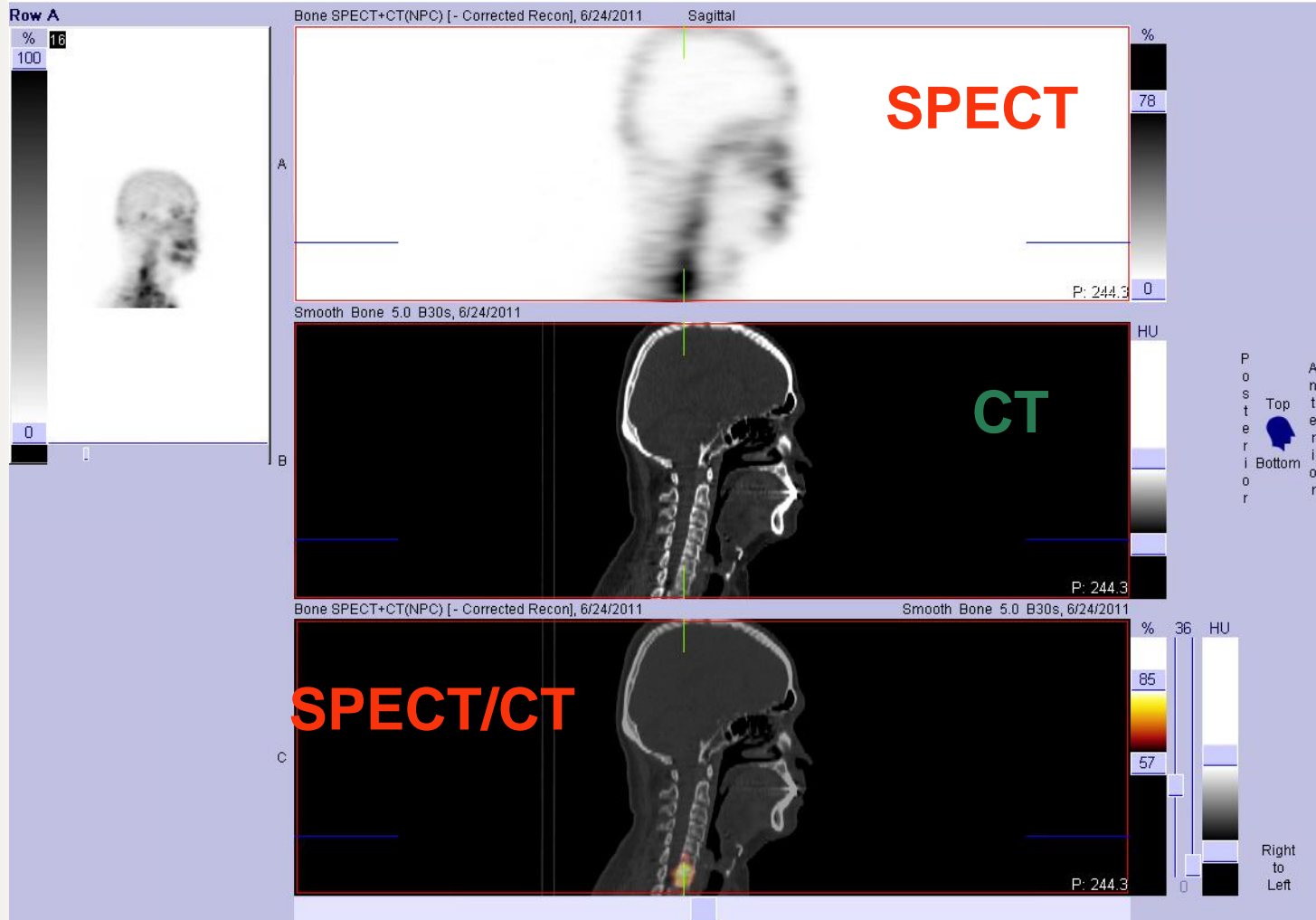
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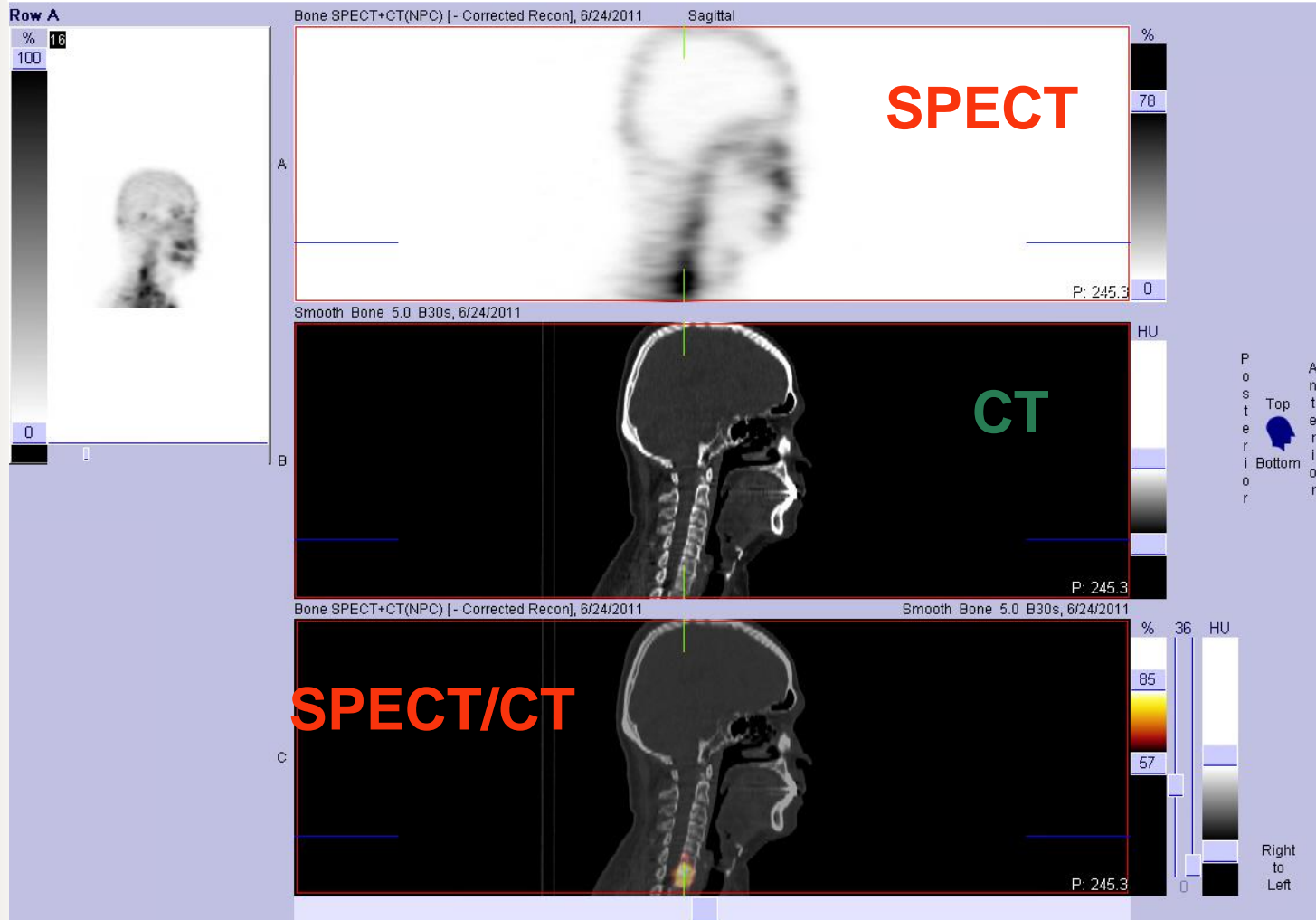


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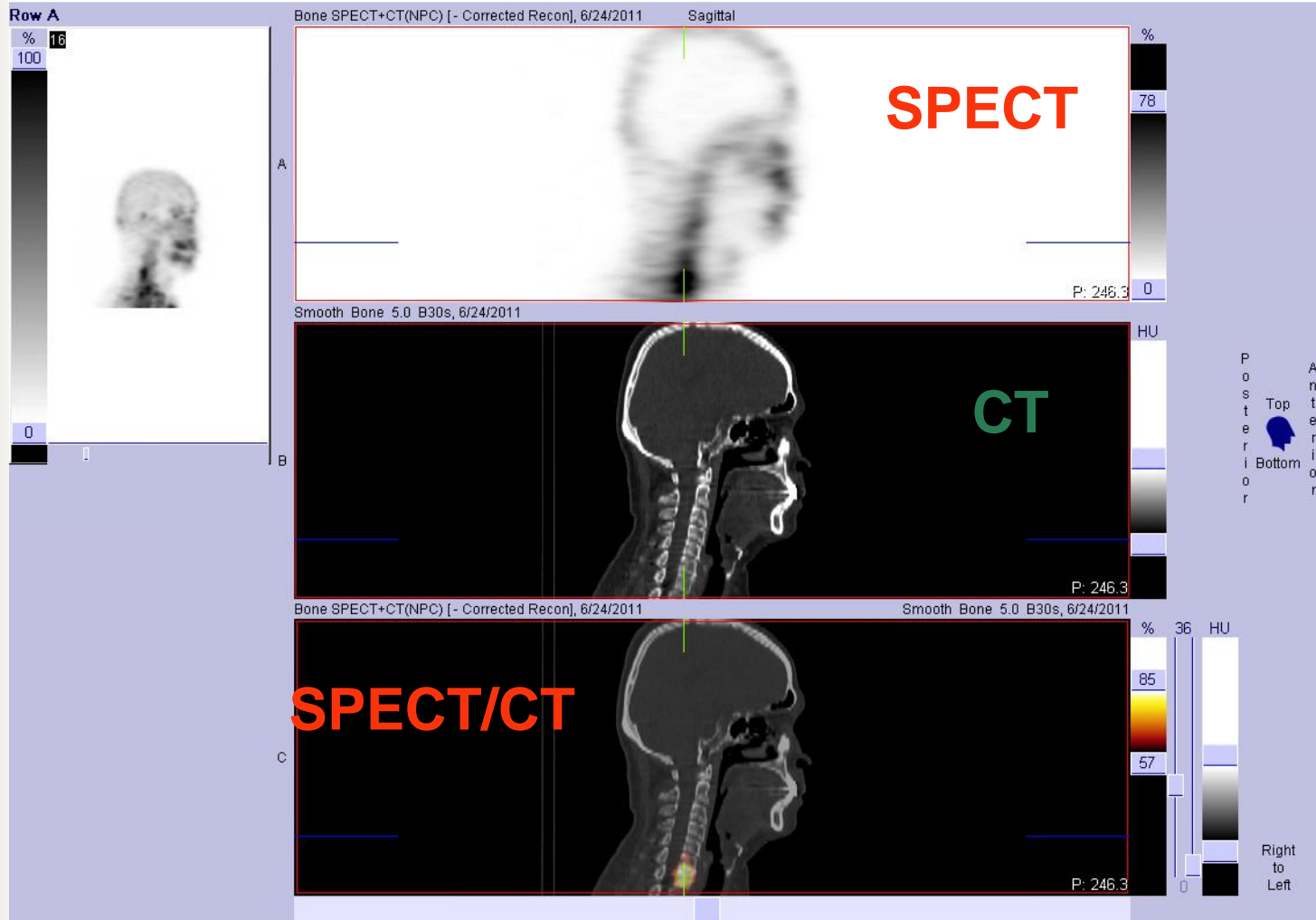




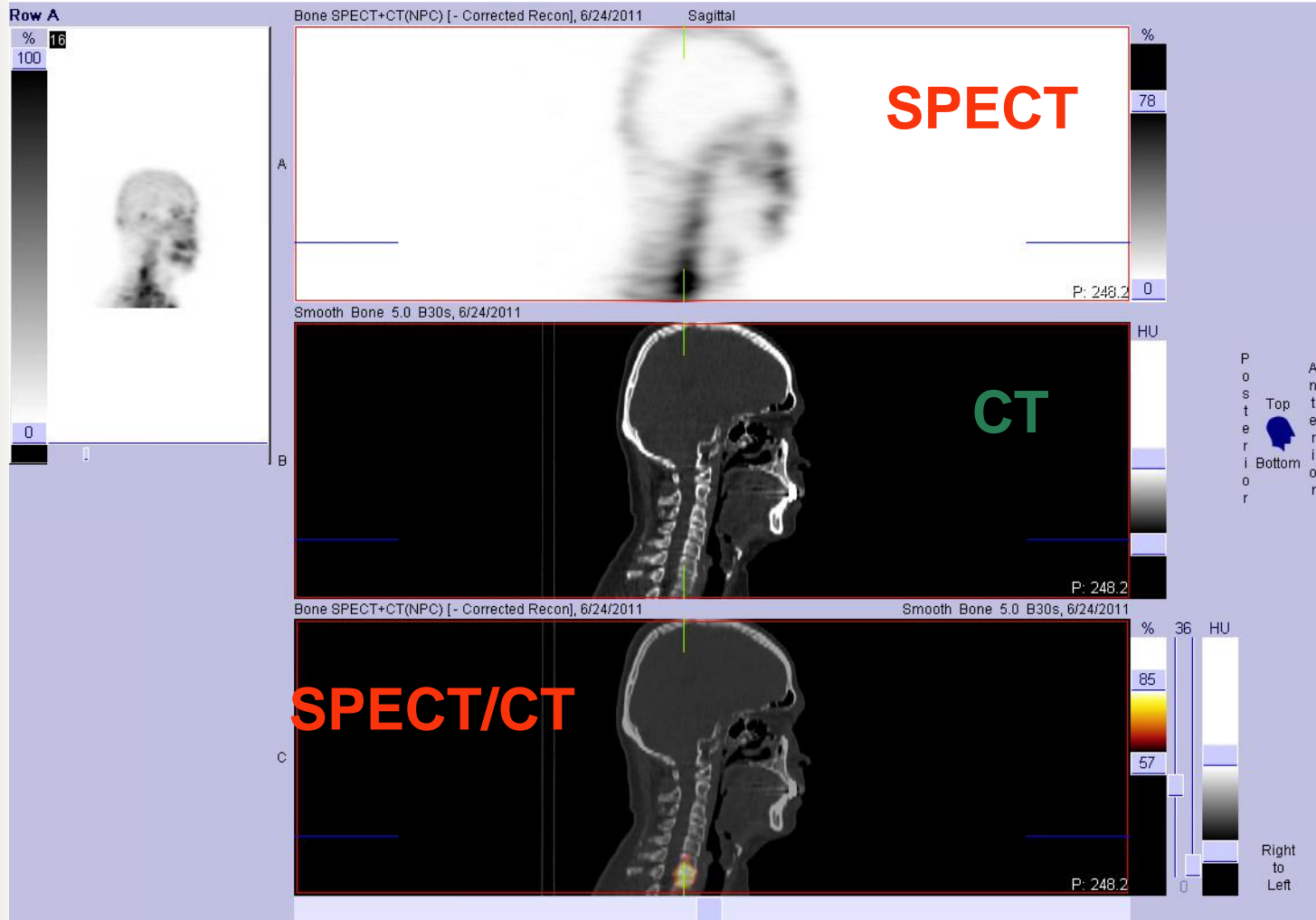
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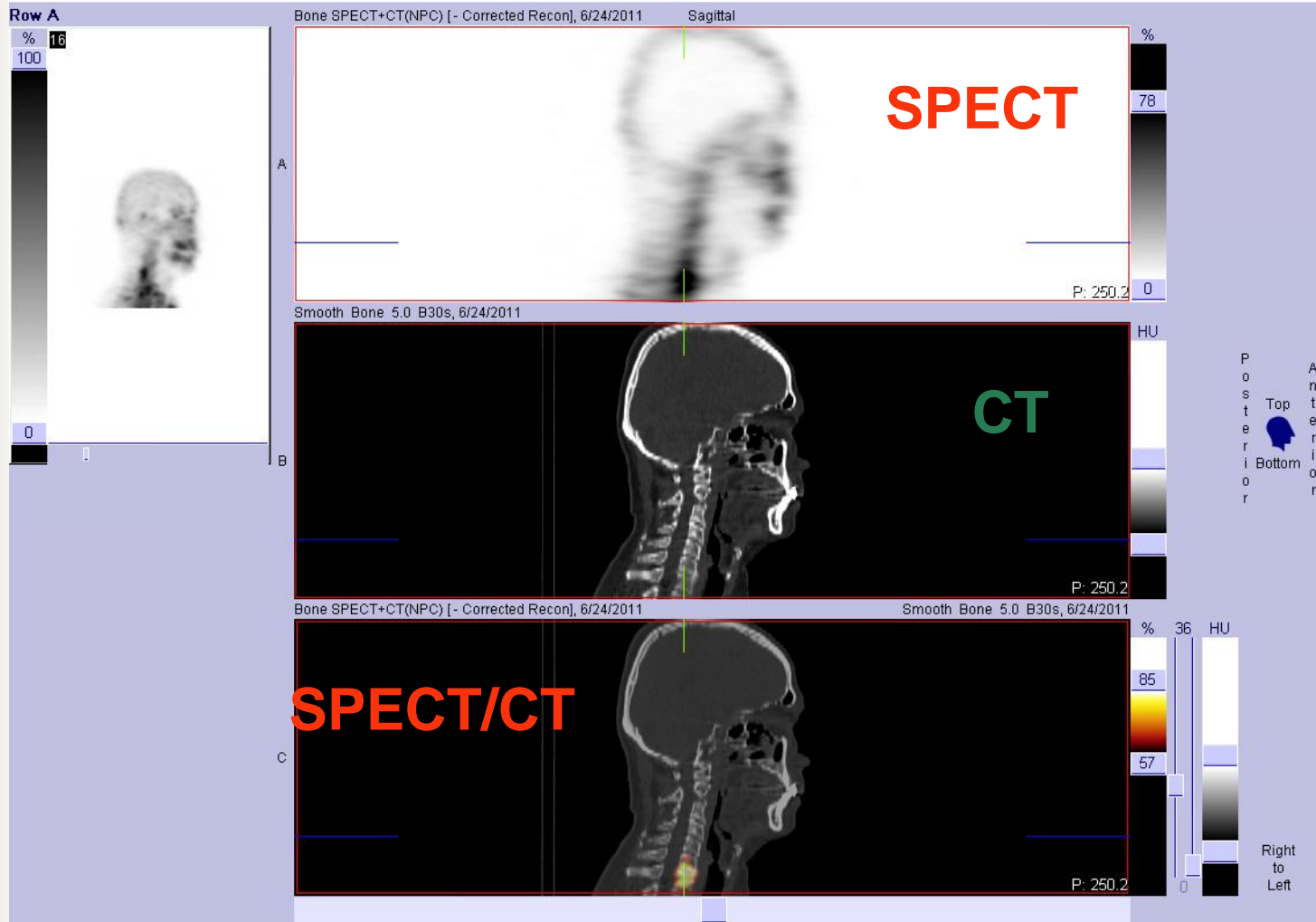
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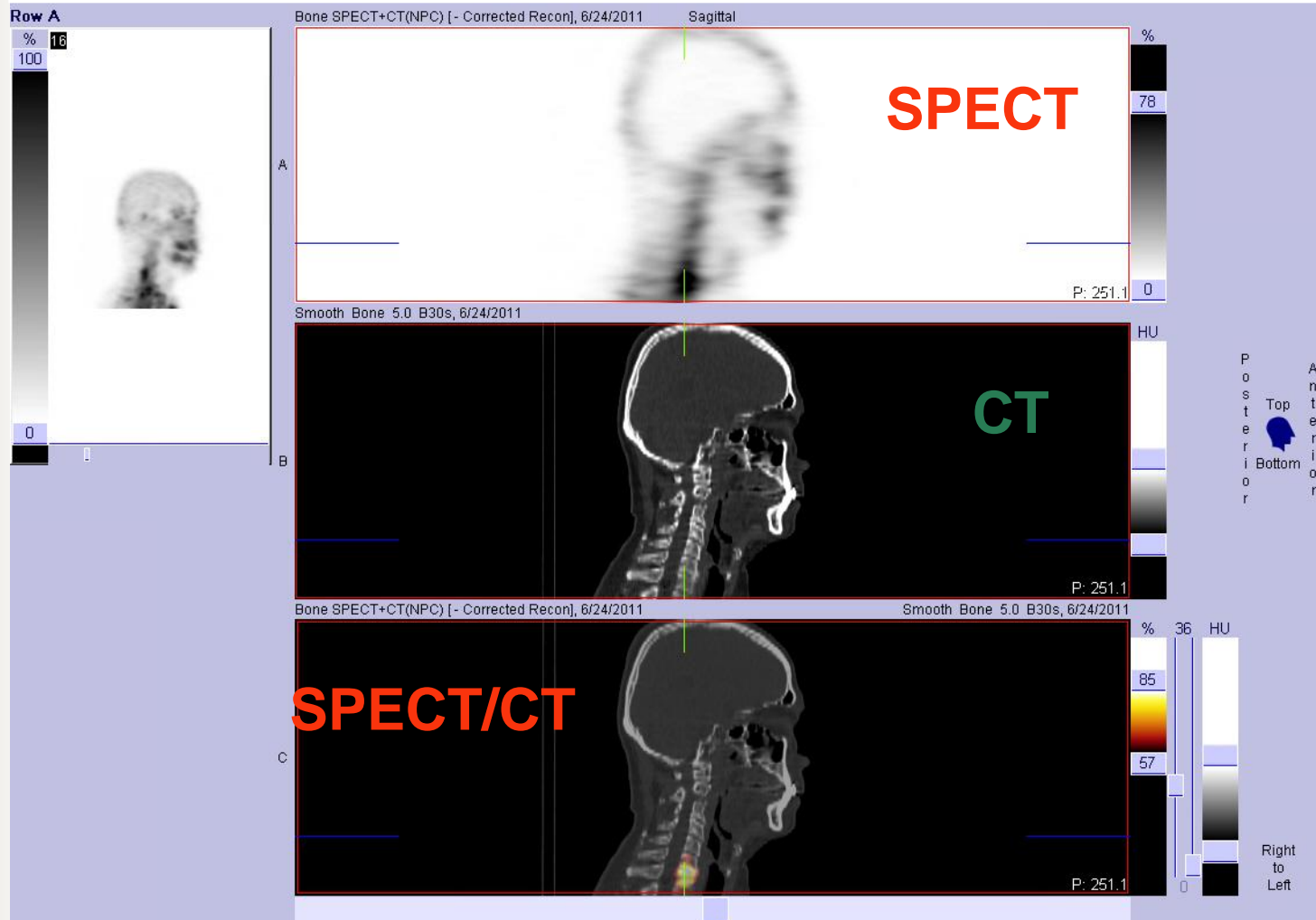


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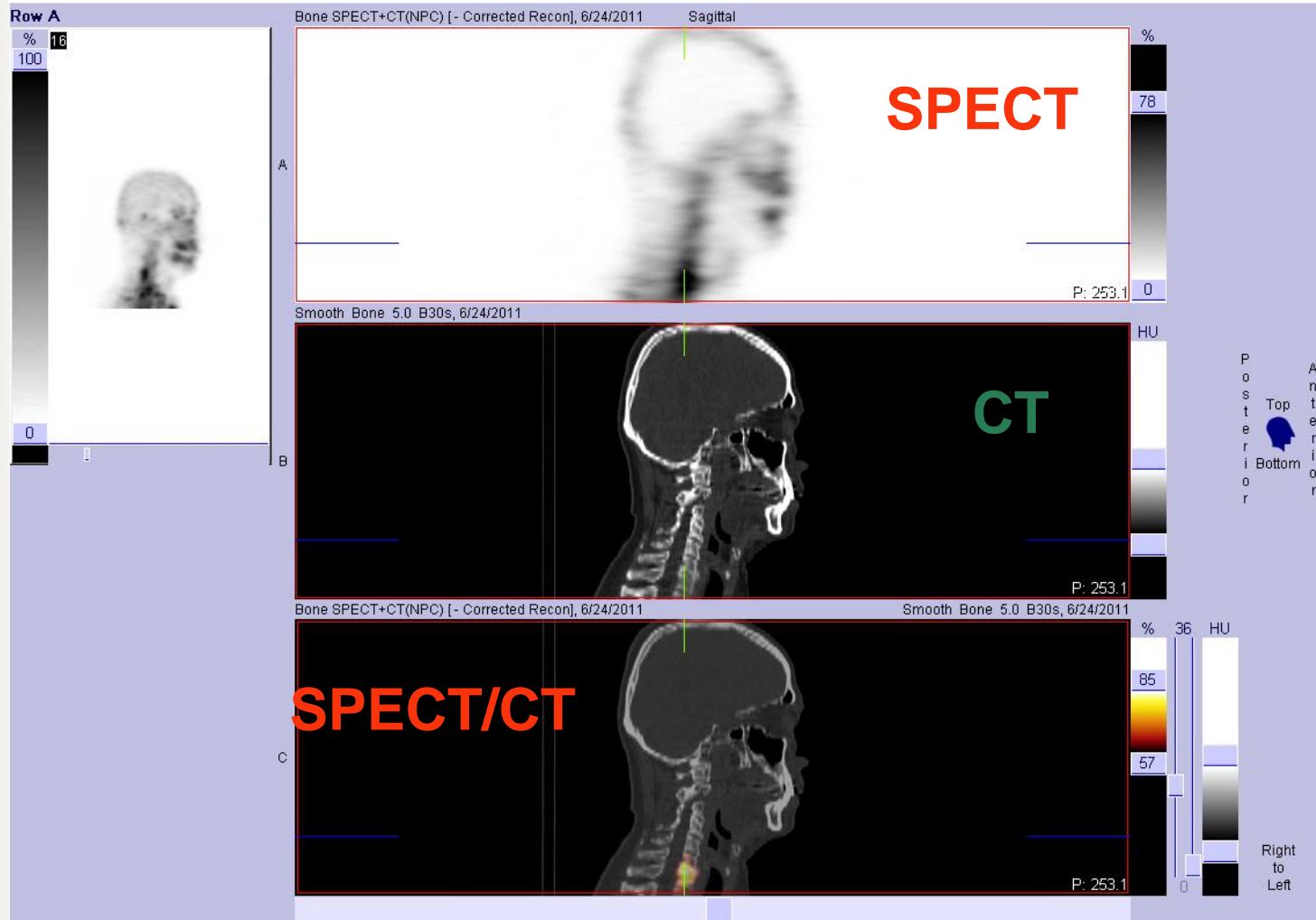




# BONE SPECT/CT (NPC) Sagittal view



# BONE SPECT/CT (NPC) Sagittal view



# BONE SPECT/CT (NPC) Transverse view

Shiung Kui Lin

ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium

799.2 MBq (21.60 mCi) MDP

Study Date: 6/24/2011

Row A

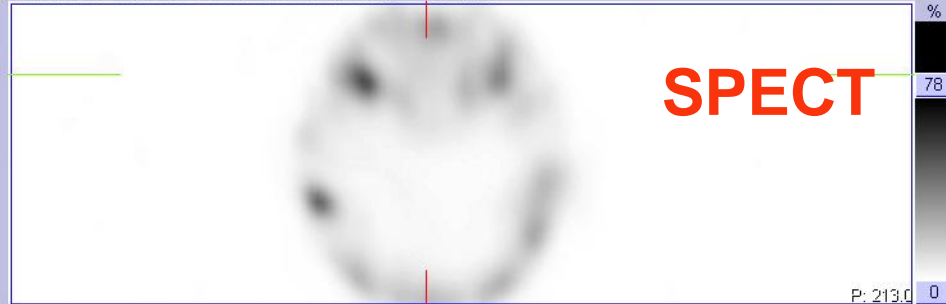
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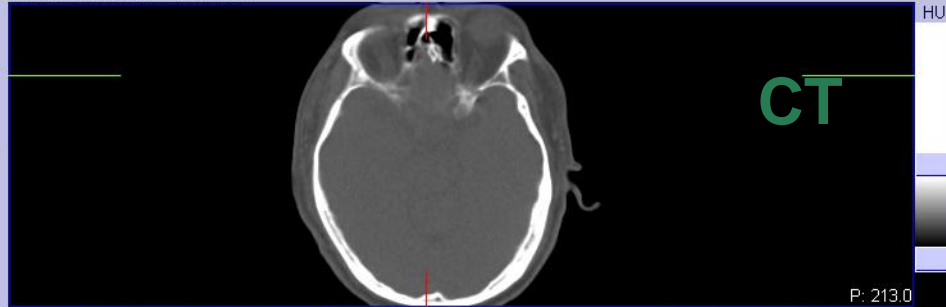
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

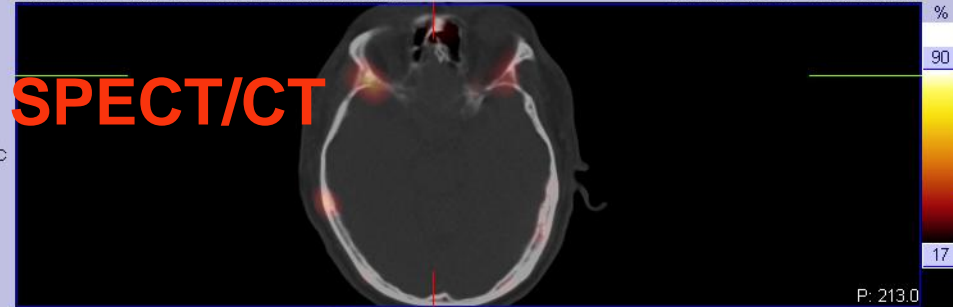


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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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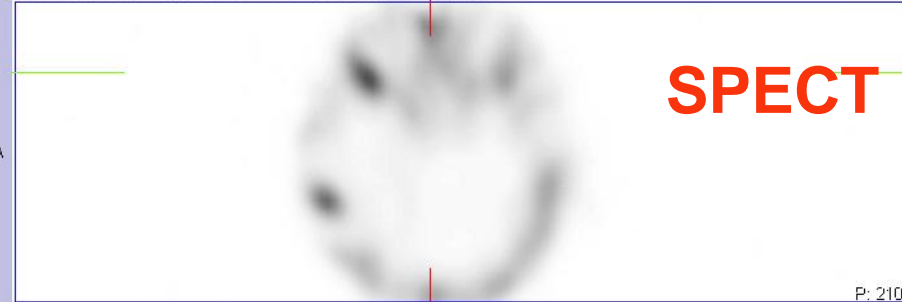
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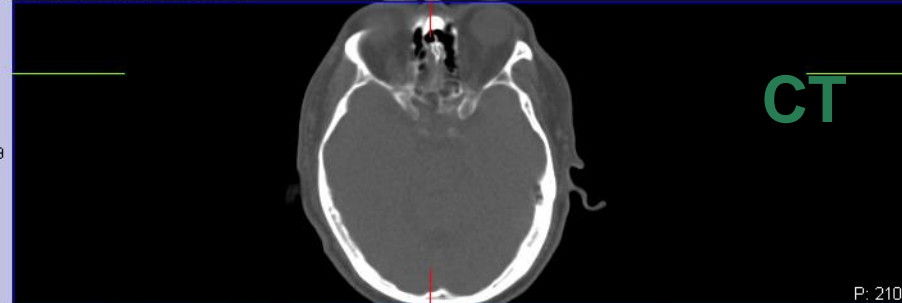
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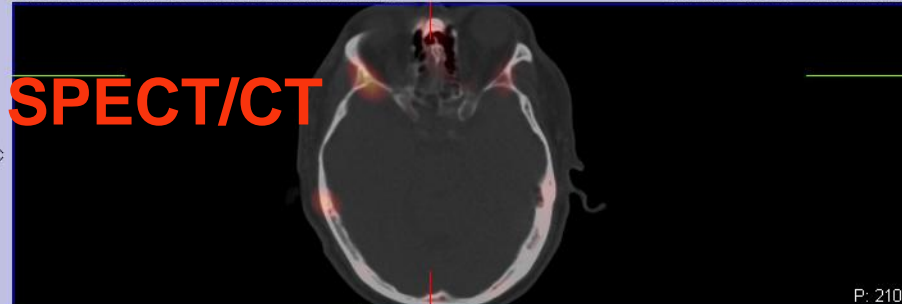


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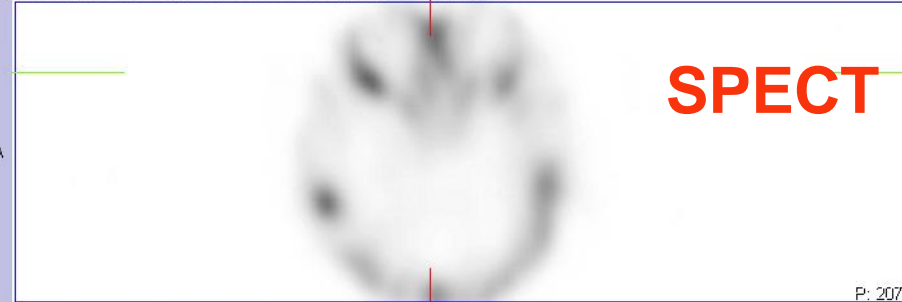
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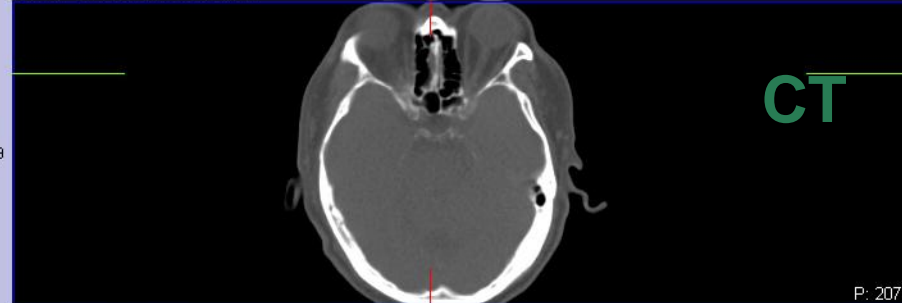
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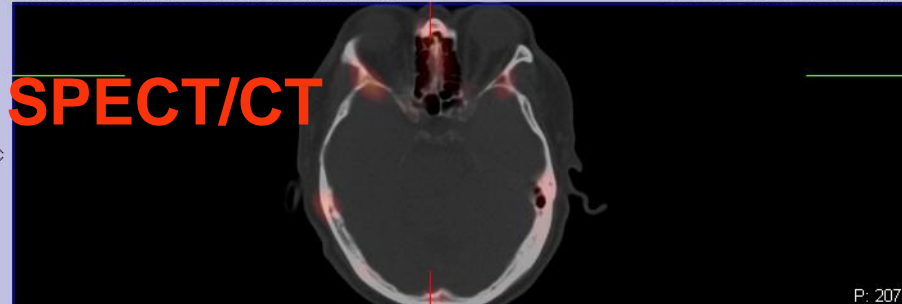


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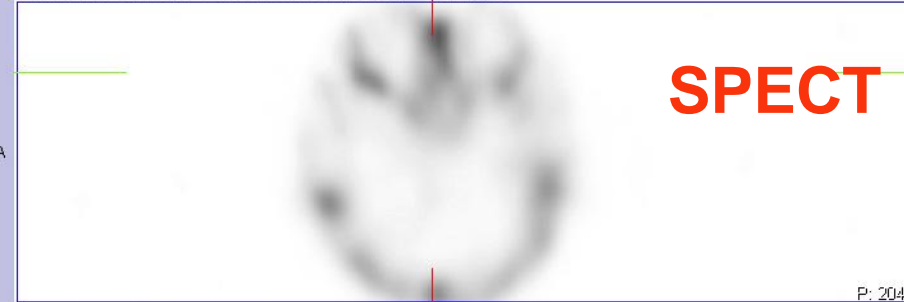
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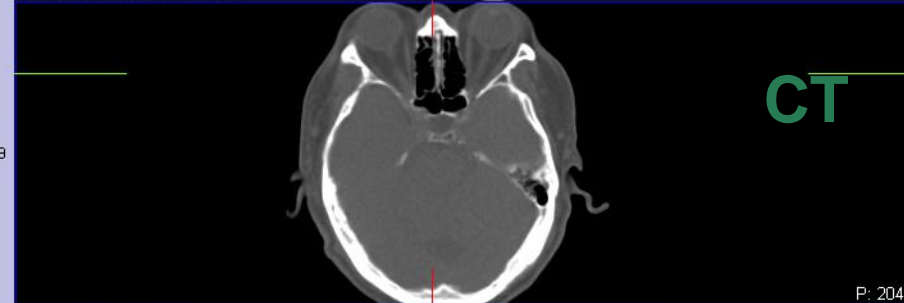
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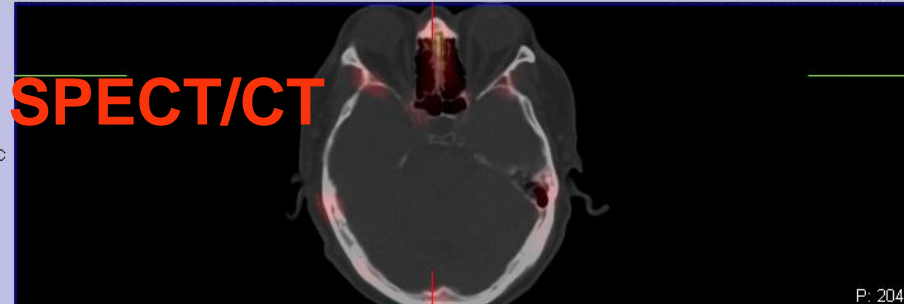


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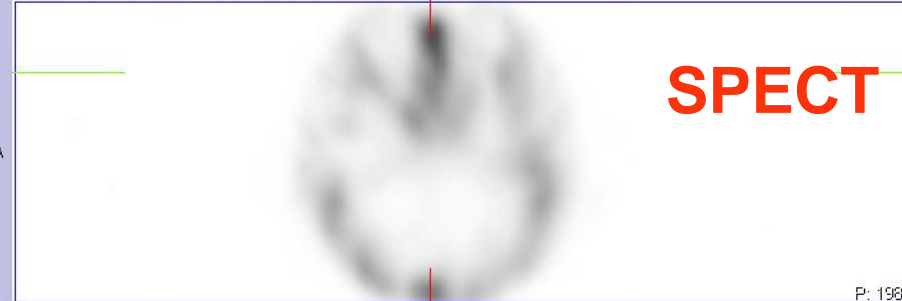
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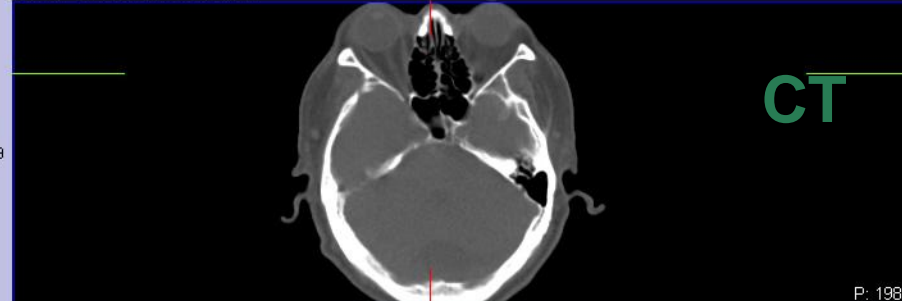
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Transverse

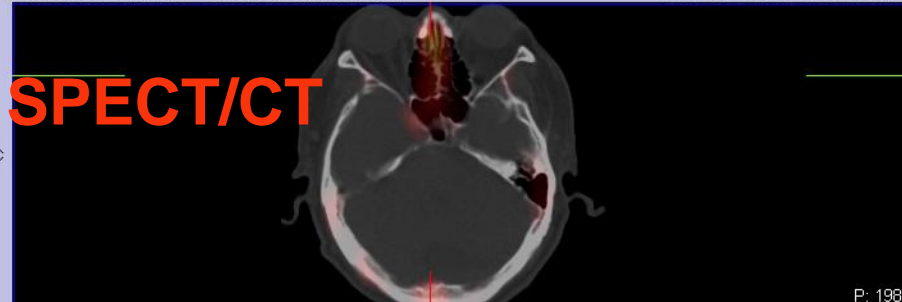


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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# BONE SPECT/CT (NPC) Transverse view

Shiung Kui Lin

ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium

799.2 MBq (21.60 mCi) MDP

Study Date: 6/24/2011

Row A

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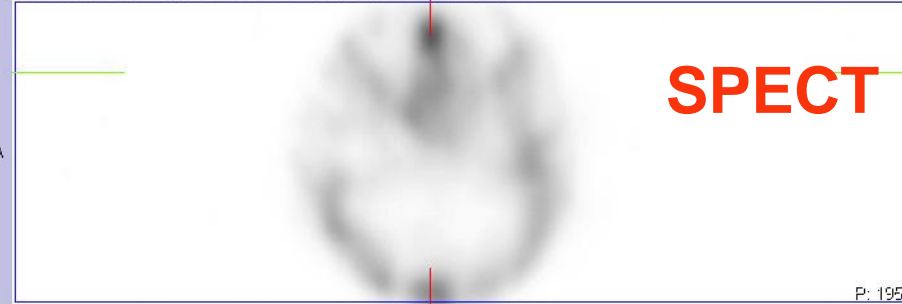
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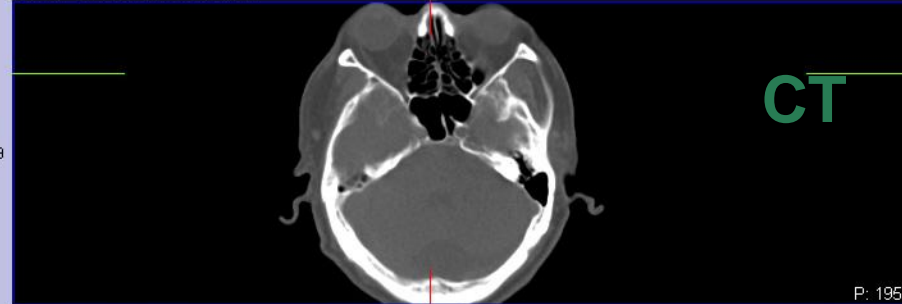
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Transverse

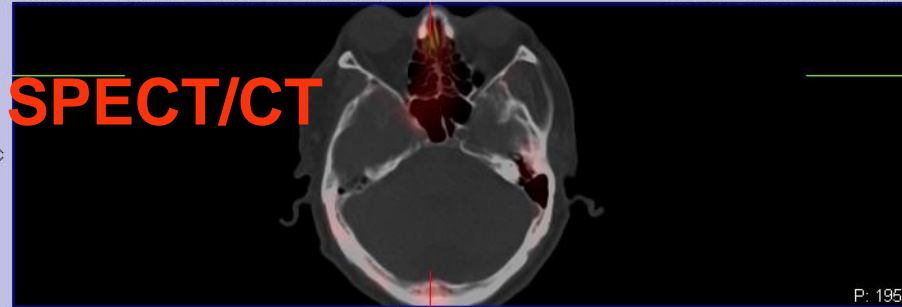


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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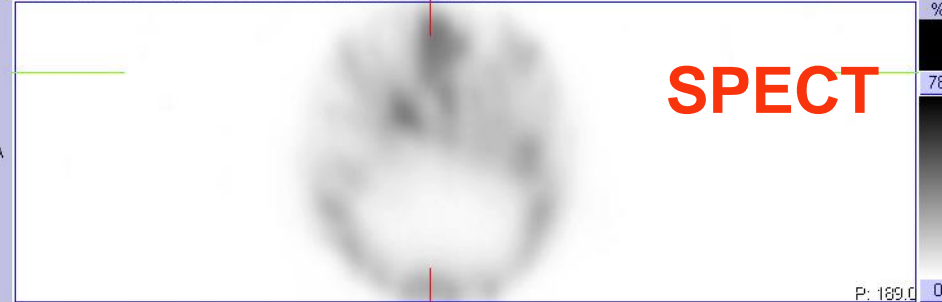
Study Date: 6/24/2011

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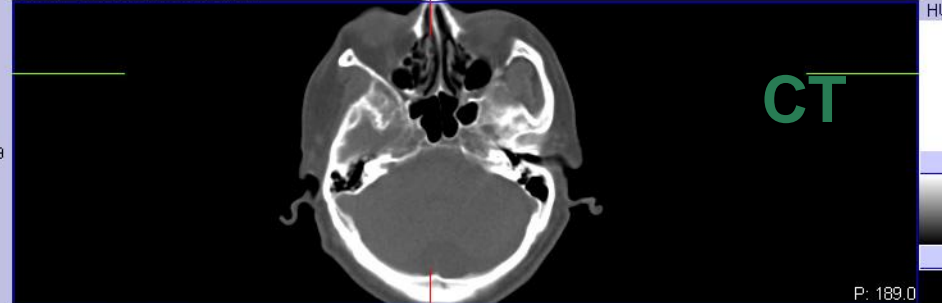
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

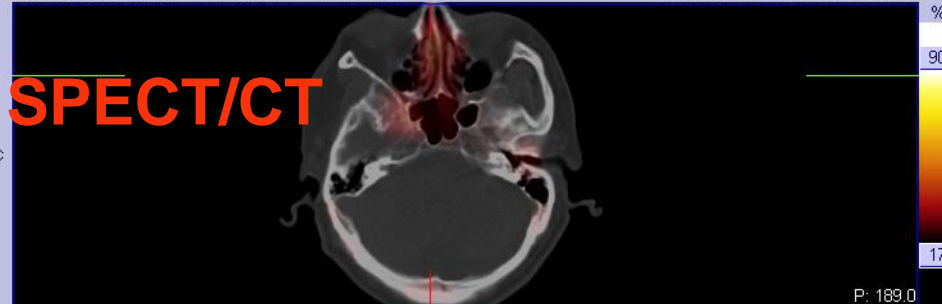


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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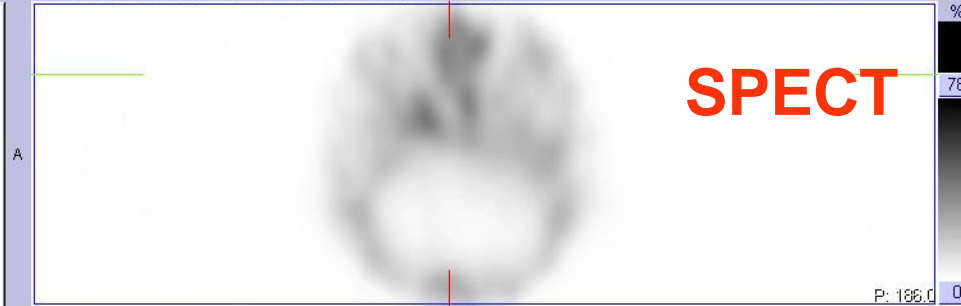
Study Date: 6/24/2011

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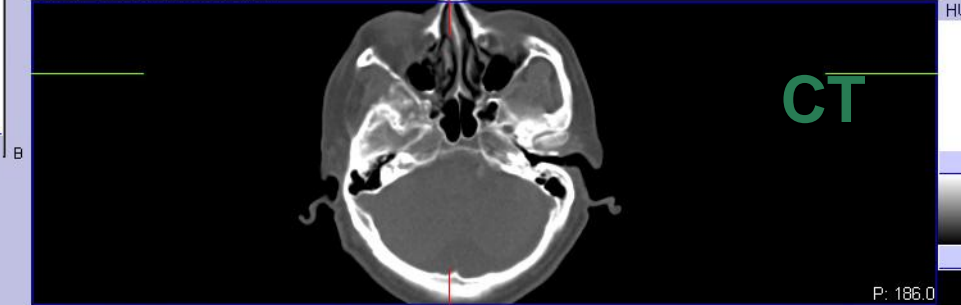
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

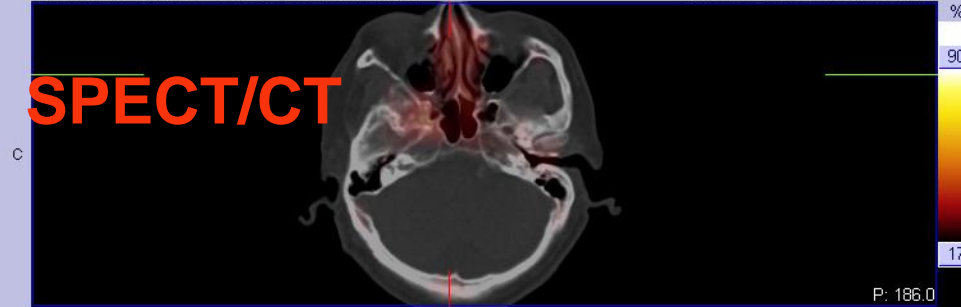


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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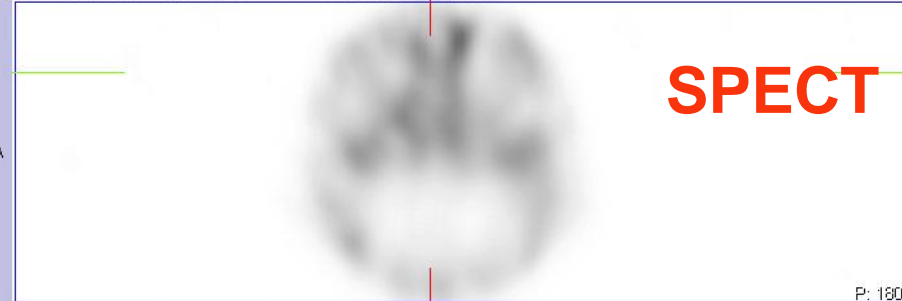
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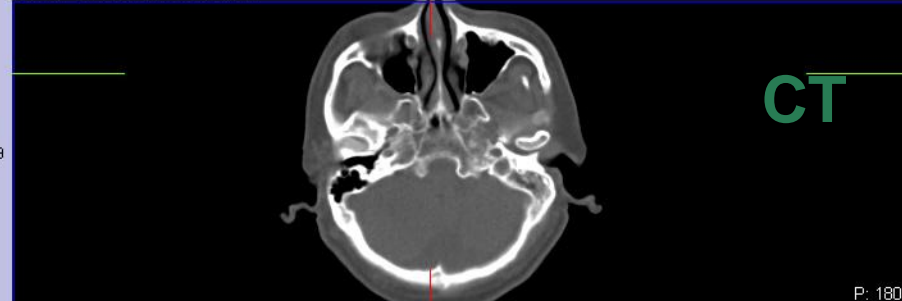
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Transverse

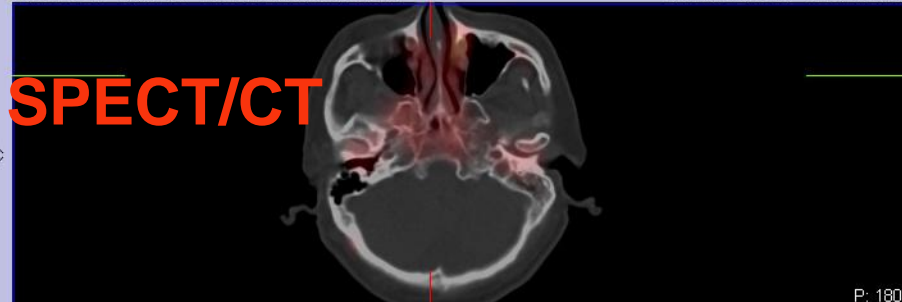


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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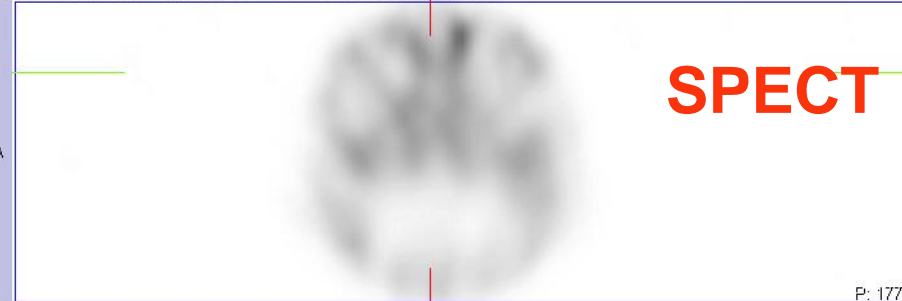
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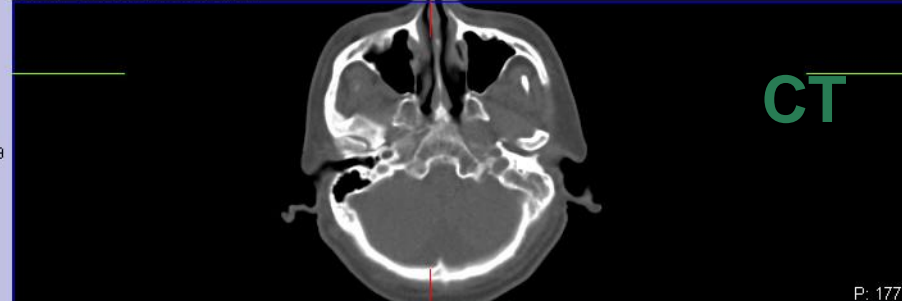
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Transverse

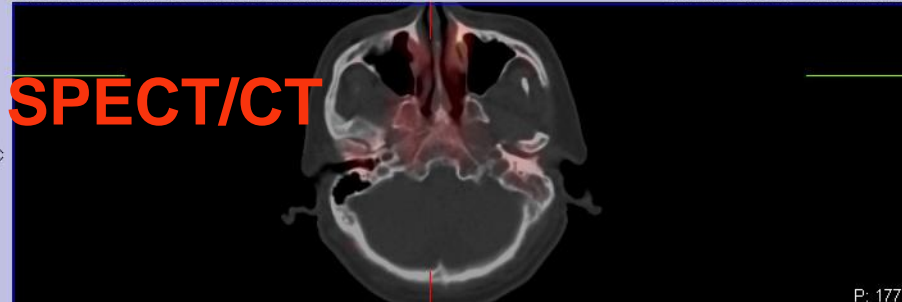


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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Shiung Kui Lin

ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium

799.2 MBq (21.60 mCi) MDP

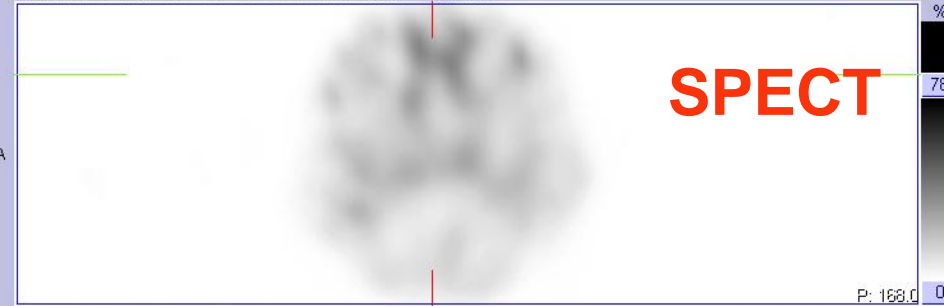
Study Date: 6/24/2011

Row A

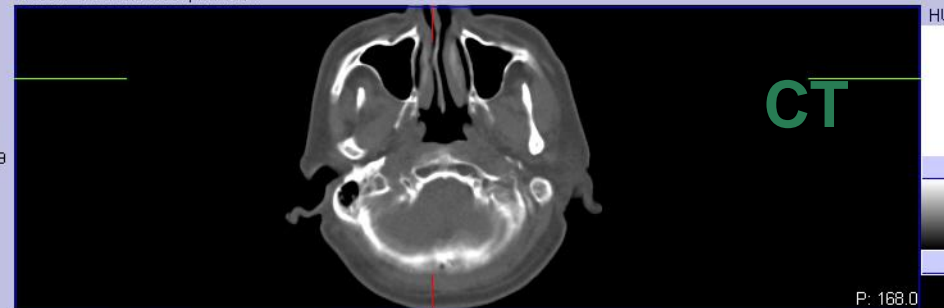
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

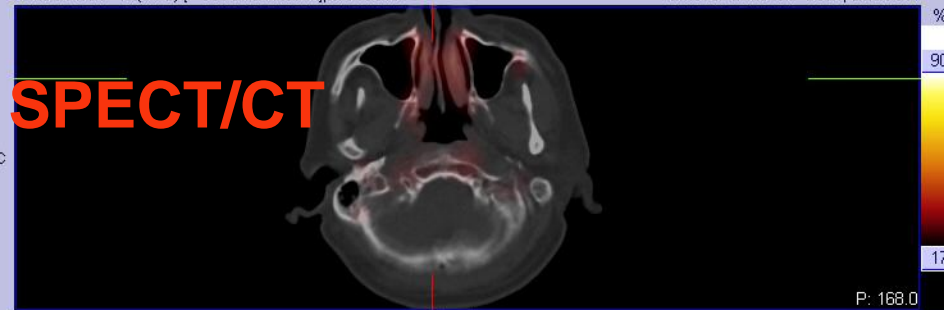


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium

799.2 MBq (21.60 mCi) MDP

Study Date: 6/24/2011

Row A

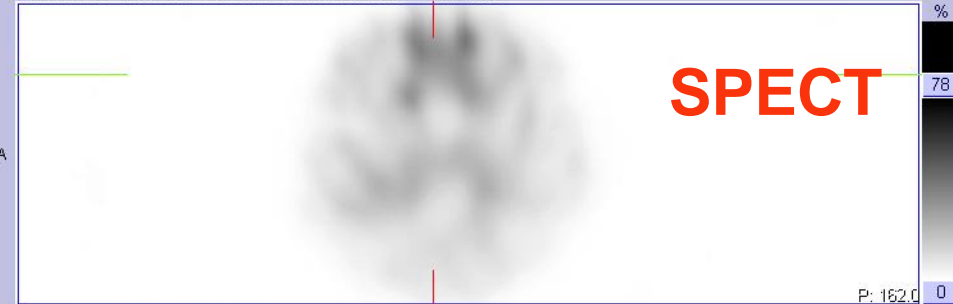
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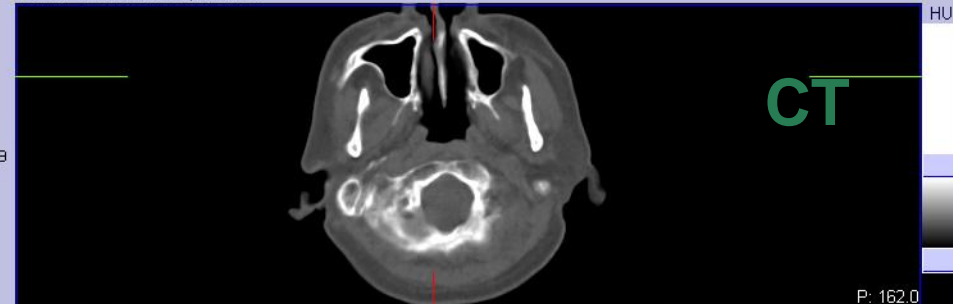
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

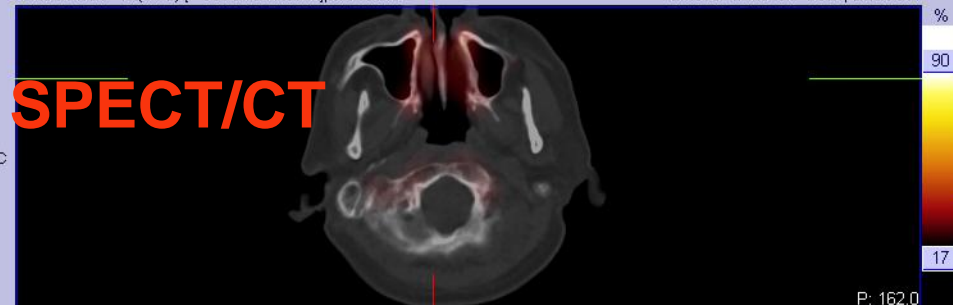


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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799.2 MBq (21.60 mCi) MDP

Study Date: 6/24/2011

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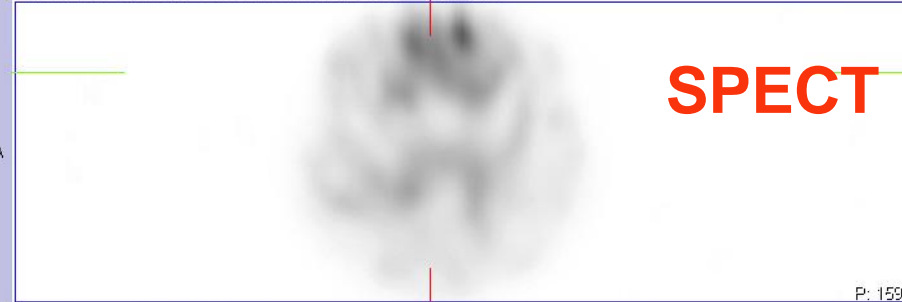
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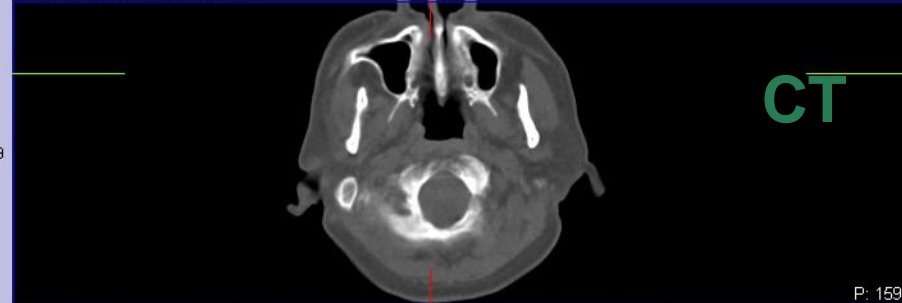
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Transverse

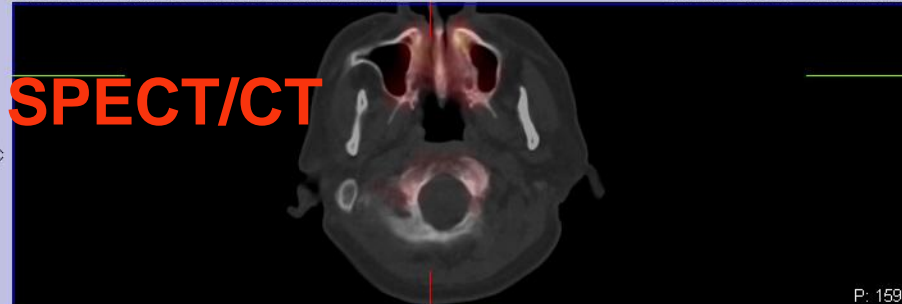


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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# BONE SPECT/CT (NPC) Transverse view

Shiung Kui Lin

ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium

799.2 MBq (21.60 mCi) MDP

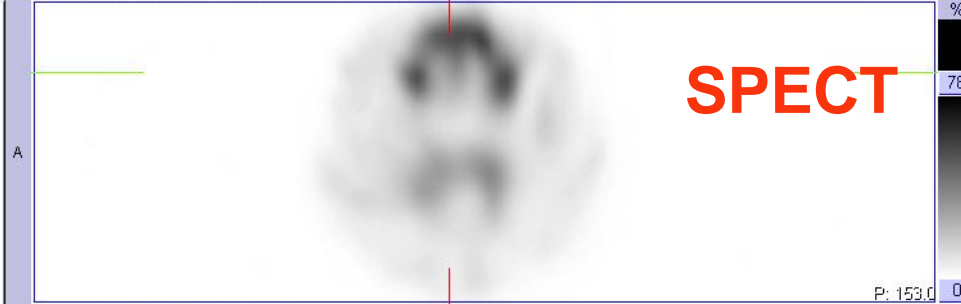
Study Date: 6/24/2011

Row A

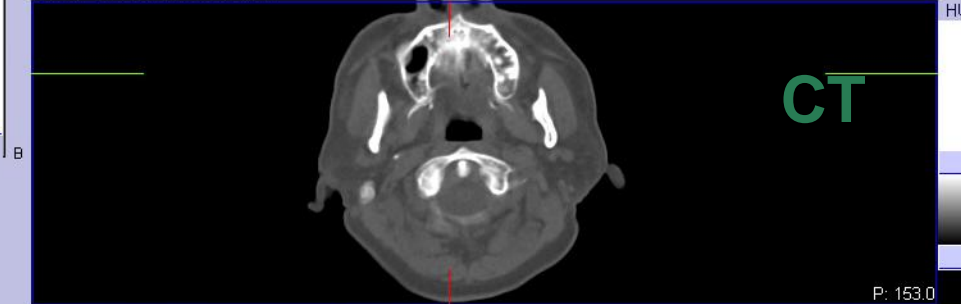
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

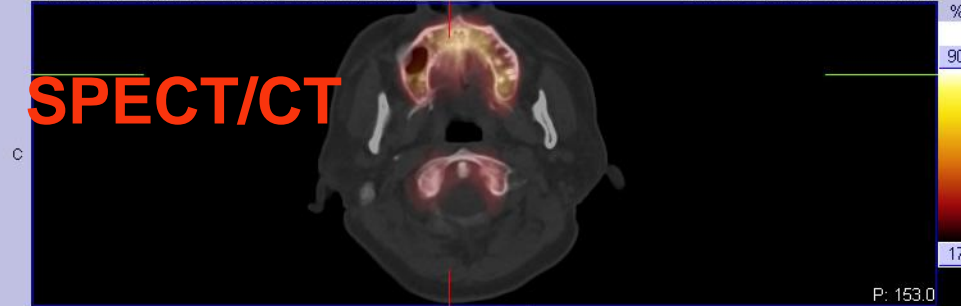


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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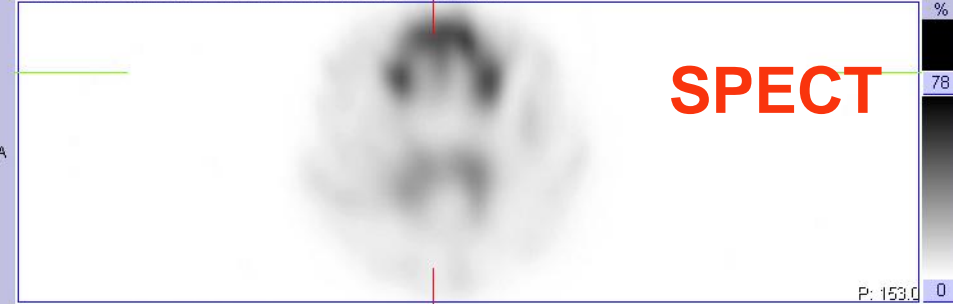
Study Date: 6/24/2011

Row A

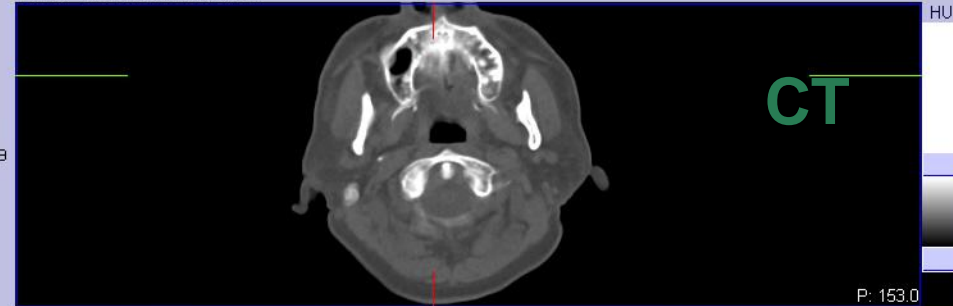
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Transverse

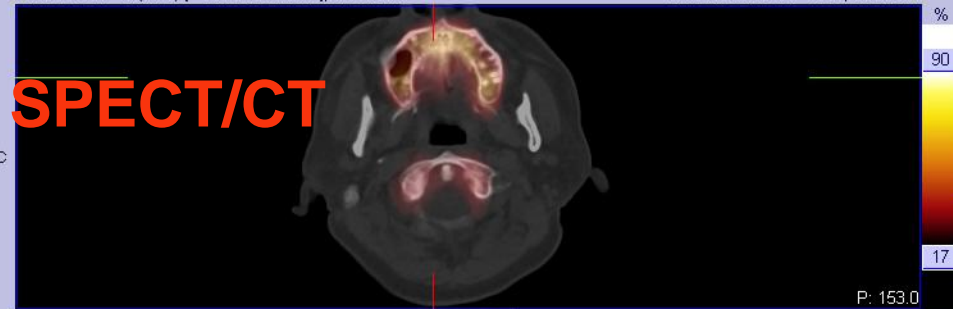


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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# BONE SPECT/CT (NPC) Coronal view

Shiung Kui Lin

ID: 9355026

DOB: 6/10/1956

Sex: M

SPECT

: 99m Technetium 799.2 MBq (21.60 mCi) MDP

Study Date: 6/24/2011

Row A

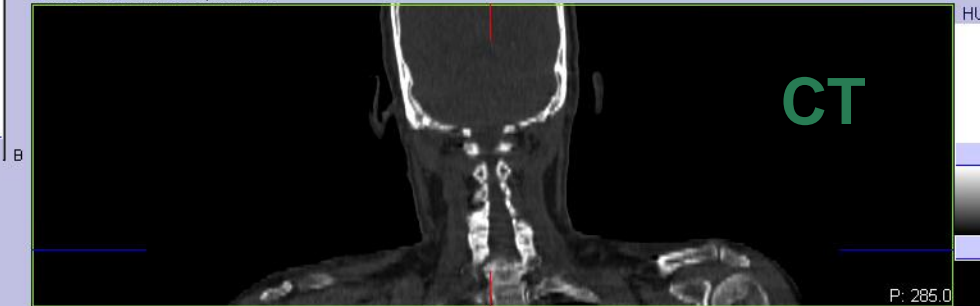
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Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011 Coronal

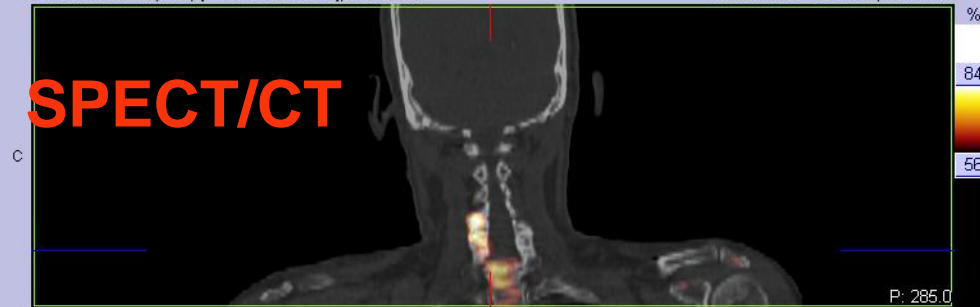


Smooth Bone 5.0 B30s, 6/24/2011



Bone SPECT+CT(NPC) [- Corrected Recon], 6/24/2011

Smooth Bone 5.0 B30s, 6/24/2011



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## ❁ Sr-89 可減輕癌症轉移骨痛

### ■ Metastron美他時壯

■ 它就像是Ca一樣，可以找出那些因為吸收過量的鈣質而造成疼痛的骨骼，然後停留在那些部位數週並減輕疼痛

on”

# 課後重點提示:

1. 骨骼閃爍造影所使用的放射製劑？ **Ans: Tc-99m MDP**
2. 常規骨骼掃描, 通常在打藥後多久進行？ **Ans: 3hrs**
3. 骨骼閃爍造影之適應症有哪些？ **Ans: 癌病分級, 治療預後, 評估追蹤**
4. 治療骨疼痛骨轉移的放射核種？ **Ans: Sr-89**
5. 骨骼閃爍造影製劑 Tc-99m MDP 解離會在哪些地方有活性？  
**Ans: 甲狀腺, 胃, 唾液腺**
6. 骨骼造影, 應用何種準直儀較為合適？ **Ans: LEAP, LEHR (低能高解)**
7. Tc-99m MDP 主要排泄路徑？ **Ans: 腎臟**



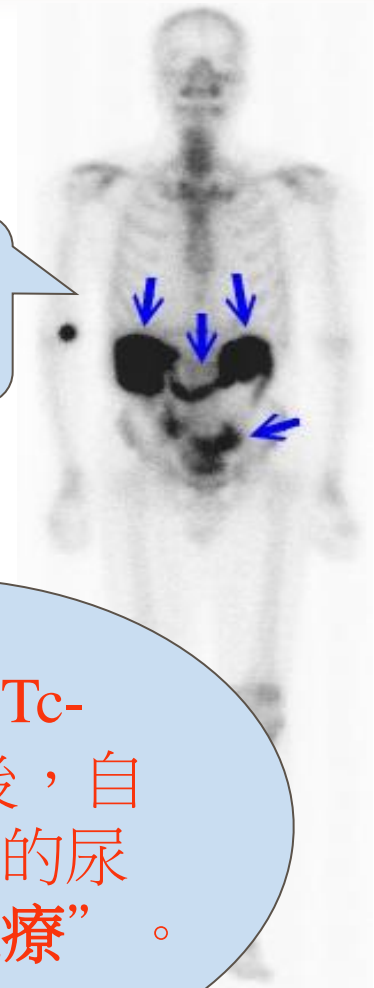
# 臨床腦筋急轉彎?!

ANS:



活性聚集處為  
箭頭處)。

?



此病人注射Tc-99m-MDP後，自行飲用本身的尿液進行“尿療”。

похе.ру

休息片刻!!

偷偷告訴你：  
你的拉鍊沒拉。



## PartII<腫瘤發炎系統造影作業>

# 🌸 Ga-67 scan for osteomyelitis, inflammation, tumor survey



**Speaker: Chang-Ching, Yu**

高雄榮總核醫科 俞長青





# 課前提要:



- 發炎與感染疾病常隱晦不明，容易逃過臨床監測或造成爆發性的致命危機。有時即使做完詳細的病史詢問、理學檢查、常規影像檢查及血液培養等，仍未能偵測出病源所在。在這種情況下，核醫影像檢查提供了另一種選擇。

- 常用發炎反應放射製劑: 1. **Ga-67** citrate 

**In-111 與 Tc-99m HMPAO**  
均是利用其標化白血球，  
利用白血球聚集於發炎部  
位之特性而造影

2. **In-111** labeled WBC
3. **Tc-99m** HMPAO





# 本章學習重點



## ■ Osteomyelitis(3-phase)

1.原理 2.目的 3.方法與條件 4.步驟 5.影像呈現

如何用isotope去鑑別?

Ga-67發炎  
3 mCi (打藥後  
24小時造影)

## ■ Ga-67 Scan Inflammation

1.原理 2.正常與異常影像呈現 3.Note 4.值得一提

## ■ Ga-67 Tumor Survey

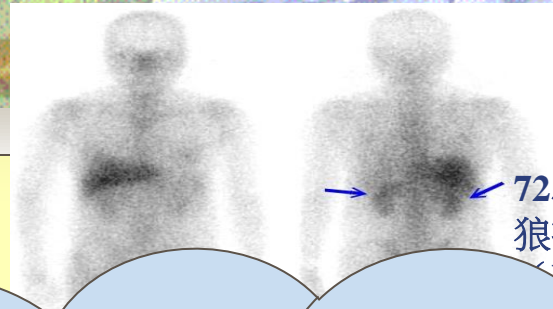
1.適應症 2.造影條件 3. Note

5 mCi 腫瘤  
(打藥後48小時  
造影)





# 可能的問題



72小時造影，  
狼瘡性腎炎  
(lupus nephritis)

- 1. 與骨骼  
不易判  
解剖位  
否相  
一  
近，
- 2. 正  
時內  
活性  
炎。腸道放  
的病變診斷  
有腸道干擾

Q: 什麼是骨髓  
炎或蜂窩性組  
織炎? 如何鑑別?

放射  
腎  
部、骨盆  
白血球掃描沒  
，故適合用以診斷腹部、骨盆感染。

# Osteomyelitis(OM)申請單

24hrs收集 (Ga+Tc-MDP)影  
像

加做3-phase

Gallium 3 mCi 1906 Injection Time 3.27  
 H52 08/09/12 09:01:04 8/3-14 80N call  
 ORBHMS1  
 ◆申請單◆ 核子醫學科  
 W72 - 037 李俊雄 4064259 1967/09/26 男 健保  
 科別：腸胃科  
 申請醫師：蕭雪斌 7839J  
 申請時間：2012/08/09 - 08:57  
 排程時間： / / - :  
 診斷名：Hemorrhage of gastrointestinal tract, unspecified  
 Diagnosis: Avascular necrosis, L't femoral head s/p THA  
 History: This 44 y/o man, a alcoholism, suffered from AVR, left femoral head, s/p THA with recurrent septic arthritis.  
 Abx Blood ( ) Ca. (X) fever (X) Rhs p Liver Unk (X)  
 Previous study: <Y> (Y/N)  
 申請序號 醫 藥 項 目 申請序號  
 58347309 Osteomyelitis scan 2012-8  
 Bone 0915 Injection Time 0183 20.8  
 時間 8:27  
 Tc-MDP 3 mCi  
 58327447

# 骨骼三相顯像 (3-phase)



## <臨床應用>

- 1. 早期診斷惡性轉移骨腫瘤
- 2. **急性**骨髓炎的早期診斷
- 3. 原發性骨腫瘤範圍的判斷和療效觀察

## <正常所見>

- \***血流相**:約在IV注射isotope後8-12秒大動脈和二級動脈陸續顯影,隨即逐漸顯示軟組織輪廓,骨骼放射性減少
- \***血池相**:此時isotope大部份存於血液中,均勻分佈在血床與血竇內軟組織更加清晰,放射性增高
- \***延遲相**:同骨骼影像





# Osteomyelitis(3-phase)

- 1. 第一相 (**Dynamic phase**): 乃IV注入 isotope 後立即顯影, 又稱灌注相或血流相。
- 2. 第二相 (**Pool phase**): 乃IV注入 isotope 後5mins內立即顯影, 又稱瞬間血池相或組織相。
- 3. 第三相 (**Delay phase**): 延遲3-4hrs後照相, 又稱骨骼相。
- 4. 第四相: 打Ga-67後, 延遲24hrs照相, 可同時搜集Tc-99m+Ga-67兩個同位素的影像。



# Purpose



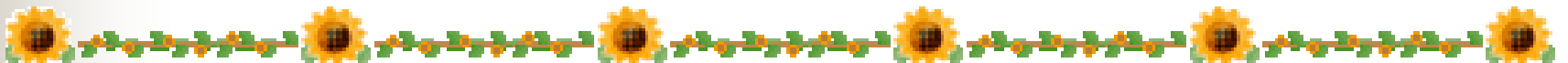
- **3-phase**可用來鑑別診斷骨髓炎與蜂窩性組織炎,並可用以觀察骨骼系統病變或骨骼移植的供應情形。

- **Tc-99m**半衰期:6hr



- **Ga-67**半衰期:78.2hr

- 對於(OM)關節炎及感染等骨科疾病以三相式掃描為宜;若作為cancer轉移篩檢等,則只進行(WBBS)全身靜態掃描即可。





## <骨髓炎與蜂窩性組織炎>


# Osteomyelitis vs Cellulitis



<i>phase</i> \ <i>Lesion</i>	<b>Osteomyelitis</b>	<b>Cellulitis</b>
1. Blood flow (Dynamic)	+ (5sec/f)	+ (blood)
2. Blood pool (static scan)	+ (1-4min)	+ (soft tissue)
3. Delay view (WBS+static)	+ (2-4hrs)	- (bone)

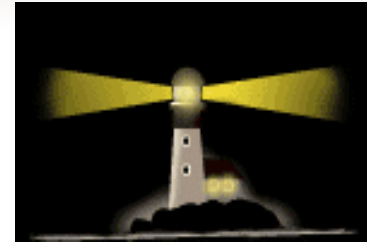


# Method

1. 作**Dynamic**檢查,先將檢查的部位擺好,一打針即開始造影(5sec/frame)。
2. 接著作**early (Pool) phase**,  
**static:500k**,及**whole body pool scan**。
-  3. 再隔**3hr**後,請病人再來作全身及局部**delayed (Bone) phase**。
4. 最後再視病人情況,醫師決定是否注射**gallium** 的藥。



## ■ 造影條件:



■ Collimator: MED

■ Energy window:  $92\text{Kev} \pm 20\%$ ,  
 $185\text{Kev} \pm 15\%$ ,  $300\text{Kev} \pm 15\%$

■ Whole body :  $20\text{cm}/\text{min}$ ,

Static: skull, thigh, foot: 300k

chest, spine, pelvis: 500k

SPECT/CT:  $30\text{s}/\text{frame} \times 64$

# ■ 檢查步驟:

## ■ 1. 局部檢查



(a) 依據 **Three Phase Study** 位置或全身掃描, 閱片後醫師指定部位。

(b) 檢查自注射後 **24hours** 開始照相, 每張設定 **500k counts**。



## ■ 2.全身檢查



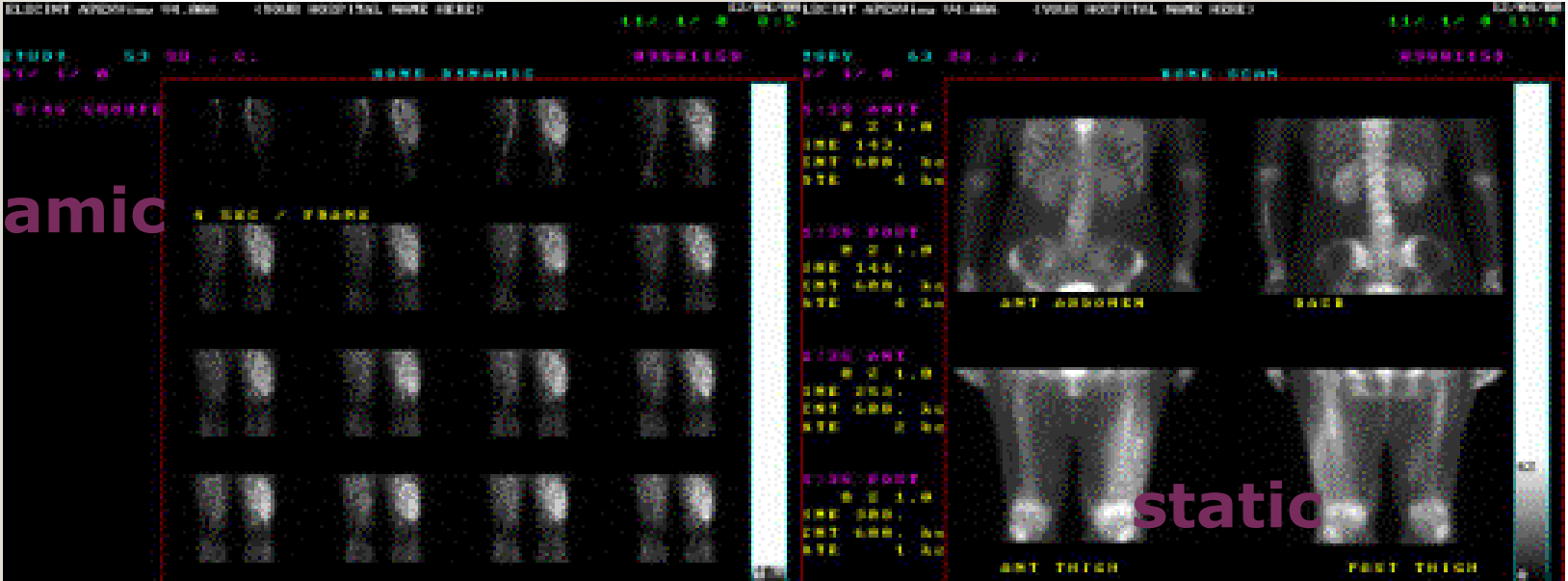
(a) 注射後**24 hours** 掃描  
**anterior** 及 **posterior view**各  
一張,一般自頭部至腳底。

(b) 掃描完後由醫師閱片,進行進一步局部檢查。



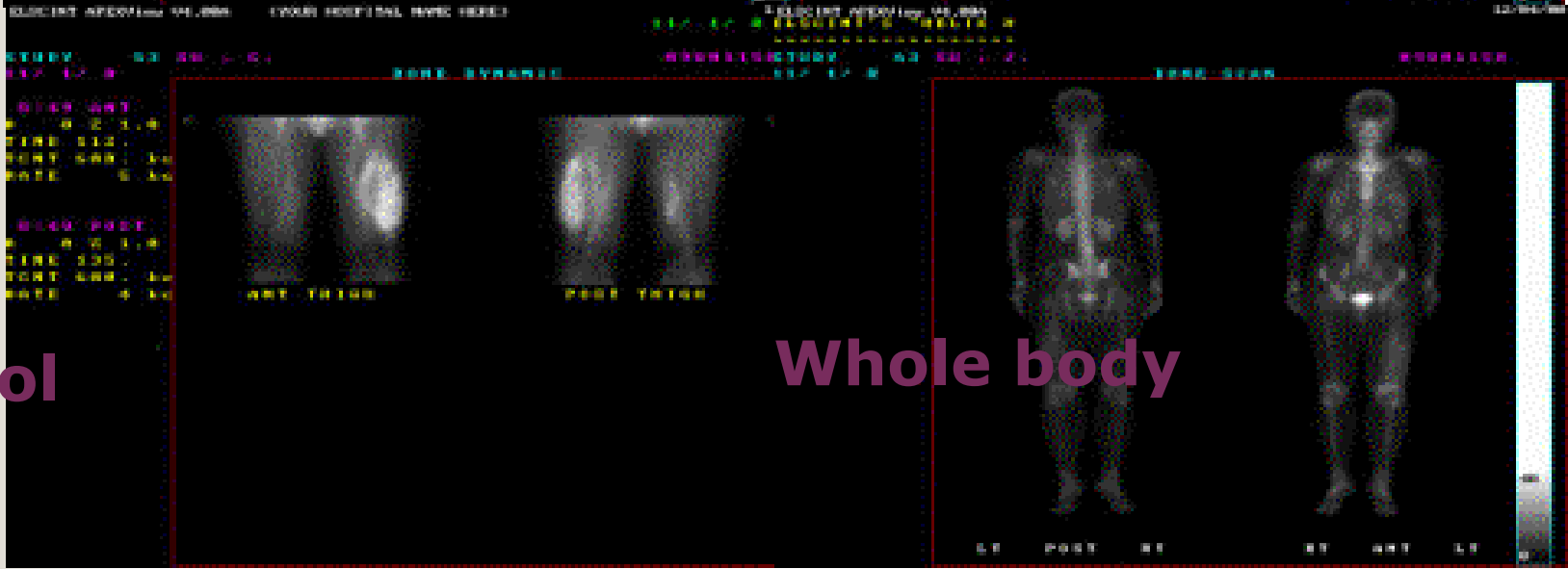
# Osteomyelitis(3-phase)

Dynamic



static

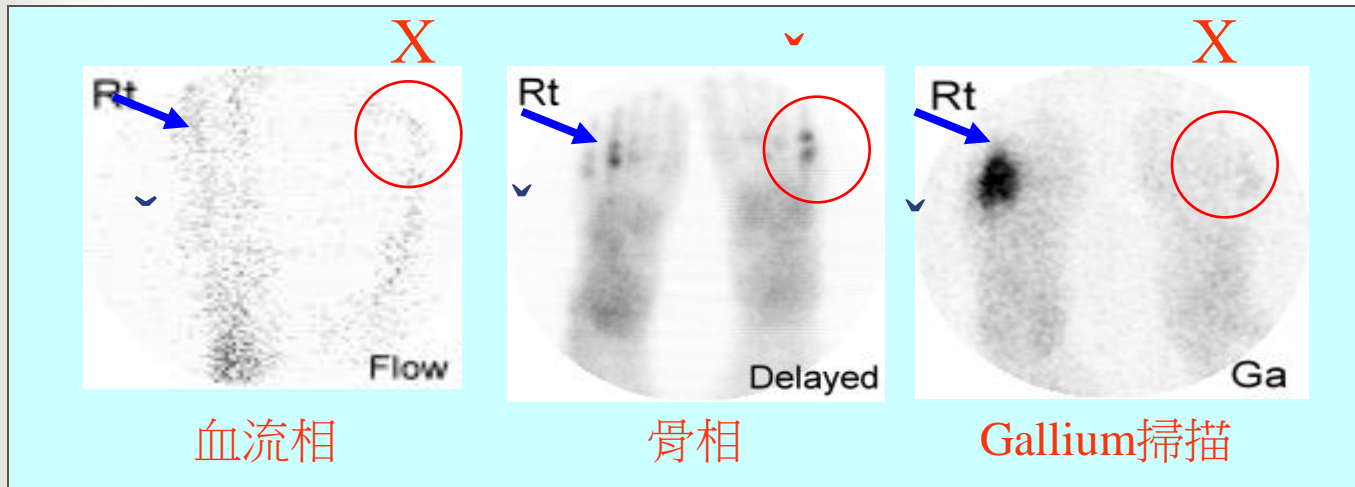
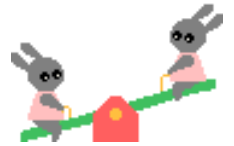
pool



Whole body



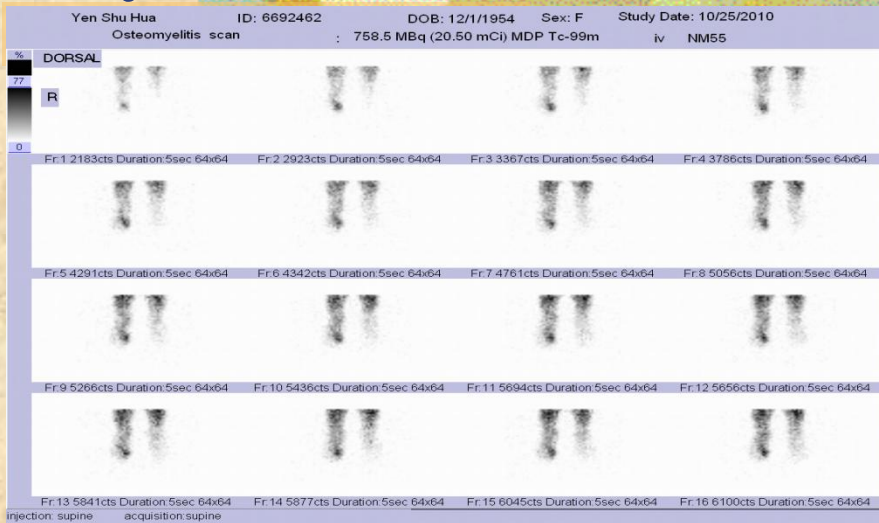
# 臨床發炎影像 (蜂窩性組織炎+骨髓炎) :



Rt 4th骨髓炎  
Lt 5th退化性關節炎、創傷

糖尿病足併發蜂窩性組織炎 (cellulitis) 與骨髓炎 (osteomyelitis) 。  
影像由左自右依次為骨骼掃描之血流相 (足背視圖)、骨相 (足底視圖) 及 Gallium 掃描 (足底視圖)。觀察到右足外側血流量增加，第四趾骨MDP攝取增強，Gallium 掃描在相同處顯示強烈且不相符 (incongruent) 的放射活性，範圍涵蓋第四趾、第三及第四蹠間之軟組織。診斷為右足蜂窩性組織炎合併第四趾骨骨髓炎。注意在骨相中左足第五趾近端關節也有MDP攝取，但血流量及gallium攝取並不增強，表示此處為陳舊性之骨骼病變，可能是退化性關節炎、創傷等造成

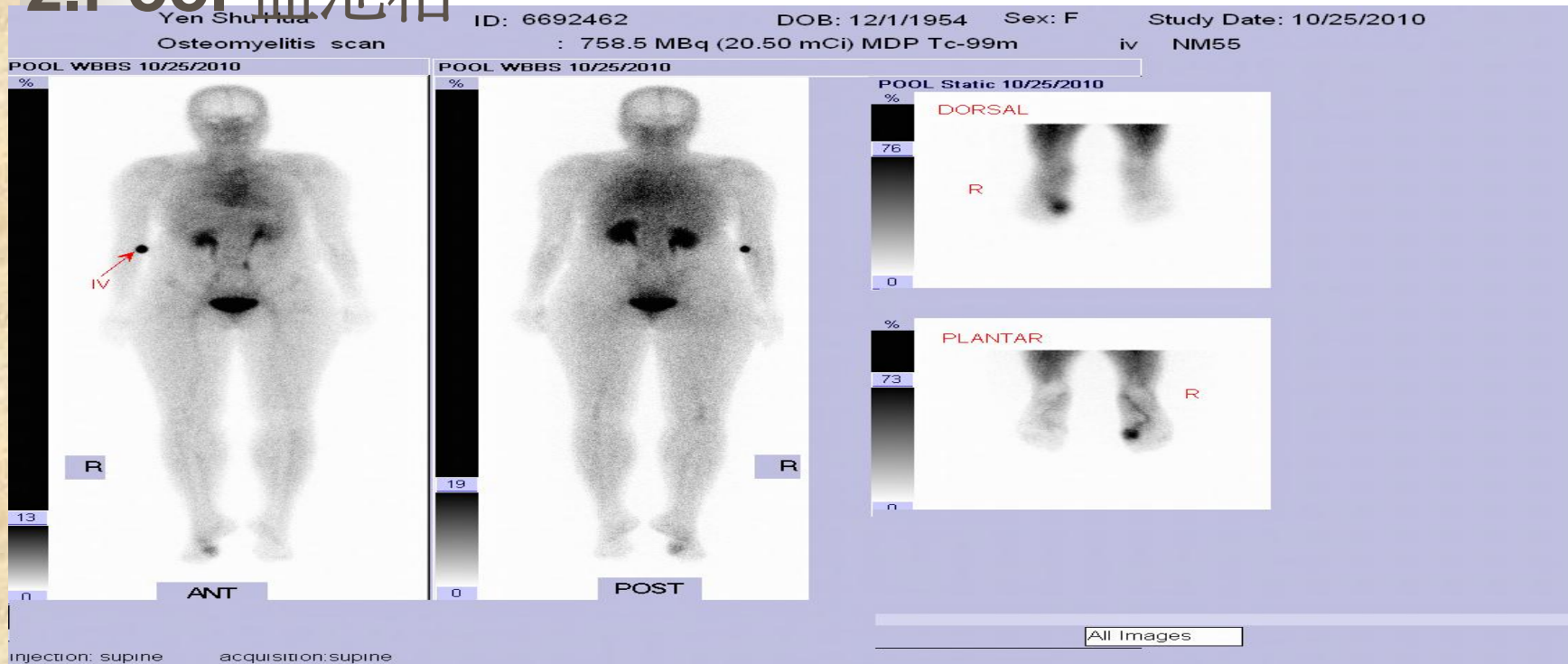
# 1. Dynamic-動態相(動脈相)



# 1. Dynamic-動態相(動脈相)



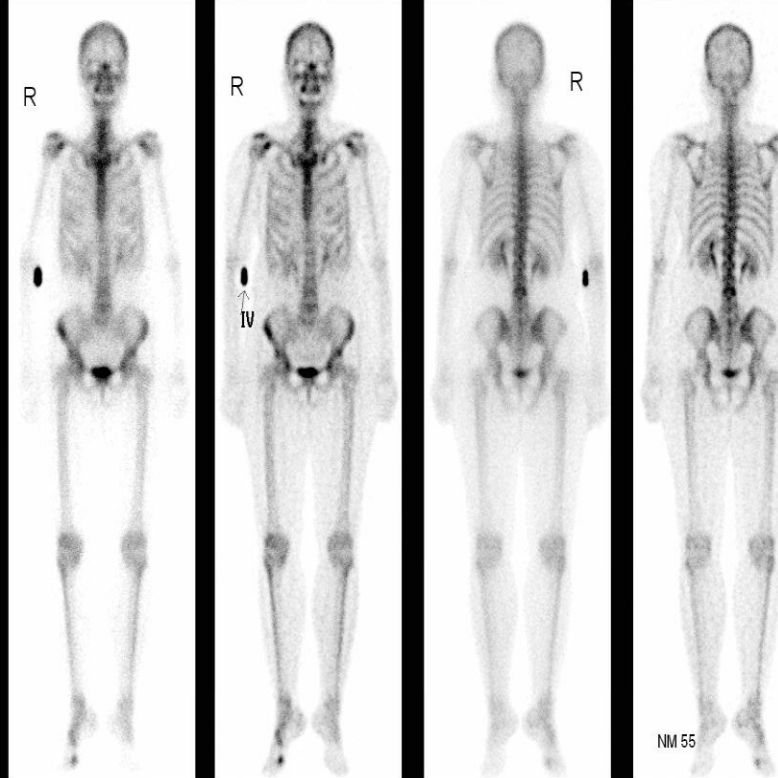
# 2. Pool-血池相



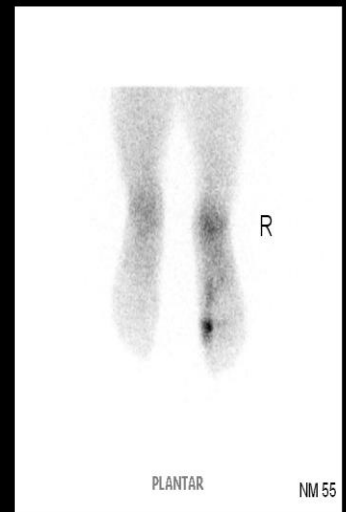
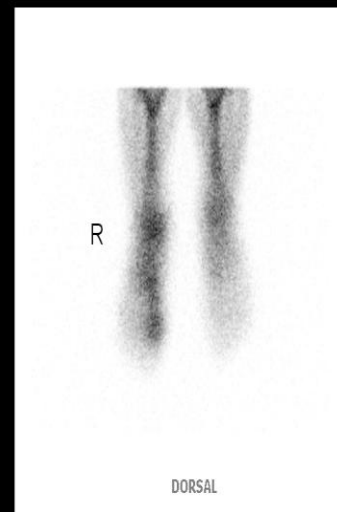
# 3.Delay 延遲相(骨骼相)

Yen Shu Hua ID: 6692462 Osteomyelitis scan Sex: F DOB: 1/12/1954 October 25, 2010

Yen Shu Hua ID:6692462 Osteomyelitis scan Sex: F DOB: 1/12/1954 October 25

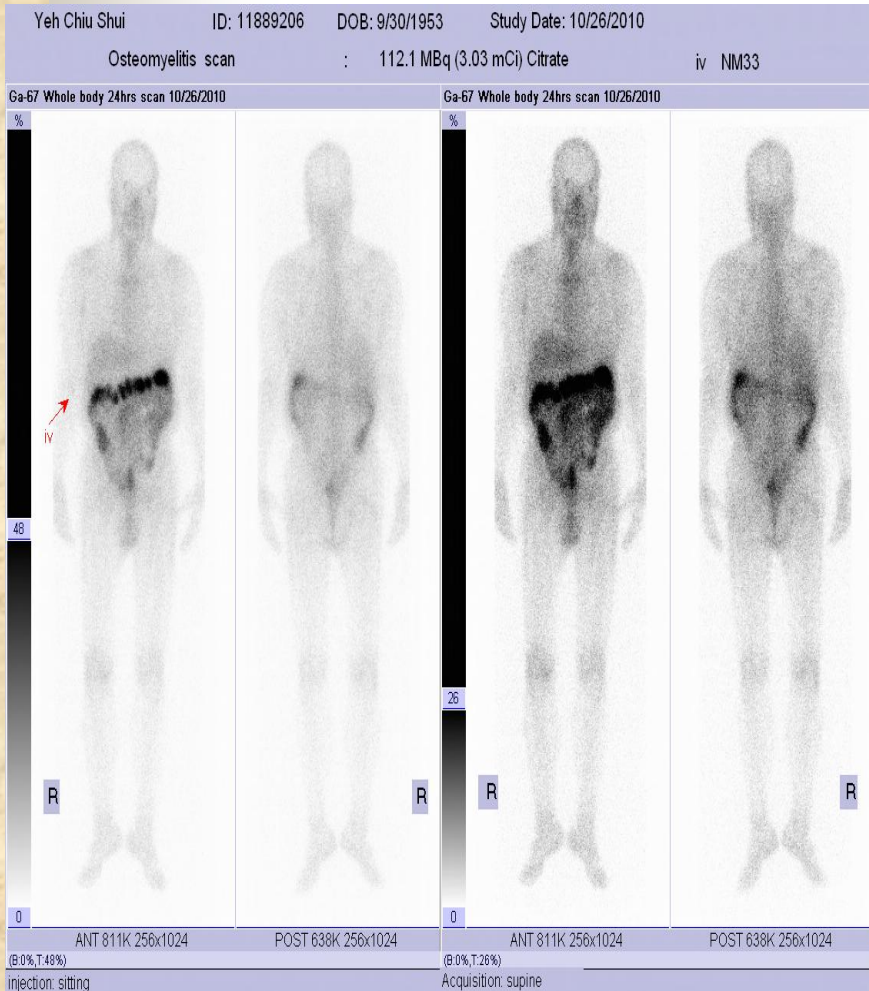


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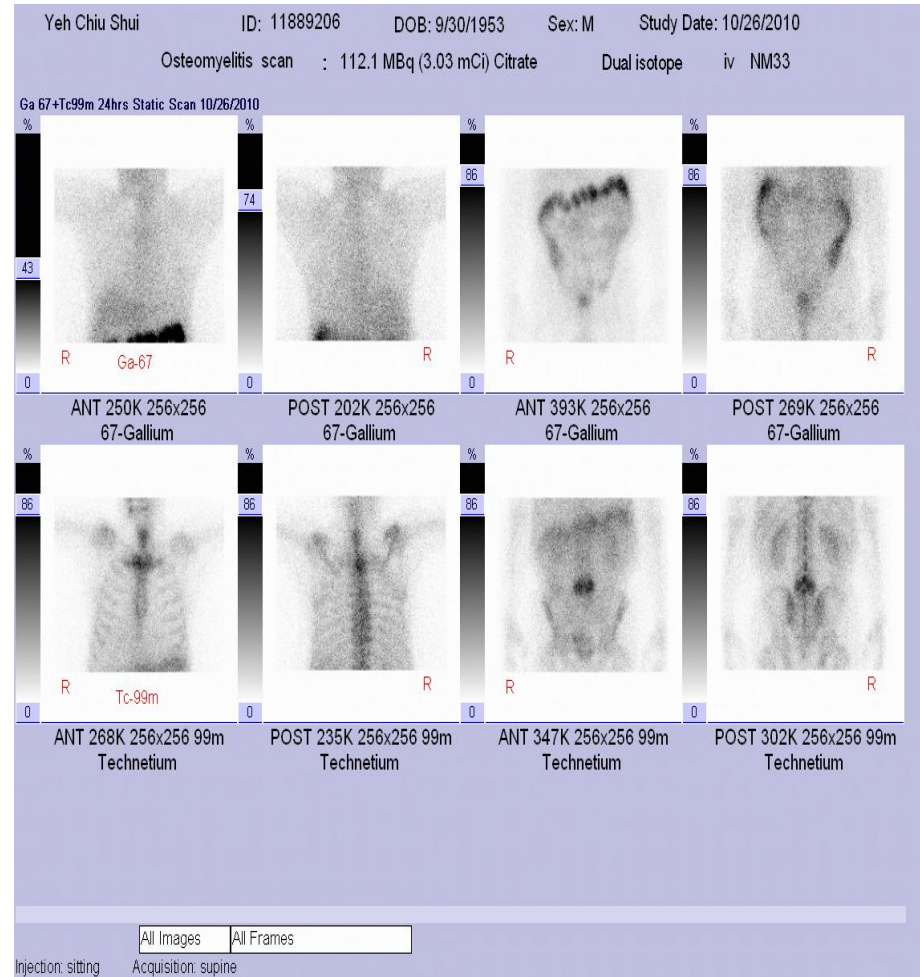




# 4. Ga-67 whole body scan - (Osteomyelitis or inflammation)



**Ga-67 WBS**



**Ga-67+Tc-99m static**



# Ga-67 Scan Inflammation

- 檢查準備事項:
- 檢查前一晚需服用兩顆緩瀉劑,以利清腸。
- 放射製劑種類劑量:
- 3mCi, Ga-67
- 病患姿勢: **supine**

Ga-67 3 mCi 發炎 (打藥後 24小時造影)



# Ga-67 Scan Inflammation

PDPCS FROM UK32 TO IH52 08/11/12 08:09:20 ORENMS1

◆申請單◆ **尿布** 核子醫學科 ORENMS1

W63 - 052 柯謝局 10149914 1929/07/10 女 健保 ORENMS1

科別： 胸腔內科

申請醫師：蕭惠元 3586A

申請時間：2012/08/11 - 08:08

排程時間： / / - :

診斷名：  
Diagnosis: MILD FEVER FOR ONE MONTH, CAUSE?  
History: SOB, COUGH, GENERALIZED SORENESS  
SPUTUM, WHEEZING

Previous study: <N> (Y/N)

申請序號 醫 藥 項 目 申請序號 醫 藥 項 目

58377999 Gallium scan inflammation

Gallium <sup>67</sup> Injection 3 mCi Time 1904 @ thigh IV

101 8. 13 11:18

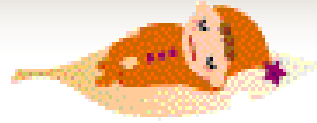
GA 3mCi

101 8. 13

11:18

小Ga (3 mCi)看發炎感染24hrs照相

# Principle



- **1. Ga-67 citrate**之結構與**鐵離子**相近會和血液中之**攜鐵蛋白 (Transferrin)**結合而達到造影目的。在人體內以攜鐵蛋白為主；在細菌則會有**Siderophore (鐵螯合物)**可與**Ga-67**結合°
- **2. 腫瘤有較強的攜鐵蛋白受體 (Transferrin receptor)**因此增加與**Ga-67**的結合°



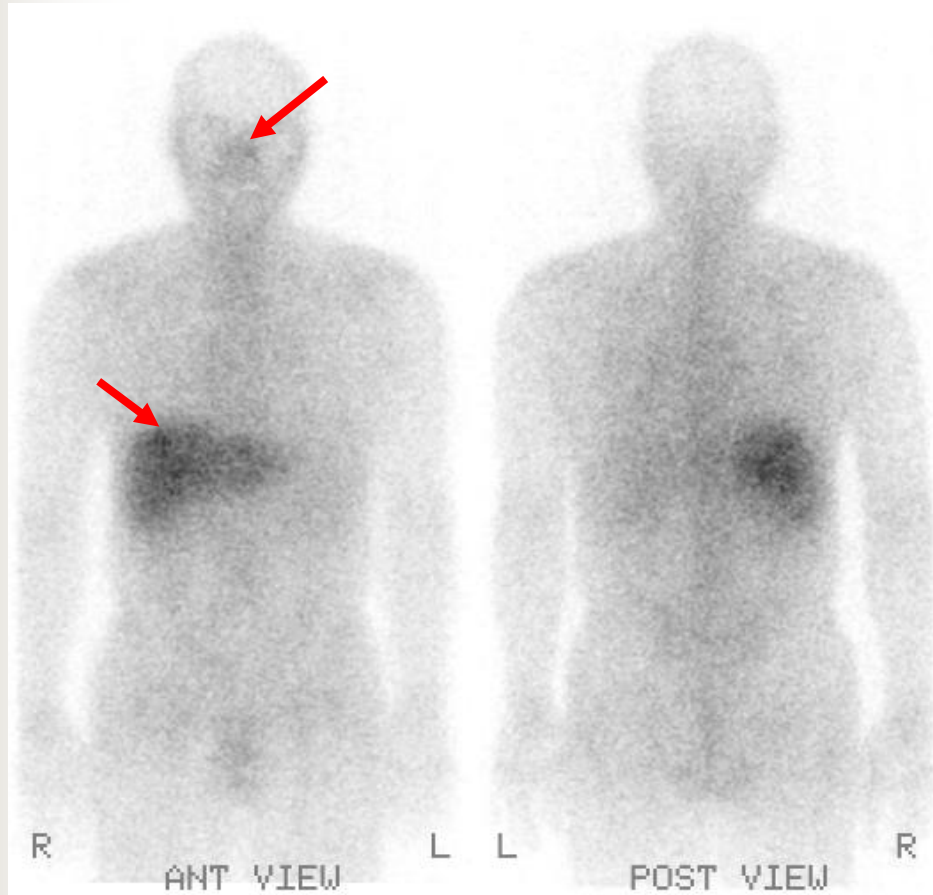


- **3. 腫瘤細胞有較多之新生血管聚集大的通透性使腫瘤細胞外液間隙有組織液儲留因此Ga-67 聚集量也相當高。**
- **4. 在腫瘤細胞內Ga-67大多於溶小體及網狀內皮組織結合而存於細胞質中。**
- **5. Ga-67會與白血球內Lactoferrin(乳鐵蛋白)和細菌中的Siderophore結合而在發炎處聚集成像。**





# 正常Gallium影像



正常情況下，放射活性會聚集在**肝、脾、骨髓、淚腺、鼻咽、唾液腺、腸胃道及外陰**等處。有時，哺乳期婦女的乳房組織也明顯可見。

本檢查多採用延遲掃描

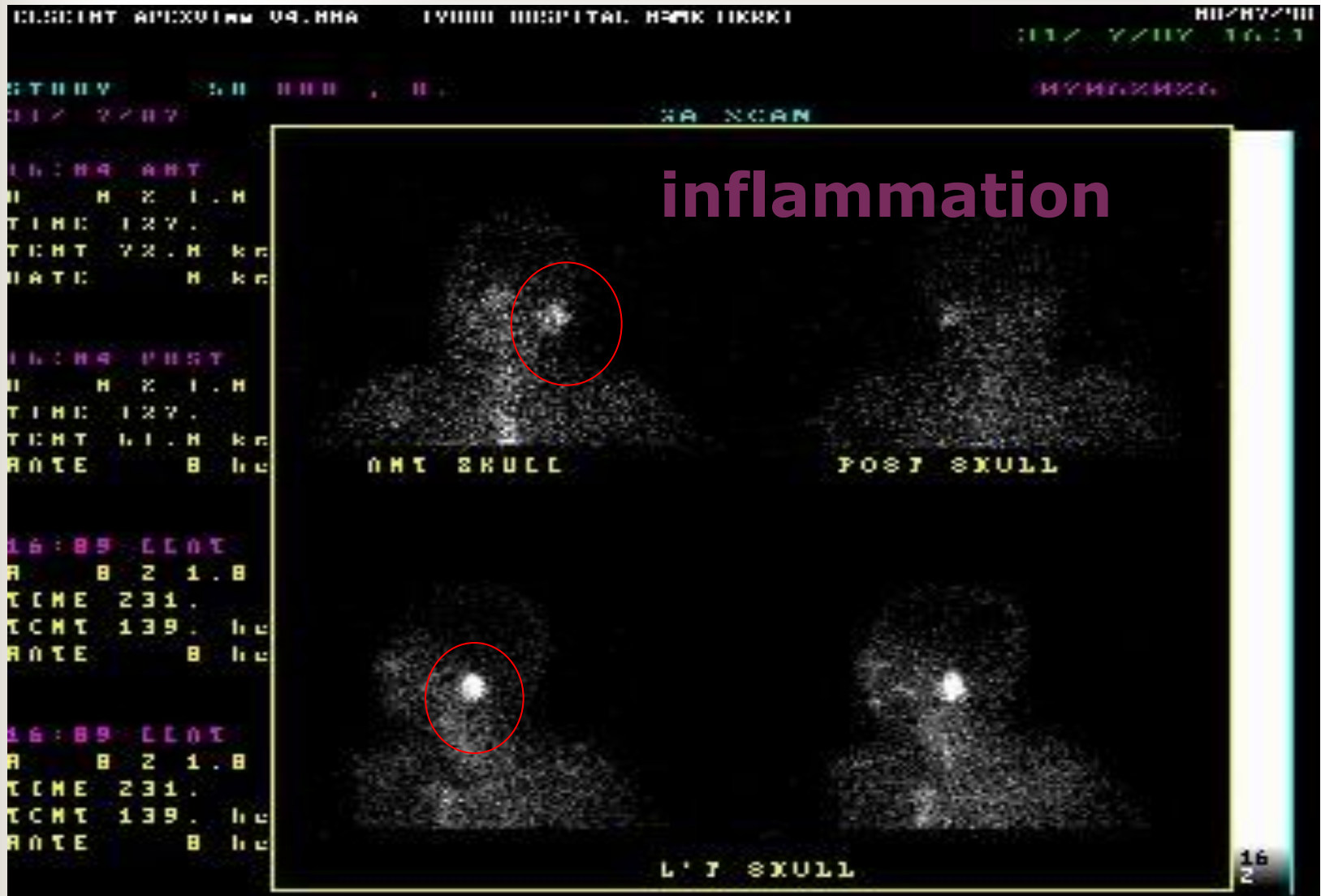
（注射**24, 48至72 hrs**），此時Gallium已極少經尿液排出，腎臟幾乎不顯像。

# Ga-67 whole body scan

inflammation



# Ga-67 static scan





# GAWB With inflammation

File Edit Layers Desktop Special Help

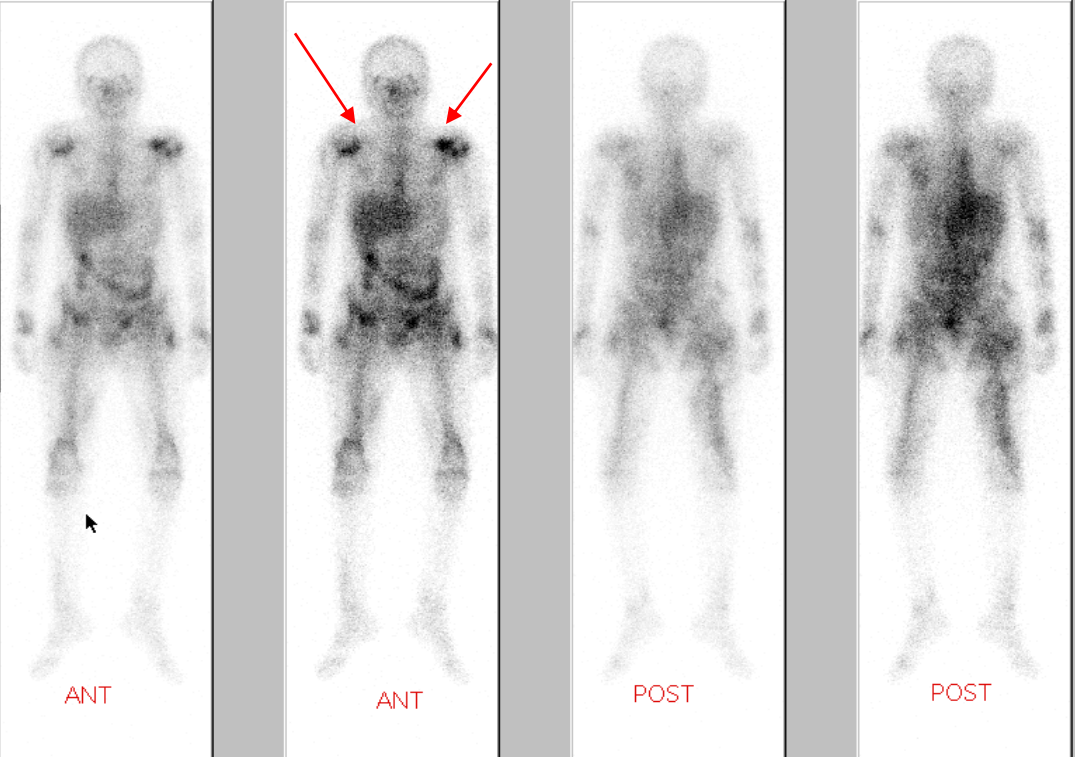
Display / Analysis

Wed 8:13 AM

Display Analysis Curve View MPE

Display Parameters Name: LU CHIU HSANG ID: 7756685

PATIENT NAME : INSTITUTE : UGHKS NM DEPT. NS11  
PATIENT ID : 7756685 PROTOCOL : GA67 24HRS WBS DUAL INTENSITY DISPLAY  
BIRTH DATE : 21-NOV-1989 ACQ. DATE : 31-AUG-2004



ANT ANT POST POST

WholeBo (Di) SPECT

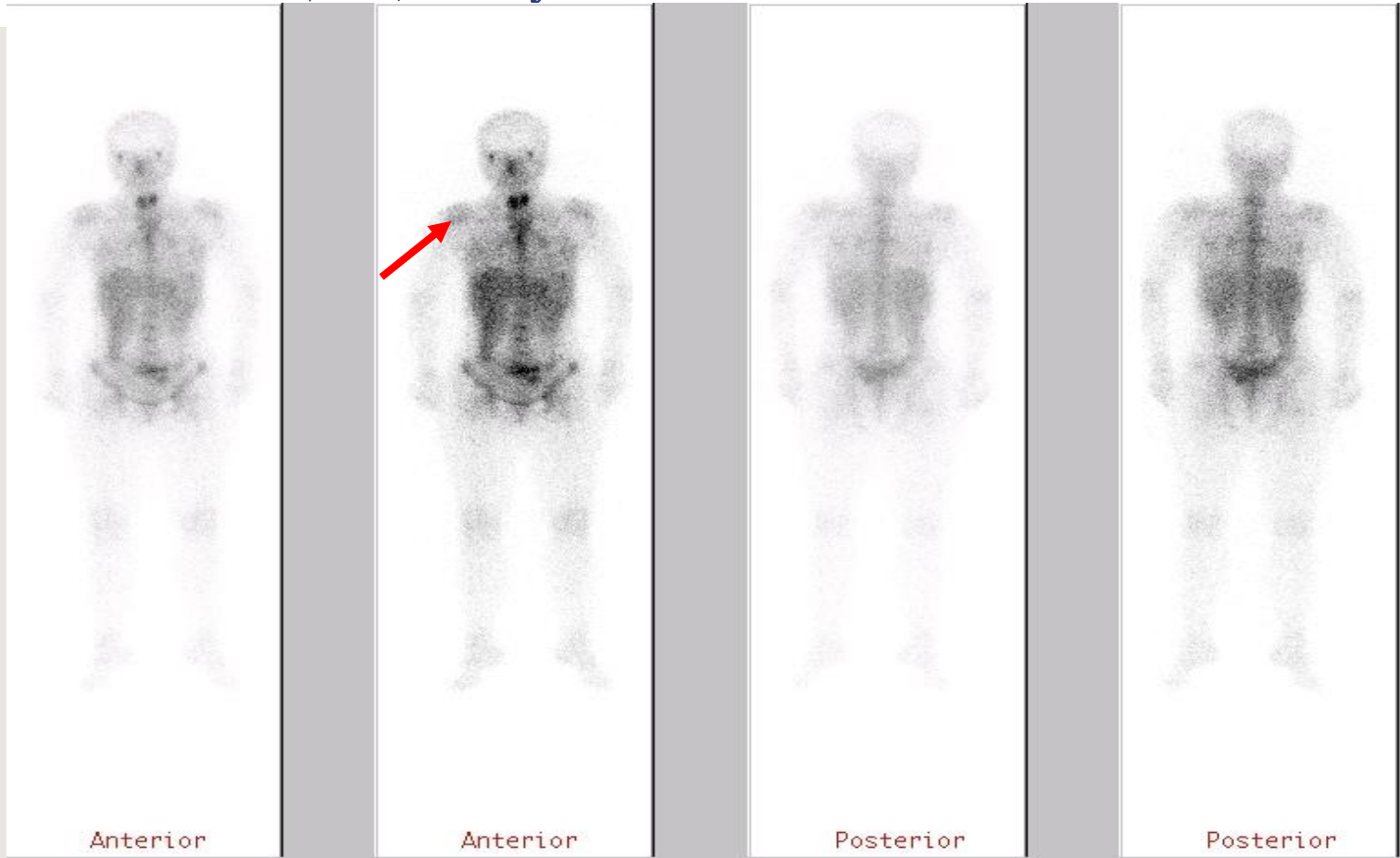
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Set Window Level  
Mask Area(s)  
Labels  
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Done

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hp color LaserJet 4600  
ICON 3 BACKUP  
FROM ICON 1  
Trash



# Ga-67 Scan Inflammation/ Gaillium tumor survey

## Inflammation 範例：Thyroiditis



Neck LN: granulomatous lymphadenitis,  
R/O cat-scratch disease

Biopsy: subacute thyroiditis  
No thyroid function data

# Note



- **1. MRI**使用的造劑” **gadolinium(Gd)釷**” 會影響 **Ga-67**之分佈,兩者需相隔**24hrs**以上。
- **2. 乳汁**可以分泌**Ga-67**,需哺乳婦女不宜作此項檢查需若檢查,則於檢查後需停止哺乳**2-4週**。
- **3. 應用於化學治療**後**3-4週**才能實施 **Ga-67**檢查,因化學治療會減低**tumor**對**Ga-67**攝取。



- 4. 作炎症偵測時若病人事先投予抗生素, 則可能出現假陰性。
- 5. 肝臟病肇因正常肝臟可吸收**Ga-67**而較難判讀, 必要時可與肝臟造影(**Tc-99m sulfur colloid scan**)結果作減除以得到精確的診斷。
- 6. **Tumor**的診斷中以**2-5cm**的淋巴癌效果最好, 小於**1cm**者或低度惡性者不易偵測, 可使用**Tl-201 Cancer workup** 或**Tc-99m MIBI Cancer workup**檢查來替代。

# § 值得一提



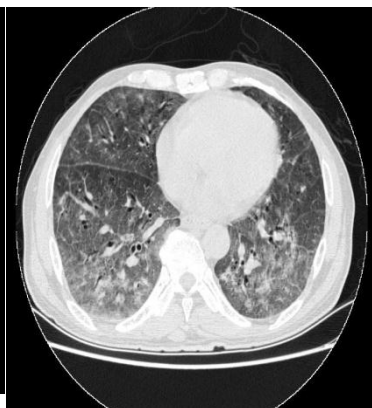
(AIDS病人疑似呼吸道感染:卡氏肺囊蟲肺炎)

- 核醫Thallium掃描是非侵襲性的影像檢查，它診斷淋巴瘤的靈敏度幾近100%，特異度90%，使淋巴瘤病人得以及早接受放射治療。

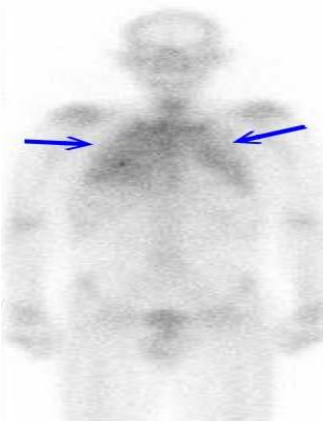
- Gallium對於卡氏肺囊蟲肺炎的靈敏度幾近100%。



X-ray



CT



Gallium scan



前兩者可觀察到典型廣泛性毛玻璃現象並有肺間質與肺泡浸潤，肺泡壁變薄，Gallium掃描則顯示兩側肺野廣泛性放射活性增強（箭號處）。



# Ga-67 Tumor Survey

## ■ Indication:

■ (1) 何杰金氏病 (2) 組織細胞性淋巴瘤  
(Histolytic lymphoma)



(3) Burkitt氏淋巴瘤

(4) 肺癌瘤或肝細胞癌(HCC)

(5) 黑色素瘤 (malignant melanoma)

(6) 骨瘤

(7) 白血病

(8) 非何杰金氏淋巴瘤

(9) 睪丸腫瘤



# Ga-67 Tumor Survey

PD TOR FROM 1A62 TO 1H52 08/08/12 17:14 *8/10 - 8/13 9=30* ORENMS1

◆申請單◆ 核子醫學科 1931/03/06 男 健保榮民 ORENMS1 *東*

*NS2 - 027 楊誠錄*  
科別： 眼科

申請醫師：郭乃文 2112E  
申請時間：2012/08/08 - 17:14  
排程時間： / / - : :  
診斷名：Other general symptoms  
Diagnosis: RETROBULBAR TUMOR, WITH LYMPHNODE ENLARGEMENT, CAUSE<sup>10L</sup>  
History: RIGHT EYE EXOPHTHALMOS, HEADACHE, VOMITING  
W/O METASTATIC TUMOR *LAT 8.10 9=43*

Previous study: (W) (N/A)  
申請序號 醫囑項目 申請序號 醫囑項目  
58343822 Gallium scan tumor survey

大Ga (5 mCi)看腫瘤48hrs照相

# Ga-67 Tumor Survey

5 mCi 腫瘤 (打藥後48  
小時造影)

- 檢查準備事項:
- 檢查前一晚需服用兩顆緩瀉劑,以利清腸。
- 放射製劑種類劑量: 5mCi, Ga-67
- 病患姿勢: **supine**

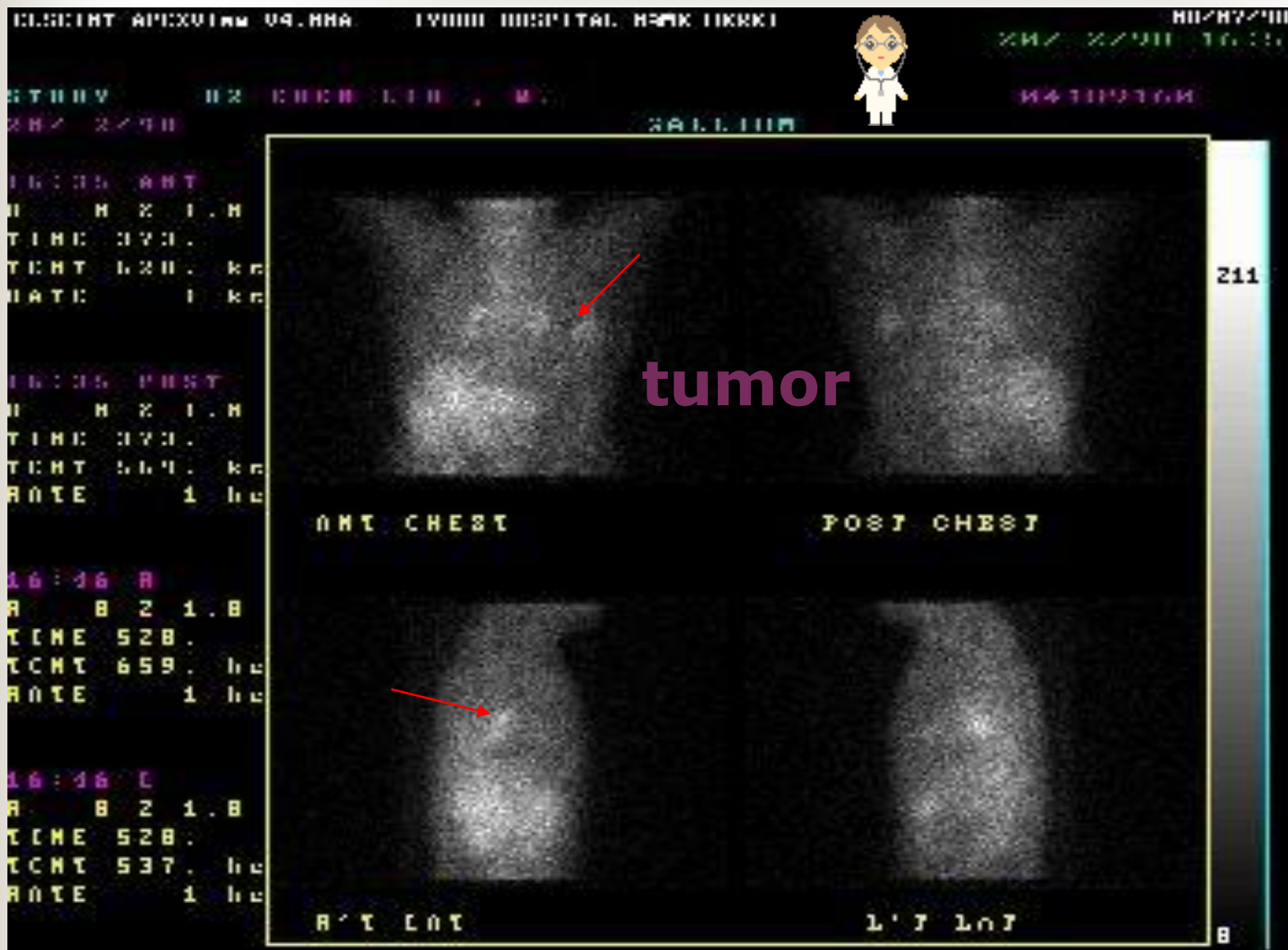






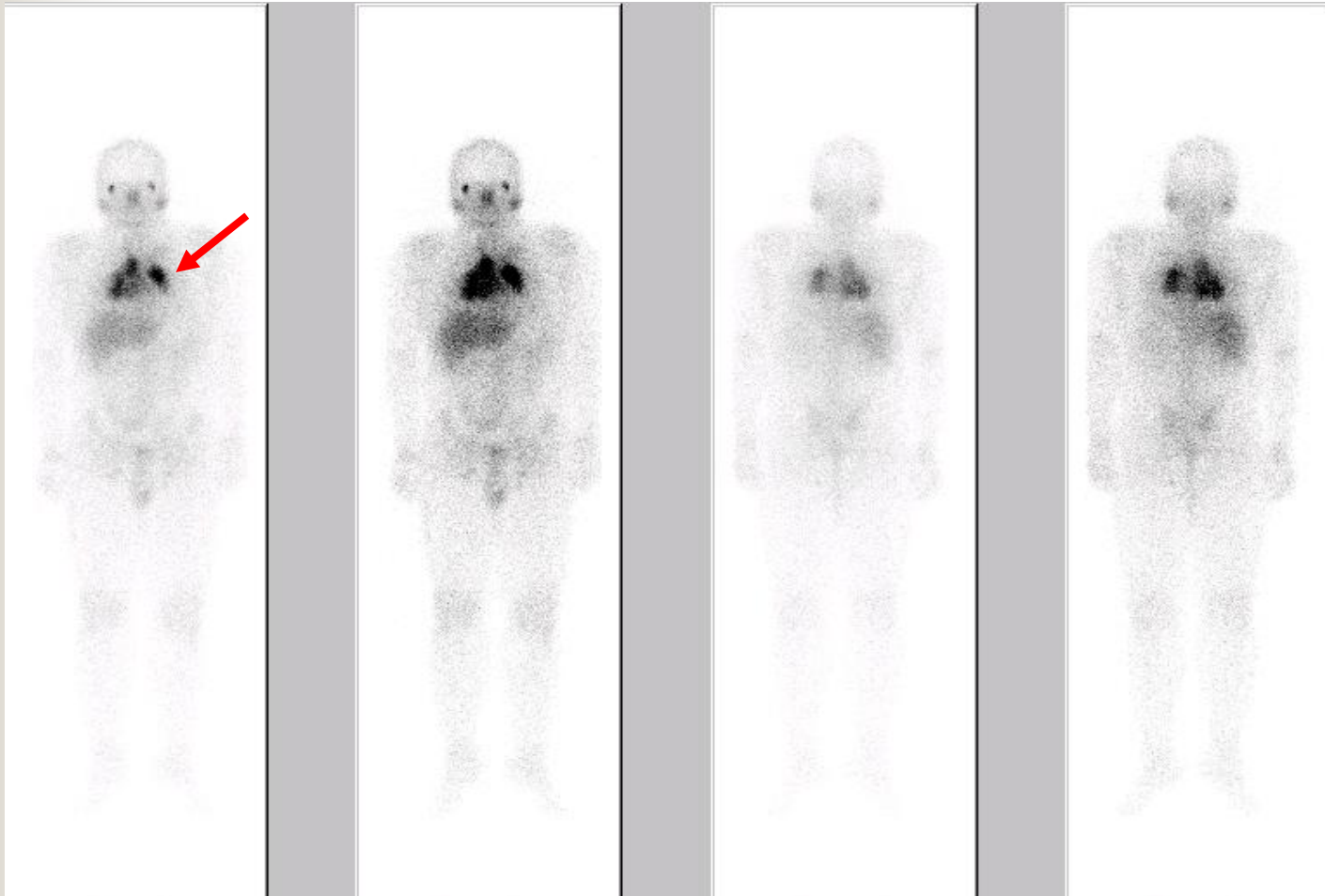


# Ga-67 static scan



# Ga-67 Scan Inflammation/ Gaillium tumor survey

## Gaillium tumor survey 範例：Sarcoidosis(肉狀瘤)

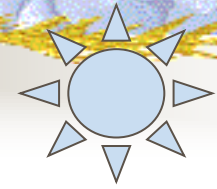


# ■ 檢查注意事項：

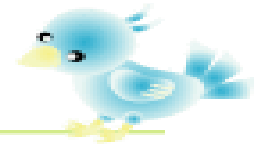


1. 當物理檢查發現身體有如疤痕、血管瘤、紅疹區域,有不正常的區域必須加以註記。
2. 靜脈注射的部位,亦須加註,以免外滲,造成偽影。





3. 詳載病人病史,如近期服用抗生素或接受過其他核醫或**X-ray** 對比劑檢查。
4. **Ga-67**影像可以追蹤至**48,72,92**小時。
5. 若病人有包尿布,最好更換新尿布後,再**scan**才不致影響判讀。







# 課後重點提示:

- 1. 3-phase可用來鑑別診斷? **Ans:蜂窩性組織炎,骨髓炎**
- 2. Ga-67之半衰期為多少?其化學結構與哪種離子相似? **Ans:78hrs, Fe**
- 3. Ga-67之主要用途為何? **Ans:淋巴瘤,淋巴癌**
- 4. Ga-67之主要副作用為何? **Ans:量<Medium>**
- 5. Ga-67之主要適應症為何? **Ans:兩顆緩瀉劑**
- 6.全身性Ga-67之主要適應症為何? **Ans:24hrs**
- 7. Ga-67之主要適應症為何? **Ans:rs**
- 8. Ga-67之主要適應症為何?
- 9. 哪些放

**Ans:卡氏肺囊蟲肺炎**

**Ans: Ga-67 ,Tc-99m HMPAO , In-111 labeled WBC 。**

**THANK YOU FOR YOUR ATTENTION!**



**該起床啦！！**

**THE END**



# Question

1. 利用Ga-67造影偵測發炎病灶時，病灶吸收Ga-67之可能原理中，不包括下列何者在內？
  - (A) Gallium會和白血球釋放的乳酸鐵蛋白形成複合物
  - (B) Gallium會藉由chemotaxis而吸引至發炎區域
  - (C) Gallium會和細菌所產生之siderophores結合
  - (D) 在體內Gallium具有與鐵離子相似的特性
2. 進行 $^{67}\text{Ga}$ 影像檢查時，最可能會影響 $^{67}\text{Ga}$ 身體吸收的因素為何？
  - (A) 檢查前24小時接受無對比劑的MRI檢查
  - (B) 檢查前24小時曾經接受輸血
  - (C) 檢查前一週曾服用含碘食物
  - (D) 檢查前一週曾服用輕瀉劑
3.  $^{67}\text{Ga}$ 在組織聚集與下列何種物質無關？
  - (A) 攜鐵蛋白(transferrin)
  - (B) 鐵蛋白(ferritin)
  - (C) 乳鐵蛋白(lactoferrin)
  - (D) 白蛋白(albumin)