PATIENT PROCEDURES IN NUCLEAR MEDICINE

OBJECTIVES:

1. DISCUSS THE PURPOSE FOR PERFORMING EACH DIAGNOSTIC PROCEDURE
2. LIST THE MAJOR EQUIPMENT AND MATERIALS NEEDED TO PERFORM VARIOUS DIAGNOSTIC PROCEDURES
3. DESCRIBE IN GENERAL TERMS HOW DIAGNOSTIC INFORMATION IS ATTAINED

CARDIOVASCULAR SYSTEM

MULTIGATED BLOOD POOL STUDY (MUGA STUDY)

PURPOSE: MUGA STUDY IS USED TO DETERMINE SIZE AND SHAPE OF HEART; CALCULATE HEART PUMPING EFFICIENCY (EJECTION FRACTION); CARDIAC WALL MOTION

EQUIPMENT AND MATERIALS REQUIRED

1. SCINTILLATION OR SPECT CAMERA
2. ELECTROCARDIOGRAPH MACHINE WITH EKG LEADS
3. ^{99m}Tc-LABELED RED BLOOD CELLS
4. COMPUTER WITH GATED SOFTWARE
5. FOR STRESS TESTING: EXERCISE BICYCLE, TREADMILL, OR PHARMACOLOGIC AGENT

MUGA (CONTD.)

PROCEDURE

- EKG LEADS PLACED ON PATIENT
- COMPUTER IMAGES HEART FROM R WAVE TO R WAVE (16 PICTURES)
- PATIENT IS INJECTED WITH LABELED RED BLOOD CELLS
- COMPUTER COMPARES MOST RELAXED AND CONTRACTED IMAGES OF HEART TO DETERMINE BLOOD EJECTED
- COMPUTER ILLUSTRATES CARDIAC WALL MOTION; STUDIES CAN BE DONE AT REST AND EXERCISE

FIG. III - 1

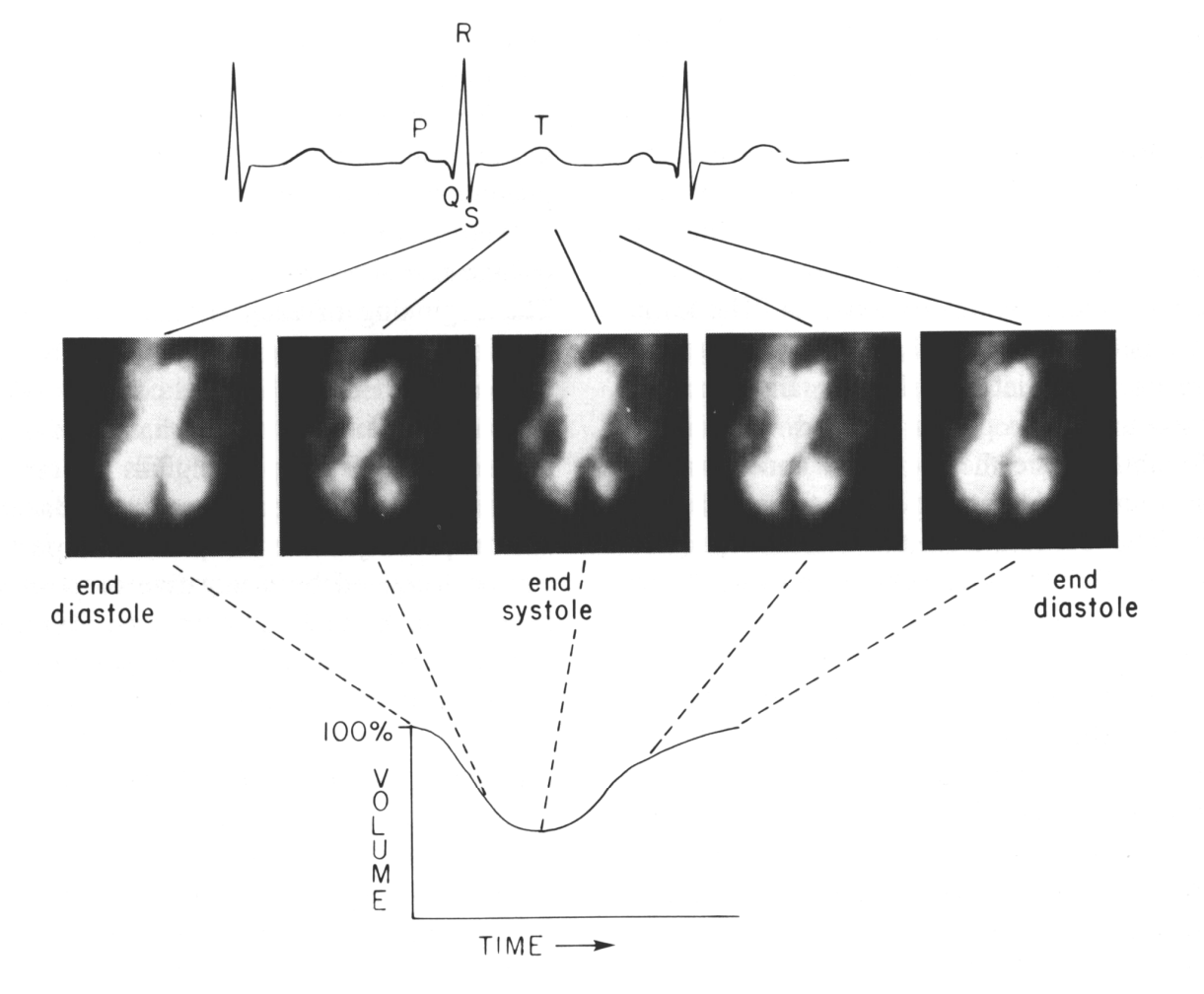
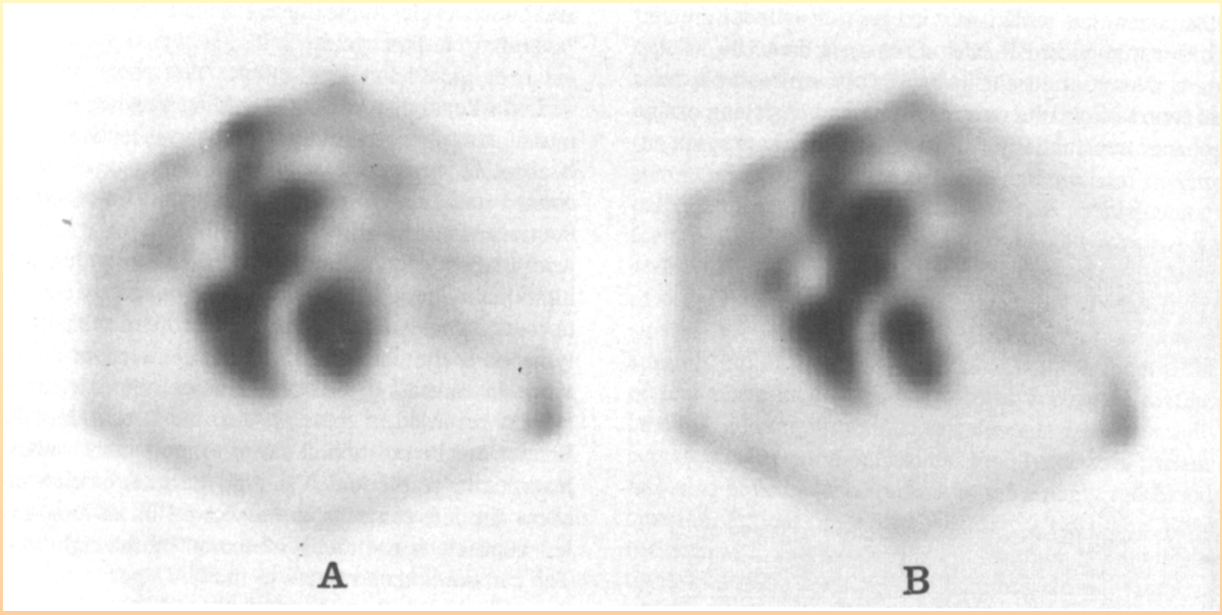

R
P
T
Q
S
end diastole
end systole
end diastole
100%
VOLUME
TIME

FIG. III - 2



MYOCARDIAL PERFUSION STUDY

PURPOSE: THE MYOCARDIAL PERFUSION STUDY IS USED TO DETERMINE CORONARY ARTERY BLOOD FLOW;

DISTINGUISH BETWEEN ISCHEMIA (REDUCED BLOOD FLOW TO AN AREA OF CARDIAC MUSCLE) AND INFARCT (DEATH OF CARDIAC MUSCLE)

EQUIPMENT AND MATERIALS REQUIRED

1. SCINTILLATION OR SPECT CAMERA
2. 201TI CHLORIDE OR ^{99m}Tc-SESTAMIBI
3. EXERCISE STUDY: TREADMILL OR PHARMACOLOGICAL STRESS AGENT
4. ECG MACHINE WITH ECG LEADS

MYOCARDIAL PERFUSION
(CONTD.)

PROCEDURE:

ECG LEADS PUT ON PATIENT

INTRAVENOUS LINE PUT IN PLACE

PATIENT EXERCISES ON TREADMILL

PATIENT INJECTED WITH ^{201}Tl-Chloride or ^{99m}Tc-Sestamibi AT MAXIMUM EXERCISE LEVEL

PATIENT ASKED TO EXERCISE AN ADDITIONAL 1 MINUTE IF POSSIBLE

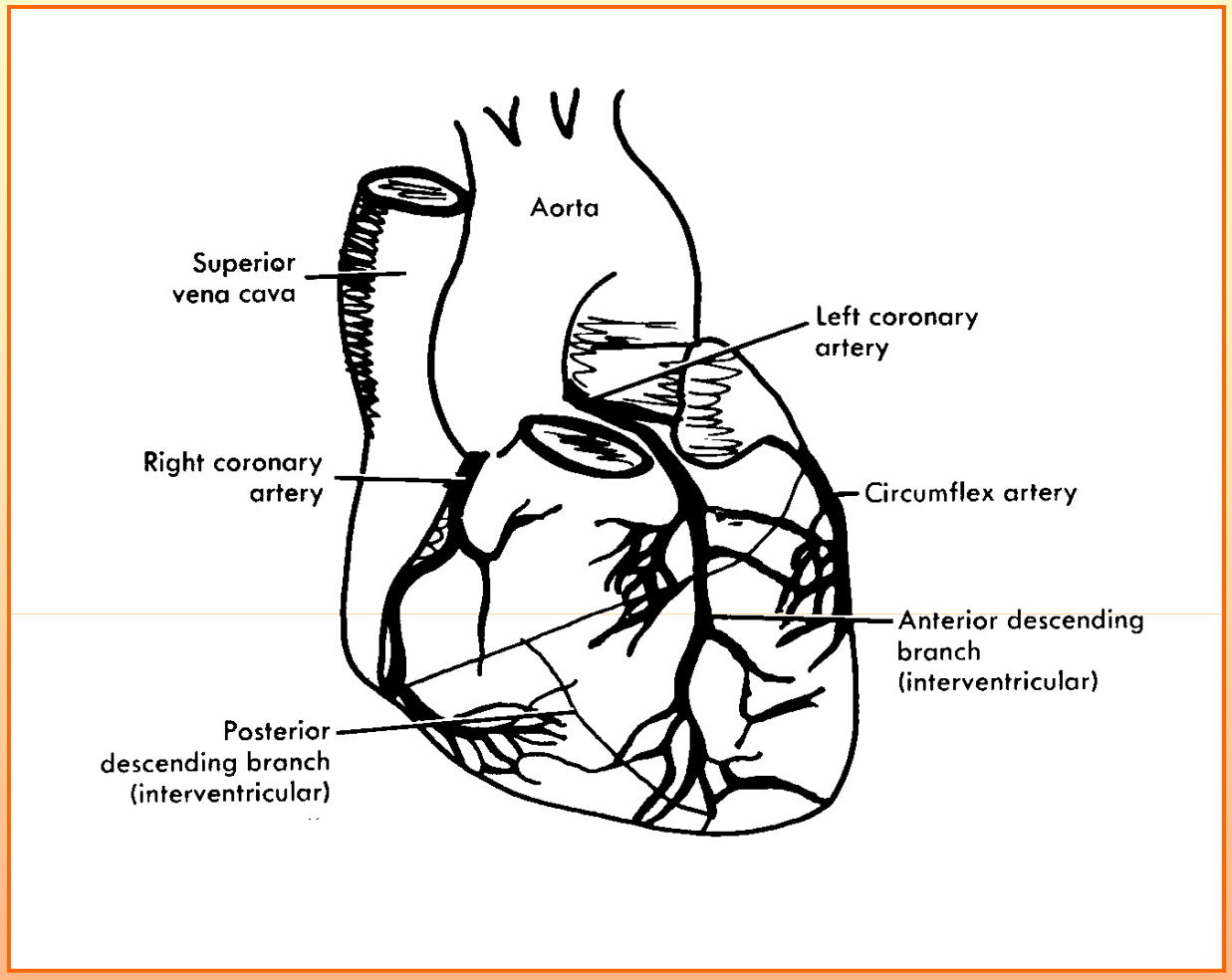
PLANAR OR SPECT IMAGES ARE TAKEN IMMEDIATELY FOLLOWING EXERCISE

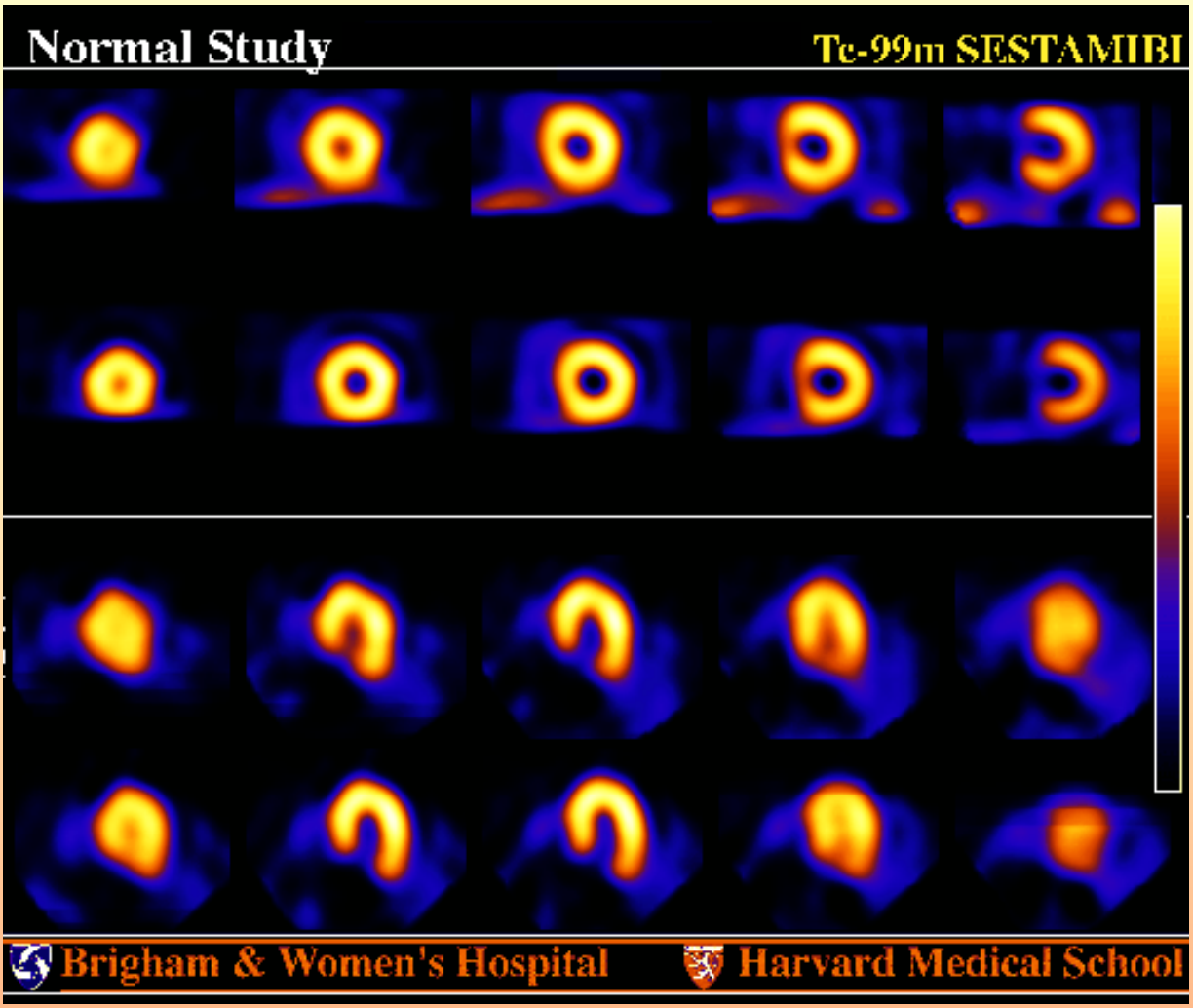
PATIENT RETURNS IN 3 HOURS FOR RESTING THALLIUM IMAGE (NO NEED TO REINJECT) ADDITIONAL PICTURES TAKEN

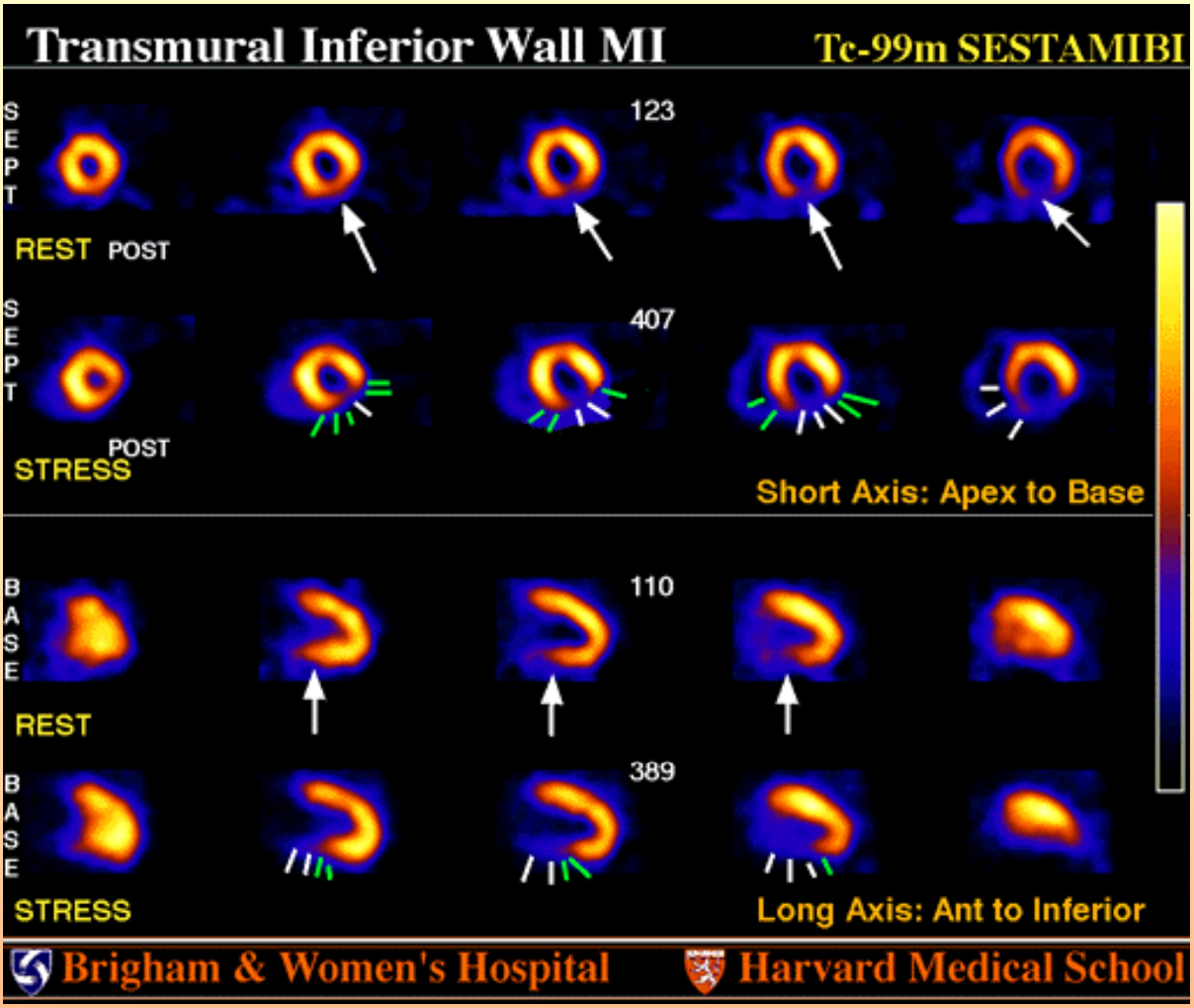
*SESTAMIBI - SEPARATE INJECTIONS FOR REST AND EXERCISE STUDIES (1 OR 2 DAY STUDY)

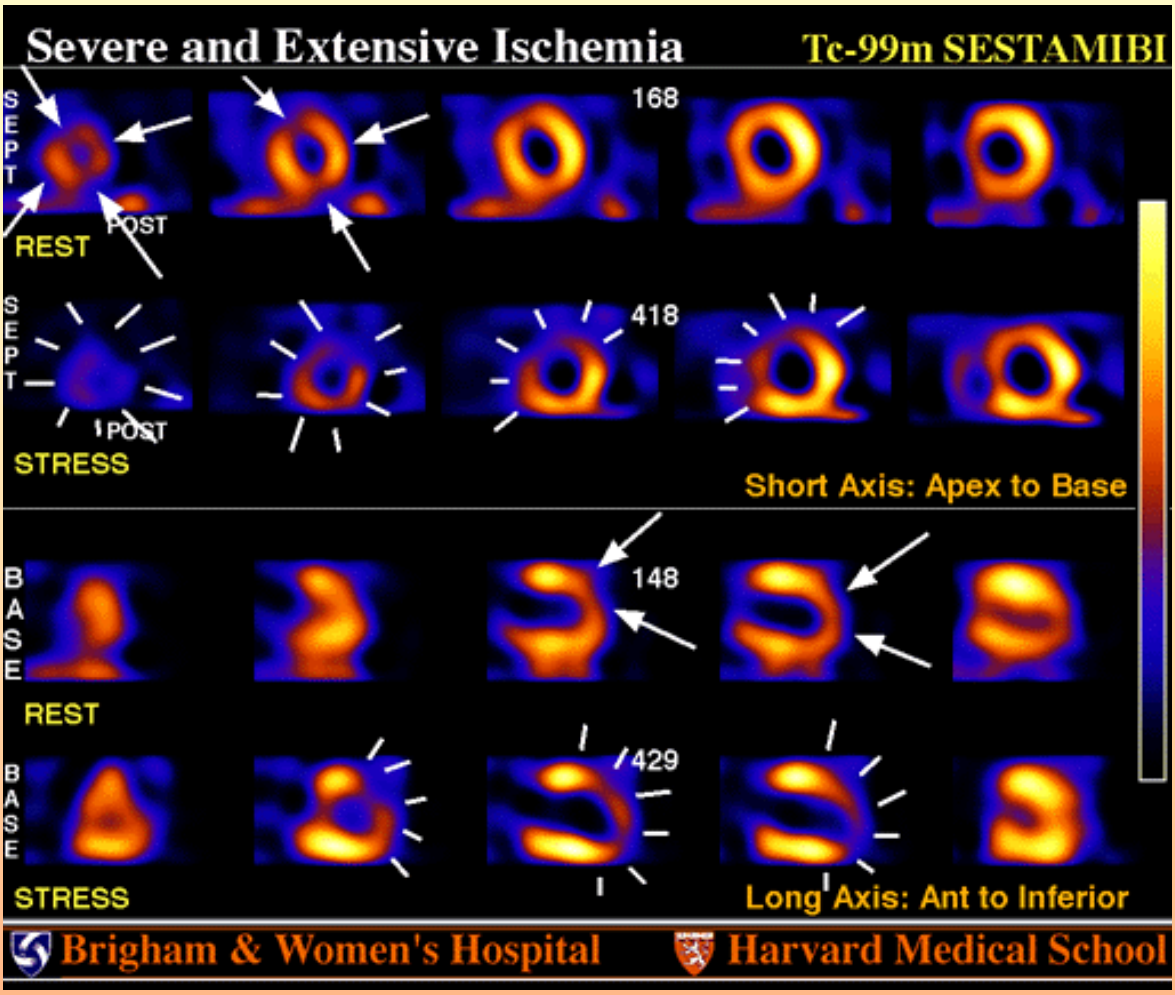
IF THE STUDY IS GATED – EJECTION FRACTION CAN BE DETERMINED AND A MOVING PICTURE CAN BE ILLUSTRATED

FIG. III - 3


Aorta
Superior vena cava
Left coronary artery
Right coronary artery
Circumflex artery
Anterior descending branch (interventricular)
Posterior descending branch (interventricular)


Normal Study
Tc-99m SESTAMIBI
Brigham & Women's Hospital
Harvard Medical School


Transmural Inferior Wall MI
Tc-99m SESTAMIBI
SEPT
REST POST
123
SEPT
STRESS POST
407
Short Axis: Apex to Base
BASE
REST
110
BASE
STRESS
389
Long Axis: Ant to Inferior
Brigham & Women's Hospital
Harvard Medical School


Severe and Extensive Ischemia
Tc-99m SESTAMIBI
SEPT
168
POST
REST
SEPT
418
POST
STRESS
Short Axis: Apex to Base
BASE
148
REST
BASE
429
STRESS
Long Axis: Ant to Inferior
Brigham & Women's Hospital
Harvard Medical School

VENOGRAPHY

PURPOSE: A VENOGRAM IS USED TO STUDY THE DEEP VENOUS SYSTEM

IF BLOOD CLOTS EXIST IN THE VENOUS PATHWAYS A DISRUPTION OF BLOOD FLOW WILL BE VISUALIZED

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. SCALP VEIN NEEDLE (BUTTERFLY NEEDLE)
3. THREE WAY STOPCOCK (2)
4. FOUR TOURNIQUETS
5. ^{99m}Tc-MACROAGGREGATED ALBUMIN (MAA)

PROCEDURE:

- TWO TOURNIQUETS PLACED ABOVE EACH ANKLE (DRIVES RADIOPHARMACEUTICAL INTO THE DEEP VENOUS SYSTEM)
- BUTTERFLY NEEDLES PLACED INTO THE DORSAL VEIN OF EACH FOOT
- 3 SEPARATE INJECTIONS OF RADIOPHARMACEUTICAL ADMINISTERED THROUGH THE STOPCOCK
- 3 SEPARATE PICTURES OF TRACER FLOW
  - LOWER LEGS
  - THIGHS
  - PELVIS

CENTRAL NERVOUS SYSTEM

BRAIN DEATH STUDY

PURPOSE: USED TO DETERMINE BRAIN DEATH WHEN ORGANS WILL BE TRANSPLANTED TO ANOTHER PATIENT

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. ^{99m}Tc-DTPA
3. HEADBAND OR TOURNIQUET

PROCEDURE:

- PATIENT'S FOREHEAD IS SECURED AGAINST CAMERA
- HEADBAND IS PUT AROUND PATIENT'S FOREHEAD
- RADIOPHARMACEUTICAL ADMINISTERED
- CAMERA FOLLOWS FLOW OF TRACER TO BRAIN
- IF TRACER DOES NOT GO ABOVE NOSE, CONFIRMATION OF BRAIN DEATH

SPECT BRAIN PERFUSION STUDY

PURPOSE: USED TO STUDY FUNCTIONAL NEUROLOGICAL DISORDERS SUCH AS CEREBROVASCULAR DISEASES (HEMORRHAGE, INFARCTION, ETC.), ALZHEIMER'S DISEASE, EPILEPSY, AND HEAD TRAUMA.

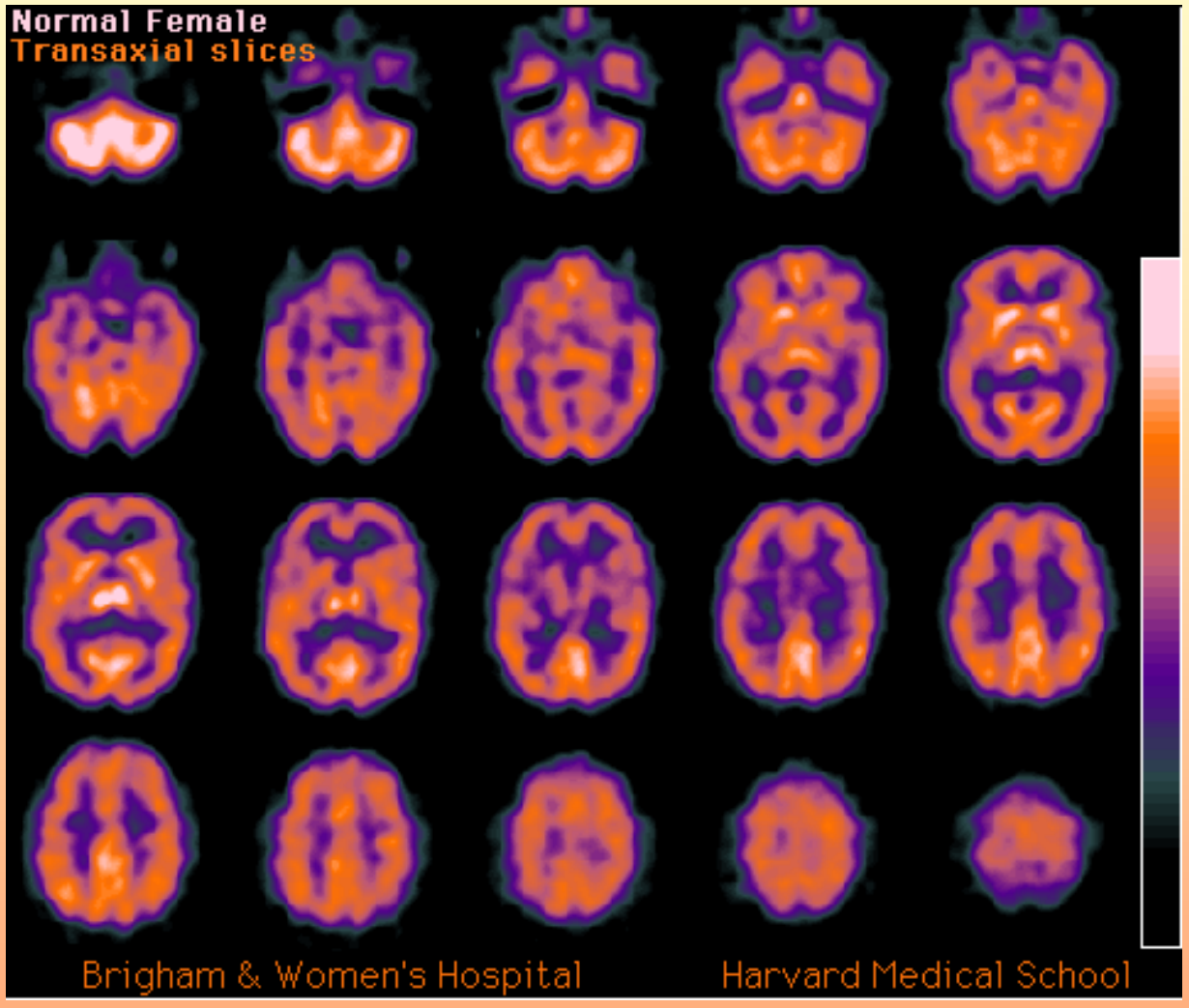
EQUIPMENT AND MATERIALS REQUIRED:

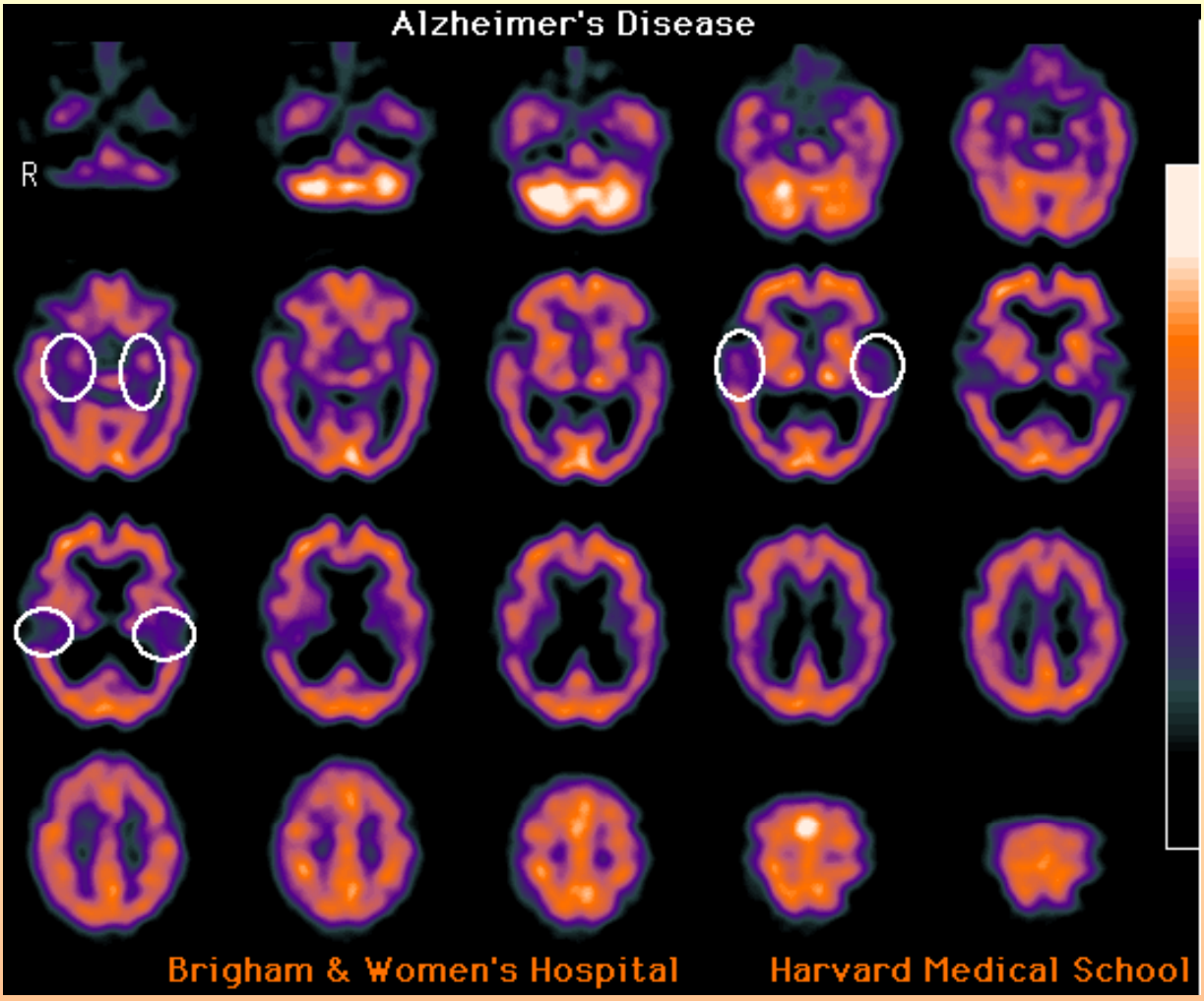
1. SPECT CAMERA
2. ^{99m}Tc-CERETEC OR NEUROLITE (CROSS THE NORMAL BLOOD BRAIN BARRIER)
3. VELCRO STRAP

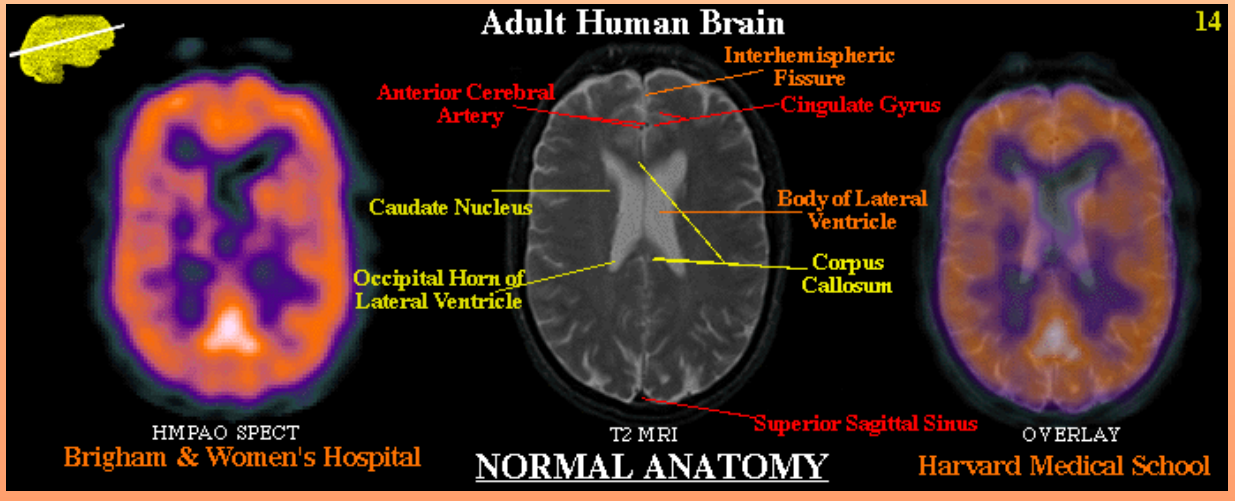
PROCEDURE:

- STUDY DONE IN QUIET AND DIMLY LIT ROOM
- IV LINE SET UP IN ADVANCE OF INJECTION (DON'T WANT THE PATIENT TO EXPERIENCE PAIN DURING TRACER ADMINISTRATION)
- PATIENT'S HEAD SECURED WITH VELCRO STRAP TO AVOID PATIENT MOTION DURING SCAN
- FIFTEEN MINUTES AFTER PATIENT INJECTED CAMERA ROTATES AROUND PATIENT'S HEAD TO ATTAIN DATA
- DISPLAY: CORONAL, SAGITTAL, AND TRANSVERSE IMAGES OF BRAIN

FIG. III - 5


Normal Female
Transaxial slices
Brigham & Women's Hospital
Harvard Medical School


Alzheimer's Disease
R
Brigham & Women's Hospital
Harvard Medical School


Adult Human Brain
14
Interhemispheric Fissure
Anterior Cerebral Artery
Cingulate Gyrus
Caudate Nucleus
Body of Lateral Ventricle
Occipital Horn of Lateral Ventricle
Corpus Callosum
Superior Sagittal Sinus
HMPAO SPECT
T2 MRI
OVERLAY
Brigham & Women's Hospital
NORMAL ANATOMY
Harvard Medical School

CISTERNOGRAM

PURPOSE: A CISTERNOGRAM IS USED TO FOLLOW THE CEREBRAL SPINAL FLUID THROUGH THE VENTRICULAR SYSTEM OF THE BRAIN

BLOCKAGES OF NORMAL PATHWAYS MAY EXIST

A SHUNT MAY BE NEEDED TO RELIEVE PRESSURE ON BRAIN

CRACKS IN THE SKULL MAY LEAD TO CSF LEAKAGE

EQUIPMENT AND MATERIALS:

1. SCINTILLATION CAMERA
2. STERILE LUMBAR PUNCTURE TRAY
3. ^{111}In-DTPA
4. COTTON PLEDGETS WITH STRINGS ATTACHED
5. WELL COUNTER TO COUNT PLEDGETS

CISTERNOGRAM (CONTD.)

PROCEDURE:

- PHYSICIAN PERFORMS AN INTRATHECAL INJECTION VIA A LUMBAR PUNCTURE
- IMAGES
  * 2 HOURS POST INJECTION - INVESTIGATE INJECTION
  * 6, 24, 48, SOMETIMES 72 HRS. POST INJECTION IMAGES OF HEAD
- COTTON PLEDGETS ARE PLACED AND REMOVED FROM THE NOSE AND EARS BY PHYSICIAN TO CHECK FOR CSF LEAKS

ENDOCRINE SYSTEM

PARATHYROID STUDY

PURPOSE: USED TO IDENTIFY HYPERPARATHYROIDISM CAUSED BY **PARATHYROID TUMORS**

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. CAMERA COMPUTER
3. ^{99m}Tc-SESTAMIBI OR ^{201}TI CHLORIDE & ^{99m}Tc-PERTECHNETATE

PROCEDURE:

- SESTAMIBI INJECTED AND IMAGES OF THE UPPER CHEST AND NECK ARE TAKEN AT 15 MINUTES AND 3 HOURS POST INJECTION
- THALLIUM AND TECHNETIUM STUDY

  THALLIUM INJECTED -GOES TO PARATHYROIDS AND THYROID GLAND
- TECHNETIUM INJECTED WHICH ONLY GOES TO THYROID GLAND
- TECHNETIUM IMAGE SUBTRACTED FROM THALLIUM IMAGE TO VISUALIZE PARATHYROIDS

THYROID IMAGE

PURPOSE: THE THYROID IMAGE CAN

- SHOW THE SIZE AND SHAPE OF THE THYROID
- DEMONSTRATE HOW THE THYROID FUNCTIONS
- IMAGE NODULES
- VISUALIZE THYROID TISSUE OR CANCER OUTSIDE THE NECK AREA

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. RADIOPHARMACEUTICAL
   - ^{99m}Tc-PERTECHNETATE
   - ^{123}IODINE
   - ^{131}IODINE (RESERVED FOR WHEN THERAPY WILL BE NEEDED OR CANCER FOLLOW-UP STUDIES)

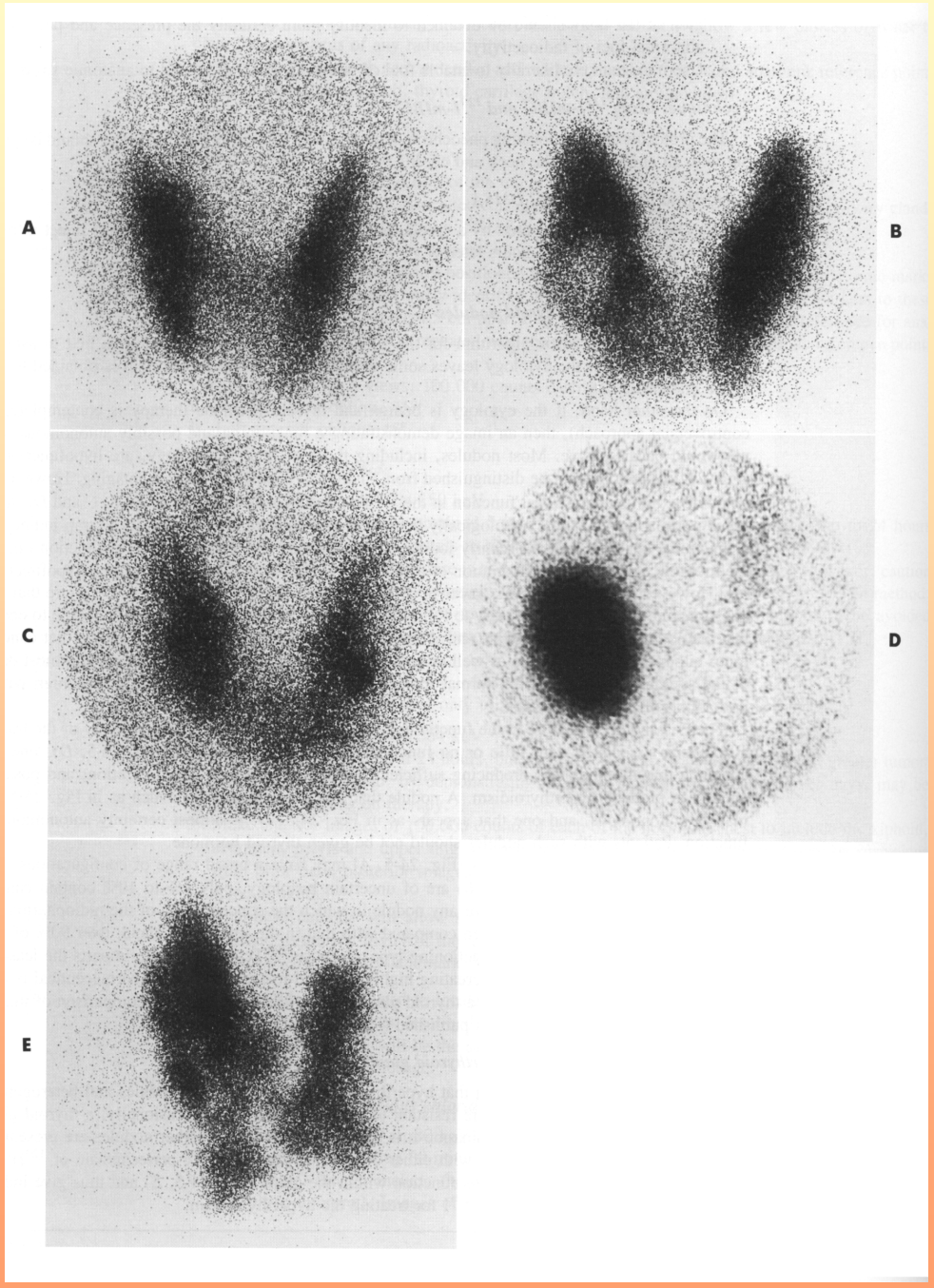
PROCEDURE:

- PERTECHNETATE - INJECTED IV AND IMAGES OF THE NECK ARE TAKEN AT 20 MINUTES POST INJECTION
- ^{123}I -ADMINISTERED ORALLY AND PATIENT IMAGED ROUTINELY 6 HOURS AFTERWARDS
- ^{131}I -ADMINISTERED ORALLY AND PATIENT IMAGED 24 HOURS AFTERWARDS

*THYROID CANCER AND CANCER TREATMENT FOLLOW-UP STUDIES REQUIRE WHOLE BODY IMAGE

*DELIVERS HIGH RADIATION DOSE TO THYROID

FIG. III - 7



THYROID UPTAKE

PURPOSE: USED TO QUANTITATE THYROID FUNCTION

HYPOTHYROID (LOW FUNCTION)

EUTHYROID (NORMAL FUNCTION)

HYPERTHYROID (HIGH FUNCTION)

EQUIPMENT AND MATERIALS REQUIRED:

1. THYROID PROBE
2. ^{123}I or ^{131}IODINE (^{123}I ROUTINELY USED)
3. NECK PHANTOM

PROCEDURE:

- ^{123}I CAPSULE OR LIQUID COUNTED IN NECK PHANTOM (SIMULATES PATIENT'S NECK)
- TRACER ADMINISTERED ORALLY
- PATIENT RETURNS IN SIX HOURS AND HAS THYROID AND KNEE (BACKGROUND) COUNTED
- NET COUNTS TO THYROID ARE COMPARED WITH TOTAL DOSE DELIVERED TO GIVE THYROID UPTAKE PERCENT

IN VITRO (IN THE TEST TUBE) THYROID STUDIES

PURPOSE: USES PATIENT'S BLOOD TO DETERMINE THYROID FUNCTION

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION WELL COUNTER
2. PIPETS OR AUTOMATIC PIPET SYSTEM
3. COMMERCIALLY AVAILABLE KITS
4. BLOOD DRAWING EQUIPMENT
5. CENTRIFUGE

PROCEDURE:

- PATIENT'S BLOOD DRAWN
- BLOOD CENTRIFUGED
- PLASMA OR SERUM USED
- PROTOCOL OF COMMERCIALLY AVAILABLE KIT FOLLOWED
- THYROID FUNCTION DETERMINED FROM RESULTS

GASTROINTESTINAL SYSTEM

GASTRIC EMPTYING STUDY

PURPOSE: DETERMINES HOW FAST OR SLOW INGESTED SOLIDS OR LIQUIDS CAN BE EMPTIED BY STOMACH

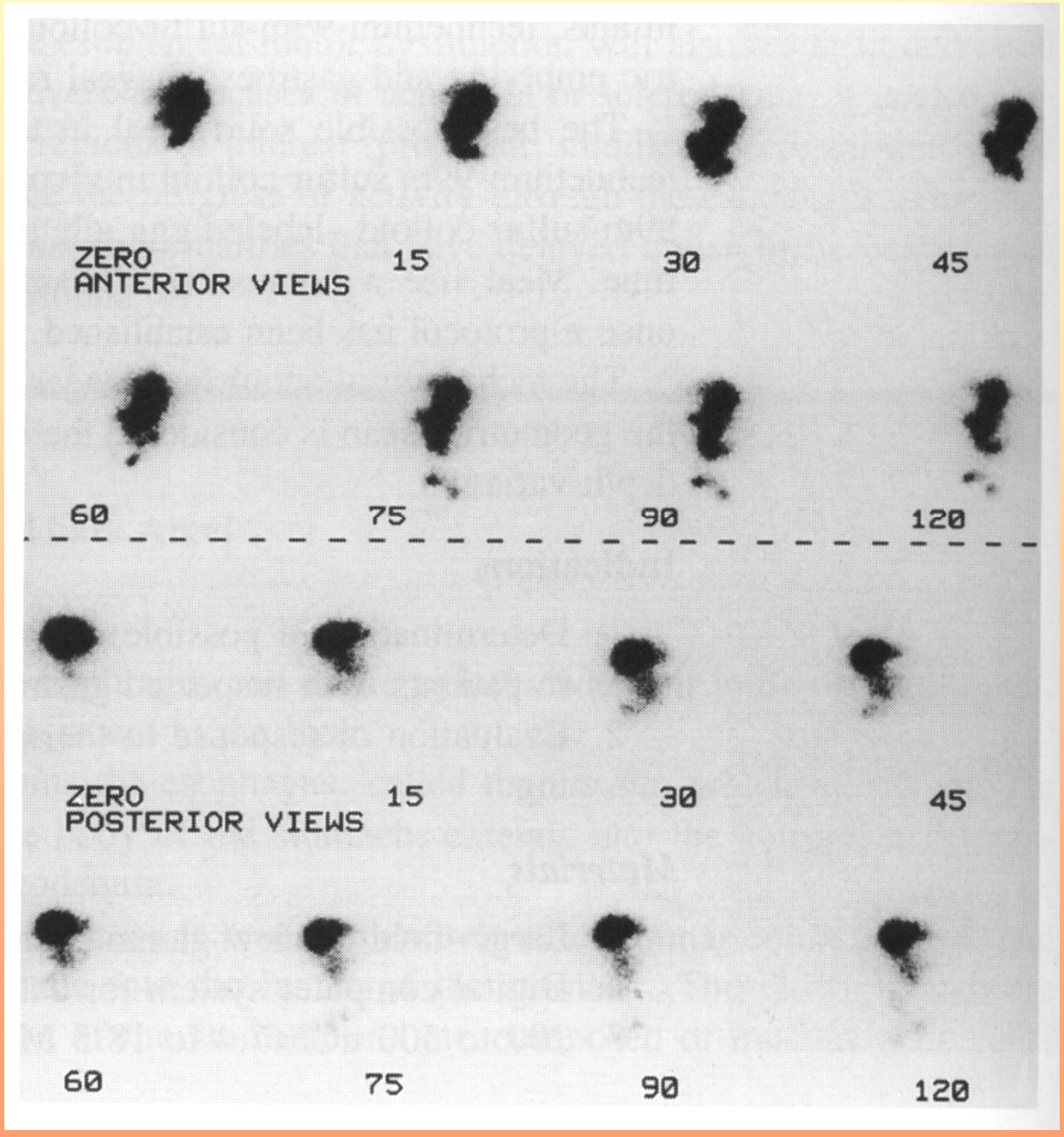
EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH LARGE FIELD OF VIEW
2. COMPUTER WITH APPROPRIATE SOFTWARE
3. ^{99m}Tc-SULFUR COLLOID LABELED EGG ALBUMIN ^{99m}Tc-SULFUR COLLOID LABELED MILK (MANY OTHER SOLIDS OR LIQUIDS MAY BE USED)

PROCEDURE:

- PATIENT'S INGESTS RADIOLABELED MEAL
- PICTURES OF STOMACH TAKEN EVERY 15 MINUTES FOR 2 HOURS
- TECHNOLOGIST TELLS COMPUTER TO LOOK AT STOMACH
- COMPUTER DETERMINES HOW LONG FOR STOMACH TO EMPTY ONE HALF ITS CONTENTS
- TIMES COMPARED WITH NORMAL STANDARDS

FIG. III - 8


ZERO
ANTERIOR VIEWS
15
30
45
60
75
90
120
ZERO
POSTERIOR VIEWS
15
30
45
60
75
90
120

GASTRO-ESOPHAGEAL REFLUX STUDY

PURPOSE: THIS STUDY ILLUSTRATES IF INGESTED FOODS AND LIQUIDS WILL BACKFLOW UP THE ESOPHAGUS AFTER THEY HAVE REACHED THE STOMACH.

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. ^{99m}Tc-SULFUR COLLOID MIXED IN ACIDIFIED ORANGE JUICE
3. ABDOMINAL BINDER
4. CAMERA COMPUTER

PROCEDURE:

- PATIENT DRINKS LABELED ORANGE JUICE WHILE SITTING UPRIGHT
- CAMERA DETERMINES WHEN ALL JUICE REACHES STOMACH
- PATIENT LAYS DOWN AND ABDOMINAL BINDER IS FITTED BELOW RIB CAGE
- IMAGES ARE ACQUIRED WITH PRESSURES SET AT 0, 20, 40, 60, 80, AND 100 mm Hg
- COMPUTER INSTRUCTED TO COMPARE COUNTS IN ESOPHAGUS WITH COUNTS IN STOMACH
- NO MORE THAN 5% OF CONTENTS SHOULD BACKFLOW TO ESOPHAGUS

GASTROINTESTINAL BLEEDING STUDY

PURPOSE: THIS STUDY DETERMINES THE LOCATION OF GI BLEEDING IN THE LOWER GI TRACT

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH A LARGE FIELD OF VIEW
2. CAMERA COMPUTER
3. ^{99m}Tc-LABELED RED BLOOD CELLS (TO STUDY INTERMITTENT BLEEDING)

   ^{99m}Tc-LABELED SULFUR COLLOID (TO STUDY ACTIVE BLEEDING)

PROCEDURE:

- LABELED RED BLOOD CELLS ARE INJECTED
- CAMERA IMAGES ARE TAKEN FOR 30 MINUTES
- CAN TAKE ADDITIONAL IMAGES FOR UP TO 36 HOURS POST INJECTION
- BLEEDING LOCATION IS DETERMINED

HEPATOBILIARY STUDY

PURPOSE: TO DIAGNOSE A STONE IN THE CYSTIC DUCT (ACUTE CHOLECYSTITIS) THAT LEADS TO THE GALLBLADDER.
OTHER OBSTRUCTIONS MAY BE SEEN.

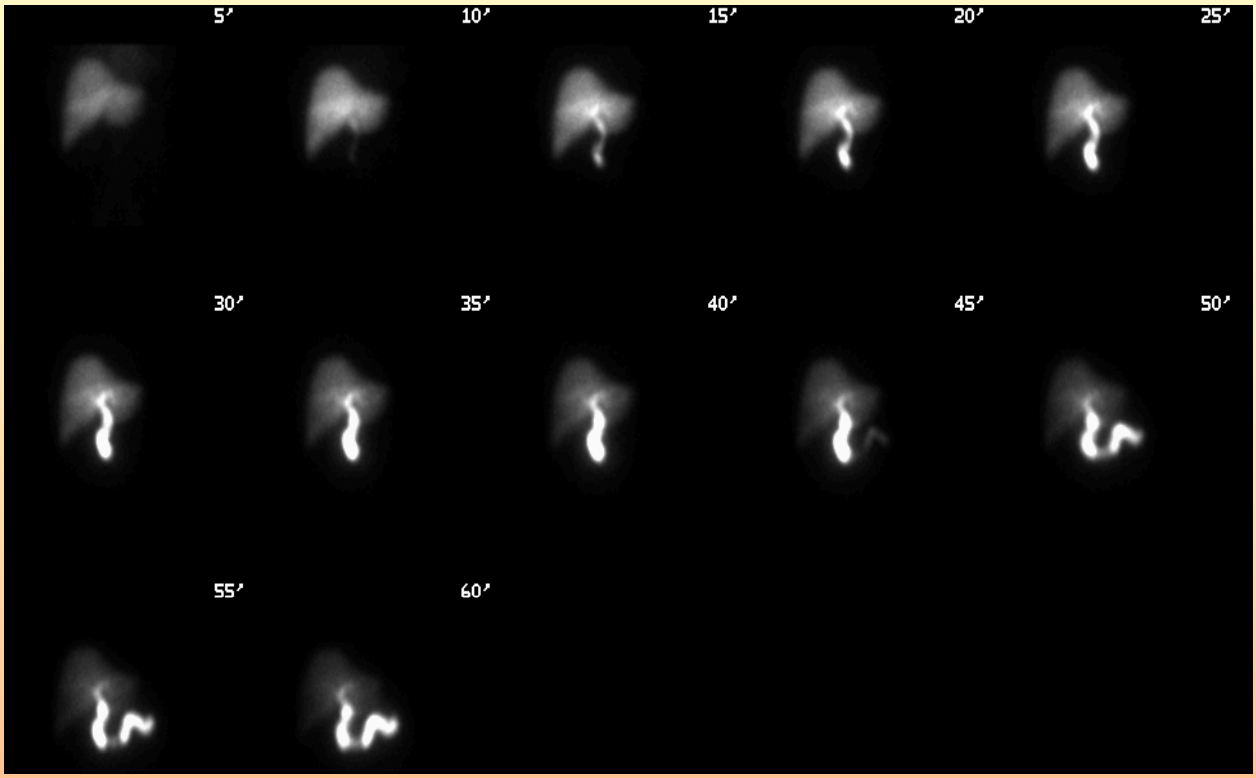
EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH LARGE FIELD OF VIEW
2. CAMERA COMPUTER
3. ^{99m}Tc-MEBROFENIN
4. MORPHINE

PROCEDURE:

- PATIENT INJECTED WITH MEBROFENIN
- PICTURES OF THE LIVER, LIVER DUCTS, GALLBLADDER, AND INTESTINES TAKEN OVER A ONE HOUR PERIOD
- IF GALLBLADDER NOT VISUALIZED AT 1 HR MORPHINE MAY BE ADMINISTERED AND THE IMAGES CONTINUE FOR AN ADDITIONAL HOUR
- IF GALLBLADDER IS STILL NOT VISUALIZED THE PATIENT HAS A STONE BLOCKING BILE DELIVERY TO GALLBLADDER

FIG. III - 9



LIVER/SPLEEN STUDY

PURPOSE: SIZE, POSITION, AND SHAPE OF LIVER AND SPLEEN CAN BE DETERMINED. ABNORMALITIES SUCH AS CIRRHOSIS, TUMORS, CYSTS, INFECTION, TRAUMA, AND HEPATITIS MAY BE DEMONSTRATED.

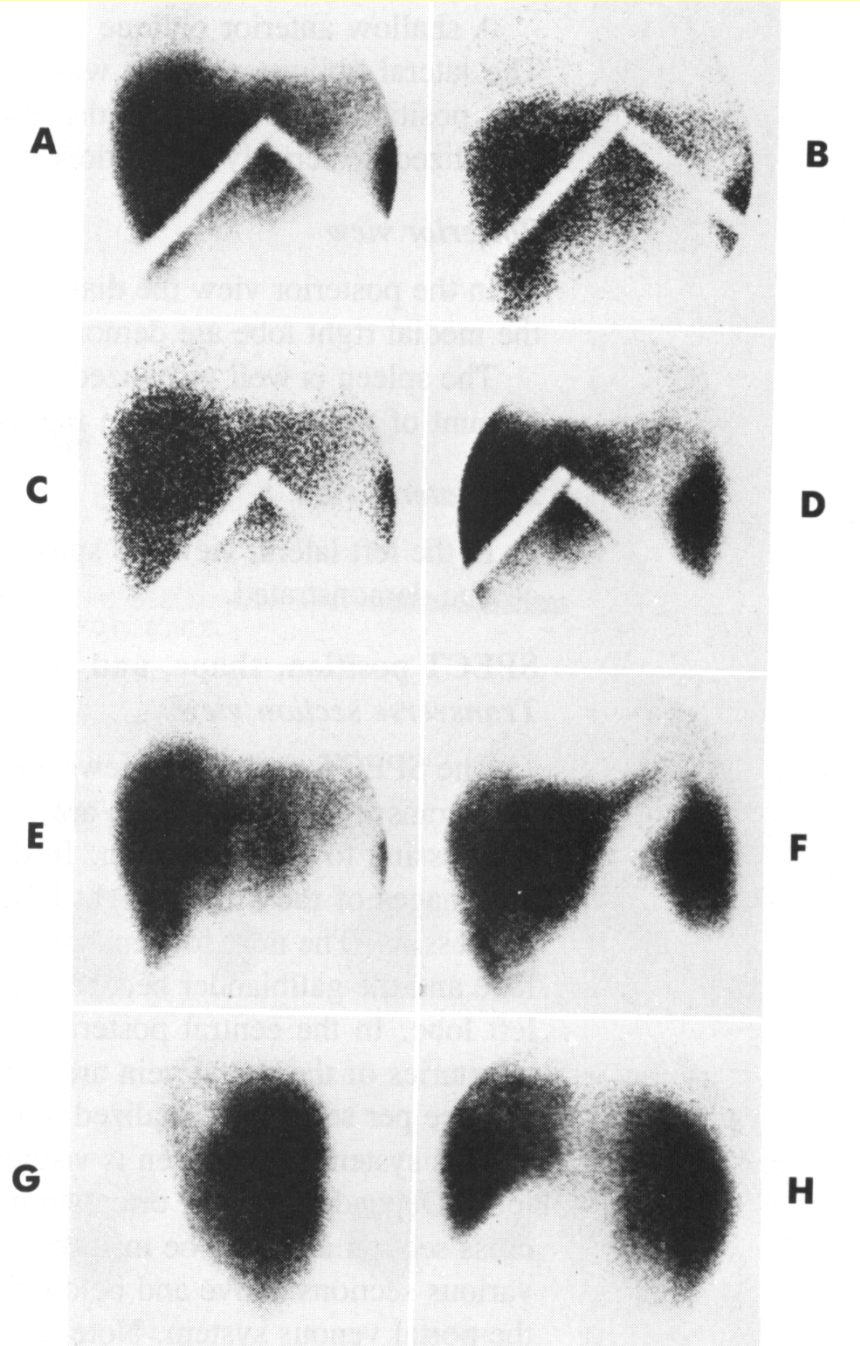
EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH A LARGE FIELD OF VIEW OR SPECT CAMERA
2. ^{99m}Tc-SULFUR COLLOID
3. LEAD STRIPS OR COBALT-57 RULER TO DETERMINE SIZE AND POSITION OF LIVER/ SPLEEN

PROCEDURE:

- PATIENT INJECTED WITH SULFUR COLLOID
- MARKERS PLACED ON BOTTOM OF RIB CAGE
- IMAGE ACQUIRED AND MARKERS REMOVED
- ADDITIONAL PICTURES AT DIFFERENT ANGLES OR SPECT CAMERA ROTATES ALL THE WAY AROUND PATIENT AND ACQUIRES DATA

FIG. III - 10



GENITOURINARY SYSTEM

CYSTOGRAM

PURPOSE: TO STUDY THE BACKFLOW OF URINE OUT OF THE BLADDER IN CHILDREN. THIS IS A MAJOR CAUSE OF URINARY TRACT INFECTIONS.

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. ^{99m}Tc-PERTECHNETATE
3. FOLEY CATHETER INFUSION SET
4. NORMAL SALINE

PROCEDURE:

- PATIENT IS ASKED TO EMPTY BLADDER
- PATIENT IS CATHETERIZED (FOLEY DIRECTLY INSERTED INTO BLADDER)
- NORMAL SALINE CONTAINING TECHNETIUM IS ADMINISTERED THROUGH FOLEY
- PATIENT'S BLADDER FILLED TO CAPACITY
- IMAGES TAKEN DURING FILLING AND VOIDING PHASES
- LOOK FOR EVIDENCE OF REFLUX (URINE BACK FLOWING OUT OF BLADDER UP TOWARDS KIDNEYS)

RENAL (KIDNEY) STUDIES

PERFUSION IMAGE -WATCH BLOOD FLOW OVER A ONE MINUTE PERIOD

ADDITIONAL RENAL STUDIES:

GLOMERULAR FILTRATION RATE -^{99m}Tc-DTPA

TUBULAR FUNCTION - ^{99m}Tc-DMSA

TUBULAR SECRETION - ^{99m}Tc-MAG_3

FIG. III - 11

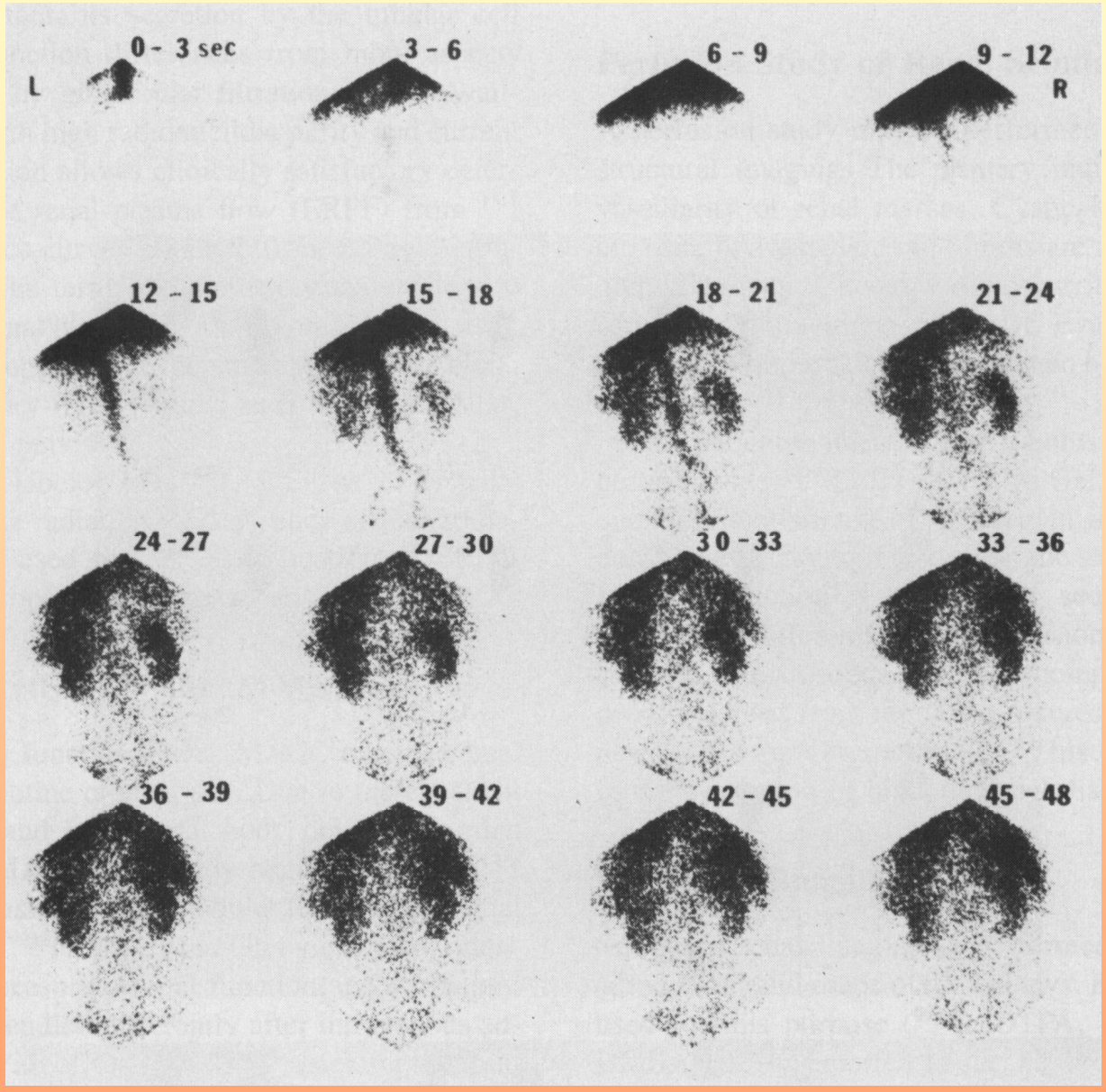
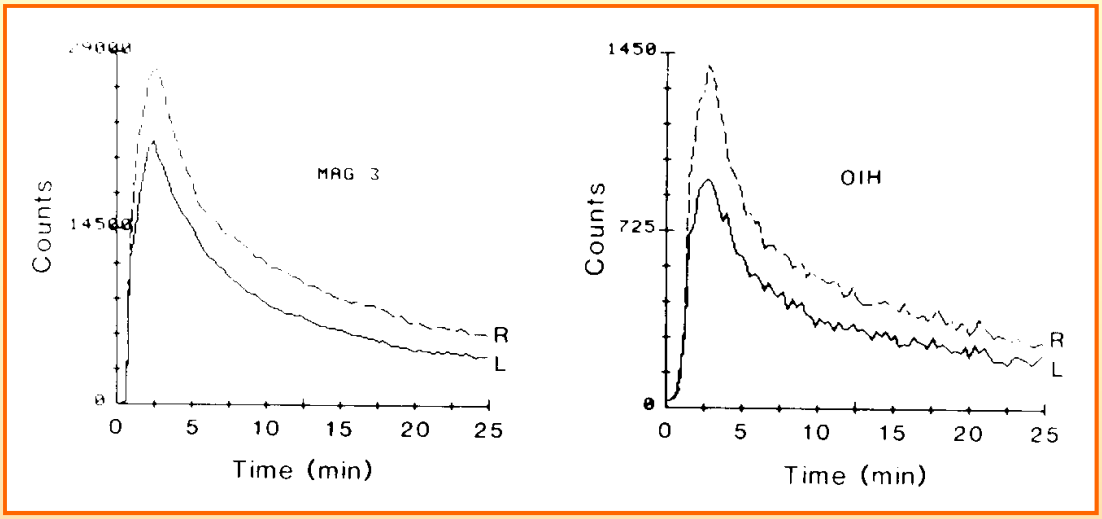
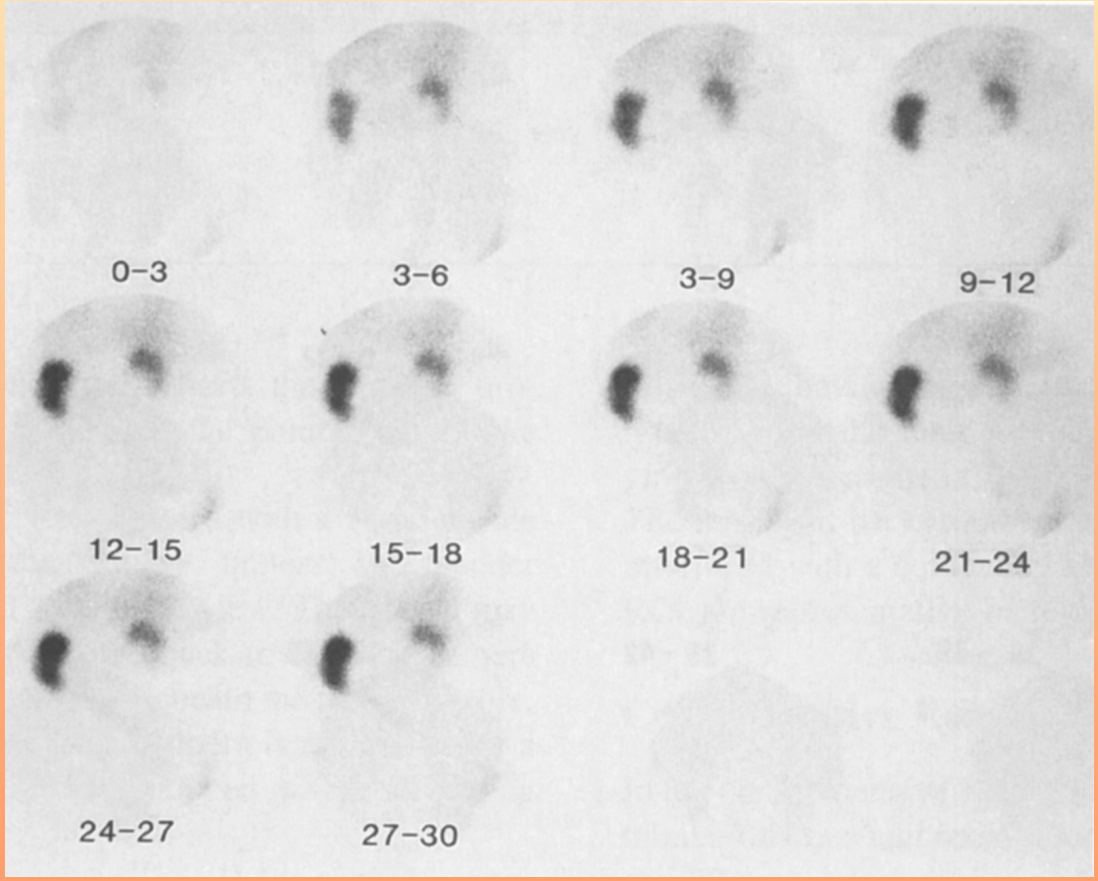

0 - 3 sec
3 - 6
6 - 9
9 - 12
L
R
12 - 15
15 - 18
18 - 21
21 - 24
24 - 27
27 - 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48

FIG. III - 12


MAG 3
Counts
1450
0
0 5 10 15 20 25
Time (min)
R
L
OIH
Counts
1450
725
0
0 5 10 15 20 25
Time (min)
R
L


0-3
3-6
3-9
9-12
12-15
15-18
18-21
21-24
24-27
27-30

TESTICULAR IMAGING

PURPOSE:

DISTINGUISH TESTICULAR INFLAMMATION FROM TORSION (A TWISTING OF THE TESTES THAT CUTS OFF BLOOD SUPPLY)

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH A PINHOLE COLLIMATOR
2. ^{99m}Tc-DTPA OR PERTECHNETATE

PROCEDURE:

PHARMACEUTICAL ADMINISTERED IV INTO ARM VEIN AND THE FLOW OF THE RADIOPHARMACEUTICAL OBSERVED BY CAMERA FOR 10 MINUTES

INFLAMMATION -INCREASED TRACER UPTAKE

TORSION -ABSENCE OF TRACER UPTAKE

HEMATOLOGICAL STUDIES

BLOOD VOLUME DETERMINATIONS

PLASMA VOLUME DETERMINED BY USING ^{125}I-RISA

RED CELL MASS DETERMINED BY USING ^{51}Cr LABELED RED BLOOD CELLS

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION WELL COUNTER
2. APPROPRIATE RADIOPHARMACEUTICAL
3. BLOOD DRAWING SUPPLIES

PROCEDURE:

IN BOTH STUDIES THE RADIOPHARMA-CEUTICAL IS INJECTED AND LATER BLOOD IS DRAWN FROM THE PATIENT. THE CON-CENTRATION OF THE INJECTED MATERIAL IS COMPARED WITH THE BLOOD DRAWN FROM THE PATIENT AFTER IT HAS HAD A CHANCE TO MIX. BLOOD, PLASMA, AND RED BLOOD CELL VOLUMES CAN BE DETERMINED THROUGH THESE COMPARISONS.

SCHILLING TEST

PURPOSE: TO STUDY THE BODY'S ABILITY TO ABSORB VITAMIN B12.

PROCEDURE:

A CAPSULE OF ^{57}Co-LABELED B12 IS ADMINISTERED ORALLY TO THE PATIENT.

THE PATIENT IS ASKED TO COLLECT ALL THEIR URINE FOR THE NEXT 24 HOURS.

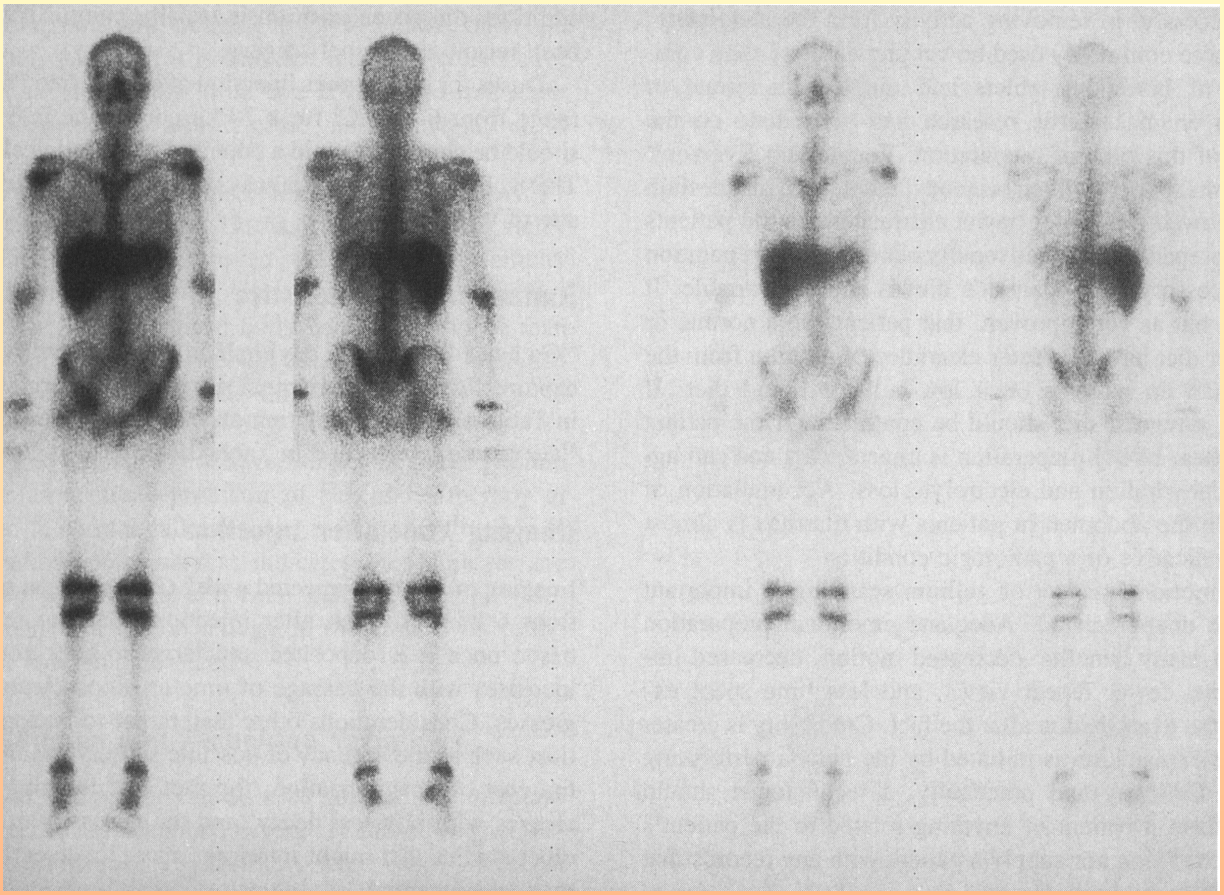
ACTIVITY IN THE URINE IS COMPARED WITH CAPSULE ACTIVITY TO DETERMINE THE B12 ABSORBED.

TUMOR AND INFECTION IMAGE

^{67}Ga CITRATE CAN IMAGE TUMOR AND INFECTION

^{99m}Tc-LABELED WHITE BLOOD CELLS CAN ONLY SEE INFECTION

FIG. III - 13



RESPIRATORY SYSTEM

LUNG PERFUSION IMAGE

PURPOSE: THE MAIN REASON FOR DOING A LUNG PERFUSION SCAN IS TO IDENTIFY PULMONARY EMBOLI (BLOOD CLOTS IN THE LUNGS). OTHER RESPIRATORY DISEASES MAY ALSO BE DEMONSTRATED.

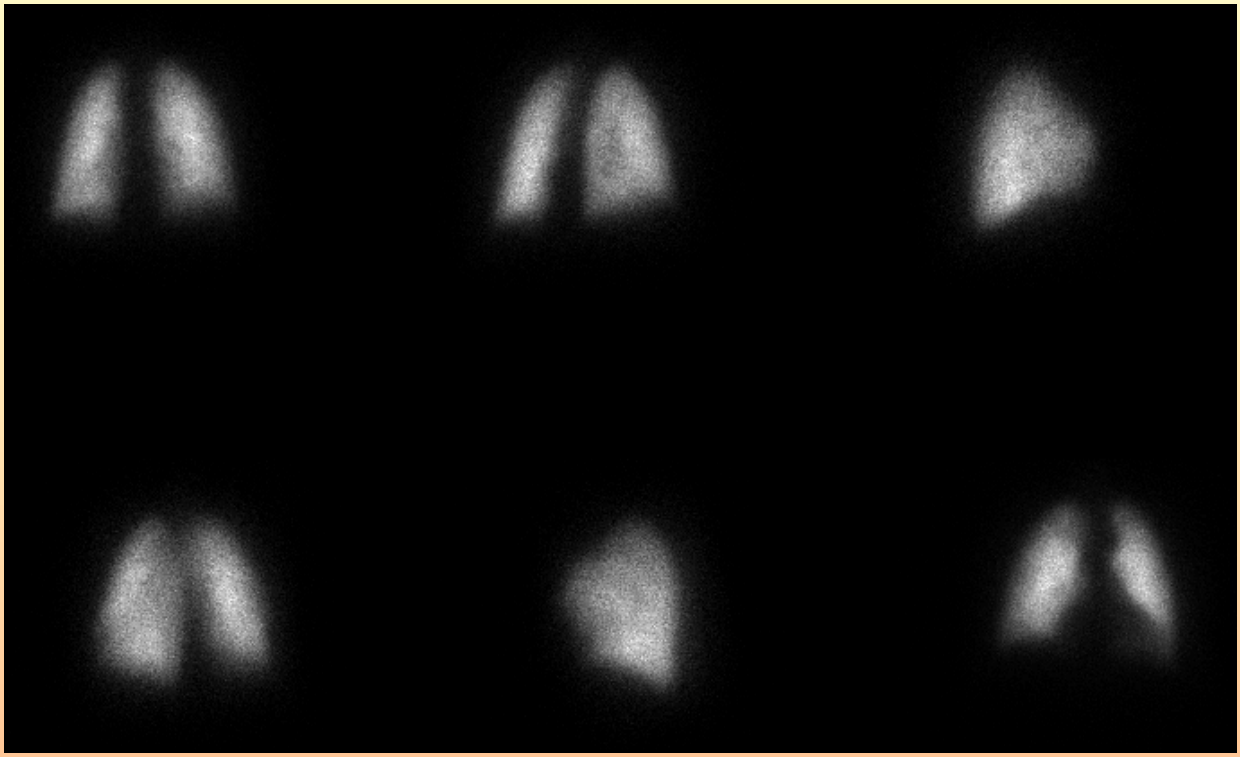
EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA
2. ^{99m}Tc-MAA

PROCEDURE:

A RADIOPHARMACEUTICAL IS INJECTED IV AND THE BLOOD PERFUSION TO THE LUNGS IS DEMONSTRATED. IF A CLOT EXISTS IN THE LUNGS, THE MATERIAL WILL NOT BE ABLE TO GO BEYOND THE SITE. A COLD SPOT (AREA OF REDUCED TRACER UPTAKE) WILL APPEAR BEYOND THE CLOT'S LOCATION.

FIG. III - 14



LUNG VENTILATION STUDY

PURPOSE: USUALLY USED IN CONJUNCTION WITH LUNG PERFUSION SCAN TO RULE OUT PULMONARY EMBOLI. THE INVOLVED AREA WILL USUALLY VENTILATE BUT NOT RECEIVE BLOOD PERFUSION.

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA WITH A LARGE FIELD OF VIEW
2. ^{133}XENON GAS
3. XENON DISPENSER
4. XENON DELIVERY SYSTEM WITH RETURN DECAY TRAP
5. OXYGEN SUPPLY
6. ROOM WITH NEGATIVE PRESSURE

PROCEDURE:

RADIOPHARMACEUTICAL IS ADMINISTERED THROUGH PATIENT INHALATION.

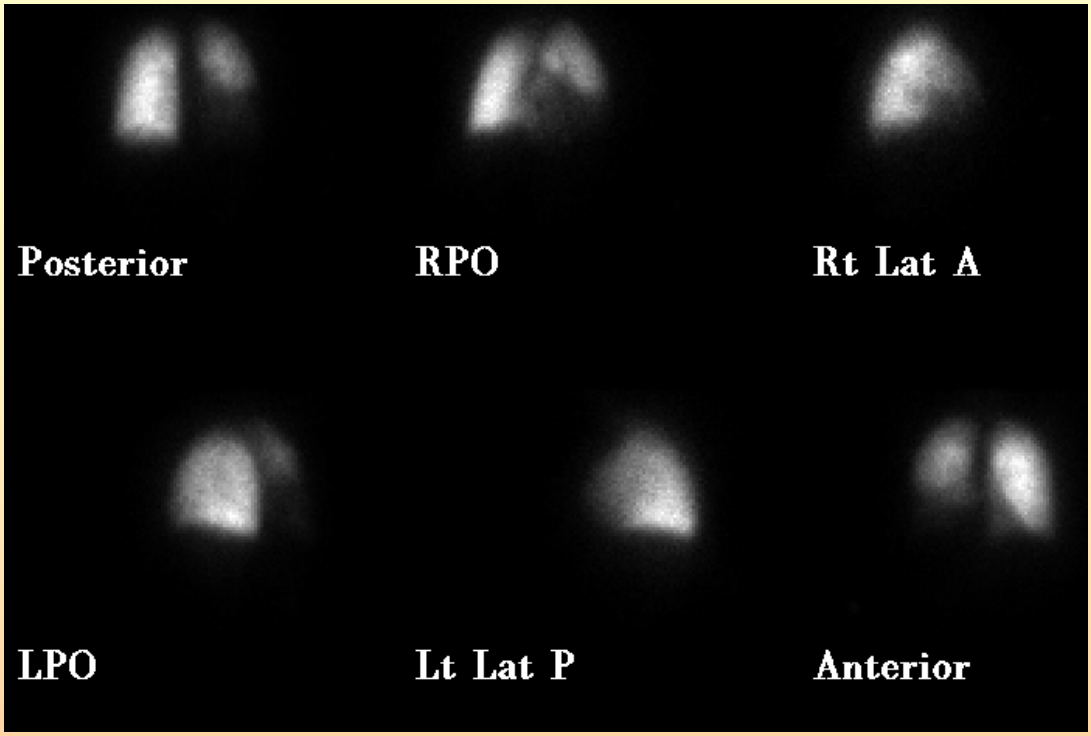
BREATH HOLDING PHASE

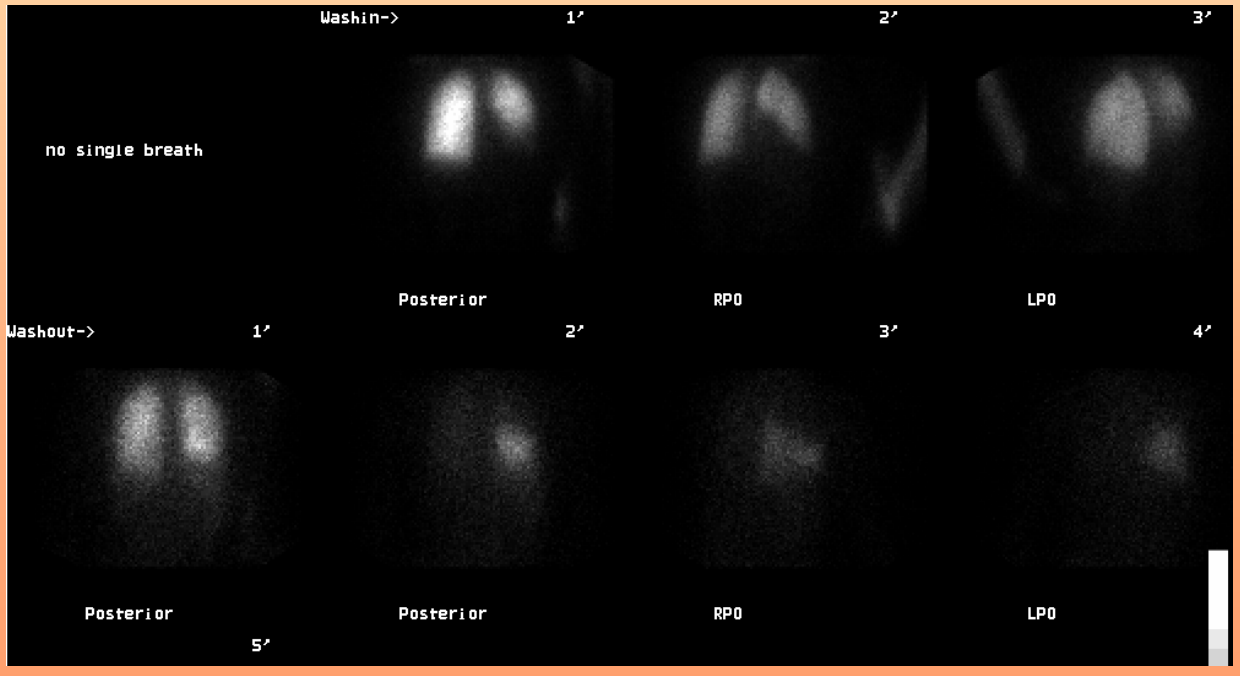
EQUILIBRIUM PHASE

WASHOUT PHASE

NORMAL LUNGS WILL FILL HOMOGENEOUSLY AND WASHOUT THE TRACER QUICKLY

FIG. III - 15


Posterior
RPO
Rt Lat A
LPO
Lt Lat P
Anterior


Washin->
1'
2'
3'
no single breath
Posterior
RPO
LPO
Washout->
1'
2'
3'
4'
Posterior
Posterior
RPO
LPO
5'

SKELETAL IMAGING

BONE SCAN

PURPOSE: MOST OFTEN DONE TO FOLLOW THE PROGRESSION OF MALIGNANT CANCER FROM OTHER SITES.

EQUIPMENT AND MATERIALS REQUIRED:

1. SCINTILLATION CAMERA (PREFERABLY WITH TWO HEADS TO SHORTEN SCAN LENGTH)
2. ^{99m}Tc-MDP OR HMDP

PROCEDURE:

- PATIENT INJECTED WITH TRACER
- WHOLE BODY SCAN TAKEN 3 HRS POST INJECTION

THREE PHASE STUDY FOR OSTEOMYELITIS

1. ONE MINUTE FLOW STUDY
2. IMMEDIATELY AFTER TAKE A ONE MINUTE STILL PICTURE
3. 2 HOUR DELAYED PICTURE

FIG. III - 16

FIG. III - 17