VENTILATION PERFUSION LUNG SCAN

THEORY:
The VENTILATION PERFUSION LUNG SCAN is useful in determining the presence of pulmonary embolism. The patient will inhale a radioactive gas which when imaged will demonstrate areas in the lungs that do not ventilate well. The patient is then injected with a radioactive tracer that is filtered out of the bloodstream by the first capillary bed that it reaches. Images are then taken to determine if there are any areas of the lungs that do not perfuse properly. Any mismatches where there are perfusion defects not seen on the ventilation lung scan are likely areas of pulmonary emboli.

CLINICAL INDICATIONS:
1) + d dimer
2) Shortness of breath
3) Previous history of PE
4) Low O2 saturation in the blood
5) Pleuritic chest pain

RADIOPHARMACEUTICAL:
1) 5-25 mCi 133 Xenon Gas
2) 3-7 mCi 99m Tc MAA

EQUIPMENT:
1) Siemens’s E-CAM
2) Xenon Gas Trap
3) Disposable face mask with attachable micropore filter
4) Lead lined 133 Xenon Gas dispensing gun
5) Normal veinipuncture equipment

PREPARATION OF EQUIPMENT:
1) Perform usual Daily QC (camera, well counter, dose calibrator, survey meter)
2) Do a Xenon Gas Trap Monitor test if one has not been done in the previous month

PREPARATION OF PATIENT:
1) A chest XRAY must be obtained if one has not been done in the previous 24 hours. 4 hours is preferable.

PRINCIPLE:
The VENTILATION PERFUSION LUNG SCAN is acquired to determine the presence of pulmonary emboli (usually in a very sick patient). On the VENTILATION LUNG SCAN diseases such as COPD, pneumonia, airway disease, infiltrates in the lungs are demonstrated. On the PERFUSION LUNG SCAN diseases such as COPD, pneumonia, airway disease, infiltrates in the lungs and pulmonary emboli are demonstrated. By detecting perfusion defects that are not seen on the VENTILATION LUNG SCAN pulmonary emboli can be detected. However, in the presence of defects on the VENTILATION LUNG SCAN the VENTILATION PERFUSION LUNG SCAN becomes less sensitive as there may be perfusion defects being hid in the ventilation defects.
PROCEDURE:

VENTILATION LUNG SCAN:
1) Upon arrival in the Nuclear Medicine Truck the patient is interviewed to assure that the
patient is not pregnant or nursing and to determine the nature of the patient’s chief complaint
(if there is pain, is it pleuritic? Where is it?).
2) The patient’s name, MR number, DOB and the type of scan are entered into the computer.
3) The patient’s name on the computer monitor is highlighted and the ICON for the
VENTILATION PERFUSION LUNG SCAN is clicked on.
4) The SCAN PREPARATION button on the monitor is clicked on and the monitor on the
gantry is checked to assure the START button is ready for use.
5) The patient is positioned on the scanning pallet in the supine position with a pillow under
their head and knees for comfort.
6) The VENTILATION PERFUSION LUNG SCAN is explained to the patient. The ventilation
mask is held up to the patient’s face and the patient is told that there will be resistance while
the patient is breathing through the face mask.
7) The 133 Xenon button on the Dose Calibrator is pressed. The 133 Xenon Gas vial is assayed
and placed in the Xenon Dispensing Gun.
8) O2 is flooded into the bag in the Xenon Trap.
9) The Xenon Trap is turned on and the lever placed in the START position.
10) The patient is told that they will be instructed to TAKE IN A DEEP BREATH, LET IT ALL
THE WAY OUT, TAKE IN A SECOND DEEP BREATH AND HOLD THIS BREATH.
11) The face mask is positioned on the patient. The needle on the Xenon Dispensing Gun is
entered into the soft adapter near the face mask.
12) The patient is instructed to TAKE IN A DEEP BREATH, LET IT ALL THE WAY OUT,
TAKE IN A SECOND DEEP BREATH AND HOLD THIS BREATH. While the patient is
taking in the second breath, the bulb on the Xenon Dispensing Gun is squeezed several times
to administer the 133 Xenon Gas.
13) Immediately, the START BUTTON is pressed to start the scan.
14) The patient is encouraged to hold his/her breath for the duration of the breath holding image.
15) The lever on the Xenon Gas Trap is turned to the EQUILIBRIUM position so that at the end
of the breath holding phase of the scan, the equilibrium phase is ready.
16) When the equilibrium phase is started, the patient is instructed to breathe through the face
mask. There is resistance in the corrugated tubing connecting the face mask to the Xenon
Gas Trap so the patient is encouraged to continue to breathe through the face mask and to
force his/her breath if necessary.
17) At the end of the equilibrium phase the lever is turned to the WASHOUT position. Breathing
through the face mask is somewhat easier in this phase, but the patient is still encouraged to
breathe through the face mask.
18) At the end of the washout phase, the scan is stopped and stored.
19) The truck exhaust fan is turned on for about 30min (this time is determined by our physicists
every 6 months).

PERFUSION LUNG SCAN:
1) Immediately following the VENTILATION LUNG SCAN, a PERFUSION LUNG SCAN is
performed.
2) The 99m Tc button the Dose Calibrator is pressed.
3) The syringe with this patient’s dose of 99m Tc MAA is measured in the dose calibrator.
4) The syringe is inverted several times to re-suspend the MAA which undoubtedly has settled
since it was drawn up several hours earlier.
5) Using aseptic technique, the patient is injected with the 99m Tc MAA.
6) On the computer, the PERFUSION LUNG SCAN button is clicked on.
7) When the MAA has adequately concentrated in the lungs, patient images of the lungs are obtained in the POSTERIOR, LPO, LT LATERAL, RPO, RT LATERAL, AND ANTERIOR projections.
8) The images are reviewed and the scan is COMPLETED.

PROCESSING THE SCAN:
1) On the VENTILATION LUNG SCAN, enter the activity of Xenon, route of administration (by inhalation), time and date of administration and technologist’s initials who administered the Xenon and did the scan.
2) On the PERFUSION LUNG SCAN enter the activity of 99m Tc MAA, route of administration, time and date of administration and technologist’s initials who administered the 99m Tc MAA and did the scan.
3) Create SCREEN SAVES and transfer the SCREEN SAVES into the hospital’s PACs computer for interpretation.