Biodex Venti-Scan™ IV
Radioaerosol Lung Ventilation

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Anatomy of the lungs

- Major airways and blood vessels divide into smaller and smaller branches.

- Respiration is the transport of oxygen and carbon dioxide to and from the cells of the body.

- In healthy lungs, ventilation and perfusion (blood flow) are matched for efficiency.

- Pulmonary disease upsets this balance.
Procedure – Lung Ventilation/Perfusion Scan (V/Q scan)

- Perfusion imaging is used to determine blood flow to the lungs.
- Ventilation imaging demonstrates the flow of air into and out of the lungs.
- Ventilation performed in conjunction with perfusion imaging increases specificity of scan.
Ventilation Imaging – Radioaerosols

- Tc-99m DTPA allows for imaging in multiple projections that match perfusion images.

- Performed upright or supine.

- Tc-99m DTPA is injected into the nebulizer; oxygen is used to create a radioactive aerosol which is inhaled by patient.

- After 3 - 5 min of inhalation imaging begins.
Ventilation Imaging – Radioaerosols

- Tc-99m DTPA aerosol must have correct oxygen flow rate through nebulizer (9-10 liters/min) to create a mist and proper particle size.

- Must take precaution not to allow contamination to patient’s nose, mouth, upper chest, and floor under patient.

- Care must be taken to prevent patient from swallowing the aerosol.

- Coaching prior to study can eliminate this outcome.
Ventilation Imaging – Radioaerosols

**Nebulizer**

Fig. 1 – Basic components of the design of pneumatic nebulizers
Other Important Parts

- Hepa Filter
- Nose Clip
- Disposable plastic bag, twist wrap, instructions
- Mouthpiece
Ventilation Imaging - Radioaerosols
Even Horses Can Do It!
Venti-Scan™ IV (177-091 & 092)

- Uses 177-090 shielded canister
- IV pole mounted
- 12 inch or 24 inch tube

Components include:
- Venti-Scan™ IV Delivery System
- HEPA filter
- Patient nose clip & mouthpiece
- Yellow plastic disposable bag
- Wire twist wrap
Venti-Scan™ IV (177-091 & 092)

- Place the lower shield assembly in IV pole mount.
- Place aerosol unit in shield. Insert the bottom tip of the nebulizer into the O2 air inlet. Ensure that the injection port and the tubing are positioned in shield cutouts.
- Connect O2 air supply to shield inlet tube, but do not turn O2 on.
Venti-Scan™ IV (177-091 & 092)

- Test system and connections by injecting 1ml of saline and slowly turning on O2 air to a flow rate of 9 to 11 liters per minute (LPM) at a pressure of 40 to 45 PSI for one to two minutes.

- Mist of about four inches long should come out of mouthpiece. Turn off O2 air supply.
Dose & Breathing Time

Pre-perfusion:
- The generally accepted dosage of radioactivity is 30 to 40 mCi in 2-4 ml of injectable saline.
- Three to eight minutes of breathing time should be adequate to collect 100,000 to 200,000 counts.

Post-perfusion:
- The generally accepted dosage of radioactivity is 30 to 40 mCi in 2-4 ml of injectable saline.
- Five to six minutes of breathing time should be adequate to collect sufficient counts to override base counts by 1.5 to 3 times.

NOTE: Individual breathing times may vary. More extended breathing time may be required when using a face mask.
Procedure

- Using a shielded syringe and needle, inject Tc-99m DTPA in 2-3 ml of saline through the center of the rubber septum and into the nebulizer.

- Replace the Venti Scan™ IV top shield by aligning large slot with patient breathing tube. Push down on cover and twist to lock.

- Place the mouthpiece in the patient's mouth and attach the nose clip.
Procedure

- Slowly turn on O2 air supply. The recommended O2 air flow rate is 9 to 11 LPM, 40 to 45 PSI. Instruct patient to breath normally. Breathing time of three to eight minutes should be adequate.

  **NOTE: Immediately terminate oxygen flow should the patient release mouthpiece during administration of aerosol.**

- To minimize throat and stomach activity, ask the patient to inform of the need to expel excess saliva by raising their hand. Turn off the gas supply and collect saliva in a disposable cloth or cup.

  **CAUTION: Saliva will contain radioactivity and should be handled and disposed of in accordance with appropriate procedures. Resume procedure.**

- When desired count rate has been reached, turn off the O2 air supply. Instruct the patient to take an additional four or five breaths to purge the system of any residual aerosol.
Procedure

- Remove the mouthpiece and nose clip or face mask. Have the patient expel any accumulated saliva in a disposable cloth.

- If a face mask was used, wipe the patients face with a damp, disposable washcloth. To reduce esophageal activity, the patient may drink a small amount of water.

- Put patient under camera.

- Multiple views can be taken.
Disposal of Used System

- Disconnect the oxygen air supply.
- Remove the entire Venti Scan™ IV shield assembly from the IV pole mount and transport to the hot lab.
- Remove the top shield and locate the delivery system ejection button under the lower shield.
- Remove the delivery system by tilting the shield and pressing down firmly on ejection button. The nebulizer will disconnect from the O2 air inlet tube.
- Gently shake the kit out of the shielding and into the yellow disposal plastic bag provided and tie it closed.
- **DO NOT REMOVE THE KIT BY PULLING IT OUT OF THE SHIELDING WITH YOUR HANDS**
- Label and dispose of entire bagged system in accordance with your departmental radioactive waste disposal procedures.
Venti-Pak for Venti-Scan™ IV (177-075)

- Used for patients on a ventilator.
Cleaning and Contamination

- The outside of the administration system can be wiped with alcohol prep pads or with a damp cloth sprayed with an antimicrobial agent. Lightly spray the cloth first and then wipe the system.

- In the event of contamination from radioactivity, the administration system can be wiped with Radiacwash™.
## Troubleshooting Guide

### Radioaerosol System

#### Patient Consideration
- Radioaerosol tracers adhere to smoke particles in the lung.
- The patient should be instructed not to smoke 24 hours prior to the test.
- Explain the entire procedure to the patient prior to the test to ensure patient cooperation.
- Instruct the patient not to remove the mouthpiece or nose clip during the procedure.
- Instruct the patient to “signal” by raising their hand if they are experiencing any difficulty during the test.

#### Overall Guidelines
- Read the operational manual prior to performing the test.
- Perform the test in accordance to the operational manual.
- Explain the entire procedure to the patient prior to the test.
- Take care that the patient does not contaminate you or themselves during the test.
- Use only the correct shielded canister identified for the radioaerosol system.
- Ensure that the radioaerosol tracer is of high purity.

### Problem / Issue

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| Insufficient Air Flow | - If using a tank, replace the tank if remaining pressure drops to 250 psi of the air / O₂ in the tank.  
- If using wall oxygen, have maintenance check the regulator at the wall inlet to ensure 40 to 45 psi.  
- If using a flow meter, ensure the flow is between 9 - 11 liters per minute.  
- Ensure the radioaerosol kit is properly seated in the shielded canister.  
- Ensure the oxygen inlet tube is not blocked or damaged. |
| Oxygen inlet tube blow off | - Back pressure in oxygen for air supply is building too rapidly.  
- Turn oxygen for air supply to 9 liters/per minute and increase gradually.  
- Ensure the regulator outlet is between 40 to 45 psi.  
- In rare cases, the small oriﬁce of the nebulizer may become partially clogged creating higher than normal back pressure. Use another radioaerosol kit. |
Combined Ventilation/Perfusion Imaging (VQ Scan) Interpretation

- Perfusion imaging is normal – there is no need for ventilation.
- Perfusion defects can be segmental.
- Pulmonary disease falls into two categories:
  - Abnormal regional pulmonary blood flow (perfusion) and normal ventilation usually means PE.
  - Abnormal pulmonary blood flow (perfusion) and abnormal ventilation.
Abnormal ventilation and abnormal blood flow (perfusion) are areas of poor air intake and an indication of:

- chronic bronchitis
- emphysema
- asthma
- COPD (chronic obstructive pulmonary disease).
Normal Scan

INSTITUTE: MIDCENTRAL
PROTOCOL: V/Q LUNG S
ACQ. DATE: 11-DEC-200

NORMAL 1

NORMAL 2

ANT BENT   POST BENT

ANT PERF   POST PERF

LPD BENT   RPD BENT

LPD PERF   RPD PERF
Pulmonary Embolism
Pulmonary Embolism (PE)
Chronic Obstructive Pulmonary Disease (COPD)
Questions???

Thank you for your attention.