Pulmonary Perfusion Scintigraphy

Primary Indications:
Pulmonary perfusion scintigraphy is indicated for (1) diagnosis of pulmonary embolism (usually in conjunction with pulmonary ventilation imaging) and (2) quantification of regional pulmonary perfusion (e.g., in patients undergoing preoperative assessment for pneumonectomy, lung transplantation, or volume reduction or in patients undergoing follow-up evaluation after lung transplantation).

Rationale:
The particles of macroaggregated albumin (MAA) are too large (10-60 μ) to pass through the pulmonary capillaries (8 μ diameter). Thus, when injected intravenously, they are trapped in the pulmonary capillaries and precapillary arterioles, and their distribution is proportional to relative regional pulmonary blood flow.

Interfering Conditions: None.

Precautions: Theoretically, even transient blockage of additional pre-capillary arterioles by particles of MAA may worsen right heart function in patients with severe pulmonary hypertension. In practice, adverse reactions to MAA injection are extremely rare. Additionally, patients with an anatomic right-to-left shunt also are theoretically at increased risk due to systemic embolization of MAA particles. In practice, these micro-emboli have caused no clinically apparent adverse effect, even when they have been injected directly into coronary or cerebral arteries. These risks are minimized by limiting the total number of injected particles to a maximum of 600,000 particles.

Radiopharmaceutical: Tc-99m Macroaggregated Albumin (MAA)

Adult Dosage: 2.0 - 5.5 mCi (containing 200,000 - 600,000 particles) For perfusion studies performed without ventilation imaging or in conjunction with Xe-133 ventilation imaging, the standard dosage is 4.0 mCi. For perfusion studies performed following Tc-99m DTPA aerosol ventilation imaging, the standard dosage is 5.0 mCi. For perfusion studies performed in pregnant women, the suggested dosage is 2.0 - 4.0 mCi.

Pediatric Dosage: For perfusion studies performed without ventilation imaging or in conjunction with Xe-133 ventilation imaging, the standard dosage is 50 μCi/kg with a minimum dosage of 200 μCi and a minimum of 10,000 particles, and a maximum dosage of 4.0 mCi. For perfusion studies performed following Tc-99m DTPA aerosol ventilation imaging, the standard dosage is 62.5 μCi/kg with a minimum dosage of 500 μCi and a minimum of 10,000 particles, and a maximum dosage of 5.0 mCi.

Radiation Dosimetry: Adult (5.0 mCi). Critical organ (lung): 1.2 rem. Effective dose: 0.22 rem. Infant (1-year; 0.5 mCi). Critical organ (lung): 0.74 rem. Effective dose: 0.13 rem.

Route of Administration: Intravenous with patient lying supine.

Patient Scheduling: Requests for urgent pulmonary perfusion scintigraphy should be directed to a staff or resident physician, who should obtain relevant clinical history and the time and results of the patient's most recent chest radiograph.
Patient Preparation: None.


Patient Positioning: Supine or sitting.

Procedure: Begin with the posterior view and collect 600,000 counts. The remaining 5 views are done for the same time and should be acquired in the following order (right posterior oblique [RPO], right lateral [R Lat], left posterior oblique [LPO], left lateral [L Lat], and anterior [Ant]). If an image of the head is acquired (to evaluate for a right-to-left shunt), it should be acquired last.

<table>
<thead>
<tr>
<th>View</th>
<th>Analog (if available)</th>
<th>Digital</th>
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<tbody>
<tr>
<td>First view</td>
<td>Posterior preferred</td>
<td>Transparency film</td>
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<tr>
<td></td>
<td></td>
<td>Static acquisition, 256 x 256 word mode</td>
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<td>600,000 total counts</td>
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Remaining views (A) Acquire 5 views in the following order (RPO, R Lat, Ant, L Lat, and LPO). (B) For quantitative studies, an image of the head (anterior or posterior) should be acquired as the last view.

Items Required For Complete Study:

1. Six views as described above, or explanation (written on requisition) for limited number of views. An additional view of the head may be requested by the resident or staff physician for quantitative studies or if there is a question of a right-to-left heart shunting.
2. Label the study with the patient position (supine, prone, sitting, decubitus) during imaging.
3. When perfusion imaging is done in conjunction with aerosol imaging, label the study with the total counts and acquisition time for the first view.
4. Transfer of all digital images to the archival computer.
5. Check with resident or staff physician regarding the need to obtain existing chest radiograph or to order a new chest radiograph. For studies performed in the Division of Nuclear Medicine, this must be done before the patient is released.
6. When necessary, quantification will be performed by the nuclear medicine physician.