Tc-99m Pertechnetate Thyroid Scintigraphy

**Primary Indications:** Evaluation of thyroid morphology and global and/or regional function for purposes of: (1) distinguishing toxic nodular goiter from Graves' disease superimposed on a nodular thyroid gland; (2) diagnosing subacute thyroiditis; and (3) detecting ectopic thyroid tissue.

Use of thyroid scintigraphy for evaluating the function of a thyroid nodule to assess the likelihood of malignancy has largely been supplanted by fine-needle aspiration biopsy (FNA). However, Tc-99m thyroid scintigraphy may be helpful when the results of FNA are equivocal (although imaging with I-123 is generally preferred under most such circumstances). Determining if a thyroid gland is multi-nodular or assessing equivocal physical examination findings is generally better accomplished with ultrasonography (with no attendant radiation exposure to the patient) than with scintigraphy.

**Rationale:** Tc-99m pertechnetate (TcO4-) is a monovalent anion with ionic radius similar to that of iodide ion. It is accumulated within thyroid tissue by the active transport mechanism that normally accumulates iodide ion (iodide trapping). Unlike iodide ion, however, the pertechnetate ion is not further metabolized and thus does not undergo oxidation and binding to tyrosyl residues on thyroglobulin (organification).

**Interfering Conditions:** Thyroid hormone therapy and recent administration of iodide, iodinated contrast agents, or other iodine-containing drugs will lower the thyroidal accumulation of Tc-99m pertechnetate. Antithyroid drugs (propylthio-uracil or methimazole) do not interfere with the trapping of Tc-99m pertechnetate.

**Precautions:** None

**Radiopharmaceutical:** Tc-99m pertechnetate

**Adult Dosage:** 10 mCi

**Pediatric Dosage:** 140 uCi/kg with a minimum dosage of 1 mCi and a maximum dosage of 10 mCi.


**Route of Administration:** Intravenous
**Patient Scheduling:** Requests for thyroid scintigraphy may be submitted by the referring physician using the “Physician Request Form for Thyroid Imaging” (attached), which must be approved by a nuclear medicine attending physician before the study is scheduled. This is necessary to assess the indication for the study, to document that there are no interfering conditions/medications, and to determine whether the study is to be performed with Tc-99m pertechnetate or I-123. As an alternative, a telephone scheduling request for Thyroid Scintigraphy should be directed to a staff or resident physician, who should obtain all the required scheduling information, enter it on the “Physician Request Form for Thyroid Imaging”, and then notify a nuclear medicine registrar to schedule the study.

**Patient Preparation:** None

**Equipment Setup:** Gamma Camera: LFOV or SFOV  
Collimator: Pinhole collimator  
Energy Window: 140 keV with 20% window

**Patient Positioning:** Supine

**Procedure:** Begin imaging 15-20 minutes after injection of radiopharmaceutical. Prior to imaging, have the patient drink a glass of water to clear Tc-99m pertechnetate in saliva from the oropharynx and esophagus. Obtain an anterior view of the neck with the pinhole collimator centered over the thyroid region at a pinhole aperture-to-neck distance of 14.0 cm for 100K counts or 10 minutes, whichever requires less time. Obtain a second anterior view of the neck with the pinhole collimator centered over the thyroid region at a pinhole aperture-to-neck distance of 4.0 cm for 200K counts or 10 minutes, whichever requires less time. Ask physician to check images in order to determine if additional views are needed.

If requested, anterior oblique views should be performed with 20-30° angulation at a distance of 4.0 cm for 200K counts or 10 minutes, whichever requires less time. If images are obtained with a point-source or lead marker placed by physician over a palpable nodule, the pinhole aperture should always be centered over the marker, to prevent parallax error.

<table>
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<tr>
<th>View</th>
<th>Analog (if available)</th>
<th>Digital</th>
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<tr>
<td>Anterior (14 cm)</td>
<td>100K counts or 10 min, whichever requires less time</td>
<td>256 x 256 matrix, word mode</td>
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<tr>
<td>Anterior (4 cm)</td>
<td>200K counts or 10 min, whichever requires less time</td>
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</tr>
<tr>
<td>Obliques (4 cm)</td>
<td>200K counts or 10 min, whichever requires less time</td>
<td>256 x 256 matrix, word mode</td>
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**Items Required For Complete Study:**
1. Pinhole images at 14 and 4 cm pinhole-to-neck distances
2. Additional views, as requested by physician
3. Transfer of all digital images to archival computer.