

I-123 Thyroid Scintigraphy

Primary Indications:

Evaluation of thyroid morphology and global and/or regional function for purposes of: (1) detecting ectopic thyroid tissue, particularly substernal extension of a multinodular goiter (when the results of CT are not definitive) or true ectopic mediastinal thyroid tissue and (2) determining whether a functioning thyroid nodule seen on Tc99m pertechnetate scintigraphy is truly functioning or one with so-called “discordant” function. Because the use of thyroid scintigraphy for evaluating the function of a thyroid nodule to assess its likelihood of malignancy has largely been supplanted by fine-needle aspiration biopsy (FNA), I-123 thyroid scintigraphy should only rarely need to be performed for the latter reason. I-123 thyroid scintigraphy is occasionally used to assess the likelihood of malignancy in a nodule when FNA yields follicular cells.

Rationale:

Iodine, as iodide ion, is normally accumulated within thyroid follicular cells by an active transport mechanism (trapping) and is then oxidized and bound to tyrosyl residues on Thyroglobulin (organification); these are the initial steps in the synthesis of thyroid hormones. Radionuclides of iodine are handled in identical fashion, and this allows for the scintigraphic assessment of thyroid tissue.

The thyroid tissue/background uptake ratio achievable with radioiodine is much higher than that achievable with Tc99m pertechnetate, because the latter is trapped but not organified. As blood levels of Tc99m pertechnetate decrease with time after injection, the thyroidal tracer uptake also declines. By comparison, the organified fraction of radioiodine remains in the thyroid gland as blood levels fall. Hence, detection of thyroid tissue in regions with high blood-pool activity, such as the mediastinum, is easier on delayed radioiodine images than on Tc99m pertechnetate images.

Some thyroid nodules (both benign and malignant) retain the trapping function, but do not organify significant amounts of iodine. Thus, such nodules appear to be functioning (generally taken as an indicator of benignancy) on Tc99m pertechnetate images, when they are, in fact, hypofunctioning on radioiodine images (generally taken as indicator of malignancy).

Follicular adenoma and follicular carcinoma generally cannot be distinguished cytologically. If thyroid scintigraphy is requested to help make this distinction (based on the principle that a functioning nodule is likely to be an adenoma), the study should be performed with I-123 in order to avoid the problem with discordant nodular function discussed above.

Except for the detection of functioning thyroid carcinoma, I-123 is preferred to I-131 for thyroid imaging because of its much lower thyroidal radiation dose and better characteristics for imaging.

Interfering Conditions:	Antithyroid-drug (propylthiouracil or methimazole) therapy within 3 days of the test; thyroid hormone therapy; and recent administration of iodinated contrast agents or other iodine-containing drugs will lower the thyroidal uptake of radioactive iodine.
Precautions:	None
Radiopharmaceutical:	I-123 sodium iodide
Adult Dose:	200-400 uCi
Pediatric Dose:	3-6 uCi/kg with a minimum dose of 100 uCi (the smallest available capsules are 100 uCi)
Route of Administration:	Oral
Patient Preparation:	None
Equipment Setup:	Gamma camera: LFOV Collimator: Pinhole Energy window: 159 keV with a 20% window
Patient Positioning:	Supine
Procedure:	Perform imaging 4 hours after administration of radiopharmaceutical. Obtain an anterior view of the neck with the pinhole centered over the thyroid region at a pinhole-to-neck distance of 4.0 cm for 100k counts or 10 minutes, whichever requires less time. If requested, an anterior image of the neck and mediastinum should be obtained with a medium-energy-parallel-hole collimator for 200K counts or 10 minutes, whichever requires less time. If images are obtained with a point-source of lead marker

placed by the physician over a palpable nodule, the pinhole aperture should always be centered over the marker, to prevent parallax error.

View	Analog (if available)	Digital Data
Anterior pinhole (4cm)	100K counts or 10 minutes whichever requires less time	256 x 256 matrix word-mode
Oblique pinhole (4cm)	100K counts or 10 minutes whichever requires less time	256 x 256 matrix word-mode
Anterior mediastinum	200K counts or 10 minutes whichever requires less time	256 x 256 matrix word-mode

Reviewed & Revised: 11/06
Reviewed: 3/22/10