Thyroid Imaging/Uptake Scan

Updated 9/8/2024

- **Indications**
  - To assess the size and location of thyroid tissue (including ectopic thyroid tissue), differentiating true hyperthyroidism from other forms of thyrotoxicosis, function of nodules detected on clinical/imaging exams, evaluation of thyroid nodules with indeterminate FNA results, evaluation of multinodular goiter for hyperfunctioning "hot" thyroid nodules prior to radioiodine ablation and calculating iodine-131 activity needed for ablative therapy.
- **Radiopharmaceuticals:**
  - Option 1 - 200-400 microCi I-123 sodium iodine capsule administered by mouth
  - Option 2 - 2-10 mCi Tc-99m sodium pertechnetate administered IV
- **Patient Preparation:**
  - No specific preparation prior to radionuclide administration.
- **Conflicting Examinations/Medications:**
  - No Nuclear Medicine exams within the previous 24 hrs.
  - The following substances should be withheld (if possible) for the indicated time frames as they can interfere with the uptake of both radioiodine and Tc-99m pertechnetate:
    - IV CT contrast - 1-2 mths
    - levothyroxine (Synthroid) - 4 wks
    - liothyronine (Cytomel) - 2 wks
    - methimazole (Thiamazole) - 3-7 days
    - carbimazole - 3-7 days
    - propylthiouracil (PTU) - 3-7 days
    - amiodarone - 3-6 mths
    - iodine-containing medication/preparation - 4 wks
    - Lugol's / SSKI solution - 4-6 wks
    - perchlorate - 1 wk
    - kelp - 4 wks
- **Pregnancy/Lactation:**
  - Pregnancy testing is only needed in potentially pregnant patients who state they could be pregnant. See Pregnant, Potentially Pregnant and Lactating Patients policy for specifics.
  - Breast feeding mothers should discard breast milk for 4 days (I-123) or 24 hrs (Tc-99m) following administration.
- **Imaging Technique (for I-123):**
  - Collimator - low energy pinhole or high resolution parallel-hole
  - Photopeak - 159 keV 15% window for I-123
  - Image Preset Counts - 300k counts/image or 10 mins/image
  - Matrix Size - 128 x 128
  - Zoom - 1.5-3.0
  - Patient Positioning - supine
- **Imaging Views (for I-123):**
  - Obtain anterior, 30° RAO and 30° LAO images at 4-6 hrs. Use a sternal notch marker if necessary.
  - Determine RAIU percents at 4-6 hrs and 24 hrs by obtaining anterior images of the neck and mid thigh for 1 min each at distance of 20-30 cm, imaging a I-123 pill (same dose as given to patient) at distance of 20-30 cm and measuring background activity for 1 min.
- **Imaging Technique (for Tc-99m):**
  - Collimator - high resolution / LEAP
  - Photopeak - 140 keV 20% window for Tc-99m
  - Image Preset Counts - 300k counts/image or 10 mins/image
  - Matrix Size - 128 x 128
  - Zoom - 1.5-3.0
  - Patient Positioning - supine
- **Imaging Views (for Tc-99m):**
  - Obtain anterior, 30° RAO and 30° LAO images at 20 mins.

- **Notes:**
  - Both radioiodine and technetium are taken up by thyroid follicular cells, however only radioiodine undergoes organification.
  - Thyroid scintigraphy and RAIU determination are used to differentiate between productive thyrotoxicosis (true hyperthyroidism) versus destructive thyrotoxicosis (acute and subacute thyroiditis) and factitious thyrotoxicosis.
  - The common features of productive thyrotoxicosis (true hyperthyroidism) are diffuse thyroid overactivity with a homogeneous distribution of radiotracer, reduced uptake in major salivary glands and low background (consistent with Graves' disease); unifocal or multifocal overactive areas with reduced or suppressed uptake in the remaining thyroid tissue (consistent with autonomously functioning thyroid nodule) or multiple mixed areas of focal increased and suppressed uptake (consistent with toxic multinodular goiter).
  - Decreased uptake is typically observed in the early phases of destructive thyroiditis, factitious thyrotoxicosis or in the presence of exogenous iodine overload.
  - A hyperfunctioning "hot" thyroid nodule has a 96–99% negative predictive value for malignancy. These "hot" nodules should typically not undergo FNA due to the increased incidence of Bethesda III/IV results even when benign.
  - While most thyroid cancers are hypofunctioning "cold" nodules, up to 80-90% of "cold" nodules are benign.
  - Approximately 35% of Tc-99m sestamibi-avid and/or FDG-avid nodules are malignant, while nodules with low/absent uptake of either radionuclide have a very low risk of malignancy.
  - Normal RAIU reference ranges vary in different regions depending on iodine intake.
  - An RAIU >25% in an iodine-sufficient region and within the setting of clinical hyperthyroidism is compatible with thyroid hyperfunction.
  - Low RAIU values are present in destructive thyroiditis (injury phase), extrathyroidal source of thyroid hormone, exogenous thyroid hormone administration or after the administration of iodine-containing substances.
  - Elderly patients with hyperthyroidism may have a normal RAIU value.