



## **Austin Radiological Association**

### **Nuclear Medicine Procedure**

# **THYROID UPTAKE MEASUREMENT (I-123 or I-131 as Sodium Iodide)**

#### **Overview**

- The Thyroid Uptake Measurement measures the metabolic activity of the thyroid gland as reflected by its extraction of iodine from the blood.

#### **Indications**

- Diagnosis of Grave's disease.
- Evaluation of subacute and chronic thyroiditis.
- Abnormal thyroid lab work

#### **Examination Time**

- Initially: 15 minutes for radiopharmaceutical administration.
- Delayed measurement at 4 and 24 hours: 15 minutes.

#### **Patient Preparation**

- Must be off thyroid hormones:
  1. Thyroxine (T-4) for 4 – 6 weeks
  2. Triiodothyronine (T-3) for 2 weeks
- Must not be taking antithyroid medications:
  1. Propylthiouracil (PTU) and Tapazole for 3 - 5 days.
- Must not have had intravenous or intrathecal iodinated contrast material (CT with intravenous contrast, IVP, myelogram, angiogram) for at least 4 weeks.
- Other agents may interfere, but usually only to a small extent.
- NPO for at least 1 hour after ingesting the radiopharmaceutical.
- TSH and T4 panel results.

## Equipment & Energy Windows

- Detector: Uptake probe (single crystal probe with flat field collimator).
  - A gamma camera may be substituted for a dedicated uptake probe.
- Energy window:
  - I-123: 20% window centered at 159 keV.
  - I-131: 20% window centered at 364 keV.
- Neck phantom.

## Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical:
  - If performed as part of an I-123 imaging study: The same radiopharmaceutical is used for both studies
  - If not part of an I-123 imaging study: I-123 or I-131.
- Dose:
  - Imaging plus uptake studies: I-123: 190-270  $\mu\text{Ci}$  (7-10 MBq). Pedi dose by NACG chart.
  - Alternate uptake study only:
    - I-131: 10  $\mu\text{Ci}$  (0.37 MBq). Pedi dose by NACG chart.
- Technique of administration: Oral.

## Patient Position & Imaging Field

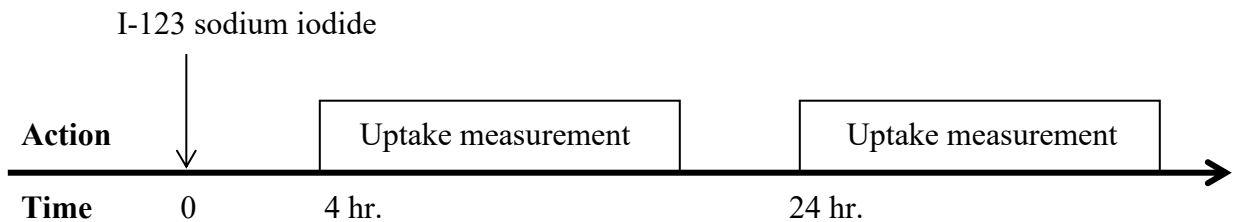
- Patient position: Sitting.
- Detector field of view: Neck and Thigh (for patient background counts)

## Acquisition Protocol

- Place radiopharmaceutical capsule(s) in neck phantom and position probe perpendicular to phantom with the positioning bar centered on capsule(s) at a standard distance, usually 24 cm.
- Acquire counts for 1 minute for I-123 and for 2 minutes for I-131; record the counts, time of acquisition, and time of day on the Thyroid Uptake Worksheet.
- Immediately administer the capsule(s) to the patient.
- At 4 and 24 hours, position the probe in front of the patient's neck with the positioning bar perpendicular to the neck and with the bar centered half way between the thyroid cartilage and the suprasternal notch.

- Acquire counts for 1 minute for I-123 and for 2 minutes for I-131; record the counts, time of acquisition, and time of day on the Worksheet.
- Position the probe over the thigh for “background” measurement. The positioning bar should be perpendicular to the thigh with the bar centered just above the knee. The patient should void before counting over the thigh and the bladder must be clearly outside of the field of view.
- Acquire counts for 1 minute for I-123 and for 2 minutes for I-131; record the counts, time of acquisition, and time of day on the Worksheet.

### Protocol Summary Diagram



### Data Processing

- Using the Thyroid Uptake Worksheet, calculate the 4 and 24 hour thyroid uptakes. Remember to correct the standard counts for decay.

### Optional Maneuvers

- Uptake measurement with a gamma camera: A gamma camera with a pinhole or parallel collimator may be substituted for an uptake probe.

### Method for timely correction of Data Analysis and reporting errors and notification of referring parties

- Data Analysis and reporting errors are reported to the interpreting physician and appropriate clinic manager for timely correction and notification of the referring physician via report addendum or STAT call if error is significant.

### Principle Radiation Emission Data - I-123

- Physical half-life = 13.2 hours.

| <u>Radiation</u> | <u>Mean % per disintegration</u> | <u>Mean energy (keV)</u> |
|------------------|----------------------------------|--------------------------|
| Gamma-2          | 83.3                             | 159.0                    |
| ce-K, gamma-2    | 13.6                             | 127.2                    |

### Dosimetry - I-123 as Sodium Iodide

| <u>Organ</u> | <u>rads/500 <math>\mu</math>Ci</u> | <u>mGy/18.5 MBq</u> |
|--------------|------------------------------------|---------------------|
| Thyroid      | 3.75                               | 37.5                |
| Stomach wall | 0.12                               | 1.2                 |
| Ovaries      | 0.02                               | 0.2                 |
| Red marrow   | 0.02                               | 0.2                 |
| Liver        | 0.01                               | 0.1                 |
| Whole body   | 0.01                               | 0.1                 |
| Testes       | 0.01                               | 0.1                 |

### Principle Radiation Emission Data - I-131

- Physical half-life = 8.04 days.

| <u>Radiation</u> | <u>Mean % per disintegration</u> | <u>Mean energy (keV)</u> |
|------------------|----------------------------------|--------------------------|
| Beta-4           | 89.4                             | 191.5                    |
| Gamma-14         | 81.2                             | 364.5                    |

### Dosimetry - I-131 as Sodium Iodide

| <u>Organ</u> | <u>rads/10 <math>\mu</math>Ci</u> | <u>mGy/0.37 MBq</u> |
|--------------|-----------------------------------|---------------------|
| Thyroid      | 13.00                             | 130.0               |
| Stomach wall | 0.01                              | 0.1                 |
| Total body   | 0.01                              | 0.1                 |
| Ovaries      | 0.01                              | 0.1                 |
| Testes       | 0.01                              | 0.1                 |

# THYROID UPTAKE WORKSHEET

## Nuclear Medicine Department

**Institution** \_\_\_\_\_

Name \_\_\_\_\_ ID \_\_\_\_\_ Age \_\_\_\_\_ Sex \_\_\_\_\_

Referring physician \_\_\_\_\_ Date \_\_\_\_\_

### Zero Hour (time \_\_\_\_\_)

|                            | counts per minute |
|----------------------------|-------------------|
| Dose in phantom (standard) |                   |
| Background                 | -                 |
| Net (standard)             |                   |

### 4 Hour Uptake (time \_\_\_\_\_)

|                    | counts per minute |
|--------------------|-------------------|
| Neck               |                   |
| Thigh (background) | -                 |
| Net                |                   |

|                         | counts per minute |
|-------------------------|-------------------|
| Standard at zero time   |                   |
| Decay correction factor | x 0.811           |
| Corrected standard      |                   |

4 hour uptake = (net neck cpm / corrected standard cpm) x 100% = \_\_\_\_\_%

### 24 Hour Uptake (time \_\_\_\_\_)

|                    | counts per minute |
|--------------------|-------------------|
| Neck               |                   |
| Thigh (background) | -                 |
| Net                |                   |

|                         | counts per minute |
|-------------------------|-------------------|
| Standard at zero time   |                   |
| Decay correction factor | x 0.284           |
| Corrected standard      |                   |

24 hour uptake = (net neck cpm / corrected standard cpm) x 100% = \_\_\_\_\_%

- Normal Range: 4 hours = 5 - 20%;      24 hours = 15-35%

Technologist \_\_\_\_\_