I-131 MIBG Scintigraphy

Primary Indications: Diagnosis or staging of pheochromocytoma and neuroblastoma.

Rationale: Meta-iodobenzylguanidine (MIBG) is an analog of norepinephrine and is taken up selectively by the adrenal medulla, the sympathetic autonomic nervous system, and tumors derived from these tissues. Uptake occurs chiefly via the energy-dependent type I amine uptake mechanism. Retention of MIBG within the intravesicular hormone storage compartment of cells in the adrenal medulla, and in pheochromocytomas and neuroblastomas permits their scintigraphic detection. MIBG can be labeled with either I-131 or I-123. Although it is more expensive, I-123 MIBG is the preferred radiopharmaceutical because it produces much better image quality with a lower radiation exposure.

**I-131 MIBG should be used only if I-123 MIBG is unavailable or if imaging is being done prior to planned therapy with I-131 MIBG, with a requirement for delayed imaging.**

Interfering Conditions: Many drugs interfere with uptake of MIBG, particularly tricyclic antide-pressants, sympathomimetics (e.g., pseudoephedrine), and certain anti-hypertensives (labetalol, reserpine, and calcium channel blockers). See attached tables entitled "Drugs Potentially Affecting MIBG Uptake" for a nearly comprehensive listing of drugs known or expected to interfere with MIBG uptake and of those without obvious effect on MIBG uptake.

Precautions MIBG is cleared primarily by the kidneys and is not dialyzable; it should not be used in anephric patients. The radiation dose to the thyroid gland should be minimized by blocking of thyroidal radiiodine uptake with stable iodine (see below). Use of I-131 MIBG should be avoided in pregnant and breast-feeding patients. Rare hypersensitivity reactions have been reported. The tracer should be injected slowly (over 1 minute) through a freely flowing venous angiocatheter, and the patient should be monitored for adverse reaction during and for 15 minutes after tracer administration. In patients with known or suspected pheochromocytoma, a blood pressure cuff and stethoscope should be available in case the patient becomes symptomatic and vital sign measurement is necessary.

Radiopharmaceutical: I-131 Iobenguane Sulfate (I-131 MIBG)

**Adult Dosage:** 0.5-1 mCi
In adults without known malignant tumors, a dosage of 0.5 mCi is recommended.

**Pediatric Dosage:** 14 μCi/kg
Minimum dosage - 0.135 mCi
Maximum dosage - 1 mCi
In children without known malignant tumors, a dosage of 7 μCi/kg, with a maximum dosage of 0.5 mCi, is recommended.

**Radiation Dosimetry:** Adult. (1 mCi dosage)
Critical organ (liver): 2.88 rem. Effective dose: 0.74 rem.
Infant (1-year; 0.135-mCi dosage)
Critical organ (liver): 2.5 rem. Effective dose: 0.48 rem.

**Route of Administration:** Intravenous, by slow injection over 60 seconds through a freely flowing venous angiocatheter. Particular care should be taken to avoid extravasation of the dose. A 250-mL bag of 0.9% saline solution should be connected to the intravenous line to confirm its patency, for flushing of the line after tracer injection, and for administration of fluids if required for adverse reaction to MIBG. The patient should be monitored for adverse reaction during and for 15 minutes after tracer administration.

**Patient Scheduling:** Requests for I-131 MIBG scintigraphy should be submitted by the referring physician using the “Physician Request for I-123 MIBG Imaging” form (attached), which must be approved by a nuclear medicine attending physician. At the time of scheduling, arrangements should be confirmed with referring physician (or physician’s staff) regarding: (1) withdrawal of interfering medications (and avoidance of such medications between time of scheduling and date of study); (2) if necessary, beta-HCG testing; (3) the patient has been given a prescription for SSKI, and (4) if necessary, scheduling of sedation. The staff nuclear medicine physician or technologist scheduling the study should notify the radiopharmacy that the study has been scheduled.

**Patient Preparation: For I-131 MIBG**
The nuclear medicine physician should write a prescription for SSKI on day 0.

**Day 0:** To block uptake of radiiodine by the patient's thyroid gland, the patient should receive SSKI (saturated solution of potassium iodide) 30-60 minutes before tracer administration.

**Day 1 and for 1 week following:** To block uptake of radiiodine by the patient's thyroid gland, the patient should receive an additional dosage of SSKI for 1 week following the imaging as described below.

**Adult Dosage:** The patient should receive 6 drops of SSKI p.o. 30-60 minutes before tracer administration and should take 2 drops of SSKI TID (three times a day) p.o. beginning on the morning of day 1 and continuing for 1 week following the injection.

**Pediatric Dosage:**
**Note:** Children who are of adult size (≥ 150 pounds) should take the full adult dosage, regardless of age.

<table>
<thead>
<tr>
<th>Age</th>
<th>SSKI Dosage</th>
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<tbody>
<tr>
<td>&lt;1 month</td>
<td>1 drop p.o. 30-60 minutes prior to injection of I-131 MIBG, then 1 drop p.o. on the morning of day 1 and daily for one week following the injection</td>
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<tr>
<td>1 month to 3 years</td>
<td>2 drops p.o. 30-60 minutes prior to injection of I-131 MIBG, then 1 drop p.o. BID (twice a day) beginning on the morning of day 1 and continuing for 1 week following the injection</td>
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3 to 18 years 3 drops p.o. 30-60 minutes prior to injection of I-131 MIBG, then 1 drop p.o. TID (three times a day) beginning on the morning of day 1 continuing for 1 week following the injection.

≥ 70 kg to adult 6 drop(s) given 30 – 60 minutes prior to injection of I-131 MIBG, then 2 drops p.o. TID (three times a day) beginning on the morning of day 1 continuing for 1 week following the injection.

**Interfering drugs** should be withdrawn for an appropriate period of time (tricyclic antidepressants - 4 weeks; other drugs - ≥ 6 half-lives).

A **negative pregnancy test** (preferably within 7 days) is desired in women of childbearing potential.

An **“MIBG ORDER” form** (attached) must be completed and finalized by a staff nuclear medicine physician before administration of the radiopharmaceutical.

**Equipment Setup:** Gamma Camera: Whole-body dual-detector camera with high-energy collimator capability
Collimator: High-energy
Energy Window: 364 keV with 20% window

**Patient Positioning:** Supine

**Procedure:** **Pediatric Imaging (patient is less than approximately 60 pounds)** The patient should void prior to imaging. Anterior and posterior, overlapping, spot images covering the area from the head to toe are obtained. The acquisition time should be 20 minutes per image. Images are routinely obtained at 48 hours. Further delayed images may be requested by the nuclear medicine physician.

**Adult Imaging** The patient should void prior to imaging. Anterior and posterior whole body images at a scan speed of 4 cm/min are obtained. Images are routinely obtained at 48 hours. Further delayed images may be requested by the nuclear medicine physician.

<table>
<thead>
<tr>
<th>View</th>
<th>Analog (if available)</th>
<th>Digital</th>
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<tbody>
<tr>
<td>Adult whole body images</td>
<td>Anterior and posterior images from head to toe.</td>
<td>4 cm/min scan speed</td>
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<tr>
<td></td>
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<td>Philips cameras: Hi Res 16 deep matrix</td>
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<td></td>
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<td>Siemens cameras: 256 x 1024 matrix, word mode</td>
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<tr>
<td>Spot images 20 minutes/view</td>
<td>Anterior and posterior images from head to toe.</td>
<td>256 x 256 matrix, word mode.</td>
</tr>
</tbody>
</table>
Additional spot images 20 minutes/view Views as directed by physician 256 x 256 matrix, word mode

Items Required For Complete Study:

1. 48-hour whole body or spot images.

2. Additional spot images or further delayed images. If these have not already been requested, technologist should confirm that none are needed.

3. Transfer of all digital images to work station