Austin Radiological Association

Nuclear Medicine Procedure

NEUROECTODERMAL/NOREPINEPHRINE STUDY (I-123-MIBG, I-131-MIBG)

Overview

- The Neuroectodermal / Norepinephrine Study is used primarily to image tumors that arise from the embryologic neural crest. Metaiodobenzylguanidine (MIBG) is an analog of norepinephrine and is taken up by the adrenergic nervous system of tissues that are derived from the neural crest.

Indications

- Identification and localization of tumors of neuroectodermal tissues:
  1. Benign and malignant, intraadrenal and extraadrenal pheochromocytomas.
  2. Neuroblastomas.
  3. Carcinoid tumors.
  4. Medullary thyroid tumors.
  5. Paragangliomas.
  6. Chemodectomas.

- Evaluation of myocardial norepinephrine receptors.

Examination Time

- Initially: 15 minutes for injection of the radiopharmaceutical.

- Delayed images at 24 hours for I-123:
  90 minutes for standard planar images and SPECT/CT.
  (Additional delayed images may be useful with I-131-MIBG.)

Patient Preparation

- Drugs to be avoided prior to study (trade names in parenthesis) – ideally, no medications 2 – 3 weeks before the examination:
  1. Tricyclic antidepressants and related drugs - should avoid for 1 - 3 weeks, based on specific medication, prior to the study:
     a) amitriptyline & derivatives (Elavil, Endep, Etrafon, Triavil, Amitril, Emitrip, Enovil).
     b) amoxapin (Asendin).
     c) loxapin.
     d) doxepin (Adapin, Sinequan).
     e) imipramine & derivatives (Tofranil, Imavate, Janimine, Presamine, SK-Pramine, Tipramine).

2. Anti-hypertensives - should avoid for 2 weeks prior to the study:
    a) labetalol (Normodyne, Trandate).
    b) calcium channel blockers.
    c) reserpine (Serpasil, Sandril).
3. Sympathetic-amines - should avoid for 2 weeks prior to the study:
    a) pseudoephedrine (Halofed, Sudafed, Sudrin, others).
    b) phenylpropalamine HCL (Propagest, Sucrets Cold Decongestant, Entex, others).
    c) phenylephrine HCL (Neo-Synephrine, Alconefrin, Rhinail, others).
    d) ephedrine.
    e) amphetamines
    f) bretylium tosylate
    g) guanethidine
    h) haloperidol
    i) phenothiazine
    j) reserpine
    k) thiothixene
4. Cocaine - should avoid at all times and for 2 weeks prior to the study.

- 1 drop of saturated solution of potassium iodide is given orally 3 times a day, for a total of 4 days, beginning the day before injection of the radiopharmaceutical or substitute iOSAT tablets (130 mg) one per day for same 4 days.

- A mild laxative, e.g. Bisacodyl, beginning three days prior to the day of injection of the radiopharmaceutical and including the day of injection for a total of 4 doses. A dose is 10mg (2-5mg tabs).

Equipment & Energy Windows

- Gamma camera: Large field of view.

- Collimator:
    - I-123-MIBG: Low energy, parallel hole.
    - I-131-MIBG: High energy, parallel hole.

- Energy window:
    - I-123-MIBG: 20% window centered at 159 keV.
    - I-131-MIBG: 20% window centered at 364 keV.

Radiopharmaceutical, Dose, & Technique of Administration

- Radiopharmaceutical:
    - I-123-MIBG (I-123-metaiodobenzylguanidine).
    - I-131-MIBG.

- Dose:
    - I-123-MIBG: 10 mCi (370 MBq). Pedi dose by NACG chart.
    - I-131-MIBG: 1 mCi (37 MBq). Pedi dose by NACG chart.

- Technique of administration: Intravenous injection over 30 seconds into placed in-dwelling I.V. catheter

Patient Position & Imaging Field

- Patient position: Supine.
- Imaging field: Head to below pelvis.

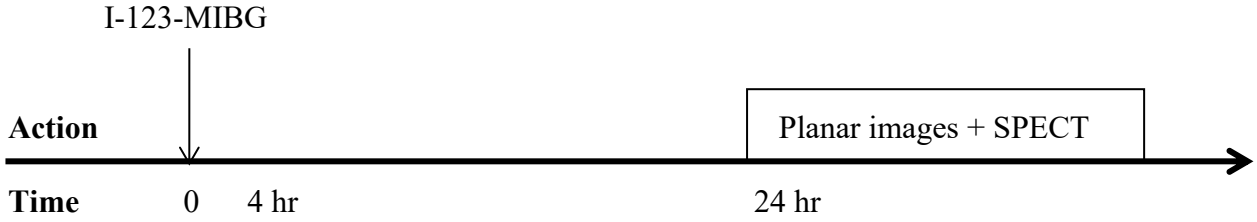
Acquisition Protocol

- For I-131 MIBG: At 24 and 48 hours acquire ANT and POST images of the neck, chest, abdomen, and pelvis.
  - Whole body technique with a scan rate of 6 cm/min
  - Optional: Overlapping static images with 5-10 minute acquisition times.

  For I-123 MIBG: At 24 hours acquire ANT and POST images of the neck, chest, abdomen and pelvis
  - Whole body technique with a scan rate of 6-8 cm/min
  - Optional: Overlapping static images with 5-10 minute acquisition times.

- I-123-MIBG: SPECT/CT images at 24 hours with dual-head camera:
  1. Degrees of rotation: 180°.
  2. Number of images: 60
  3. Time per image: 30 seconds per azimuth

Protocol Summary Diagram



Data Processing

- SPECT images in three planes

Optional Maneuvers

- Intraoperative localization of pheochromocytomas: Performed with a hand held probe and I-123-MIBG.
- Post I-131-MIBG therapy imaging: Improved accuracy may be obtained by imaging 5-10 days after a therapeutic dose of I-131-MIBG.

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.

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

Principle Radiation Emission Data - I-131

- Physical half-life = 8.04 days.

Radiation	Mean % per disintegration	Mean energy (keV)
Beta-4	89.4	191.5
Gamma-14	81.2	364.5

Dosimetry - I-123-MIBG

Organ	rads/10 mCi	mGy/370 MBq
Thyroid (unblocked)	20.70	207.0
Bladder	2.37	23.7
Adrenals	1.37	13.7
Ovaries	1.18	11.8
Spleen	1.11	11.1
Total body	0.53	5.3
Liver	0.44	4.4
Testes	0.37	3.7
Total body	0.53	5.3

Dosimetry - I-131-MIBG

Organ	rads/1 mCi	mGy/37 MBq
Thyroid (unblocked)	34.00	340.0
Adrenals	4.80	48.0
Bladder	2.80	28.0
Spleen	1.55	15.5
Ovaries	1.18	11.8
Total body	0.89	8.9
Testes	0.70	7.0
Liver	0.44	4.4