

# **PROSTATE CANCER STUDY**

## **(In-111-Capromab Pentetide [ProstaScint®])**

### **Overview**

- The Prostate Cancer Study with an indium-111 labeled murine monoclonal whole antibody seeks to image recurrent prostate cancer, particularly in the retroperitoneal nodes of the abdomen and pelvis. In-111-capromab pentetide binds to the prostate specific membrane antigen which is expressed by prostate cancer and benign prostatic hypertrophy, but not by other cancers (1).

### **Indications**

- Detection of pelvic metastases in patients with newly diagnosed biopsy proven prostate cancer thought to be clinically localized after standard diagnostic evaluation, but who are thought to be at high risk for metastases (1,2).
- Detection of metastases in patients who have undergone prostatectomy and have a rising prostatic specific antigen level (PSA) and negative or equivocal standard metastatic evaluation (1,3,4).

### **Examination Time (1)**

- Initially: 15 minutes for explaining the procedure to the patient and for injection of the radiopharmaceutical
- Early imaging 30 minutes after injection: 30 minutes for SPECT of the pelvis for delineation of the vascular space anatomy.
- Late imaging at 3-5 days: 1 hour for planar and SPECT imaging. (Additional delayed images may be needed.)

### **Patient Preparation (1)**

- Determine if the patient has previously been injected with murine (mouse) antibody-based products. If so, this is a relative contraindication; consult the nuclear medicine physician.
- Determine if the patient has a history of hypersensitivity to murine proteins. A hypersensitivity represents a contraindication.
- Explain to the patient that ProstaScint is a foreign (mouse) protein and that:
  1. There is an approximately 8 % chance of inducing human anti-murine antibodies (HAMA). HAMA may interfere with subsequent murine-

antibody based diagnostic tests and therapeutic agents. In approximately 50% of patients who do develop HAMA, the blood HAMA levels return to normal in 4-12 months.

2. There is a 5% chance of having a mild limited reaction with injection site reaction being the most common (see table below) at the time of injection; severe reactions are rare.

- The patient should void completely before each imaging session including between planar and SPECT acquisitions.
- A cleansing cathartic and/or enema should be given before the delayed imaging.

### Equipment & Energy Windows

- Gamma camera: Large field of view with SPECT capability, preferably with opposing dual heads.
- Collimator: Medium (or high) energy, parallel hole.
- Energy windows:
  - θ One pulse height analyzer: 156 to 272 keV.
  - θ Two pulse height analyzers: 20% windows centered at 171 and 245 keV.
- Computer with SPECT software.

### Radiopharmaceutical, Dose, Technique of Administration, & Acute Adverse Reactions

- Radiopharmaceutical: In-111-capromab pendetide (ProstaScint®) (1).
- Dose: 5 mCi (185 MBq) (2).
- Technique of administration: Inject intravenously over 5 minutes (2).
- Acute adverse reactions (1).

Reaction	Frequency (%)	Reference
Any reaction	4	1
Bilirubinemia	1	1
Hypotension	1	1
Hypertension	1	1
Injection site reaction	< 1	1
Alkaline phosphatase increased	< 1	1
Pruritis	< 1	1
Fever	< 1	1
Rash	< 1	1
Asthenia	< 1	1
Headache	< 1	1

Myalgia	< 1	1
Hyperkalemia	< 1	1

### Patient Position & Imaging Field

- Patient position: Supine.
- Imaging field: Chest, abdomen, and pelvis.

### Acquisition Protocol (1)

- Acquire SPECT images of the pelvis at 30 minutes after injection to serve as reference images of the pelvic blood pool anatomy.
- Acquire delayed planar images of the chest, abdomen, and pelvis at approximately 3-5 days:
  - θ Moving acquisition protocol: Acquire ANT and POST images using a camera/table motion of approximately 5-10 cm/min.
  - θ Static acquisition protocol: Acquire ANT and POST images for approximately 5-10 minutes each.
- Acquire SPECT images of the pelvis at 3-5 days:
  1. Image acquisition parameters:
    - a) degrees of rotation: 360°.
    - b) number of images: 64.
    - c) time per image: 30 seconds (longer with multiple heads).
- Further delayed imaging, usually at 24 hour intervals, may be needed to differentiate normal colonic activity from lesions in the abdomen and pelvis.
- It is essential to have a recent computed tomographic study of the abdomen and pelvis for correlation.

### Protocol Summary Diagram



## Data Processing

- SPECT image reconstruction:
  1. The exact procedure for processing SPECT images depends on the computer software being used. This varies with the manufacturer and, in general, the manufacturer's protocol should be followed.
  2. The reconstruction process in general terms is:
    - a) correct the 64 planar images for uniformity (camera non-uniformity) using a high count, e.g. 30 million count, cobalt-57 flood acquisition.
    - b) check the images for patient motion and apply a motion correction algorithm if indicated and if available.
    - c) if the entire field of view is not of interest, indicate the region that is of interest to conserve computer time during reconstruction.
    - d) specify the filters to be used in the reconstruction process and the pixel thickness of the tomogram (usually 1 or 2 pixels).
    - e) reconstruct transverse, sagittal, and coronal image.

## Optional Maneuvers

- Computed tomography and SPECT image fusion: May be accomplished by adding external fiducials to both studies (5).
- Dual isotope imaging: Prostate cancer and the blood pool can be imaged simultaneously resulting in perfect coregistration and a single acquisition (6).
- Intraoperative probes: Tumor deposits may be localized intraoperatively with hand held probes (7).

## Principle Radiation Emission Data - In-111 (8)

- Physical half-life = 2.83 days.

<u>Radiation</u>	<u>Mean % per disintegration</u>	<u>Mean energy (keV)</u>
Gamma-2	90.2	171.3
Gamma-3	94.0	245.3

## Dosimetry - Capromab Pendetide (9)

<u>Organ</u>	<u>rads/5 mCi</u>	<u>mGy/185 MBq</u>
Liver	18.5	185.0
Spleen	16.3	163.0

Kidney	12.4	124.0
Heart wall	7.8	77.7
Lower large intestine	7.6	75.9
Gallbladder wall	7.2	72.1
Lungs	5.7	57.4
Testes	5.6	55.5
Red marrow	4.3	42.5
Whole body	2.6	25.9

## References

1. ProstaScint V Kit (capromab pendetide): Package insert. Cytogen Corporation, Princeton, NJ, November, 1996.
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4. Haseman MK, Reed RN: ProstaScint imaging: Selection of patients with recurrent prostate cancer for salvage radiation therapy. Radiology 201P:300, 1996.
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8. 49-In-111: In MIRD: Radionuclide Data and Decay Schemes, DA Weber, KF Eckerman, AT Dillman, JC Ryman, eds, Society of Nuclear Medicine, New York, 1989, pp 196-197.
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### Normal Findings

- > ProstaScint V Kit (capromab pendetide): Package insert. Cytogen Corporation, Princeton, NJ, November, 1996.
- > Wright GL, Haley C, Beckett ML, et al: Expression of prostate-specific membrane antigen in normal, benign, and malignant prostate tissues. Urol Oncol 1:18-28, 1995.