# Prostatic Tumor Imaging

**Primary Indications:** Localization of primary, recurrent, or metastatic adenocarcinoma of the prostate. The test is most often employed (1) before initial therapy in men whose clinical staging data suggest a high likelihood of regional nodal metastasis; and (2) in men who have undergone prostatectomy or pelvic irradiation as primary therapy and now have suspected recurrent or metastatic disease evidenced by a rising blood level of prostate-specific antigen (PSA).

**Rationale:** In-111 capromab pendetide is a radiolabeled murine $IgG_{1K}$ monoclonal antibody (7E11-C5.3) directed against a glycoprotein, prostate-specific membrane antigen (PMSA), expressed by prostate epithelium. This antigen is also expressed in over 95% of primary and metastatic Prostatic adenocarcinomas, and uptake of the radiopharmaceutical in tumor foci allows for the detection by scintigraphy.

**Interfering Conditions:** Barium sulfate in the bowel from concurrent gastrointestinal radiography or CT scan may obscure sites of tracer uptake in the abdomen or pelvis. In patients who have previously undergone imaging or therapy with murine monoclonal antibodies, human anti-mouse antibody (HAMA) may be present. This can cause agglutination of the agent in the plasma, increasing non-specific uptake in the liver and decreasing uptake in tumor.

**Contraindications:** Known hypersensitivity to In-111 capromab pendetide or any other product of murine origin.

**Precautions:** In-111 capromab pendetide is a murine monoclonal antibody. It has been shown to induce HAMA in about 10% of patients after a single infusion and in about 20 % after repeat infusions (at low levels in the vast majority of these patients). Thus, if the patient has had previous exposure to this or other murine antibodies, the blood HAMA level should be measured before injection of the radiopharmaceutical. If it is greater than 100ng/mL, the test should not be performed. Elevated HAMA is of potential diagnostic significance for two reasons. First, it can complex with the radiolabeled monoclonal antibody and alter its Biodistribution (as noted above), thus changing the sensitivity and/or specificity of the test. Second, the

presence of HAMA can interfere with some antibody-based immunoassays; hence, assays unaffected by HAMA or resistant to its effects should be considered in patients who have received this or other murine antibodies.
Because this antibody is a foreign protein, the possibility of reactions to it must be anticipated, although there are no reported cases of anaphylactic reactions. Hypotension, (as well as transient hypertension), fever, chills, and tachycardia have been reported rarely. Intravenous fluids should be running and blood pressure and pulse should be monitored during infusion of the radiopharmaceutical. The radiopharmaceutical should be infused slowly over 5 minutes.

**If anaphylaxis develops during injection of In-111 capromab pendetide, the injection should be discontinued immediately. The patient should receive prompt treatment with 0.3-0.5 ml of 1:1000 epinephrine subcutaneously if there is any sign of airway obstruction.**

**Radiopharmaceutical:** In-111 capromab pendetide (ProstaScint®)
Tc-99m *in vitro* labeled red blood cells

**Adult Dose:** 4-6 mCi In-111 capromab pendetide
4-6 mCi Tc-99m *in vitro* labeled red blood cells

**Route of Administration:** Intravenous. A secure intravenous infusion catheter should be placed and an infusion of normal saline solution started. Unimpeded flow of saline solution and the absence of extravasation must be confirmed before injection of both radiopharmaceuticals.

**Patient Scheduling:** Telephone scheduling requests for prostate tumor imaging should be directed to the staff or resident physician, who should obtain all required scheduling information. On the day of radiopharmaceutical injection (day 1), 1 hour should be allotted for the infusion. On the standard day of tumor imaging (day 5), approximately 3 hours are needed to complete the study.

**Patient Preparation:** None is necessary on or before day 1 (the day of radiopharmaceutical injection). On day 4 (the day prior to tumor imaging), and at breakfast the day of the examination, the patient should restrict food intake to a

liquid diet. On the afternoon of day 4, the patient should take a cathartic (one bottle magnesium citrate, or two bisacodyl [Dulcolax®] tablets if patient is unable to tolerate magnesium citrate). These preparatory steps are necessary because tracer is excreted into the bowel and this can obscure uptake in tumor foci.

**Equipment Setup:**

Gamma camera: LFOV (Dual-head)
Collimator: medium-energy parallel-hole collimator
Energy Window:
Before injection of Tc-99m red cells-- 172 keV with 20% window and 247 keV with 20% window
After injection of Tc-99m red cells—140 keV with 10% window, 172 keV with 10% window, and 247 keV with 20% window

**Patient Positioning:**

Supine with support under knees to minimize back discomfort.

**Procedure:**

On day 1, the radiolabeled antibody is infused as described above. No images are obtained on day 1.

On day 5, blood is withdrawn for *in vitro* labeling of the patient's red blood cells, and anterior and posterior planar images, each of 10-minute duration, are obtained of the thorax, abdomen, and pelvis. It is essential to ensure that the entire pelvis is included in these images. Then, SPECT imaging of the upper abdomen (liver at the top of the field) is routinely performed. The Tc-99m red cells are then re-injected and a **dual-energy** SPECT study of the pelvis is performed. At the discretion of the nuclear medicine physician, additional SPECT and/or planar images may need to be obtained on subsequent days.

| View | Digital Acquisition | Digital Processing/Display |
|---|---|---|
| **Anterior and Posterior Planar Images** | 256 x 256 matrix, word-mode<br>Acquisition time 10 min (day 5)<br>And 15 min (day 6 or later) | |
| **SPECT Images** | 128 x 128 matrix, word mode<br>No magnification<br>Day 5, 90 stops: 60 sec/stop | Reconstruct entire volume<br>No attenuation correction<br>Butterworth filter (cutoff frequency 0.8 cycles/cm; order 10) on acquisition computer |

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**Items Required for Complete Study:**

1. Film of planar images
2. Processed SPECT images for both In-111 and Tc-99m, with films of coronal and transverse data sets. Sagittal data set to be filmed only at direction of nuclear medicine physician.
3. Transfer of all digital data to workstation.

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