MIBG Imaging and Radionuclide Therapy

What is MIBG Imaging and MIBG radionuclide therapy and how does it work?

MIBG imaging and MIBG radionuclide therapy are procedures used to detect and treat specific types of cancer.

A small amount of radioactive material, called a radionuclide, is attached to a cell-targeting molecule called metaiodobenzylguanidine (MIBG). Radioactive iodine (either Iodine-131 or Iodine-123) is the radionuclide that is attached to MIBG. When the radioactive iodine is attached to MIBG, the radioactivity can be used to image tumors or to treat tumors.

**MIBG imaging** is used to detect tumors that come from hormone-producing neuroendocrine cells. Once injected into the patient's bloodstream, the drug travels to and enters neuroendocrine cells. A special imaging machine called a gamma camera is then used to take pictures of the body showing where the radioactive MIBG is located in the body. This procedure helps doctors find and diagnose neuroendocrine tumors.

**MIBG radionuclide therapy** is a radioactive cancer therapy being used to treat certain neuroendocrine tumors, including neuroblastoma, pheochromocytoma, and paraganglioma. For this treatment, MIBG is attached to I-131. It is injected into the patient's bloodstream and travels to the tumor cells, where it delivers a targeted high dose of radiation to kill the tumor. It is currently FDA approved for clinical use in the treatment of pheochromocytomas and paragangliomas, and it is currently used in clinical trials for the treatment of neuroblastomas.

What conditions are imaged and treated with MIBG?

**MIBG scans** are used to detect and diagnose neuroendocrine tumors including neuroblastoma, pheochromocytoma and paraganglioma. Neuroblastoma most commonly occurs in infants, but it also occasionally occurs in teen-agers and young adults. Pheochromocytomas are tumors of the adrenal gland that sometimes spread to other parts of the body. Paragangliomas are similar to pheochromocytomas, but these tumors do not start in the adrenal gland.

**I-131 MIBG radionuclide therapy** is used to treat neuroblastoma that has either relapsed or has not responded to initial treatment. Pheochromocytomas and paragangliomas can also be treated with I-131 MIBG. Not all neuroendocrine tumors take up the radioactive MIBG, and as a result, I-123 MIBG scan is performed first to confirm that the patient's neuroendocrine tumor can be treated with I-131 MIBG.

How is MIBG scan performed?

MIBG scan is usually a two-part outpatient procedure that begins with injection of I-123 MIBG into the bloodstream.

One day later, after the radioactive MIBG has traveled throughout the body, a gamma camera is used to take pictures of the body.

Children occasionally may need to be sedated for this procedure to ensure they remain still. MIBG imaging may not be suitable for pregnant women. Prior to undergoing an MIBG scan, patients are given non-radioactive iodine to limit uptake of MIBG or radioactive iodine in the thyroid gland.
How is MIBG radionuclide therapy performed?
I-131 MIBG radiotherapy is an inpatient procedure that lasts approximately five days. On the first day, the patient receives an intravenous infusion of the I-131 MIBG solution which usually takes 90 minutes to infuse. During the rest of the hospital stay, the patient will follow radiation safety precautions to limit contact with other people and decrease radiation exposure to other people while the radiation is being removed from the body, mostly through urine. The patient returns home once the amount of radioactivity in the body has reached a safe level for the patient to be around other people.

What are the potential advantages of MIBG imaging and MIBG radionuclide therapy?
MIBG scans: In addition to helping your doctor find or confirm the presence of a neuroendocrine tumor, MIBG scan examines the whole body and can help determine if the cancer has spread to other parts of the body. The scan can also help determine if your cancer therapy is working.
MIBG radionuclide therapy: This treatment is able to target neuroendocrine tumors and is highly selective in damaging cancer cells while limiting radiation exposure to healthy tissue. As a result, I-131 MIBG it is not painful and has limited side effects.

Is it safe?
MIBG imaging is safe. It has been used in patients for over thirty years.
All therapies, including MIBG radionuclide therapy, have side effects and risks. You should discuss the risks and benefits of MIBG radionuclide therapy or any other therapy you are considering with your doctor. Your doctor will help you determine whether this therapy is right for you. Please make sure to tell your provider about any prior therapies you have received, as this can affect treatment.

Radiation safety precautions
Following an MIBG scan, the radioactive MIBG quickly loses its radioactivity and is removed from the body through the urine and stool. It typically takes a few days for the MIBG to be completely removed from the body. Drinking fluids after the scan helps to flush out the radioactive MIBG from the body. Due to low level of radioactivity, no radiation safety precautions have to be followed after an I-123 MIBG scan.
Due to higher amounts of radioactivity, MIBG radionuclide therapy is always performed while the patient is admitted to hospital and special radiation safety precautions are taken during the hospital stay. Patients are sent home once the amount of radioactivity in the body has reached a safe level. Any additional instructions will be provided to the patient at the time of discharge from the hospital.
Radiation detection devices used at airports, train stations, tunnels, border crossings and government buildings may detect radioactivity in patients after MIBG scan or MIBG radionuclide therapy. You will be given a discharge form/letter from the hospital which documents the radioactive procedure you received. You will be instructed on how long you need to carry the discharge form/letter with you.
In addition, trash stained with urine, sweat or blood may trigger radiation alarms at waste disposal sites. Ask your doctor for advice on how to safely dispose of these items.
Are MIBG procedures covered by insurance?

MIBG scans are approved by the FDA and covered by insurance. MIBG therapy for pheochromocytomas and paragangliomas is now FDA approved and covered by insurance. MIBG radionuclide therapy for neuroblastomas is currently available only through clinical trials, and it is covered by insurance on a case-by-case basis.

About SNMMI

The Society of Nuclear Medicine (SNMMI) is an international scientific and medical organization dedicated to raising public awareness about nuclear and molecular imaging and therapy and how they can help provide patients with the best health care possible. With more than 18,000 members, SNMMI has been a leader in unifying, advancing and optimizing nuclear medicine and molecular imaging since 1954.

The material presented in this pamphlet is for informational purposes only and is not intended as a substitute for discussions between you and your physician. Be sure to consult with your physician or the nuclear medicine department where the treatment will be performed if you want more information about this or other nuclear medicine procedures.