

## **Omega Hospitals Health Care expertise**

Omega Hospitals Health Care is one of the first health care providers in Twin States to offer this leading-edge imaging technology to patients. Because of the increased detail of PET/MRI scans, only the most expert radiologists and nuclear medicine physicians can accurately interpret these images. Our radiologists and nuclear medicine physicians are nationally recognized as leaders in their field. They are often asked by their peers to give second opinions on tests performed outside of Telangana.

Your doctor has recommended that you have a PET/MRI (positron emission tomography/magnetic resonance imaging) scan. PET/MRI combines the functional imaging of PET with the anatomic imaging of MRI for exceptional image quality. PET/MRI is used to analyse a variety of cancers, as well as various neurological and cardiac conditions.

Our team of specialized doctors, nurses and technologists is led by Dr. Ch. Mohana Vamsy and chief of Nuclear Medicine.

## **AI enabled Digital PET MRI Scan**

A PET/MRI scan is a two-in-one test that combines images from a positron emission tomography (PET) scan and a magnetic resonance imaging (MRI) scan. This new hybrid technology harnesses the strengths of PET and MRI to produce some of the most highly detailed pictures of the inside of your body currently available. Doctors use those pictures to diagnose medical conditions and plan their treatment. For example, PET/MRI scans of the brain are useful in the care of Alzheimer's disease, epilepsy, and brain tumors.

Combines enhanced morphological information and superior soft tissue contrast of MRI with the highest molecular sensitivity and accurate quantification of PET.

Simultaneous positron emission tomography and MRI (PET/MRI) is a technology that combines the anatomic and quantitative strengths of MR imaging with physiologic information obtained from PET. PET and computed tomography (PET/CT) performed in a single scanning session is an established technology already in widespread and accepted use worldwide. Given the higher cost and complexity of operating and interpreting the studies obtained on a PET/MRI system, there has been question as to which patients would benefit most from imaging with PET/MRI versus PET/CT.

Combined PET and MRI is an emerging technology that aims to capitalize on the inherent advantages of MRI, including increased soft tissue contrast and lack of ionizing radiation exposure.

Advantages of PET/MRI, which include decreased radiation dose, improved motion correction, and the convenience of a combined exam

### **How do PET/MRI scans work?**

MRI scans use a strong magnetic field to produce detailed images of internal structures of the body. They can also provide information about how well these structures are functioning.

PET scans use tracers to highlight abnormalities that indicate disease.

Until now, scientists could not integrate PET and MRI for simultaneous scanning because MRI's powerful magnets interfered with the imaging detectors on the PET scanner.

PET and MRI scans have been conducted separately, and the separate images later merged. That merger, however, requires a complex computer process. At Omega Hospitals, our newly-available Digital PET/MRI scanner can perform both types of scans at the same time to gather more information than merged PET and MRI scans.

### **Benefits of PET/MRI scans**

There are major benefits to PET/MRI scans:

- **More accurate diagnosis and treatment options:** PET/MRI scans of the brain can detect abnormal findings that PET/CT misses in more than 50% of patients scanned.
- **Improved safety from significantly reduced radiation exposure:** Compared to PET/CT scans, PET/MRI exposes patients to about 85% less radiation.
- **Convenience of two scans in one:** PET/MRI eliminates the need for separate appointments.

PET/MRI • Improved soft tissue contrast

- Added value of DWI
- Increased available time to collect PET data
- Better motion correction
- Convenience and time savings with combined exams
- Use of MRI specific contrast agents
- No ionizing radiation from MRI component

## **Before Your Exam**

- It is very important to follow all preparation instructions below to ensure the best image quality.
- If you are diabetic or have cardiac sarcoidosis, please call 9849022121 to discuss important information about diet and medication.
- If you have any of the following, please call your doctor to discuss whether you should proceed with the exam: any metal implants, claustrophobia or pain when lying in a scanner, are pregnant or may be pregnant.
- If your doctor gave you an order, please bring it with you.
- If you have any questions, please call Nuclear Medicine at 9849022121.

## **48 Hours Before Your Exam**

- Refrain from all strenuous exercise or deep-tissue massage.

## **24 Hours Before Your Exam**

- Strictly follow the low-carbohydrate, no-sugar diet below.

- Hydrate by drinking plenty of water, unless restricted.
- If you are having a brain PET scan, avoid foods and beverages with caffeine (including decaffeinated drinks).

### **Day of Your Exam**

- Starting six hours before your scan, it is very important that you do not eat, drink (except water) or chew gum or mints (including sugar-free). Continue to stay hydrated by drinking water.
- Continue taking any regular prescribed medications unless instructed not to do so.
- Wear warm, comfortable, loose-fitting clothing with minimal metal and avoid wearing jewellery.
- Bring a list of your current medications with you.

### **During Your Exam**

- Please be sure to arrive at your specified check-in time, as this exam uses time-sensitive procedures and may need to be rescheduled if you do not arrive on time.
- The duration of your exam will vary, but please plan to be at the imaging centre for about three hours. Due to the nature of the exam, children and pregnant women are not allowed to accompany patients in the exam or waiting areas.
- You will be transported to the nearby PET/MRI imaging facility for your exam.
- An IV line will be placed to administer the radioactive glucose (FDG) and will remain in place until the scan is completed. Commonly, contrast is injected to better define the images of the body. If your MRI requires contrast, it will be given through the same IV that was placed for the FDG.
- The FDG will be given and must circulate for about 60 to 90 minutes before your scan can begin. You will be asked to sit quietly in the waiting room during this time.
- The technologist will position you on the scanner table, and give you instructions to remain still or to hold our breath. You can ask the technologist questions before the exam begins.

### **After Your Exam**

- After the exam, you will be able to drive yourself home.

- Please drink plenty of fluids (about five glasses of water) throughout the day to help rinse the FDG and any contrast from your system.
- Your PET/MRI will be interpreted by an expert imaging physician, and a report will be sent to your doctor. Please contact your primary care physician for the results.
- If you want a copy of your report, please call 9849022121, option 2 or submit an online request.

## **PET/MRI Preparation Diet**

Starting 24 hours before your scan, follow a low-carbohydrate diet. Additionally for PET brain patients, refrain from having any foods and drinks with caffeine.

Starting six hours before your scan, begin fasting by avoiding all food, drink (except water) and all gum/mints.

## **Suggested Foods**

- **Protein:** chicken, turkey, fish, pork, lamb, ham (without honey), hot dogs, lunch meats, fish, peanut butter (one or two servings total), most nuts and sunflower seeds (2 ounces total) and eggs
- **Dairy:** , cheese, sour cream, butter,
- **Vegetables:** Green beans, asparagus, broccoli, cabbage, cauliflower, celery, cucumber, lettuce, mushrooms, radishes, spinach and zucchini
- **Condiments:** Mayonnaise, salad dressing (those with 3g or less per serving of carbohydrates), oil, vinegar, mustard, hot sauce, tartar sauce, olives, dill pickles
- **Beverages:** Diet soda, black coffee or tea (may add artificial sweetener).

## **Foods to Avoid**

All foods containing sugar and most processed foods, even “low-carb” items.

- Potatoes
- Corn
- Carrots
- Legumes

- Ketchup
- Cereal
- Tomatoes
- Peas
- Fruit
- Juices
- Milk
- Chips/pretzels
- Yogurt
- Bread — all types of grains
- Breaded foods
- Rice (white and brown)
- Pastas/noodles
- Sauces and gravy
- Candy/gum (including sugarless)
- Nutritional shakes
- Veggie burger
- Soybeans and tofu
- Syrups and jams
- Crackers
- Breath mints
- Rice cakes
- Smoothies

### **Caffeinated Foods to Avoid (only for patients having PET brain)**

Starting 24 hours before your scan, avoid all foods containing caffeine, including decaffeinated beverages.

Common examples include:

- Coffee
- Decaf coffee/tea
- Chocolate
- Candy bars
- Hot chocolate
- Some protein bars (check label)
- Some noncola sodas (check label)

- Some ice creams and yogurt (check label)
- Some fancy waters (check label)

## **Benefits of PET/MRI**

- Convenience of two exams at once
- Reduced radiation dose
- Enhanced image quality
- More comprehensive diagnosis

## **Clinical Indications**

For the initial introduction of PET/MRI into the clinic, we provide the following protocols:

- Brain tumors
- Seizure disorders
- Head and neck cancers
- Liver tumors
- Pediatric tumors
- Rectal cancer
- Cervical cancer

## **Brain Tumors PET/MRI**

MRI is the standard imaging modality for detection and characterization of intracranial metastatic disease. PET can be helpful in specific circumstances to help differentiate treatment related effect and residual tumor. There is great promise in the future for PET/MRI of intracranial malignancy, especially with the translation of new tracers to the clinic.

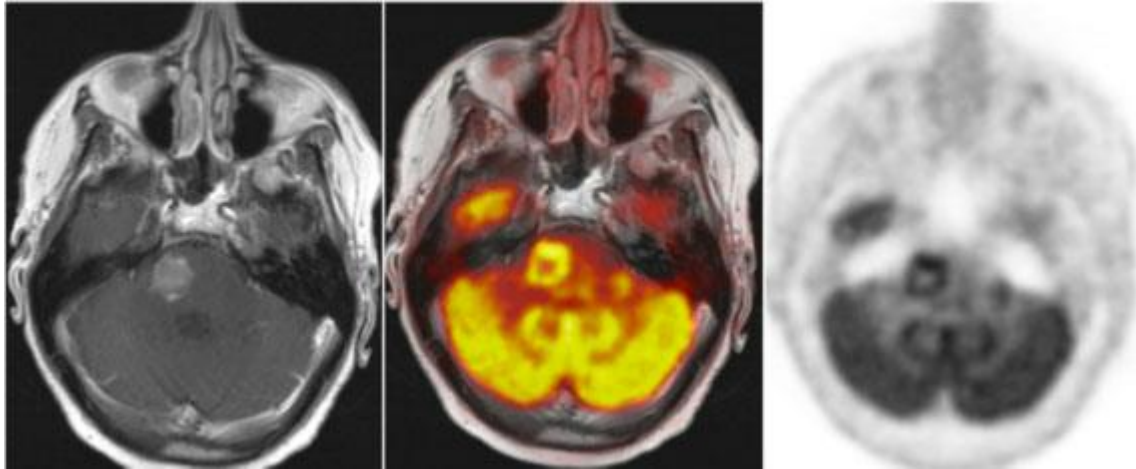


Figure: Simultaneous PET/MRI in a patient with intracranial metastatic disease. Post-contrast T1 weighted MRI (left image) demonstrates an enhancing lesion near the skull base which may represent either radiation changes or residual tumor. FDG PET imaging (right image) demonstrates increased avidity within the lesion helping characterize the lesion as being tumor rather than treatment related effect.

### **Seizure PET/MRI**

Patients who suffer from epilepsy can be treated most effectively when the origin of their seizures can be specifically localized to one or more regions within the brain. Careful clinical evaluation, electroencephalogram (EEG) and 3 tesla MRI serve as the cornerstones for modern seizure localization. When the exact location of seizure onset remains uncertain after these tools have been used, adjunct imaging modalities such as PET, magnetoencephalography (MEG) and single-photon emission tomography (SPECT) become especially useful for the successful evaluation of patients with epilepsy. Decreased uptake of FDG on PET images of the brain reflects diminished metabolic activity within epileptogenic brain regions. This allows one to co-localize anatomic and metabolic abnormalities by simultaneously exploiting the advantages of MRI and PET, thereby promising greater accuracy and ultimately more successful treatment of this common disorder.



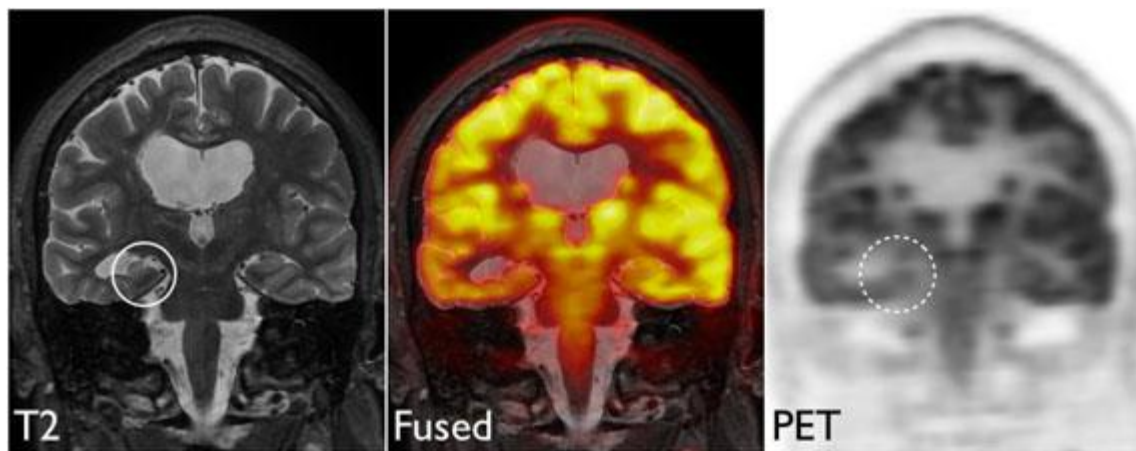


Figure 1: PET/MRI in a patient demonstrating volume loss in the right hippocampus (left, solid circle) with associated decreased metabolism seen on PET (right, dotted circle).

## Head and Neck Cancers

Both PET and MRI play a central role in the staging and management of patients with head and neck cancers. MRI provides excellent anatomic depiction of the complex soft tissues of the neck allowing for the detection and precise localization of primary tumors, residual disease and nodal metastases. At UCSF this information is also used for precise planning for radiation delivery with IMRT, a collaborative process between our radiologists and radiation oncologists. PET provides information on tissues that are hypermetabolic. Although PET does not have the resolution of MRI, it provides specificity allowing one to distinguish malignant and benign lesions. PET/MRI enables these two modalities to be acquired at the same time, with accurate fusion of the two data sets, allowing more precise tumor mapping.

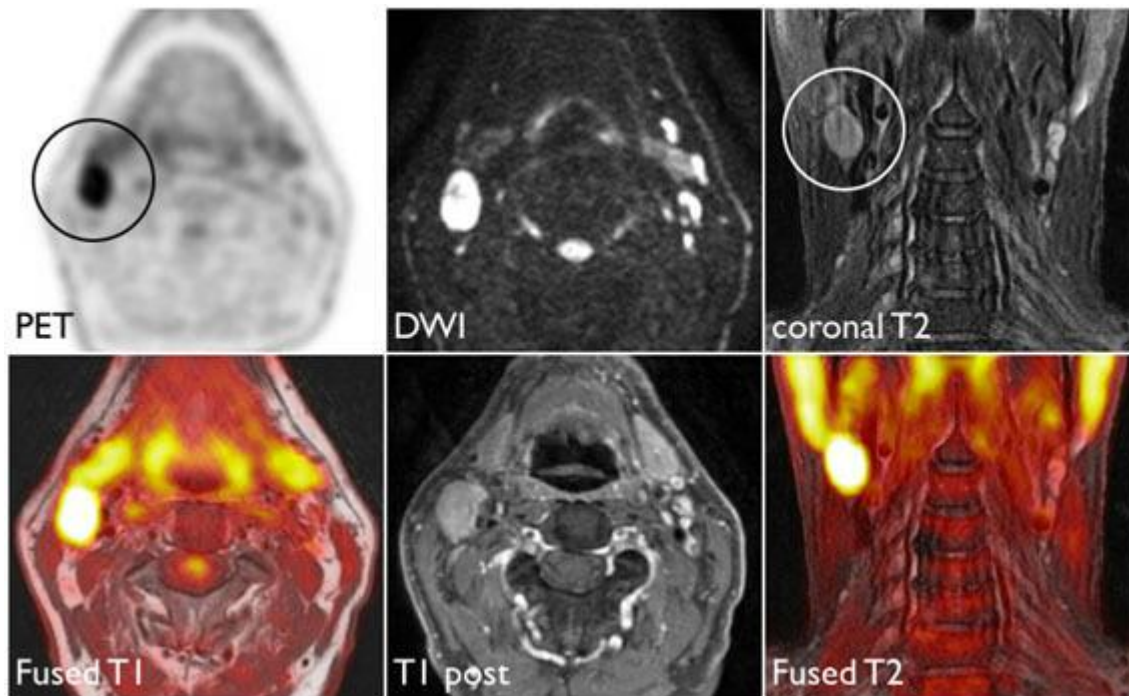


Figure 1: PET/MRI in a patient with head and neck cancer demonstrating a right cervical nodal metastasis (circle).

### Liver Tumor PET/MRI

MRI is the gold standard for anatomic imaging of the liver. Different types of MRI contrast agents can increase the detection of lesions, and additionally the biliary system can be imaged. For patients with liver lesions, combining the extra information provided by a PET tracer with liver MRI can help oncologists and surgeons plan therapies.

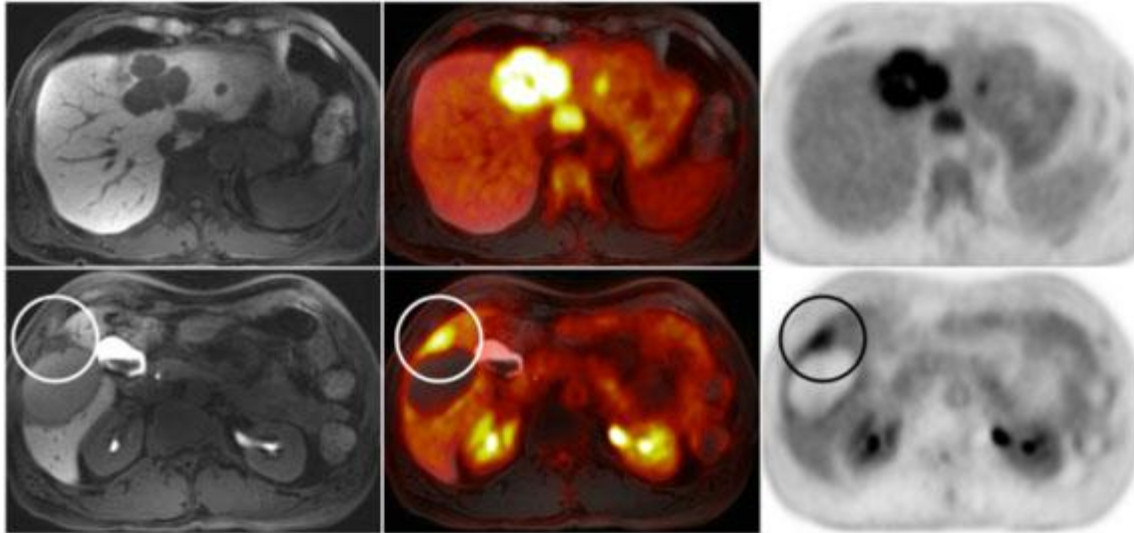


Figure 1: combined PET/MRI using FDG for staging of a patient with liver metastasis. In the right lobe of the liver there is a large treatment site seen on MRI (left column), but only when combining the information from the PET (right column) is it clear that there is viable tumor along the treatment site (circle).

## Rectal Cancer PET/MRI

Oncologic staging for patients diagnosed with rectal cancer involves imaging of the primary tumor using MRI as well as evaluation for metastatic disease. This can be performed either using a CT of the chest/abdomen/pelvis or a whole body PET/CT. With the introduction of a simultaneous PET/MRI system, evaluation of the primary tumor using MRI and whole body staging for metastatic disease can be performed on the same machine. This allows for improved workflow and patient convenience. Improved therapy response prediction using information from both PET and MRI data is currently being evaluated, but holds promise for the future.

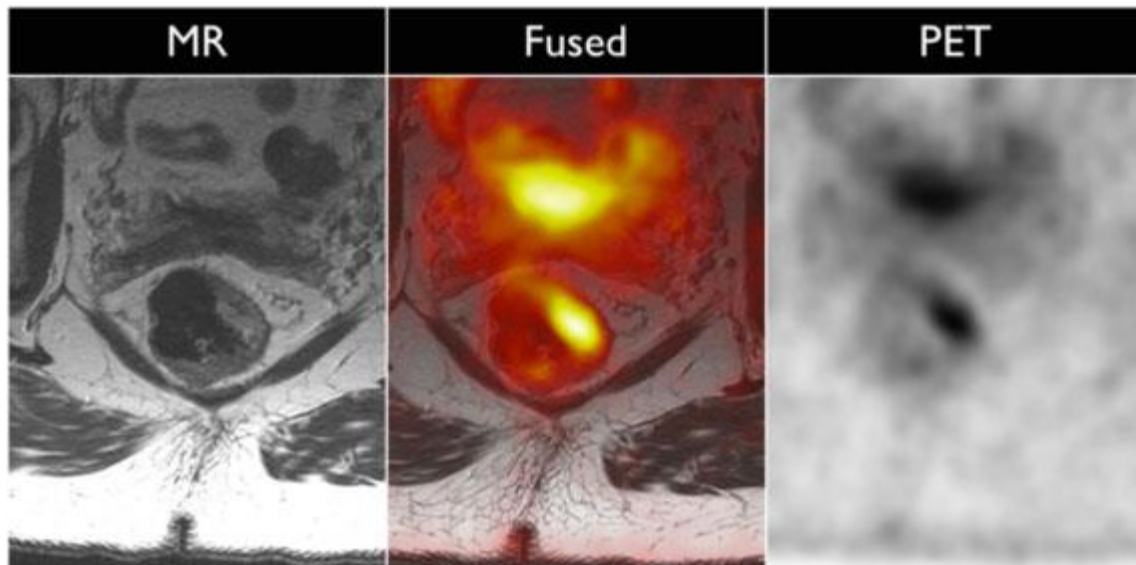


Figure 1: patient with newly diagnosed T2 rectal cancer. The mass is can be seen on MRI, but localization using PET imaging aids in localization. Additionally, the metabolic activity can be used to determine therapy response on serial imaging, and PET data can be used to detect distant metastasis.

PET/MRI's precision insights, low radiation and convenience are also especially important for paediatric patients and patients in therapies requiring repeat imaging.