

# FieldStrength

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## User experiences



**Osman Ratib, MD, PhD**, professor and chair of the department of medical imaging and information sciences and head of the nuclear medicine division.

University Hospital Geneva (Geneva, Switzerland) is one of the two largest academic hospitals in Switzerland. The hospital recently installed the Ingenuity PET/MR system, the first in Europe. Philips' [Ingenuity TF PET/MR](#) is a hybrid modality that combines the Achieva 3.0T MR scanner with Time-of-Flight PET technology.

# University Hospital Geneva uses PET/MR in oncology patients

Ingenuity TF PET/MR gains interest for imaging oncology patients

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Osman Ratib, MD, PhD, professor and chair of the department of medical imaging and information sciences and head of the [nuclear medicine division](#), says, “Our hospital has a history of developing collaborative projects between radiology, nuclear medicine and radio-oncology, typically for hybrid imaging and for research in new imaging modalities.”

#### **Different types of oncology patients undergo PET/MR**

Clinically, the Ingenuity TF system at the hospital is used about 20% of the time as a PET/MR system and 80% as a dedicated MRI scanner. “Our first goal was not to shift business from our PET/CT to the PET/MR, but to evaluate cases that could clinically benefit from the combination of PET/MR,” explains Prof. Ratib. “This results in up to five patients a week for PET/MR and 12-13 patients a day for routine MRI such as neuro and MSK.”

Dr. Ratib uses PET/MR for patients who would typically have both a PET/CT and an MRI as part of their clinical workup. “In patients with head and neck cancers, for instance, anatomical exams for pre-op, post-op and post-treatment are very complex, so PET/CT alone is usually not enough, and most patients will also get an MR exam in addition. Now they can have both PET and MRI done at the same time, and we can reduce radiation exposure by using just PET/MR\*,” says Prof. Ratib.

“MRI provides information that PET/CT doesn’t have,” says Prof. Ratib. “Many prostate patients, who would previously undergo both PET/CT and MR, are now just referred for one combined PET/MR exam. In addition, PET/MR is ideal for some cancer patients who often don’t get the PET/CT study at all to avoid the CT radiation. I wouldn’t use PET/MR for every cancer patient, but in those complex cases it is invaluable.”

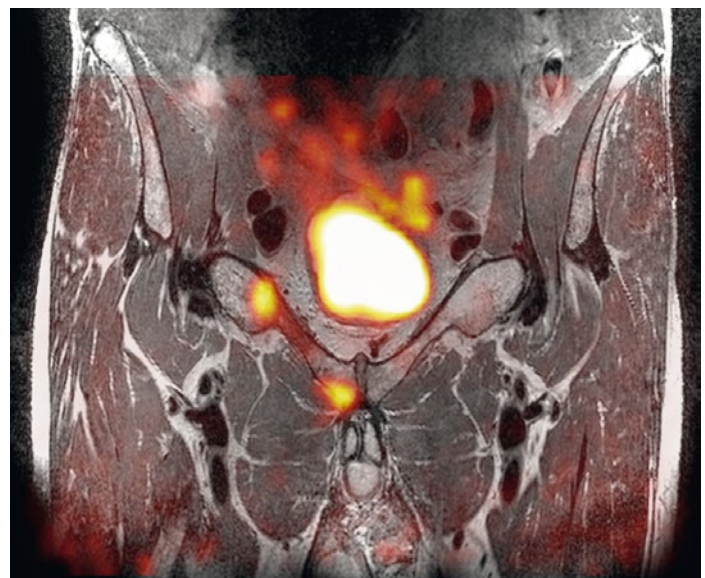
In Geneva, PET/MR is also used in pediatric oncology. “PET/MR is a great option for young patients who need repetitive scans to follow up on recurrence of tumors, particularly brain tumors. And MRI has an exquisite quality of soft tissue identification and characterization that CT doesn’t have.”

\*The system does not expose the patient to ionizing radiation, only the dose contribution from the PET radiopharmaceutical.

Dr. Ratib is also seeing a high level of interest from oncologists in the staging of gynecological cancers; MRI is the imaging modality of choice in those cases, and PET brings the molecular component to help identify where the tumor is and how far it extends.

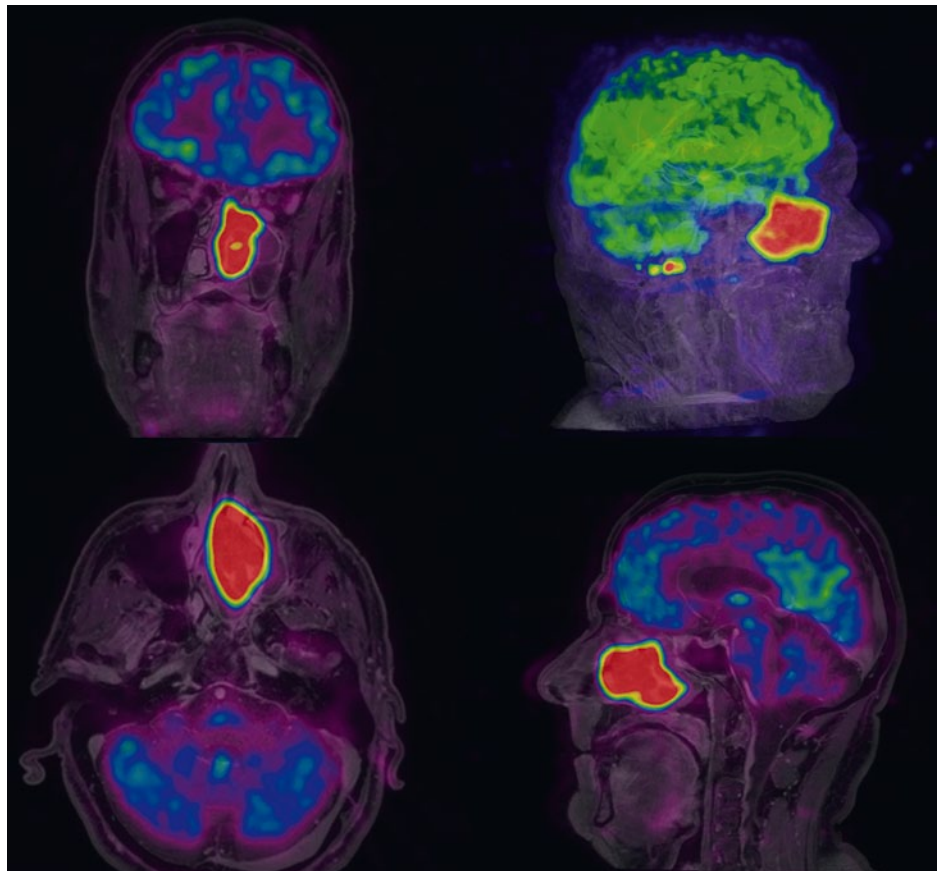
#### **System setup and course of the examination**

Unique in the design of the Ingenuity PET/MR system is that it combines two powerful, proven Philips imaging systems. For easy operation, the system features a single, integrated user interface for MR and PET. The two machines were already established systems,” says Dr. Ratib. “Philips added special magnetic shielding on the PET side and brought them together so they are attached to the same bed and operate in the same room. So, we have two top-of-the-line clinical machines in one place.” Dr. Ratib confirms that the MR image quality produced by the PET/MR system matches the quality of the stand-alone Achieva 3.0T.



PET/MR of 68-year-old male with prostate cancer and metastatic disease in the pelvic bone.

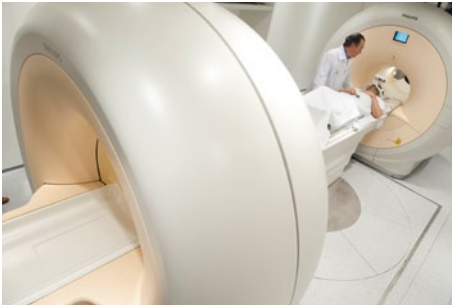
*“The Ingenuity PET/MR system combines two powerful, proven Philips imaging systems. For easy operation, the system features a single, integrated user interface for MR and PET.”*



B-cell lymphoma of the left sinus with no metastatic disease. PET/MR images are shown in all 3 imaging planes for a clear picture of the pathology in a very critical nasal cavity area.



Comparison of PET only and PET/MR in a staging examination for oncology.



Patient table is attached to MR scanner.



Patient table is rotated.



Patient enters PET.

A PET/MR exam starts with the MR acquisition, for instance with whole body imaging and a T1-weighted FFE for the attenuation correction. Dr. Ratib recently added a 3D whole body Dixon acquisition sequence that provides additional high-resolution anatomical images. After that, the table with the patient is rotated and moved to the PET machine. And finally the study is completed with specific diagnostic protocols dedicated to a given body part.

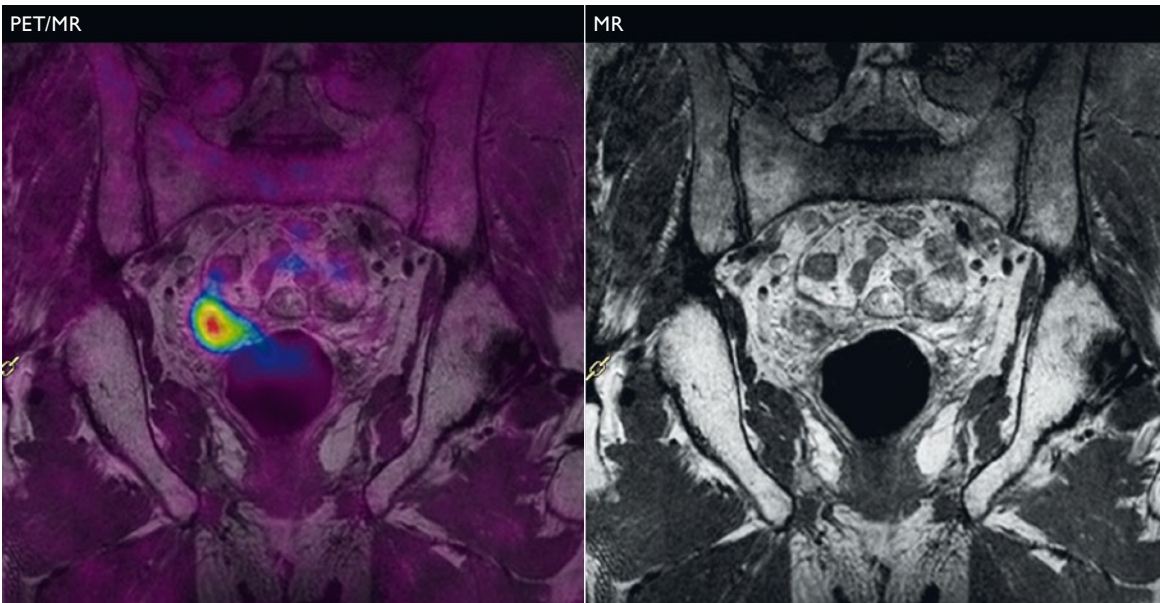
“We had to optimize the protocols so they don’t take too long. Furthermore, we analyze the whole body images because every suspicious lesion, even outside the area of interest, might require additional dedicated MRI sequences. Instead of having the patient come back, we do it right away. We then match these additional high-resolution MR images with the whole body PET data to better identify lesions where abnormal tracer uptake is identified.”

### Superb image quality with Time-of-Flight

“The Time-of-Flight (TOF) PET technology allows us to acquire images in a much shorter time, with enhanced SNR and spatial resolution, and faster reconstruction,” Dr. Ratib says. “It was the first machine with TOF in our institution, and we clearly saw the difference. During the initial testing phase, patients underwent a PET/CT first and a PET/MR after that, so there was a delay between scans causing decay in the radioactive tracer. Still, the image was actually much better, because the quality of PET with TOF compensated for reduced activity of the tracer.”

Dr. Ratib will continue to validate what PET/MR can bring to clinical practice. “Anticipating that it will become more widely available, we chose to begin with very basic applications that would previously be on two separate machines. We think PET/CT still has its clinical applications, but PET/MR has really added value to that subset of clinical areas.” ■

*“The Time-of-Flight technology allows us to acquire images in a much shorter time.”*



Comparison of PET/MR and MR only. PET/MR clearly shows a lesion outside of the prostate that does not stand out on MR only.