Located in the heart of Paris, the Groupe hospitalier Paris Saint-Joseph (St. Joseph Hospital) has a strong reputation for the diagnosis and treatment of urologic cancers, including prostate, kidney and bladder. For the last 15 years, Isabelle Boulay-Coletta, MD, radiologist, has been using MR for prostate imaging—first at 1.5T and in the last eight years at 3.0T with the Discovery™ MR750. An average of 20 MR prostate exams are conducted each week.

When Dr. Boulay-Coletta began to use MR for prostate imaging, the exam was most often used to depict the extent of the disease—patients were already diagnosed with the cancer based on prostate biopsy. Today, this has dramatically changed. MR is being increasingly used prior to prostate biopsy to avoid artifacts due to hemorrhage and to aid in the diagnosis of prostate cancer in men with elevated prostate-specific antigen (PSA) levels.

Although there is not yet a clear consensus in the literature about when to perform prostate MR, the role of MR imaging is rapidly extending to a variety of clinical situations, both before and after prostate biopsy. For example, when performed after a positive prostate biopsy, MR is an important tool for treatment decisions. In cases of a negative prostate biopsy with elevated PSA, a clinician will want to be sure that no significant prostate cancer is undetected by the biopsy before reassuring the patient on the status of their disease.

In the same setting, patients potentially eligible for watchful waiting, or active surveillance, are referred to MR to rule out significant cancer before being included in the program. During active surveillance, if PSA increases with no prostatitis then another MR is performed to detect any modification and/or appearance of a new target for MR transrectal ultrasound (TRUS) fusion biopsy.

Finally, more patients are being referred to MR prior to prostate biopsy as a means of aiding the clinician with a diagnosis and to image the suspected cancer.

Diffusion MR sequences are of increasing importance to delineate the target and guide the TRUS biopsy. Based on MR, Dr. Boulay-Coletta will decide whether to add targeted biopsy, especially to lateral and anterior locations.
**Value of MR imaging**

In cases of known cancer confirmed by biopsy, the hospital’s protocol initially included three T2 sequences acquired in each orthogonal plane, followed by FOCUS DWI and contrast-enhanced DISCO. In cases referred for diagnosis of prostate cancer, Dr. Boulay-Coletta performs a Sagittal 3D HyperCube T2 followed by an Axial T2, FOCUS DWI and contrast-enhanced DISCO. She explains that HyperCube provides the reference MR images that, when fused with ultrasound, can guide a transrectal targeted biopsy if needed.

While DWI has always been a useful sequence for prostate cancer, the sequence has become essential in the PI-RADS™ Version 2 reporting scheme.
Dr. Boulay-Coletta explains, “So, you must be able to succeed with this sequence all the time. Utilizing FOCUS for diffusion-weighted images with a small FOV has improved overall image quality at 3.0T. To maximize the quality and minimize artifacts inherent to DWI, patient preparation before the exam is important. In our institution, we ask patients to administer an enema 2 hours before the MR to eliminate rectal gas.”

To fulfill the PI-RADS™ technical requirement concerning diffusion, Dr. Boulay-Coletta relies on an ADC map acquired with b-values of less than 1,000 as well as diffusion-weighted images with a high b-value greater than 2,000. Therefore, it is necessary to acquire two different sets of diffusion images.

However, acquiring the b-value of 2,000 comes with a time penalty. So, when MAGIC DWI, also known as synthetic diffusion, became available, it was added to St. Joseph’s 3.0T scanner via an upgrade to SIGNA™Works. For the first three months, Dr. Boulay-Coletta and colleagues compared the image quality of acquired diffusion with a b-value of 2,000 with MAGIC DWI at the same b-value. Most importantly, Dr. Boulay-Coletta wanted to ensure that MAGIC DWI provided the same information as the high b-value acquired images. Also, the images generated by MAGIC DWI are slightly different in terms of noise and appearance, and she wanted to verify there would be no change in diagnostic confidence.

After comparing the high b-value MAGIC DWI images with those acquired using FOCUS, Dr. Boulay-Coletta determined that all the same necessary information was provided by MAGIC DWI. Radiologists at St. Joseph Hospital also became accustomed to reading and reporting from the MAGIC DWI images. After three months of image evaluation, the department confidently replaced conventional diffusion acquisitions of high b-values with MAGIC DWI. This has also led to time savings.

The multiple b-value DWI sequence would take approximately 4:50 minutes with b-values of 50, 500, 1,000 and 2,000. However, with MAGIC DWI and comparable image quality, 50, 500 and 1,000 FOCUS b-value images can be acquired in 2:30 minutes and synthetically processed to generate the b2000 images. This helped save more than 2 minutes off the acquisition.

HyperSense with HyperCube is another sequence enabling higher image quality without a time penalty. Dr. Boulay-Coletta acquires HyperCube T2 in the Sagittal plane and then reconstructs in the Coronal plane. She continues to acquire a 2D Axial T2 to obtain the highest quality Axial plane. PROPELLER Multi-Blade can be added if the patient cannot control movement or has contractions.

“We decided to use HyperSense with 3D HyperCube T2 to improve the image quality rather than reduce scan time,” Dr. Boulay-Coletta explains.
“Now, we have very high confidence when using MR to detect prostate cancer,” she adds. “All these new sequences also give us the information we need to report into PI-RADS™ Version 2. So, when we tell the patient that his imaging results are normal, we can be very reassuring that if the MR exam is negative, the patient has no significant cancer.”

MR for treatment planning

In cases of a positive diagnosis of prostate cancer, MR is an important tool for determining the extent of disease and the appropriate treatment. For example, today many men with non-significant, localized cancer will undergo a period of active surveillance. The idea behind active surveillance is that often, prostate cancer will grow slowly and if localized to only this gland, the cancer is unlikely to harm the patient or decrease his life expectancy. In fact, a recent study on active surveillance has found that less than 1% of men with local, slow-growing and non-metastatic disease had meaningful progression of their disease after 15 years.2

“The key is, of course, to monitor these patients regularly and begin treatment if the disease becomes more aggressive,” Dr. Boulay-Coletta says.

MR is considered as a baseline exam at St. Joseph Hospital and it is used to determine if the patient will be placed on active surveillance. The information from MR can also impact the planning for radical prostatectomy in patients undergoing surgical treatment.

“Surgeons and radiologists are using MR imaging data to determine the type of surgery for the patient,” Dr. Boulay-Coletta explains. “They review the images to detect any irregularity of the capsule and evaluate the extension to the neurovascular bundle. For capsule extension, high-resolution Axial T2 is mandatory and sometimes high spatial resolution DISCO can help to distinguish normal vessels from capsule extension.”

Technical inputs

Simplified review, assessment and reporting of multi-parametric MR prostate exams

While multi-parametric MR of the prostate is increasingly easy to perform, the ability to report per medical association guidelines has been challenging. PROView is a new solution from GE Healthcare that simplifies reading and reporting and applies PI-RADS™ Version 2 report guidelines to help standardize the MR evaluation of prostate cancer.

PROView delivers simple, guided workflow including prostate volume calculation, PSA density, lesion mapping and measurement. It intelligently displays MR images to guide workflow and enables MR-to-MR rigid registration to reduce patient motion effects. Clinicians can score T2-weighted, diffusion-weighted and dynamic contrast enhanced acquisitions as well as localize lesions per guidelines and add new lesions with flexible options to create a comprehensive report. Tool-tip reminders of PI-RADS™ scoring definition assists with reporting compliance along with standardized report creation and export. Additional clinical information through relative region-of-interest measurements, curves and color parametric images can be created to provide the referring physician with clinically relevant information that may aid in patient management.

PROView, accessible from a PC, laptop or PACS/RIS workstation, is fully integrated with GE Healthcare’s Volume Viewer for access to standard measurement options.
because it increases her confidence for diagnosis and helps determine the extent of disease. Yet, it is the inclusion of MAGiC DWI and ADC maps that she believes has made the greatest impact.

“I would advise other institutions to use MAGiC DWI. It is a robust sequence that considerably reduces the exploration time in every prostate case.”

Dr. Isabelle Boulay-Coletta

References

1. PI-RADS™ v2 guidelines suggest the use of diffusion b-values greater than 1,400.