PHILIPS

Radiation Oncology

MRI

MRCAT Pelvis

Unleash the real power of MR simulation

MRCAT Pelvis

MRCAT Pelvis clinical application lets you plan radiation therapy using MRI as a single-modality solution. Within just one, fast MR exam, MRCAT Pelvis provides excellent soft-tissue contrast for target and OAR delineation, and CT-like density information for dose calculations.

Fast, robust scanning protocols and embedded post-processing steps are used to generate MRCAT (MR for Calculating ATtenuation) images with continuous Hounsfield units directly on the MR console.

MRCAT data can be used for export to treatment planning systems for CT-equivalent[1] dose calculations. In addition, MR-based imaging enables CBCT-based positioning based on soft-tissue contrast with the look and feel of CT.

Philips MRCAT Pelvis clinical application lets you plan radiation therapy for male and female pelvic cancer patients diagnosed with soft-tissue tumors using MRI as a single modality solution.

This not only extends the benefits of MRI's excellent soft-tissue contrast to radiotherapy (RT) planning, but it also eliminates arduous, error-prone CT-MRI registration from the process, reducing uncertainties and complexity.

Fast, consistent imaging protocol
The dedicated MRCAT Pelvis imaging protocol includes a single, high-resolution, multi-contrast mDIXON sequence as the source for MRCAT generation. This scan is accelerated by Compressed SENSE and takes just a few minutes to complete. Moreover, it is standardized to deliver consistent results. A complementary 3D T2W scan provides high geometric accuracy and high-resolution image quality to support accurate delineation of target and critical structures.

The total imaging protocol takes less than 15 minutes, helping to minimize intra-scan motion, limiting the time the patient has to be immobilized, and supporting patient throughput.

Positioning to meet your patient's preferences
The MRCAT Pelvis imaging protocol lets you work flexibly in line with your and your patient's positioning preferences. You can image patients with their arms in the field of view, next to their body, or held on their chest. Head-first, or feet-first imaging is possible, enhancing patient comfort and simplifying positioning.

Automatic generation of synthetic CT images
MRCAT images are automatically generated using the mDIXON scan as source. Embedded image post-processing runs in the background, parallel to image acquisition, adding no time to the scanning session. Smart, validated algorithms enable automatic tissue segmentation and assignment of continuous Hounsfield units to deliver MRCAT images with CT-like density information for dose calculations.

Density information directly on the MR console
As the density information is generated directly on the MR console, the resulting data is available for immediate review during the scan. This potentially reduces the need to call patients back for repeat exams.

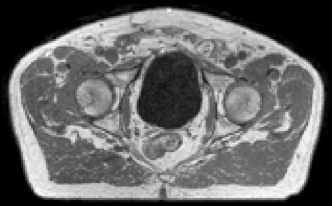
MRI as primary image set in treatment planning
The MRCAT images generated on the MR console conform to the DICOM CT standard. They can be automatically exported to your main treatment planning systems and used as the primary image dataset for dose calculations.

Accuracy in dose planning
MRCAT images have high geometric accuracy[2] and validation studies have shown that MRCAT-based dose plans are robust and as accurate[1] as CT-based plans promoting confidence in dose planning.

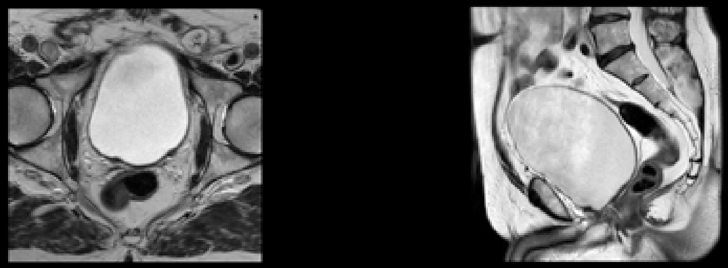
Patient positioning based on MR-only imaging
The MR-based image sets with continuous Hounsfield units enable CBCT-based positioning based on soft-tissue contrast with the look and feel of CT. You can also use MRCAT data to generate MR-based digitally reconstructed radiographs (DRRs) to allow for patient positioning using bony structure.

Large field of view imaging
A large field of view of up to 36 cm in the feet-head direction allows creation of treatment plans covering extended targets in the pelvis by providing body outline contours and geometrically accurate MRCAT images[2].

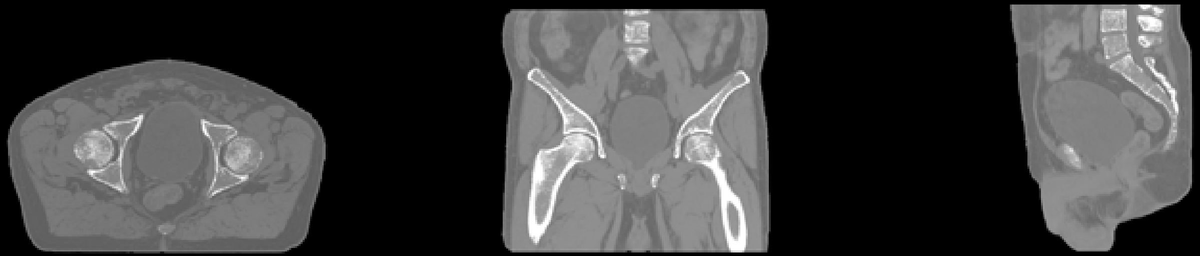
MRCAT Pelvis at a glance



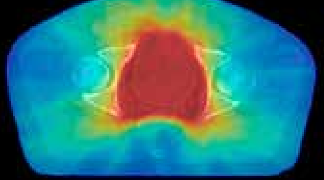
mDIXON XD FFE MRCAT source scan.



T2-weighted images for target delineation. Transversal (left), sagittal (right).



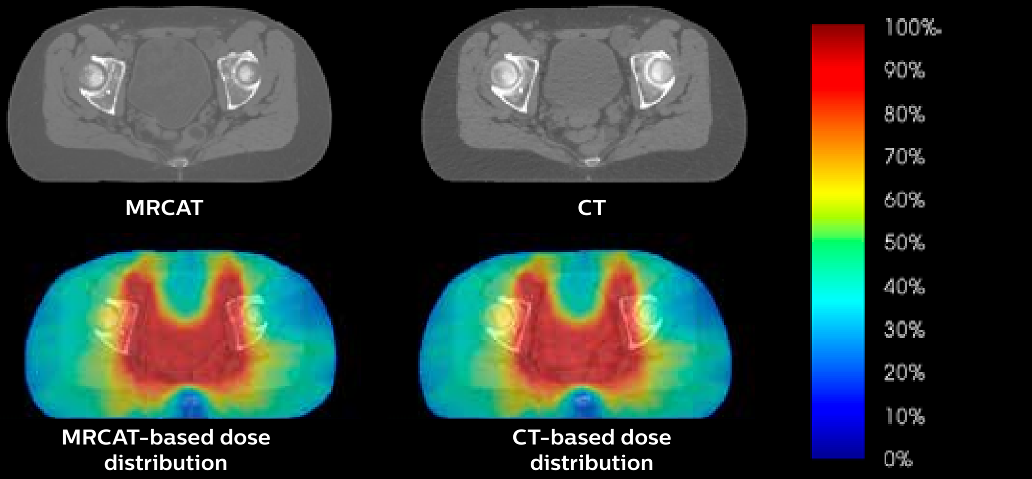
MRCAT with continuous Hounsfield units. Tranversal (left), coronal (center) and sagittal view (right).



MRCAT-based dose plan.

DRR images calculated form MRCAT in Pinnacle.

Validation studies have shown that MRCAT-based dose plans are robust and as accurate as CT-based plans[2]



Images acquired on Ingenia MR-RT 1.5T

MRCAT Pelvis

Anatomy supported	Male and female pelvis, with soft-tissue cancer in the anatomical pelvic region below L1 vertebra, including (post-operative) prostate, rectum, anus, bladder and cervix
Compatibility MR system	Ingenia 1.5T and 3.0T MR-RT, Ingenia Ambition 1.5T MR-RT and Ingenia Elition 3.0T MR-RT
Imaging protocol	Dedicated ExamCard provides: • 3D mDIXON XD FFE with breathing compensation and powered by Compressed SENSE. This scan is standardized and fixed for consistent MRCAT generation results. • 3D T2W TSE. For high resolution, anatomical information for delineation purposes, can be modified to match hospital preferences Other sequences can be added to the protocol based on department's needs
Field of View (FoV)	Up to 36 cm in feet-head direction
3D mDIXON scan time	Typical scan times 1.5T: • 3:02 min. for single station up to 55 x 55 x 30 cm FoV • 3:58 min. for 2-station up to 55 x 55 x 36 cm FoV Typical scan times 3.0T: • 1:58 min. for single station up to 55 x 55 x 30 cm FoV • 2:41 min. for 2-station up to 55 x 55 x 36 cm FoV
Coil configuration	Anterior coil combined with Posterior coil
Imaging smart functionality	• Allows patient to position the arms next to the body – arms will be automatically segmented and removed from the MRCAT images • MRCAT reconstruction automatically detects flaws in image acquisition, such as patient movement, and alerts the user when re-scanning of the patient is necessary
MRCAT generation	Running parallel to image acquisition on the MR console, embedded postprocessing performs: • Automated segmentation and tissue classification • Automated assignment of CT-based density values
Density maps	Continuous Hounsfield units for CT-like image appearance
Export to treatment planning systems	MRCAT images are DICOM conform (CT)
Geometric accuracy – essential performance	• MRCAT provides < ± 1 mm total geometric accuracy of image data in < 20 cm Diameter Spherical Volume (DSV). • MRCAT provides < ± 2 mm total geometric accuracy of image data in < 40 cm Diameter Spherical Volume (DSV)*
CT equivalent dose plan/robustness	The simulated dose based on MRCAT images does not differ in 95% of pelvic cancer patients when compared with the CT-based plan for EBRT[1].

1. The simulated dose based on MRCAT images does not differ (Gamma analysis criterion 3%/3mm realized in 99% of voxels within the PTV or exceeding 75% of the maximum dose) in 95% of the pelvic cancer patients when compared with CT-based plan for EBRT
2. Accurate means: MRCAT image acquisition provides < ± 1 mm geometric accuracy of image data in < 20 cm Diameter Spherical Volume (DSV) and < ± 2 mm geometric accuracy of image data in < 40 cm Diameter Spherical Volume (DSV)*. * Limited to 32 cm in z-direction in more than 95% of the points within the volume

4522 991 51901 * MAY 2020

PHILIPS

www.philips.com/MRCATPelvis