PHILIPS

Radiation Oncology

MRCAT Head and Neck

Unleash the real power of MR simulation

MRCAT Head and Neck

Philips MRCAT Head and Neck enables MR-only radiotherapy planning of patients with soft tissue tumors in the Head and Neck, without the need for CT.

Using an AI-based approach, MRCAT (MR for Calculating ATtenuation) images with CT-like density information are automatically generated from a single, high-resolution MR scan.

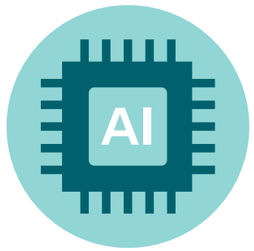
MRCAT data can be used for direct export to treatment planning systems for CT-equivalent[1] dose calculations. In addition, MRCAT image data allows for patient positioning at the linear accelerator using DRR or CBCT-based positioning, like with conventional CT.

Innovative Philips MRCAT Head and Neck lets you implement MR-only radiotherapy planning for your head and neck cancer patients. Within just one fast MR exam, you can acquire excellent soft-tissue contrast for target and OAR delineation, and CT-like density information for dose calculations.

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

Consistent imaging protocol
Image acquisition is made easy by a dedicated ExamCard that includes a single, multi-contrast 3D T1W mDIXON scan, which is standardized to deliver consistent results and high geometric accuracy. The MRCAT Head and Neck scan can be acquired before or after contrast agent administration. Additional sequences, e.g. for delineation, can be easily added to the protocol to address your specific clinical needs.

Automatic generation of synthetic CT images using AI
MRCAT Head and Neck uses Artificial Intelligence (AI) for fast computation of MRCAT attenuation maps based on the mDIXON source scan. The resulting MRCAT density maps provide continuous Hounsfield Units for CT-like image appearance and are shown right at the MR console for immediate review.



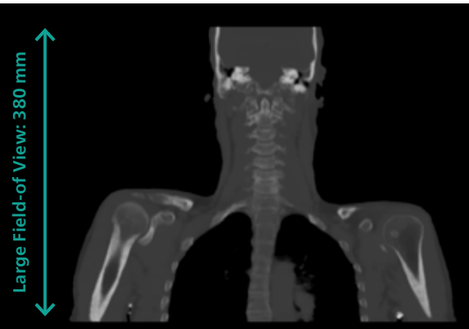
MRI as primary image set in treatment planning
The MRCAT images generated on the MR console conform to the DICOM CT standard. They can be automatically exported to treatment planning systems and used as the primary image dataset for dose calculations.

Accuracy in dose planning
MRCAT Head and Neck has been designed with strict radiotherapy accuracy requirements in mind. MRCAT image acquisition is geometrically accurate[2] and MRCAT-based dose plans are as accurate[1] as CT-based plans, promoting confidence in dose planning.

Rely on MRCAT-based patient positioning
You can use MRCAT data for patient positioning verification at the linear accelerator that is as accurate[3] as with conventional CT images. MRCAT's continuous Hounsfield units, with the look and feel of CT, enable CBCT-based positioning using soft-tissue and bony contrast. You can also use MRCAT data to generate MR-based digitally reconstructed radiographs (DRRs).

New opportunities for treatment monitoring and adaptive strategies
As MR does not provide X-ray radiation dose to the patient, MRCAT Head and Neck allows you to perform MR-only radiotherapy planning and get consistent density and contouring information over the course of treatment as part of adaptive strategies.

Short scan times promote patient comfort
Head and neck cancer patients often find it difficult to endure an MRI exam, especially when immobilized by a thermoplastic mask. The high-resolution 3D MRCAT source scan is accelerated by Compressed SENSE and requires <3 minutes to complete – while covering a large FOV (up to 380 mm in the feet-head direction). This promotes patient comfort, as well as productivity by minimizing time in the scanner.

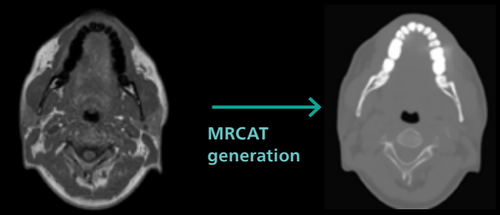


Ingenia MR-RT 1.5T

Scan time
<3 minutes

MRCAT Head and Neck at a glance

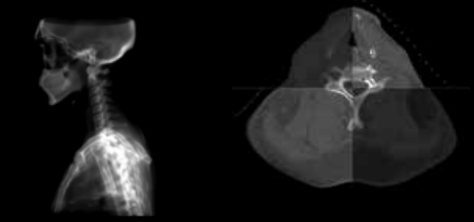
Dose calculation



3D T1W mDIXON in-phase
1:24 min

MRCAT with continuous Hounsfield Units

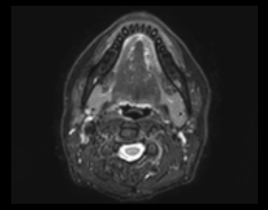
Patient positioning



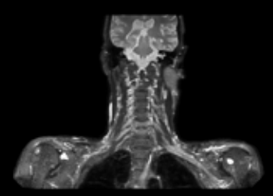
MRCAT-based DRR

MRCAT-CBCT matching

Contouring – optional scans



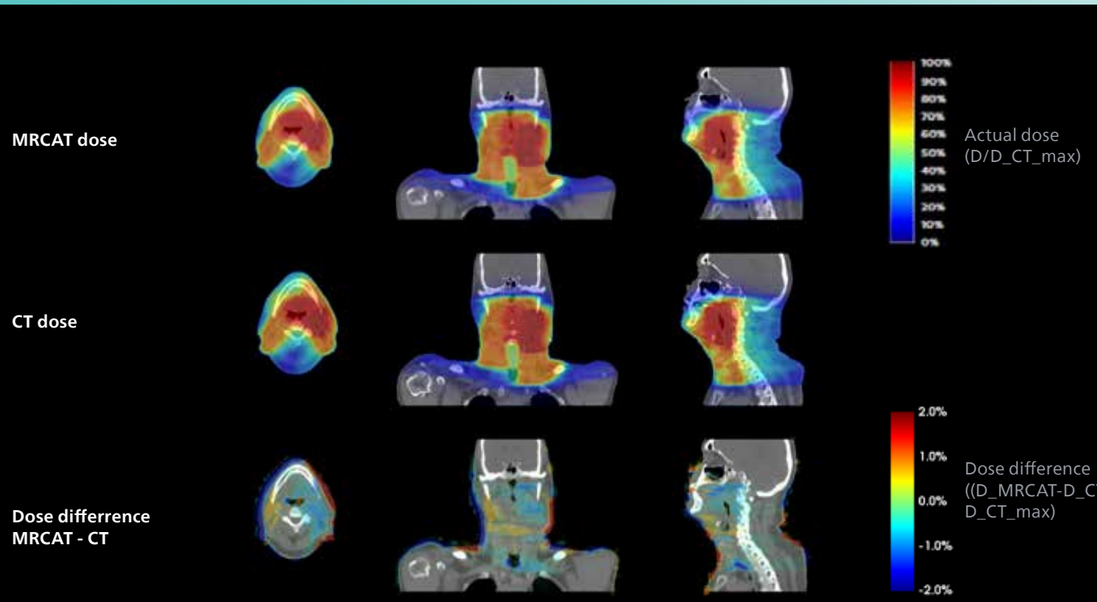
2D T2W TSE



3D NerveView

Ingenia MR-RT 3.0T

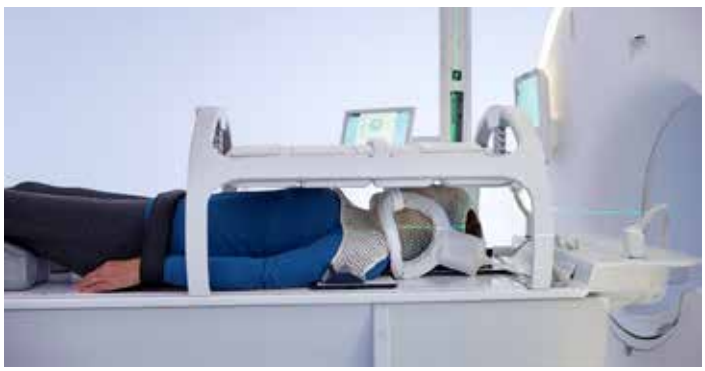
Validation studies have shown that MRCAT-based dose plans are robust and as accurate[1] as CT-based plans



Ingenia MR-RT 1.5T. Courtesy: Turku University Hospital, Finland.

MRCAT Head and Neck

Anatomy supported	Soft tissue tumors in the Head and Neck region *For primary and metastatic brain tumor patients, use MRCAT Brain*
Compatibility MR system	Ingenia MR-RT 1.5T and 3.0T, Ingenia Ambition MR-RT 1.5T S and X, Ingenia Elition MR-RT 3.0T S and X, Ingenia Evolution MR-RT 1.5T and 3.0T
Imaging protocol	Single, high resolution 3D T1W mDIXON XD FFE scan
	Resolution: 0.99*0.99*2.0 mm
	Field of View: 380 mm in the feet-head direction
	The MRCAT Head and Neck scan is accelerated by Compressed SENSE • Typical scan time at 1.5T: 2:01 min. • Typical scan time at 3.0T: 1:24 min.
	The MRCAT Head and Neck scan is standardized and fixed for consistent MRCAT generation results
	The MRCAT Head and Neck scan can be acquired before or after contrast agent administration
Coil configuration	dStream Torso coil (FlexCoverage Anterior coil and Posterior coil) combined with dStream Flex L coils
MRCAT generation	• AI-based computation of density maps • Running parallel to image acquisition on the MR console
Computing system	Runs on dedicated high-performance GPU hardware on the MR console
Density maps	Continuous Hounsfield Units for CT-like image appearance
Export to treatment planning systems and linear accelerators	MRCAT images conform to the DICOM CT standard
Geometric accuracy – essential performance	• MRCAT provides < ± 1 mm total system geometric accuracy of image data in < 20 cm Diameter Spherical Volume (DSV) • MRCAT provides < ± 2 mm total system 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
CT equivalent dose plan/ robustness	MRCAT-based dose plans are robust and as accurate[1] as CT-based plans
Position verification	3D MRCAT Head and Neck images can be used for bony and soft-tissue CBCT-based patient positioning, like with conventional CT
	MRCAT-based patient positioning verification at the linear accelerator is as accurate[3] as with conventional CT images
	MRCAT data can be used to generate MR-based digitally reconstructed radiographs (DRRs)



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1 The mean dose in the PTV does not differ more than 1% in MRCAT-based plans as compared to CT-based plans for 95% of the patient cases
2 Accurate means: MRCAT provides < ± 1 mm total system geometric accuracy of image data in < 20 cm Diameter Spherical Volume (DSV) and < ± 2 mm total system 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
3 Accurate means: MRCAT-based patient positioning is within 2 mm accuracy for bony anatomy compared to CT-based patient positioning for 95% of cases

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How to reach us
Please visit www.philips.com/mr-rt
www.philips.com/mrcatheadneck
healthcare@philips.com