High quality, large coverage head-neck MRI

University Hospitals Leuven clinicians invest Ingenia 3.0T’s high SNR in large coverage and more comprehensive imaging, and still save time.
Leon sees high quality, large coverage head-neck MRI with Ingenia.

Ingenia 3.0T enhances head and neck imaging at Leuven

High quality, large coverage head-neck MRI supports diagnostic confidence

University Hospitals Leuven (Leuven, Belgium) is one of the largest medical facilities in Belgium. About 150 patients are scanned each week on the hospital’s Ingenia 3.0T system, including about 15 head and neck patients. In both tumoral and non-tumoral pathology, Ingenia’s high SNR and homogeneity are boosting the diagnostic quality of the hospital’s head and neck MRI exams.

“Investing Ingenia’s high SNR to get a larger FOV while maintaining spatial resolution and speed provides an advantage in our patients with lesions in the oral cavity.”

For head and neck imaging, the field homogeneity is the biggest advantage of Ingenia 3.0T,” says radiologist Vincent Vandecaveye, MD, PhD. “MRI of the head and neck area can be challenging because of the many air-tissue interfaces that influence magnetic field homogeneity, which may lead to artifacts. However, with Ingenia 3.0T we get very uniform signal over all our images, as well as fewer artifacts. This is especially true of our functional MR imaging; the diffusion weighted imaging and the perfusion imaging are very homogeneous. And the signal-to-noise ratio is very high. We don’t do 1.5T imaging for head and neck anymore. Everything is done on Ingenia 3.0T because it provides so much more signal and resolution and speed.”

“We invest Ingenia’s high SNR in getting a much larger field of view and coverage while maintaining spatial resolution and speed,” he says. “This provides an important advantage...
in our patients with lesions in the oral cavity. Whereas in the past they needed an additional CT exam for staging the rest of the neck, we can now do it all with MRI in one scan with a large field of view. We scan from the base of the skull down to the thoracic inlet, similar to how CT is done. So, patients come to MRI for a complete loco-regional staging, covering the primary tumor and all the neck stations including the lymph nodes.”

“Our routine examinations have become much shorter with Ingenia 3.0T, especially ear and sinus exams. In applications like staging of cancers, primary tumor staging and visualization

Patient with right-sided glottis cancer showed cystic metastatic adenopathy in right neck (level II). As this is an unusual presentation for glottic cancer, the patient was referred to MRI with DWI to assess a possible second lesion. The T2-weighted image shows the right glottis cancer; the second image shows the cystic adenopathy in the right neck (level II). No apparent abnormalities are seen in the right tonsil (second row first images), but DWI shows a hyperintense lesion in the right tonsil. Histopathology proved this to be a second primary tumor. This lesion was not visible on CT and PET/CT. Ingenia 3.0T with dSHeadNeckSpine coil solution allows scanning of the entire head and neck with large coverage in acceptable scanning time. Compared to our 1.5T protocol the Ingenia 3.0T offers larger coverage in significantly less time.
“Patients now come to MRI for a complete loco-regional staging, covering from the base of the skull down to the thoracic inlet, similar to how CT is done.”

we are able to increase the coverage and do more functional imaging in the same time slot as a 1.5T MRI exam,” he adds.

A convenient system for techs and patients

“Ingenia’s SmartSelect automatic coil selection is a huge step forward. It saves a lot of time and effort by avoiding the need to reposition patients and coils,” says Frederik De Keyzer, MSc. “Another big advantage is the dS HeadNeckSpine coil solution. The spine coil is conveniently integrated in the table. The head coil is smaller and more open than previous coils but it gives the same image quality, and it’s so much lighter and thus easier for the technologist and the patient. It has a neck extension, and it allows us to scan patients in a slightly tilted plane. And, of course, we benefit from dStream providing high SNR and digitization in the coil and high dS-SENSE speed-up capability, for better image quality or reduced scan time or larger coverage.”

“Our patients are quite comfortable in the Ingenia. I can’t even remember in the last few weeks anybody having problems getting in the system due to kyphosis, scoliosis or claustrophobia,” says De Keyzer.

In Leuven, the wide-bore Ingenia 3.0T is combined with Philips Ambient lighting.

Optimization multiplies advantages

“When we received Ingenia 3.0T, we transferred our ExamCards from our Achieva 3.0T TX to optimize them for Ingenia,” says De Keyzer. “But to our surprise, we didn’t have to change much. We saw that SNR was better

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Nodal staging in recurrent thyroid cancer

Patient underwent thyroidectomy 2 years ago for small papillary thyroid cancer. Follow-up ultrasound shows non-vascularized node anterior to the trachea. Clinically there is a slight elevation of the tumor marker.

Ultrasound shows a non-vascularized node anterior to the trachea. The node is heterogeneously intense on the T2-weighted image and clearly hyperintense at b1000 DWI. It has a calculated ADC b500-1000 (cellular fraction) of 0.68 10⁻³ mm²/sec, so suspect for metastasis.

The hypervascularity is confirmed by calculation of the initial slope map. Findings suggest recurrence of papillary thyroid cancer presenting as an abnormal node anterior to the trachea in level VII. This was proven by histopathology after surgery.

Ingenia 3.0T with dSHeadNeckSpine coil solution is used to scan the entire head and neck from skull base to thoracic inlet. DWI and 4D-THRIVE improve lesion conspicuity, and provide additional information on the node characterization and help differentiation of post-radiotherapy necrosis and inflammation from tumor recurrence.
Our routine examinations are much shorter with Ingenia 3.0T, especially ear and sinus exams.

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**Recurrent head and neck cancer**

Patient with prior history of floor of mouth cancer on the right side and multiple recurrences for which multiple surgical interventions and chemoradiation have been performed. There is clinical suspicion of small ulceration on the right lateral tongue. MRI is requested for pre-operative staging.

Top row images show the area of the clinically suspected small ulceration. On the T2-weighted images it is visible as a thin slightly hyperintense line (arrow). This area was proven to be in-situ squamous cell carcinoma. No clear abnormalities are seen on b1000 DWI.

The bottom row T1-weighted image shows no focal abnormality at the level of the base of the left tonsil. The b1000 DWI shows a hyperintense lesion in the left base of the tonsil. Histopathology proved this is synchronous tumor recurrence. This finding made the patient inoperable. Surgery was not performed.

Ingenia 3.0T with dSHeadNeckSpine coil solution is used to scan the entire head and neck from skull base to thoracic inlet. This case highlights the advantages of using combined DWI and perfusion imaging to help visualize potential tumor recurrence. DWI and 4D-THRIVE improve lesion conspicuity, nodal characterization and differentiation of post-radiotherapy necrosis and inflammation from tumor recurrence.

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on Ingenia, and we used that to get a larger coverage, a higher matrix. Ingenia also allows us to use higher dS-SENSE factors than before. Another example of improvement is DWI; we were used to diffusion MRI being sensitive to artifacts, but these are lessened on Ingenia 3.0T, due to the excellent field homogeneity allowing better fat suppression.

**Shorter scan time and more diagnostic confidence**

“We have invested the extra SNR gain of Ingenia into larger coverage and more comprehensive imaging, rather than decreasing total scan time,” says De Keyzer. “However, even after the addition of routine functional imaging, the entire scan time is still shorter than an equivalent examination at 1.5T in our center.”

“In terms of workflow, Ingenia 3.0T is an easy system to use. It has easy patient positioning, even in our whole body scans,” concludes Dr. Vandecaveye. “And because we can pack so much information into one MRI head and neck examination, we are more confident in our diagnosis.”