HCMC chose SmartPath to dStream rather than a new scanner

Bringing its Achieva 1.5T to a digital broadband MRI system significantly improved its imaging

Dr. Truwit, Hennepin County Medical Center, Minneapolis, Minnesota, USA
Hennepin County Medical Center (HCMC) chose SmartPath to dStream rather than a new scanner. HCMC went for SmartPath to dStream to bring its Achieva 1.5T magnet to a digital broadband MRI system that is virtually new and significantly improves their imaging.

Because HCMC was happy with the performance of its two Ingenia systems, they considered replacing their third scanner, an Achieva 1.5T, with another Ingenia system. However, this was not a viable option due to the associated siting cost. The SmartPath to dStream solution allowed them to get a dStream system in a cost-effective manner, with minimal downtime because the magnet can stay. Now, HCMC has three systems with dStream, all providing terrific scans.

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Hennepin County Medical Center (HCMC, Minneapolis, Minnesota, USA) is among the premiere Level 1 trauma centers in the nation. In the past 12 years, a complete overhaul of its installed equipment has resulted in HCMC having one of the best-outfitted radiology departments in the US Upper Midwest. HCMC is a safety net hospital whose patient population includes a broad array of orthopedic and brain injury patients.

**SmartPath to dStream an easy choice**

Chip Truwit, MD, FACR, is neuroradiologist and Chief of Radiology at Hennepin County Medical Center. “Already privileged to host both Ingenia 1.5T and 3.0T, we decided to bring SmartPath to dStream to our last scanner, an Achieva 1.5T,” he says. “The short version of that story: it’s spectacular!”

“Initially we replaced one of our Achieva 1.5T systems with an Ingenia 1.5T. Until that point, most of our orthopedic MRI was done on our Achieva 1.5T scanner. Almost immediately, our musculoskeletal radiologists shifted the orthopedic MR workload to the Ingenia 1.5T due to the quality of the images. Subsequently, we replaced the Achieva 3.0T with an Ingenia 3.0T. Some musculoskeletal work moved to that scanner, but the images were so good on the Ingenia 1.5T at our outpatient imaging center that we continued to scan many of our outpatients at 1.5T.”

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**Consistent quality on all three systems**

“We had very high expectations for SmartPath to dStream to succeed,” Dr. Truwit adds. “And indeed the converted dStream system provides the high quality imaging we expected. The scans are remarkable.”

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“Before converting the final Achieva there was such a difference between our two Ingenia systems and the non-dStream Achieva, we felt that we were somewhat limited in which patients we could put on that scanner,” says Dr. Truwit. “With dStream now up and running on our third scanner, it really makes no difference where we scan; the images look terrific.”

“We have the luxury of three dStream scanners. The image quality is so good that most of our work can go on any of the three systems, unless the patient specifically requests one of the large bore Ingenia scanners. That just makes us much more versatile, much more flexible.”

**dStream boosts clinical performance**

Dr. Truwit is seeing improvements in all types of exams. “We have first optimized our neuro scans and they’re looking very good now. As we continue to optimize other scans, we continue to see improvements. Our 3D FLAIR images were already quite good on the Achieva scanners, but they are even better now. The DWI images are much improved, and we have seen improvements in our spin echo T1-weighted sequences as well, which is long overdue.”

**Meniscal tear**

A 37-year-old male presented with chronic left knee pain and a remote history of injury. Physical exam suggested a meniscal injury. No prior imaging was available. MRI was performed on a 1.5T dStream system using the 16-channel dKnee coil. The exam includes sagittal and coronal proton density TSE and T2W SPAIR sequences as well as an axial T2W SPAIR sequence. Sagittal proton density and T2W SPAIR images demonstrate extensive abnormal signal in the body and posterior horn of the medial meniscus with extension to both the tibial and femoral articular surfaces. There is an additional multi-lobular cyst abutting the meniscal root that extends posterior to the posterior cruciate ligament. The diagnosis is a complex horizontal tear involving the body and posterior horn of the medial meniscus with associated para meniscal cyst. The 1.5T dStream system clearly demonstrates the meniscal tear as well as the para meniscal cyst, providing image quality of the pathology and adjacent structures similar to that of 3.0T.

The sagittal proton density-weighted image from pre-dStream Achieva 1.5T in another patient, while still a good quality image, reveals the advantages of the dStream enhancement. Note the image quality of the cartilage, marrow trabeculation, menisci as well as the meniscocapsular ligaments does not quite meet the standard of the 1.5T dStream upgrade.

**MRI of appendicitis in pregnancy**

A 25-year-old female, 20 weeks pregnant, presented with right lower quadrant pain. Her white blood cell count was elevated, measuring 14.6. Ultrasound failed to visualize the appendix. Consequently, the patient was referred for MRI. The scan was performed on a 1.5T SmartPath to dStream system using the integrated Posterior coil and the Anterior coil. The exam includes 3-plane T2-weighted scans, 3-plane B-FFE scans and axial T2W SPAIR, all in breath holds < 15 seconds. The MR images demonstrate a distended appendix with adjacent fat stranding. The diagnosis is acute non-perforated retrocecal appendicitis, surgically confirmed.

MRI successfully supports diagnosing appendicitis in pregnancy without using ionizing radiation or contrast. This 18-minute exam without contrast or ionizing radiation has replaced CT in pregnant women at our institution. We have performed over 60 cases in the last 5 years, with 9 positive, surgically confirmed. We saw no false positives, and to the best of our knowledge, no false negatives either. We usually start with ultrasound, but it is frequently negative in these patients.

T2-weighted sequences are the mainstay for our diagnosis. With our SmartPath to dStream system, SENSE and dStream allow us to acquire these faster with improved signal. In these patients, who are often short of breath, the scan can be completed in 15 minutes or less.

Courtesy of Gopal Punjabi, MD, HCMC.
Comparison before and after SmartPath to dStream

A 70-year-old male diagnosed with hepatocellular carcinoma underwent MRI before and after chemoembolization. The first exam was performed on an Achieva 1.5T, the second exam in the same magnet following the SmartPath to dStream upgrade.

The comparison shows that imaging with dStream affords improved fat saturation, faster scan times and higher resolution post-contrast images in liver MR. The dStream images show better fat saturation and better liver signal on T2 SPAIR, better MRCP background suppression, less inhomogeneities on in-phase and out-of-phase images. In particular, on the THRIVE sequence, we have better resolution as the slice thickness decreased from 3 mm to 2 mm, while maintaining a similar matrix and FOV. On the T2 SPAIR sequence, we have reduced the slice thickness from 8.5 mm with a 1.5 mm gap to 6.6 mm with a 0.6 mm gap.

In short, combining SENSE and dStream results in improved SNR, which we are able to use either in a shorter scan time or to obtain an image with improved resolution, or both. We are seeing higher resolution while maintaining breath-hold times under 15 seconds.

Courtesy of Gopal Punjabi, MD, HCMC.
Hydrocephalus secondary to meningitis and cerebellitis
A 21-year-old man with a history of seizures presented with headache and fevers. A prior study performed at 1.5T (at an outside institution) was unremarkable. The sagittal T1-weighted image reveals normal appearance of the posterior fossa and fourth ventricle. In particular, the cerebellar tonsils are in the normal location.

At the time of presentation, he underwent MR imaging on our Ingenia 3.0T. The sagittal reconstruction from 3D TSE FLAIR sequence shows dramatic signal and morphologic changes involving the posterior fossa and cervical spinal cord. The patient has already undergone ventriculostomy placement for acute hydrocephalus. The sagittal contrast-enhanced T1-weighted gradient echo image shows avid leptomeningeal enhancement. Diagnosis was acute hydrocephalus secondary to meningitis and cerebellitis.

A few months later, a follow-up exam on the 1.5T SmartPath to dStream system shows persistent diffusion restriction and meningeal enhancement. The sagittal contrast-enhanced T1-weighted gradient echo image shows avid leptomeningeal enhancement and tonsillar herniation. The axial diffusion weighted image shows persistent restricted diffusion of inferior cerebellar cortices, a consequence of meningitis and downward compressive forces secondary to acute hydrocephalus. While the continued contrast enhancement was not surprising, the MR images obtained in this patient revealed persistent findings on the DWI, presumably reflecting ongoing cerebellitis, either infectious, traumatic (compressive), or both. In any event, recovery has been very slow, as patient continues to be encephalopathic. Cerebellar tonsils continue to show downward herniation through the foramen magnum.

While 3.0T imaging is excellent, in reality these dStream 1.5T images are essentially comparable and clearly confirm the ongoing pathology.

“We’re working toward sets of sequences that not only generate tremendous image quality, but that also take advantage of the increased SNR provided by dStream. We can either improve the signal within the same scan time, or cut scan time while keeping signal the same, or both. I think in our neuro work we’ve already done both.”

Enhancing productivity with digital coils and ExamCards
“Our technologists appreciate the upgrade to dStream as well, and patient throughput has improved because of it,” says Dr. Truwit. “The digital coil connections and the coil built into the table dramatically changed our workflow. Of course, the techs were already used to it on the Ingenia scanners; they’re greatly relieved that our last scanner is now up to speed. And ExamCards help to make scanning fast, easy and consistent; our techs also see terrific improvements there. When other MR users visit here, it’s been interesting to see how much our MR technologists talk about this particular feature.”

Value for money
“For my money – for Hennepin County’s citizens – SmartPath to dStream is a financial win,” concludes Dr. Truwit. “Yes, it costs money, but it’s less money than a new system. Philips dStream is a tried and true technology now. Upgrading to a dStream system without having to pull the bore out is a great achievement. This really puts Philips in a class of its own.”

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