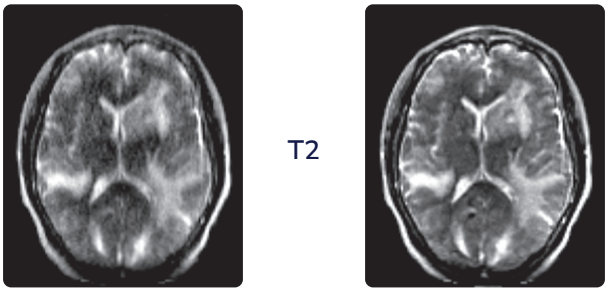
Advanced Image Reconstruction

Image intelligently. The next evolution in portable MR imaging defines the future of life-saving diagnostics with deep learning image reconstruction.

Before:
Linear (Conventional) Reconstruction

After:
Advanced Image Reconstruction



T2

Available in clinical protocols on the Swoop system, T1, T2, and FLAIR images are reconstructed with a single deep learning image reconstruction pathway.

Groundbreaking is a term one frequently hears in medicine, but the recent FDA clearance of the Swoop Portable Magnetic Resonance Imaging System advanced image reconstruction software is a technological breakthrough. The Swoop system's innovative approach uses deep learning in the reconstruction pipeline *before* constructing the image. The resulting image quality elevates the diagnostic value of portable MRI.

To create this advanced image reconstruction, Hyperfine used deep learning—an enabling technology that uses artificial neural networks (ANNs). ANNs are a set of algorithms modeled loosely after the human brain and designed to recognize patterns. Using this technology,

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Hyperfine trained Swoop software to improve T1, T2, and FLAIR image quality by reducing image blurring and noise. With this software upgrade, Swoop uses a unique advanced image reconstruction pipeline, developed using deep learning, to introduce two steps to the linear image reconstruction process—*advanced gridding* and *advanced denoising*.

Advanced gridding optimizes Swoop scanner spatial frequency domain data (k-space data) *before* transforming the data into an image. This unique approach based on deep learning is superior to the traditional approach of using non-uniform fast Fourier transform (FFT-gridding) operations.

Advanced denoising, the second application of deep learning in Swoop advanced image reconstruction, is part of the post-processing image reconstruction step. Hyperfine used deep learning to create algorithms that apply denoising in small patches across the entire image. This process removes noise from the signal while preserving diagnostically critical information.

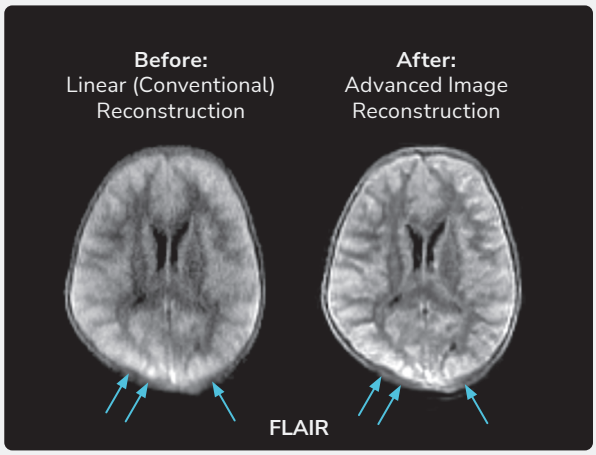
With the introduction of advanced image reconstruction, Swoop delivers crisp, clear T1, T2, and FLAIR images with the potential to provide clinicians with a greater degree of confidence in acute clinical diagnosis.

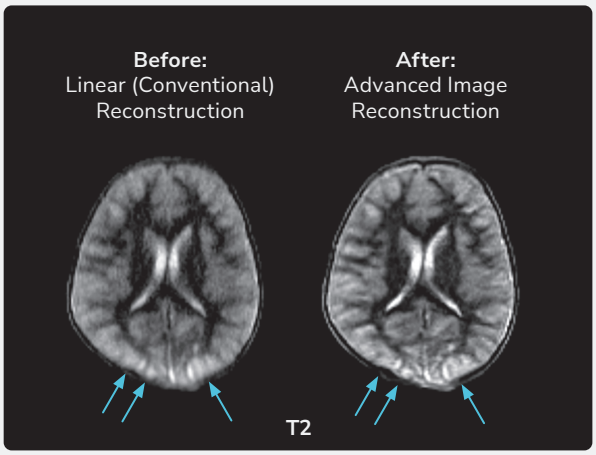
Clinical Case Studies

Using Advanced Image Reconstruction

Case 1

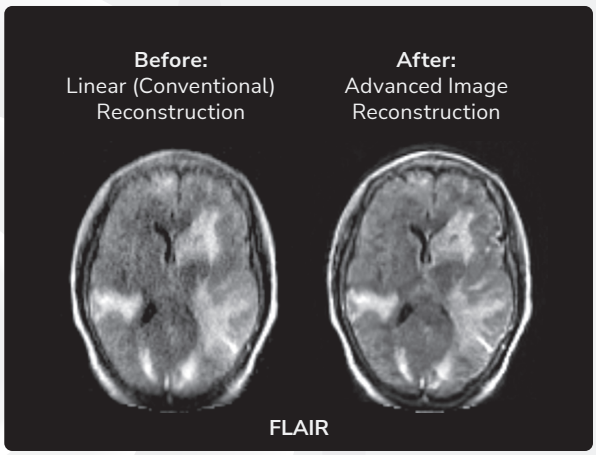
5-year old comatose boy presenting with fever. EEG is noted to be asymmetric. Swoop scan obtained immediately following EEG shows multiple focal regions of cortical edema and local mass effect. The cortical detail is more clearly seen with higher definition utilizing the advanced image reconstruction. The patient is from a sub-Saharan tropical country.
The diagnosis is cortical cerebral malaria.

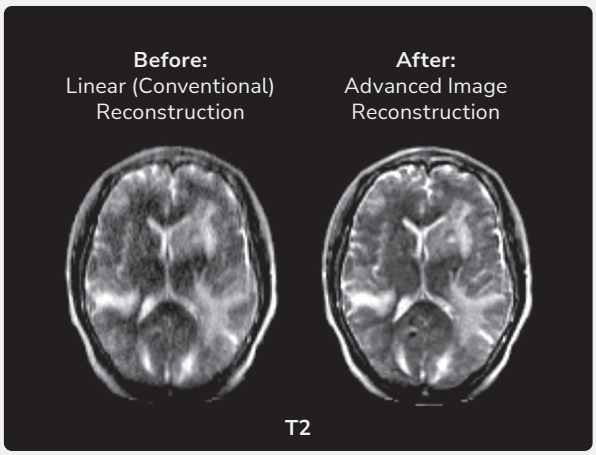




Case 2

62-year old female with prior history of breast carcinoma treated with local therapy and was in a normal state of good health until new-onset seizure. Due to the patient's unstable condition while in the emergency department, the patient was imaged at the bedside using Swoop. Images show multiple intracranial metastatic lesions with surrounding mass effect and vasogenic edema, more clearly delineated with advanced image reconstruction.





Swoop Portable MR Imaging System

Hyperfine designed the Swoop system to address the limitations of current imaging technologies and make MR imaging accessible anytime, anywhere, and to any patient.

Ready to scan in less than two minutes, the system produces its first images just minutes after that, enabling care decisions without the need for patient transport to radiology.

Small and highly portable, the system is ideal for use in the ICU, ED, or anywhere else patients are in need—even pediatric, stroke, and COVID-19 units.

Designed to fit inside elevators and through 34-inch doors, the Swoop system effortlessly maneuvers through crowded healthcare environments to a patient's bedside at the point of care. Imaging sequences include T1, T2, FLAIR, and DWI (and accompanying ADC map).

1. AI Enabled
The Swoop system automatically maps and corrects for electromagnetic interference within the imaging environment. The result is crisp, clear T1, T2, FLAIR, and DWI (with ADC map) sequences. Advanced AI Applications also offer automated and auto-aligned brain volume measurements, ventricular volume, and midline shift.

2. Power Supply
The Swoop system plugs into a standard 120V wall outlet and is ready to scan in less than two minutes. Astonishingly efficient, the system uses just 900 watts, about the same power as a coffee maker.

3. Folding Bridge
Unfold the Swoop bridge for easy bedside patient loading. Fold the bridge back up to move the system to your next patient.

4. Halo (Gauss Guard)
Even in a crowded health care environment, the system assures safety with a convenient 62-inch diameter 5 gauss guard that quickly expands and contracts.

5. RF Screen
Operation requires no external shielding with built-in continuous 'noise cancellation' of electromagnetic interference and the specific design of our aluminum screen.

6. Head Coil
An 8-channel removable head coil comes encased in clear, durable, and easy-to-disinfect polycarbonate plastic.

7. Casters and Joystick
As close to magnetic levitation as we could imagine, the Swoop system effortlessly glides between patients, courtesy of a joystick and powered drive wheels.

Indications for Use: The Swoop Portable MR Imaging System is a bedside magnetic resonance imaging device for producing images that display the internal structure of the head where full diagnostic examination is not clinically practical. When interpreted by a trained physician, these images provide information that can be useful in determining a diagnosis.

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hyperfine.io

@Hyperfine info@hyperfine.io (866) SWOOP-MR