



Breaking the MR Sound Barrier

It's no secret. An MR scan can be noisy!

While MR scans and audible noise seem to go hand in hand, GE Healthcare has been focusing on reducing scan noise for many reasons. From the patient's perspective, a quieter scan can be less stressful and improve the whole MR experience. From the clinician's perspective, quieter scans can be

advantageous because a relaxed patient is more likely to lie still and this can lead to less patient motion, improved image quality, reduced scan times, and reduced rescans.

GE's approach to reducing scanner noise is called SilentScan and includes two distinct but related imaging approaches to reducing MR noise. They are Acoustic Reduction Technology

(ART) and Silenz. These technologies are designed to reduce acoustic noise by addressing the source, the gradient-magnet interaction, and the mechanical vibration to deliver the image quality you would expect from a conventional MR scan, with a fraction of the acoustic noise. SilentScan is available on GE's Discovery™ MR750w, Optima™ MR450w, SIGNA™ PET/MR, SIGNA™ Pioneer, and SIGNA™ Explorer.

Hannah Khirwadkar,
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is a neuroradiologist at Morriston Hospital
in Swansea, UK.

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Dr. Hannah Khirwadkar

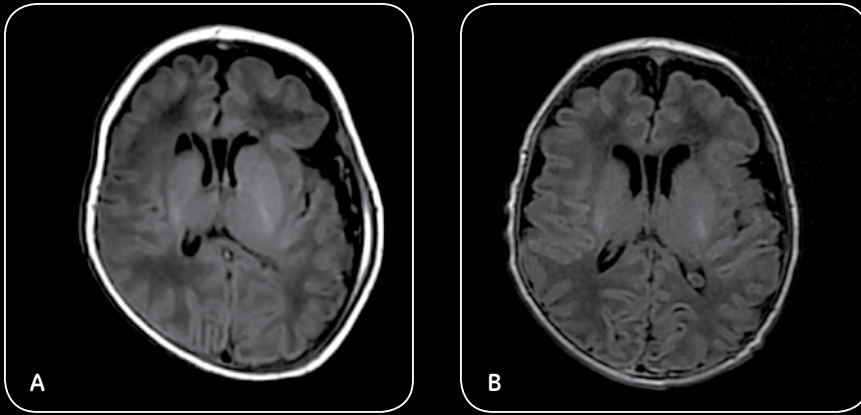


Figure 1. Comparing Axial T2 FLAIR (non-silent) (A) with Axial T2 FLAIR (B) acquired using SilentScan.

Reducing acoustic noise with ART

ART is an imaging option that reduces the gradient-induced noise for quieter scans. Since the noise in MR is directly related to the mechanical forces generated by the gradient-magnet interaction, GE developed ART which can be applied to most MR imaging sequences. ART optimizes the timing, duration, and execution of gradient pulses during the imaging acquisition to reduce mechanically induced system noise. There are two levels of ART. One that limits noise to less than 11 decibels above ambient and one that limits noise to less than 24 decibels above ambient.

Silenz shatters industry norms

In 2012, GE made MR industry headlines by introducing its proprietary technology, which leverages an innovative volumetric, 3D radial imaging sequence called Silenz that minimizes the gradient switching while acquiring high-resolution MR data. The Silenz imaging technique generates T1-weighted, proton-density weighted, and MR angiographic contrast with noise levels that are within 3 decibels of the ambient room noise.

In addition, the Silenz technique has the unique property of acquiring the data with an extremely short, effectively zero, echo time (ZTE). ZTE aids in T1-weighting, capturing signal from structures with short T2, and minimizing flow dephasing in MRA. The ZTE property of Silenz places tighter constraints on the RF subsystem, requiring fast RF switching to effectively capture the image data immediately after RF excitation.

SilentScan, a pediatric go-to

At Morriston Hospital (Swansea, UK), neuroradiologist Hannah Khirwadkar, MB Bch, FRCR, EDiNR, and her colleagues routinely use SilentScan on their Optima MR450w scanner in feed and wrap pediatric/infant neuro exams. Each SilentScan protocol consists of a T2 PROPELLER, T1 FSE, T2 FSE, and in some cases 3D Silenz T1-weighted volume sequences.

“The SilentScan images generally have very good quality and no significant motion,” Dr. Khirwadkar says. She compared the last eight SilentScan studies to eight pediatric feed and wrap studies performed at another hospital site she covers that doesn’t have SilentScan. Only one of the eight with SilentScan had motion artifacts compared to six of the eight without SilentScan and while the radiologist was still able to report the study, in each of the six cases there was a caveat in the report that the studies were limited due to significant motion artifact.

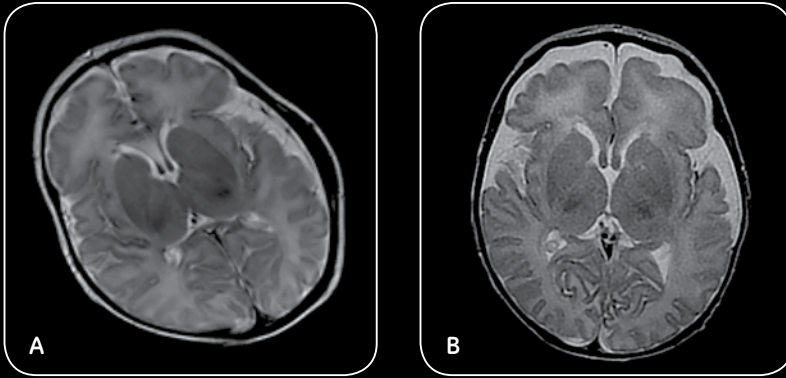


Figure 2. Comparing T2 PROPELLER (non-silent) (A) with PROPELLER acquired using SilentScan (B).

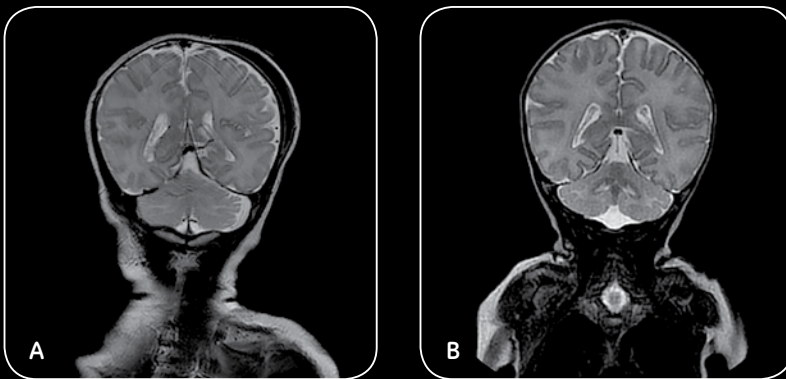


Figure 3. Comparing Coronal T2 FSE (non-silent) (A) with T2 PROPELLER acquired using SilentScan (B).

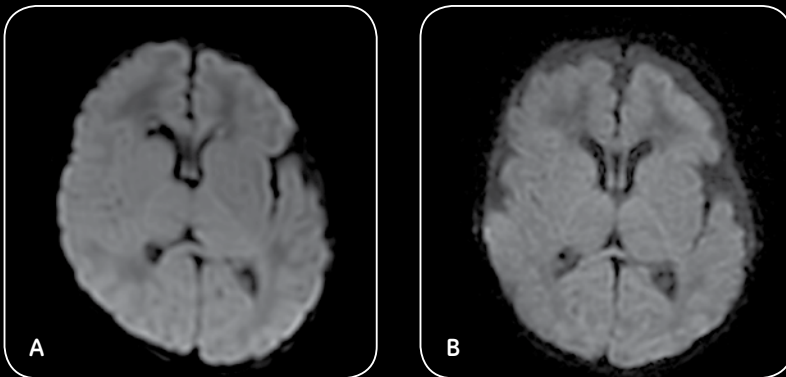


Figure 4. Comparing traditional EPI DWI (non-silent) (A) with DWI PROPELLER acquired using SilentScan (B).

“We are also avoiding a lot of general anesthesia, so that is also very important,” Dr. Khirwadkar adds. In all eight cases with SilentScan, sedation was not used, avoiding additional time and costs involved with sedation. General anesthesia also requires that the patient and parents remain in the hospital for monitoring, typically for the day, whereas they can leave immediately after the SilentScan is completed.

Parents are also less anxious, says Gareth Evans, Superintendent of MR at Morriston Hospital. “It’s always a surprise to the parents that the scan is totally silent.”

Dr. Khirwadkar definitely recommends SilentScan to any department that does a significant volume of pediatric or elderly, confused patients. “It’s a real strength to our practice, as we can be more confident in our report findings due to the higher quality of the images.” **S**

Hannah Khirwadkar, MB Bch, FRCR, EDiNR, is a Neuroradiologist at AberTawe Bro Morgannwg UHB, which operates Morriston Hospital. Dr Khirwadkar is one of three radiologists at Morriston who reports pediatric studies; her area of interest is neuro-oncology.