

CASE STUDY

Significantly Shorter Scan Times With No degradation Image Quality Achieved With Advanced intelligent Clear-IQ Engine (AiCE)

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Background

Municipal Ozu Hospital has 150 beds and is the main referral hospital in Ozu city, Ehime, Japan. Examinations of all regions of the body are performed based on requests received mainly from the departments of orthopedics, urology, and internal medicine. Municipal Ozu Hospital operates a high-end 1.5T MRI scanner, a Vantage Orian system. One year after the Vantage Orian system was installed, the hospital decided to upgrade their system by installing Advanced intelligent Clear-IQ Engine (AiCE), an advanced noise reduction reconstruction technology incorporating AI. This article is a first-hand report of the benefits of AiCE in actual clinical operation at Municipal Ozu Hospital.

Shorter examination times reduce the burden on patients and simplify scheduling

Many of the patients who visit Municipal Ozu Hospital are elderly, so we are always making efforts to shorten examination times and minimize the burden on our patients. At the same time, many referring physicians ask us to reduce the time required for each examination so we can schedule more examinations in the morning.

After our Vantage Orian was installed, the improvements in image quality were greatly appreciated by the physicians in each clinical department. The radiological technologists were also quite satisfied with the image quality. However, in response to requests from our physicians, 1 year after installation of Vantage Orian, we decided to upgrade the system by installing AiCE in order to shorten examination times without compromising image quality.

Following the installation of AiCE, we held discussions concerning image quality and came to the conclusion that taking measures to shorten examination times

would provide a greater benefit to our hospital than producing images that exceed the those of a 1.5T. Currently, with the exception of certain specialized examinations, we schedule most Vantage Orian examinations in 20-minute time blocks. Many physicians at our hospital as well as visiting radiologists have commented on the outstanding quality of our images, particularly given the short scan times. As one example, a physician from Ehime University who regularly visits our hospital recently said, "Your MR images are so much better lately!"

Figure 1 shows images of the lumbar spine. After the installation of AiCE, scan conditions can be set with fewer acquisitions and shorter scan times. It is generally thought that significant degradation of the signal-to-noise ratio (SNR) is unavoidable when such scan conditions are employed, but AiCE allows examination times to be shortened while maintaining high image quality. Because avoiding degradation of the SNR is no longer such an overriding concern, scan conditions can be set with much greater flexibility.

AiCE can be used in combination with high-speed scanning techniques

Vantage Orian features a compressed sensing technique and a 3D high-speed scanning technique known as Fast 3D. By using Fast 3D and AiCE in combination, 3D magnetic resonance cholangiopancreatography (MRCP) examinations, which previously required respiratory-gated scanning for approximately 2 minutes and 30 seconds, can now be performed in a single scan with a breath-hold time of approximately 18 seconds (Figure 2). With AiCE, we do not need to worry about the SNR and can therefore employ high-speed scanning techniques with greater flexibility. Use of the compressed sensing technique included in the new system version allows us to achieve even shorter scan times.

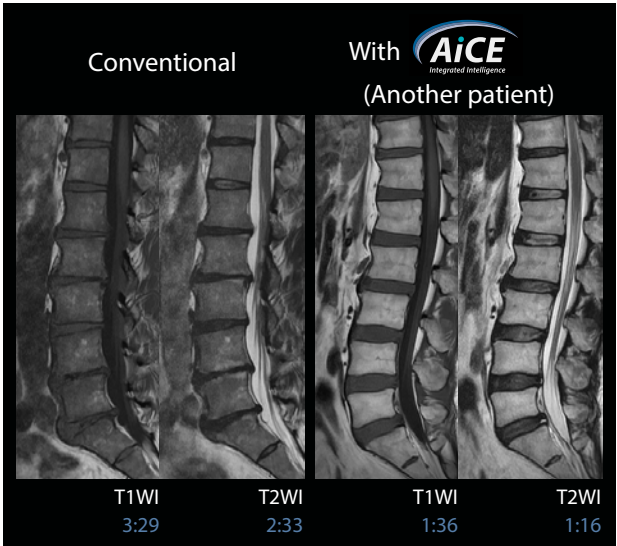


Figure 1

AiCE is used in most of our examinations

We use AiCE in most of our routine examinations, both 2D and 3D. Figure 3 shows images of the auditory nerves. These images were acquired in a scan time of 1 minute and 47 seconds, which is approximately half the previously required scan time of 3 minutes and 20 seconds. The image quality would be unacceptable without AiCE, but was significantly improved with AiCE. In addition, we were pleased to find that the time required for image reconstruction was actually shorter than when a conventional filter was used. This reduction in reconstruction time was quite surprising because we expected the reconstruction time to be longer due to the more complex reconstruction processing.

The operating procedures for AiCE are very simple. In the same way as filter processing, AiCE can be set as a part of the scan sequence or can be applied to previously acquired images in order to obtain the desired noise reduction effect. This allows us to deal effectively with any differences in SNR between patients.

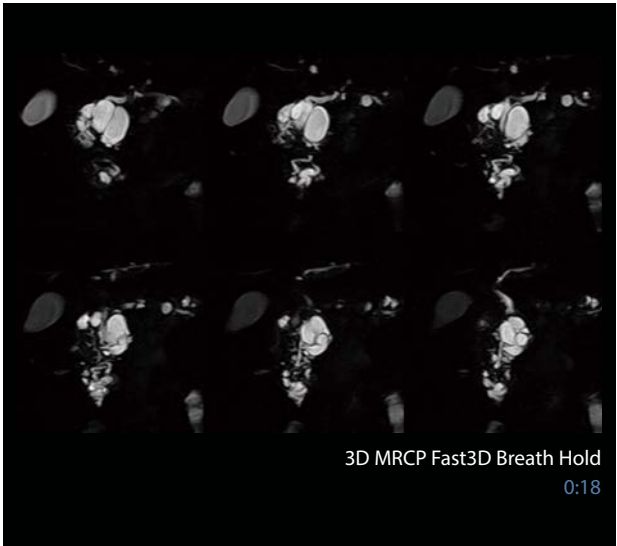


Figure 2

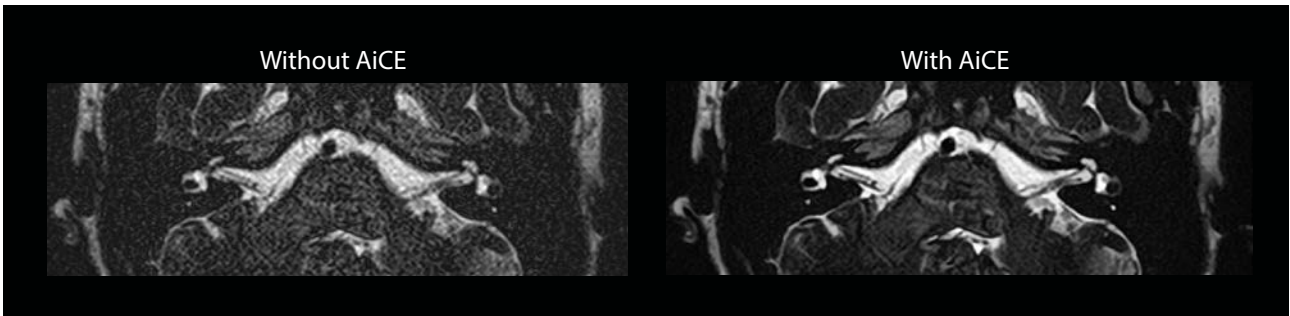


Figure 3

Our ideas concerning image quality in routine examinations have changed

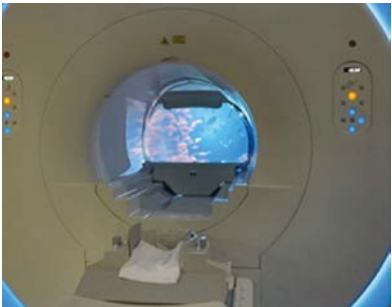
We previously had to take special care to ensure an acceptable SNR when setting the scan conditions. When AiCE was installed in our system, we had already gained a year of operational experience with Vantage Orian. This allowed us to determine how much we could shorten scan times while maintaining acceptable image quality based on direct comparison of images acquired by Vantage Orian with and without AiCE.

We gradually found that we could focus on selecting the optimal scan time and slice thickness while trusting AiCE to take care of the SNR. Of course, it is not possible to visualize things if suitable signals have not been obtained, and scan times should not be shortened without due consideration. In abdominal examinations, rather than performing respiratory-gated scanning, we can now perform breath-hold scanning thanks to the shorter scan times made possible by AiCE. We care for many elderly patients at our hospital, and the ability to perform examinations in a short time is very helpful to us. Therefore, purchasing the AiCE upgrade was definitely the right decision for our hospital. In the ER, head examinations including MRA can be completed in approximately 7 minutes when AiCE is used.

We will continue to make efforts not only to reduce scan times, but also to improve resolution and to acquire images with thinner slices based on the diagnostic objectives of each examination.

We can perform more patient-friendly examinations

We designed the examination room in which Vantage Orian is installed with special care to minimize any discomfort that patients with claustrophobia or other health conditions might experience while undergoing MRI examinations. One of our top priorities was to create a comfortable examination environment for all our patients. To achieve this goal, we carefully selected relaxing wall finishes and room lighting and also installed the MR Theater. These efforts, together with the shorter examination times made possible by installing AiCE, have made it possible for us to provide even more patient-friendly examinations.



MRI system equipped with MR Theater.



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