

The Road to the Aquilion ONE

Toshiba's vision for the Aquilion® ONE, a dynamic volume Computed Tomography (CT) system, dates back to the early 1990s. Having recently pioneered the development of helical scanning, an innovation that altered the way patients were diagnosed with CT, Toshiba defined a new vision for the future of CT. Helical scanning techniques provided the breakthrough capabilities to cover more anatomical area and acquire volume data sets. However, Toshiba and its customers were already thinking ahead to the next breakthrough – a CT system that would cover a whole organ in one rotation. To fulfill this customer vision Toshiba developed a roadmap to build the world's first dynamic volume CT system.

The Aquilion Product Line

When Toshiba developed its first Aquilion® multi-detector row product, the company's engineers carefully designed the multi-detector row system based on customer feedback so that it could evolve into the Aquilion 64. This development philosophy was a totally innovative approach to CT technology as it was completely new in all aspects, not simply modifications of single-detector platforms. Using the same philosophy, Aquilion ONE has been designed using key elements from the multi-detector row design concept to support both today's applications and future expectations for CT imaging.

Toshiba designed Quantum Detector technology to give customers the thinnest detector elements possible, 0.5mm, which ensure uniform isotropic resolution across every detector element. The Aquilion's gantry and tube were uniquely designed to support high rotation speeds. These and other fundamental design concepts allowed Toshiba to continuously provide customers the ongoing enhancements they needed to provide the best possible patient care as the product line evolved. Because of this unique design, Toshiba is able to provide all of its customers – whether they have the 4-, 8-, 16-, 32-, or 64-detector row Aquilion – with uniformly superior images. It is this commitment to leading innovation that has enabled Toshiba to develop the first dynamic volume CT system.

Today, the Aquilion CT line is one of the most successful in the industry. With nearly 1,700 Aquilion 64-detector row systems installed worldwide, Toshiba has been able to demonstrate its commitment to customer loyalty and patient care. It leads the industry in customer satisfaction ratings with both MD Buyline and KLAS Enterprises. Additionally, Toshiba has demonstrated its commitment to patient care through validation of its technology in multi-center clinical trials, including CorE64, faCTor⁶⁴ and iLEAD.

Aquilion ONE's Rapid Development

Once Toshiba developed the first 256 CT prototype to begin testing clinical aspects of dynamic volume CT in 1999, the company went directly to its customers for input. It was critical to Toshiba's development process to implement customer insights for improvement. Once all customer feedback was integrated into the prototype, a beta version was developed for intensive testing in clinical and research settings.

In early 2006, a series of beta trials were organized for three-month periods at Fujita Health University and the National Cancer Center in Japan. At Fujita, physicians tested the system's neurological and cardiac applications, while physicians at the National Cancer Center tested its applications on innovative cancer studies. In early 2007, Toshiba expanded the beta testing worldwide with a three-month installation at Johns Hopkins University in the U.S. The worldwide clinical beta trials were instrumental in helping Toshiba bring this system to market by providing important recommendations.

Finally, the remaining obstacle in the successful launch of dynamic volume CT was computing power. Toshiba was only able to bring the product to market by integrating the latest chip and reconstruction technology to make the Aquilion ONE clinically viable to the medical community. Understanding the unique workflow needs of dynamic volume imaging, Toshiba needed to ensure that chip and reconstruction technology would allow the system to perform at optimal speed for routine, clinical use.

Aquilion ONE's Clinical Realities

The Aquilion ONE can impact patient care in a number of ways. The system's power can be best demonstrated when addressing the needs of stroke patients. When a patient comes to a hospital's emergency room (ER) exhibiting stroke symptoms, it can take hours to diagnose and treat the patient when time is of the essence. In most cases, patients have to wait for at least an hour for staff to see them and initiate any diagnostic

exams. Typically, stroke patients will be taken to the hospital's CT system first, but often results can be inconclusive and additional tests, including MR exams, are necessary. This can extend the diagnosis time to as much as four hours. With the Aquilion ONE, time-to-diagnosis can be dramatically reduced from hours to minutes because of the functional data it is able to acquire accurately and quickly. This improved diagnosis time could be the difference in quality of life for patients when they leave the hospital.

In another potential scenario, diagnosis of patients exhibiting symptoms of heart conditions can be reduced from days to minutes. Typically, patients who come to the ER with chest pain are given multiple tests to identify the problem, including an EKG, calcium study, CT angiography (CTA), nuclear test and catheterization. Tests of this nature could take days to complete and would expose the patient to significant radiation doses. With the Aquilion ONE, one exam can give physicians all the information they need to diagnose and treat the patient, in less than 20 minutes and with significantly less contrast and radiation dose.

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