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TOSHIBA

Aquilion ONE Changing Patient Pathways

TOSHIBA

Leading Innovation

Changing Patient Pathways

In Health Care

Second Edition

ONE Aquilion VISION EDITION

ONE Aquilion

Changing Patient Pathways

In Health Care

Second Edition

Dear Reader,

The world's first dynamic volume CT system was introduced at RSNA 2007, changing the world of medical imaging forever. The intervening years have witnessed dramatic improvements in CT technology, including the development of AIDR 3D iterative reconstruction, advanced cone-beam correction algorithms, and electronic scatter correction.

Years of experience and customer feedback have led to the development of the second-generation Aquilion ONE™, launched in 2011, boasting a wider gantry bore and new detector technology. This system is also upgradable to the Aquilion ONE /ViSION Edition, which features faster gantry rotation and a larger capacity generator.

However, a CT scanner should not just be about technology, which is why we have established partnerships with physicians around the world to develop scanning procedures and analysis methods that improve the quality and accuracy of patient care.

This brochure features many of the truly unique applications offered by the Aquilion ONE and the ViSION Edition. Each and every one is a direct result of close collaboration with our clinical partners.

On behalf of the entire team at Toshiba, we thank you all for your passion and your commitment to improving patient outcomes, both today and tomorrow. The future of diagnostic imaging is safely in your hands.

Sincerely,

Toshio Takiguchi

President and Chief Executive Officer
Toshiba Medical Systems Corporation

Table of Contents

"Aquilion ONE provides the latest technology, which has greatly improved our ability to diagnose and treat a wide variety of intracranial vascular diseases."

Professor Kazuhiro Katada, Fujita Health University, Japan

4D DSA of the Brain

The evolution of CT technology over the last decade has been truly remarkable. Helical CT ushered in a new era of possibilities by reducing step artifacts between slices and made it possible to produce clinically useful multiplanar reconstructions to aid in diagnosis.

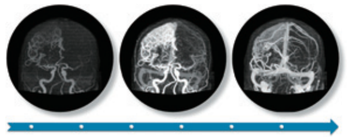
Multi-detector row systems that offer superior isotropic resolution and faster scan times have made CT angiography a commonplace examination that is performed worldwide every day.

Helical CT technology provides excellent anatomical images. However, it is not well suited to capturing useful information regarding physiological function, because the entire scan is essentially an amalgamation of information captured at different points in time.

Aquilion ONE, which is equipped with a wide-area detector that is able to capture up to 16 cm of anatomy in a single rotation, represents the very latest generation of CT technology.

With volumetric scanning, entire organs can be captured with perfect temporal uniformity and completely free from z-axis misregistration. The fact that the resultant images show one moment in time, or the exact same phase of contrast enhancement, paves the way for high-quality dynamic volume applications.

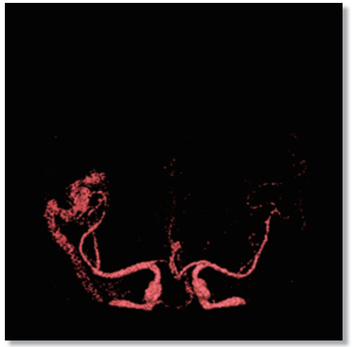
4D DSA dynamic volume imaging of the intracranial circulation provides detailed information concerning intracranial flow dynamics in a single, easy-to-perform acquisition.



SURE Subtraction automatically subtracts the skull, providing DSA-like images, with the ability to observe the data from any desired viewpoint.

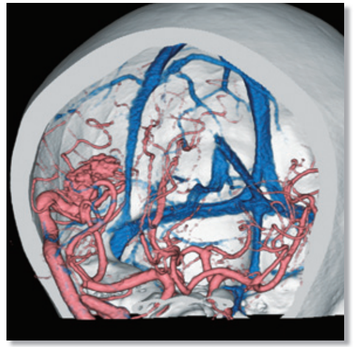
Arteriovenous Malformation

A 42-year-old woman with a history of Graves disease and a dural AVM was referred for 4D CT-DSA for preoperative treatment planning.



This early arterial-phase image from the 4D DSA scan demonstrates that the primary feeding vessels of the AVM are the middle and posterior trunks of the M2 segment of the right middle cerebral artery.

The nidus of the AVM is well opacified during the peak arterial phase of enhancement. The AVM is drained via the right subcortical and superficial sylvian veins.



Isophasic 4D DSA shows excellent separation of the arterial and venous phases of blood flow through the brain. 3D fusion provides an intuitive overview for preoperative treatment planning.

"The Aquilion ONE has made a huge impact upon our acute stroke and TIA imaging program.
The ability to acquire whole brain perfusion has led to detection of both posterior fossa and high cortical infarcts in patients that would have been missed without whole brain coverage.
In addition, whole brain coverage also prevents the underestimation of infarct core and penumbra that occurs with limited coverage. This can make a crucial difference in the selection, and prediction of response to, acute stroke reperfusion therapies.
This is the most advanced CT scanner available for stroke imaging."

Associate Professor Mark Parsons, John Hunter Hospital, Australia

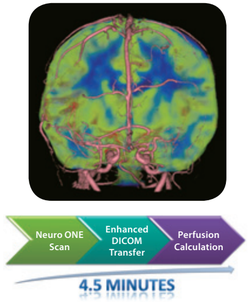
Whole Brain Perfusion

In acute stroke imaging, the time to diagnosis and treatment directly affects the degree of injury to brain tissue. Complete and rapid evaluation of cerebral ischemia can greatly improve the patient's quality of life after a stroke.

The Aquilion ONE is the ideal CT system for imaging acute stroke patients. Providing whole-brain coverage in a single rotation, a dynamic perfusion sequence can be completed in just 60 seconds with no table movement; an important consideration when imaging cerebrally irritated patients.

A specialized low-dose intermittent scan protocol provides both whole-brain perfusion and 4D DSA images of the intracranial circulation with an exposure dose of approximately 6 mSv. High-quality diagnostic results are achieved with only 50 mL of contrast medium.

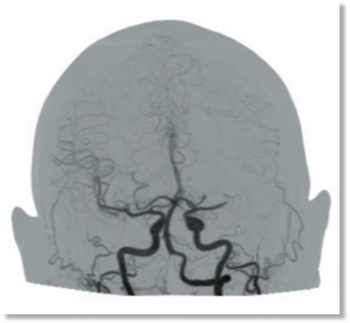
The Aquilion ONE not only reduces the time to diagnosis, but also saves money, since the need for additional imaging is greatly reduced. Whole-brain perfusion imaging also identifies deficits in brain territories that would not be seen with limited scan coverage. Equally important is the ability to confidently rule out perfusion deficits in patients with stroke-like symptoms.



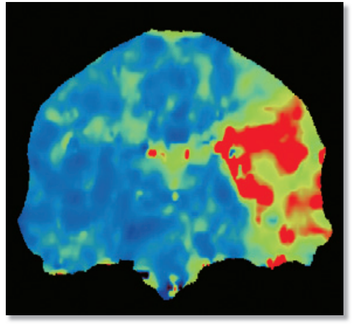
High-resolution whole-brain perfusion images, including 4D dynamic DSA images, are available for diagnosis in just 4.5 minutes from the start of the examination.

Embolic Occlusion

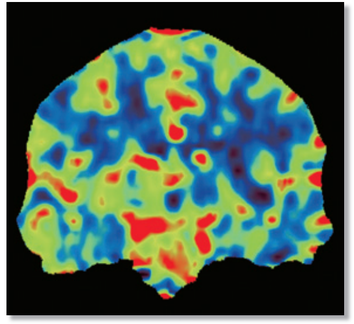
A 68-year-old woman presented to the emergency department with severe right-sided weakness and aphasia. She was immediately sent to the Aquilion ONE for whole-brain perfusion imaging. The imaging findings indicated that she was an ideal candidate for acute reperfusion therapy. The patient underwent intravenous thrombolysis immediately after imaging (door-to-needle time less than 1 hour) with an excellent clinical result. She was free of disability at 3 months after her stroke.



The arterial phase of the 4D DSA reconstruction clearly shows an embolic occlusion of the left MCA.



The TTP map shows a significant delay in blood flow to the territory of the left MCA.



The CBV map demonstrates low blood volume in the center of the MCA perfusion deficit, consistent with an infarct core. The preserved blood volume in the left MCA cortex is indicative of intact autoregulation in the ischemic penumbra.

"This deformable subtraction algorithm provides a highly accurate CT DSA examination of routine carotid CTA studies, dramatically reducing the time required for image interpretation. This is truly game changing technology, and a remarkable development."

Dr. Ruben Sebben, Consultant Radiologist, The Queen Elizabeth Hospital, Adelaide, Australia

SURE Subtraction — Carotid CTA

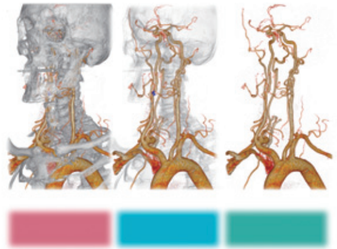
The ultimate requirement in vascular imaging is to combine the advantages of the robust subtraction available in X-ray DSA examinations with the safer alternative provided by volumetric CTA.

However, due to respiratory, pulsatile, and patient motion, bone and calcium are free to move independently from each another in 3D space, making simple registration between the mask scan and the CTA scan inadequate.

To solve this issue, Toshiba's advanced visualization scientists have developed a deformable registration and subtraction algorithm which is fine tuned for the most complex CTA examination of the neck and intracranial vessels.

Applicable to routine carotid CTA examinations, from the aortic arch to the vertex of the skull, this algorithm performs with an unprecedentedly high degree of accuracy, providing volumetric images of the carotid and vertebral arteries and their branches completely free from overlying bone and calcified plaque.

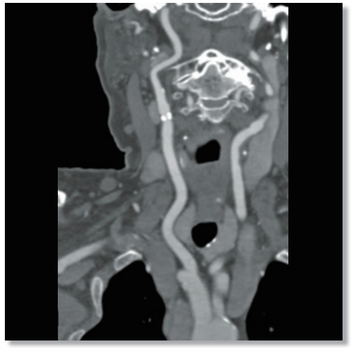
This technology is set to change the way physicians perform and read CTA studies, with improved accuracy and in much less time.



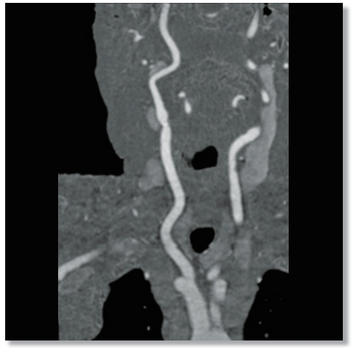
Pixel perfect subtraction carotid CTA studies are faster and easier to interpret.

Right ICA Calcified Plaque

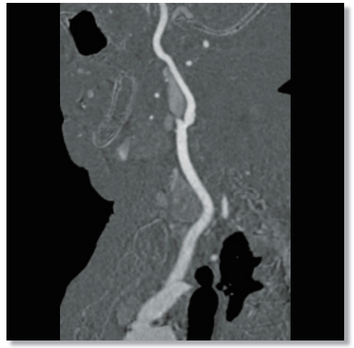
This 74-year-old woman presented with several episodes of syncope.



A circumferential calcified plaque is seen at the origin of the right internal carotid artery. The degree of stenosis appears to be approximately 75%.



The degree of stenosis appears less severe in the subtracted image due to the unobstructed view of the vessel lumen.



The lesion was graded as causing a stenosis on the order of 40% with a high degree of diagnostic confidence.

"4D isotropic volumetric imaging of the central airways provides a more comprehensive and accurate assessment of central airway dynamics for the diagnosis of tracheomalacia compared to conventional MDCT."

Associate Professor Narinder Paul, Toronto General Hospital, Canada

Tracheomalacia

Tracheomalacia is characterized by excessive airway collapse during respiratory maneuvers. Studies have shown that peak airway collapse does not occur synchronously throughout the airway. Specifically, peak collapse of the proximal trachea occurs later than in the distal trachea.

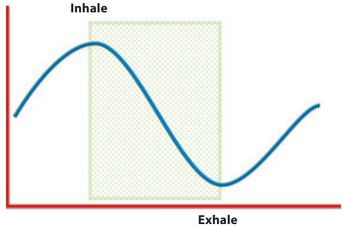
In addition, severe forms of this disease may require surgical intervention, including resection and tracheal stent placement.

Therefore, accurate delineation of the entire intrathoracic airway is invaluable to accurately demonstrate this pathology.

The introduction of the Aquilion ONE with 16 cm of anatomical coverage has facilitated dynamic imaging of the entire intrathoracic trachea and proximal main bronchi during all phases of respiration.

The patient is instructed to take in a deep breath and hold it for 2 seconds before forceful expiration. The scan is performed from the breath hold at maximum inspiration to the end of exhalation, ensuring that images are acquired for the entire breath cycle.

The resultant 4D dynamic images clearly demonstrate the extent and severity of airway collapse, and also provide volumetric data for calculating percent collapse.

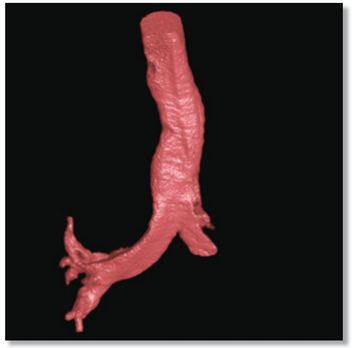


Dynamic imaging is performed from maximum inspiration to the end of forceful expiration.

Presurgical Assessment

A middle-aged man with a history of shortness of breath was sent for evaluation by dynamic volume imaging of the lower airways.

The full-inspiratory phase demonstrates a normally expanded trachea and bronchial tree.



During forceful expiration, collapse of the posterior wall of the left bronchus and trachea is observed.

At the end of forceful expiration, severe collapse of the entire posterior tracheal wall is observed. The bronchi have collapsed to the degree that they do not contain sufficient air to be seen in 3D images.

"With AIDR 3D integrated into our protocols, we may now acquire a chest CT for nodule screening with a dose equivalent to a chest X-ray, with an enormous advantage in diagnostic power."

Dr. Trond Morgens Aaløkken, Rikshospitalet, Oslo University Hospital, Norway

Microsievert Chest CT

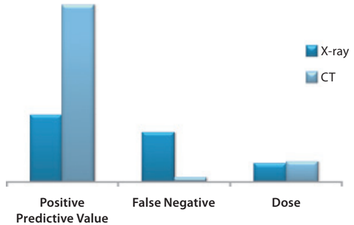
Chest CT imaging has long been considered to offer superior diagnostic accuracy compared to conventional chest X-ray. The biggest advantage in favor of radiography has been a considerably lower radiation dose.

However, since the introduction of AIDR 3D (Adaptive Iterative Dose Reduction 3D) to Toshiba CT systems, it is now possible to acquire chest CT with dose levels that are equivalent to traditional radiography.

Dr. Aalokken and his team in Norway undertook a study in 13 subjects comparing chest X-ray to ultra-low-dose CT for lung nodule screening.

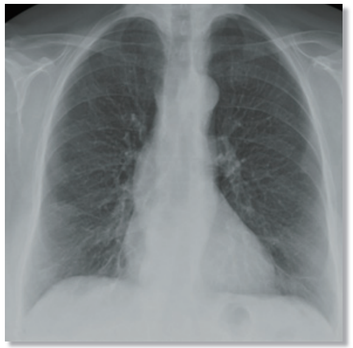
The results showed a positive predictive value of 98% for CT compared to 37% for X-ray. In addition, the readers reported 2 false negative findings for CT compared to 27 false negative findings for chest X-ray.

The clinical impact of being able to replace chest X-ray with an ultra-low-dose CT examination is expected to be truly revolutionary. Patient care will be greatly improved and there will be reduced costs, with dramatically fewer false positive findings which can lead to unnecessary follow-up examinations.



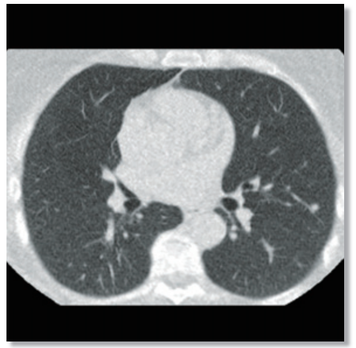
Lung Nodule Screening Study

A 60-year-old man with suspected heart disease was recruited to participate in the ultra-low-dose CT study.



The chest X-ray was read as normal, but a nodule in the left lung was missed.

Ultra-low-dose chest CT clearly shows a 7 mm nodule in the left lung and some atelectasis in the right lung.



A 3 mm axial image reconstructed with AIDR 3D shows exceptional detail at a dose equivalent to a chest X-ray.

"The ability to observe differential motion of lung tumors and to exclude tumor infiltration has the ability to increase the number of patients that are candidates for surgery, therefore dramatically improving their prognosis."

Associate Professor John Troupis, Cardiac CT, Diagnostic Imaging, Monash Health, Australia

Dynamic Lung Tumor Staging

The diagnosis of lung tumors has traditionally been based on static CT images. Tumors adjacent to the chest wall or mediastinal structures are often deemed inoperable as it is assumed they have invaded the surrounding anatomy.

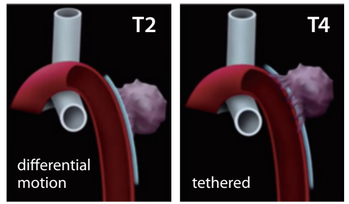
Dynamic volume imaging during patient breathing has been employed in patients with lung tumors at Southern Health Diagnostic Imaging in Melbourne, Australia.

This novel imaging technique has the ability to identify the differential motion of the tumor with respect to the surrounding anatomy, thus correctly identifying tumors that are not tethered and therefore are non-invasive.

Non-invasive tumors are able to be surgically removed with a greater degree of confidence, dramatically improving the patient's prognosis.

Diagnosis to identify differential motion is easily made on qualitative visual assessment, and additional quantification of tumor movement with the use of a grid overlay is being developed.

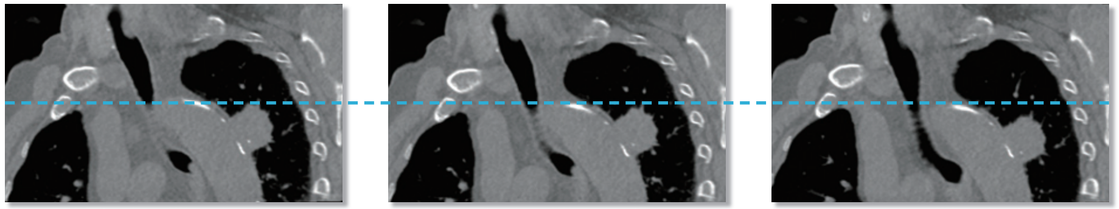
Dynamic volume assessment of lung tumors is literally changing patient pathways in healthcare.



Dynamic volume imaging during patient respiration is able to determine if lung tumors are tethered where there is no differential motion with respect to surrounding anatomy.

Downgrading Lung Cancer

A 74-year-old man presented with a left upper lobe non-small cell carcinoma adjacent to the aortic arch. No cleavage plane was seen on static CT images and it was therefore staged as a T4N2M0 lesion. Dynamic volume assessment was requested. 4D dynamic CT was performed for the assessment of differential motion of the mass.



The dynamic CT images clearly show that the tumor slides along the pulsating aorta, downgrading the staging of the tumor to T2aN0M0.

"Subtraction imaging adds diagnostic power to the routine evaluation of patients undergoing pulmonary CTA examinations. Ongoing studies also suggest new opportunities for the evaluation of interstitial lung disease and COPD, where knowledge about blood flow information may aid in diagnosis and treatment planning."

Professor Mathias Prokop, Radboud University Medical Center, Nijmegen, the Netherlands

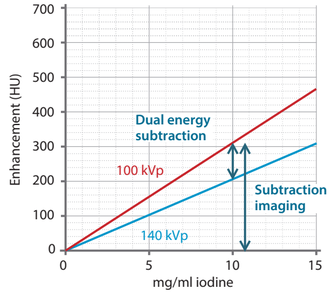
SURE Subtraction Lung — Blood Flow Mapping

Pulmonary CTA is a well-accepted examination to evaluate patients for pulmonary emboli. However, small subsegmental emboli may be difficult or impossible to identify. Contrast enhancement of the lung parenchyma provides useful additional functional information. This can be gained with a dual energy approach or, more recently, with subtraction.

For subtraction imaging, a low-dose precontrast scan is performed as the subtraction mask, followed immediately by a pulmonary CTA acquisition. Image registration is crucial and is fine-tuned to compensate for lung motion between the two scans.

A color overlay of the resulting enhancement map enables easy identification of underperfused areas in the lungs and evaluation of the extent of perfusion deficits.

Enhancement maps add a new functional dimension to pulmonary imaging. For lung embolism, the presence of perfusion defects may simplify the detection of small emboli, while evaluation of the size of these defects can help us determine the most appropriate therapeutic method and aggressiveness.

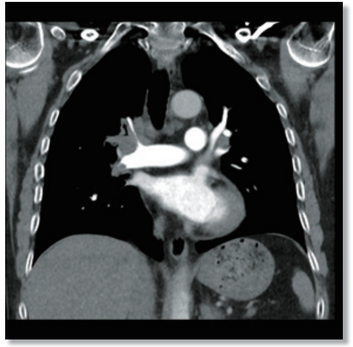


Subtraction exploits the entire iodine signal and does not subtract a high-energy signal from a low-energy signal. The resulting enhancement maps of the lung parenchyma have a contrast-to-noise ratio that is up to 3.3 times higher than that of a dual energy acquisition of similar radiation dose.

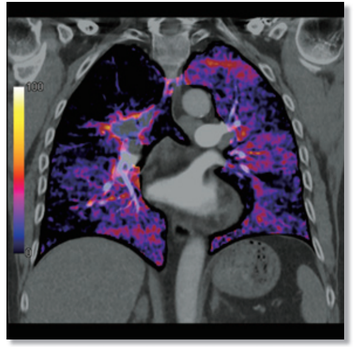
Pulmonary Embolic Disease

60-year-old man with known right upper lobe tumor and metastases. This patient presented with dyspnea and an elevated D-dimer blood test.

The lung carcinoma is seen adjacent to the right hilum. Mediastinal metastases are noted.



Pulmonary emboli are seen at the origin of the right lower lobe artery. These emboli are difficult to discriminate from the bilateral hilar lymph node metastases.



Large areas of nonperfused lung parenchyma are identified on the subtracted blood flow maps.

"The routine application of ECG gating in the chest increases the diagnostic performance for a wide variety of diseases, including the detection of lung nodules and interstitial lung disease, and eliminates pseudo-dissection artifacts in the ascending aorta, without any additional radiation exposure."

Professor Sadayuki Murayama, University of the Ryukyus Hospital, Okinawa, Japan

Dose-Neutral ECG-Gated Chest Imaging

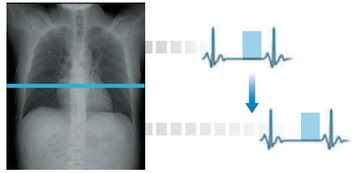
ECG-gated helical scanning has been successfully adopted as a technique to image the heart and coronary arteries following the introduction of 64-detector row CT systems. Gating is also occasionally used in examinations of the ascending aorta to evaluate dissection, particularly if the results of a non-gated scan are equivocal due to possible motion artifacts.

Although the benefits of ECG gating are applicable to the entire chest, this method has not been adopted for routine chest imaging due to the increase in radiation dose with ECG-gated helical scanning techniques.

Aquilion ONE provides a unique scanning method known as the wide-volume technique in which multiple overlapping volumetric scans (16 cm) are performed, each in a single gantry rotation. This makes it possible to obtain volumetric images of the entire lung in just two or three exposures and during a short breath-hold. When combined with prospective ECG triggering, ECG-gated images can be obtained without any additional radiation exposure.

The ACTIve study comparing ECG-gated wide-volume scanning against non-gated helical scanning has shown a significant improvement in image quality, particularly in the left lower lobe and lingular segments of the left lung.

ECG-gated wide-volume scanning provides improved diagnostic accuracy in routine lung scans without any additional radiation dose penalty.

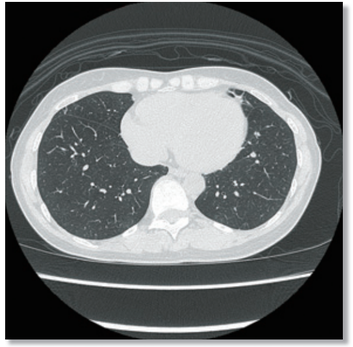


ECG-gated wide-volume scanning of the entire chest can be performed in two to three exposures, providing volumetric imaging.

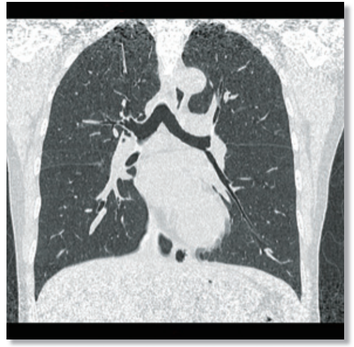
ACTIve Study Case

The images below are from a patient recruited for the ACTIve study comparing non-gated 64-row helical scanning against dose-neutral ECG-gated wide-volume scanning.

64-row helical scan — Significant motion artifacts are seen in the left lower lobe adjacent to the heart.



ECG-gated wide-volume scan — Blurring due to cardiac motion is virtually eliminated, providing dramatically sharper images of the lung parenchyma.



ECG-gated wide-volume scan — Excellent z-axis uniformity is maintained with the wide-volume technique made possible by Aquilion ONE's 16 cm detector coverage.

"We have developed a robust, easily applicable, and state-of-the-art method for the quantitative evaluation of solitary pulmonary nodules. This method can be employed easily and safely in routine clinical practice and makes it possible to differentiate between malignant and benign nodules more specifically and more accurately than with FDG-PET/CT."

Professor Yoshiharu Ohno, Kobe University, Japan

Pulmonary Nodule Perfusion

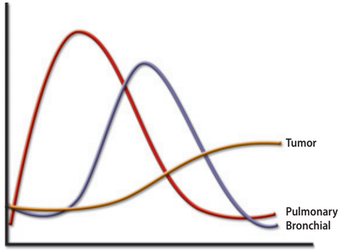
The diagnosis and management of pulmonary nodules is one of the most common and important challenges in the field of pulmonary medicine because pulmonary nodules are caused by a wide variety of conditions.

Ideally, the goal of diagnosis and management is to promptly bring to surgery all patients with operable malignant nodules, while avoiding unnecessary thoracotomy in patients with benign lesions. It is therefore essential to differentiate between malignant and benign nodules in the least invasive manner and to obtain a diagnosis that is as specific and accurate as possible.

First-pass dynamic CT perfusion with the Aquilion ONE has been shown to be a very accurate method for differentiating between malignant and benign nodules in a simple noninvasive dynamic volume scan.

The 4D volumetric perfusion analysis software provides quantitative measurements of nodule blood flow, blood volume, and extraction fraction (permeability).

Malignant tumors show significantly higher blood flow and extraction fraction values than benign tumors, even those expected to exhibit high biological activity.

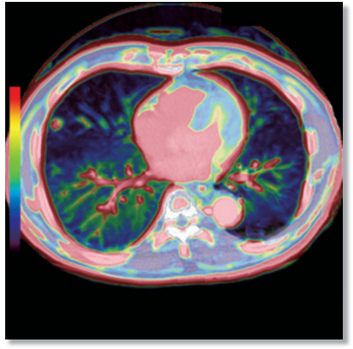


During the injection of IV contrast medium, dynamic volume images are acquired every 2 s for 28 s and then at 40, 50, and 60 s to capture the fast pulmonary flow and the slower flow in the nodule.

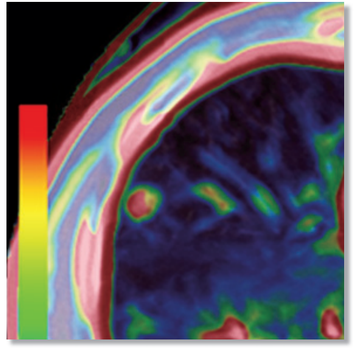
Pulmonary Nodule

A 72-year-old man with adenocarcinoma and a known pulmonary nodule was evaluated by volumetric pulmonary perfusion analysis.

A nodule measuring 15 mm is seen in the middle lobe of the right lung.



Single-input maximum slope analysis demonstrates the blood flow to the lung parenchyma and to the malignant nodule.



The perfusion map shows increased blood flow, which indicates malignancy.

"With regard to hemoptysis caused by TB fistulas, lung perfusion has changed our work-up and treatment protocol."

Dr. Yuan Xiaodong, PLA 309 Hospital, China

Dynamic Lung CTA in Hemoptysis

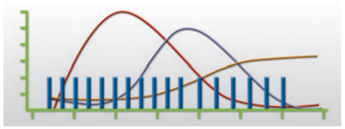
Hemoptysis is a common event, and in severe form is a life threatening condition. In patients with tuberculosis, bronchiectasis, or lung tumors, hemoptysis is often due to the formation of a fistula, with shunting between the systemic and pulmonary arterial systems. The most effective treatment option is to perform embolization in order to interrupt the blood supply to these abnormal vessels.

The management and treatment of such patients has dramatically improved at PLA 309 Hospital since the introduction of the Aquilion ONE, with its unique ability to perform dynamic volume angiography.

The new imaging protocol includes 4D CT angiography of the chest prior to embolization in order to accurately localize the fistula and shunt, immediately followed by the embolization procedure in the cath lab.

Dynamic volume angiography permits detailed flow analysis and visualization of such shunts in a single noninvasive low-dose study. In addition the time-resolved images obtained can be viewed in 3D, permitting clear visualization of the anatomy and blood flow in any desired view.

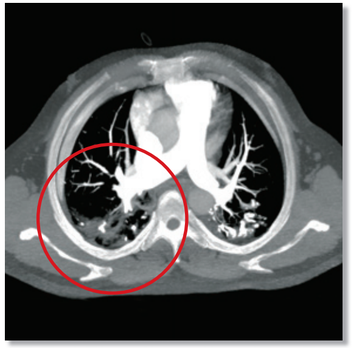
The use of dynamic CT angiography in these patients has markedly shortened the time required for performing embolization procedures, resulting in reduced radiation exposure and smaller doses of contrast agent.



During the injection of IV contrast agent, intermittent dynamic volume images are acquired over a period of 30 seconds.

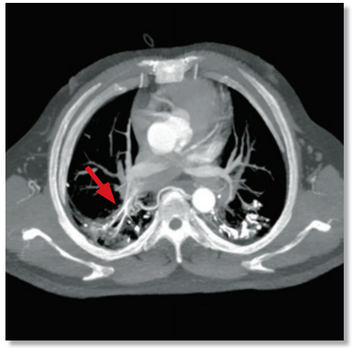
Right Upper Lobe Fistula

A 54-year-old man with chronic tuberculosis and massive hemoptysis was sent for pretreatment localization of fistulae.



This pure pulmonary arterial phase image demonstrates a decrease in perfusion in the right upper lobe (circle).

A prominent bronchial artery (arrow) is seen in the phase of peak aortic enhancement.



A fistula between the bronchial artery and pulmonary artery (arrow) is clearly seen in this later phase, with reverse flow observed due to the higher pressure in the bronchial artery.

"The second-generation Aquilion ONE was installed at our hospital in November 2013. In the first six months the median radiation dose for all patients was 1.1 mSv and the median contrast volume delivered was just 60 ml of Iopamidol 370 mgI/ml. This scanner produces highly diagnostic studies with minimal total patient dose."

Dr. Russell Bull, Royal Bournemouth Hospital, United Kingdom

Low Contrast and Radiation Dose Coronary CTA

Aquilion ONE offers several unique technologies to ensure high-quality coronary CTA examinations.

Volumetric scanning provides superior diagnostic image quality as the entire heart can be captured in just one heartbeat, eliminating the stair-step artifacts associated with the helical and step-and-shoot techniques.

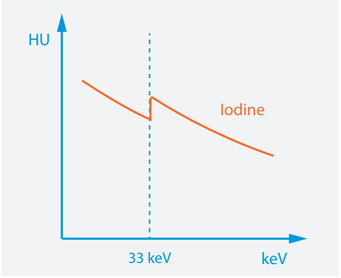
With the introduction of AIDR 3D iterative reconstruction integrated into the automatic exposure control software, the exposure dose is automatically minimized for every patient.

In addition, since AIDR 3D virtually eliminates the streak and photon starvation artifacts associated with low-kV acquisition, the majority of CTA examinations can be performed at 80 or 100 kVp, taking advantage of the photoelectric absorption of iodine, which is referred to as the K-edge effect.

Polychromatic low-kVp X-ray beams contain a higher proportion of lower energy photons at an energy level just above the binding energy of the K-shell electrons of iodine at 33.2 keV. Photons of this effective energy and slightly above are more likely to be absorbed, resulting in an increased HU density of contrast-enhanced tissues in the resultant images.

This increase in contrast opacification is advantageous because the total contrast volume administered to the patient can be reduced while maintaining excellent delineation of the coronary arteries.

Lower contrast and radiation dose results in a safer examination.

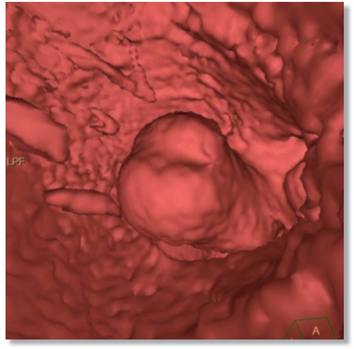


This graph shows the sudden increase in HU density of iodine at (and above) 33 keV due to the K-edge effect.

Atrial Myxoma

A 67-year-old woman presented with increasing dyspnea and dizziness on exertion. A prospectively trigged ECG-gated scan performed at 100 kVp resulted in a radiation dose of 1 mSv and a contrast dose of 60 ml of Iopamidol 370 mgI/ml delivered at 4.5 ml/s.

4-chamber image demonstrating an atrial myxoma arising from the interatrial septum and prolapsing through the mitral valve.



Intracavity 3D volume-rendered image demonstrating the polypoid tumor prolapsing through mitral valve into the left ventricle.

3D volume-rendered image showing normal coronary arteries.

"The Holy Grail in performing coronary CTA is the ability to combine unsurpassed luminal visualization free of calcium as with catheter studies with CT. Toshiba's SURESubtraction software delivers robust calcium subtraction and we can perform this with no additional radiation dose.

We routinely use the subtraction scan mode for all our cardiac CTA patients and perform subtraction in the cases with high calcium or stents."

Associate Professor Klaus Kofoed, Rigshospitalet, University of Copenhagen, Denmark

SURESubtraction — Coronary CTA

One of the remaining challenges for coronary CTA is in patients with extensive calcific plaque, which can make accurate assessment of stenosis difficult due to beam hardening effects which can overestimate the size of dense calcium. To ensure diagnostic confidence in these cases, invasive angiography is often performed.

Toshiba's registration technology has been optimized for the coronary arteries in the SURESubtraction coronary application. Using a combination of rigid and non-rigid registration, the calcium score scan is subtracted from the post-contrast CTA scan to provide an image of the vessel lumen free of calcium.

By utilizing the scan acquired for calcium scoring as the mask for subtraction, this subtraction coronary CTA is performed with no additional radiation dose to the patient.

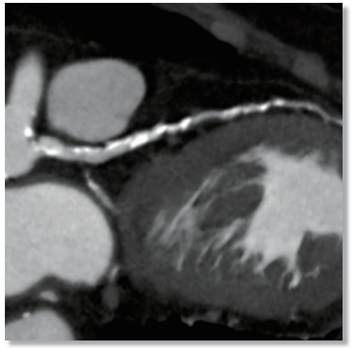
An innovative subtraction scan mode automatically matches the scan parameters for the pre- and post-contrast acquisitions, which makes scan planning simple with robust results.

The ability to view the coronary vessels free of calcium allows accurate visualization of luminal stenosis, obviating the need for additional morphological imaging.

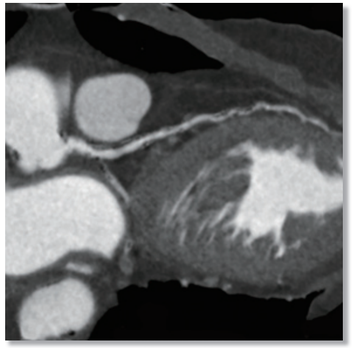
Pixel perfect subtraction of coronary calcium provides accurate visualization of arterial stenosis.

LAD Calcification

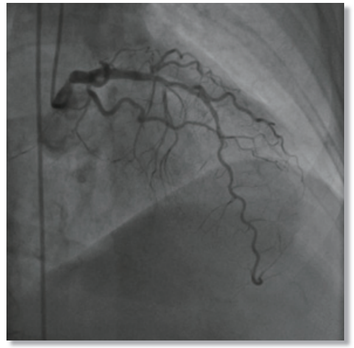
This 75-year-old woman presented with episodes of increasing dyspnea. A CT scan was requested to rule out coronary artery disease as the cause of her symptoms.



Significant calcification is seen in the proximal LAD. It is difficult to evaluate the presence of stenosis in this segment.



The subtraction image shows no significant stenosis of the proximal LAD.



This finding was confirmed on the catheter angiogram and no further treatment was required.

"We have developed a robust, revolutionary, state-of-the-art methodology for the evaluation of acute chest pain in the emergency department. This can be done seven days a week with excellent clinical outcome and is cost-effective."

Dr. Michael Poon, Stony Brook University Medical Center, USA

Acute Chest Pain

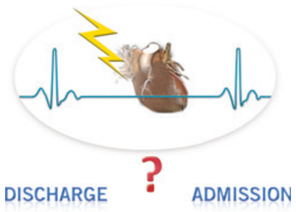
Patients presenting to an emergency department with acute chest pain who are classified as having a low to intermediate risk of obstructive coronary artery disease have traditionally followed a work-up protocol that includes ECG reading and a blood test to determine troponin levels.

However, even if these tests prove negative, approximately half of these patients are admitted for observation, and 35% of these patients are later discharged without a specific cardiac diagnosis.

The Aquilion ONE's technology provides the new standard in performing coronary CTA in emergency patients, as the exam can be performed in just one heartbeat, allowing arrhythmias to be effectively excluded, something just not possible with a helical scan technique.

At Stony Brook University Medical Center, coronary CTA is now a standard procedure in the evaluation of patients with a low to intermediate risk of coronary artery disease. Since this program's introduction in 2010, utilization of coronary CTA in ruling out coronary artery disease has reduced unnecessary hospital admissions by approximately 30%. This not only is better for patient care but also has a huge impact on healthcare costs, with an average cost savings of US$5,000 per unnecessary admission.

In addition, with the use of coronary CTA, patients with early coronary artery disease can be diagnosed and referred for early medical intervention and lifestyle changes.

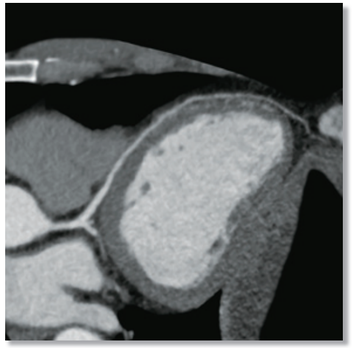


Coronary CTA examination on the Aquilion ONE provides a robust solution to improve patient care and reduce overall healthcare costs in the management of patients with chest pain.

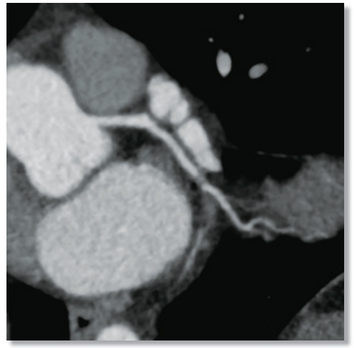
Intermittent Chest Pain

A 51-year-old male patient presented to the emergency department with a history of postprandial chest pain occurring on and off over a few weeks. An ECG stress test was performed, showing equivocal ECG changes at peak exercise.

The RCA is dominant, as shown in this 3D rendering.



The left main and LAD arteries show no signs of coronary artery disease.



A high-grade stenosis is clearly demonstrated in the midportion of the left circumflex artery. This lesion was successfully treated by PCI.

"This case was examined during the first week following installation of the Aquilion ONE in July 2008. After completion of the scan, I knew immediately that this is a truly unique scanner because I know of no other CT system that could be used to perform coronary CTA in this patient with such ease and exquisite images.

A review of 13,165 patients examined, now including the Aquilion ONE /VISION Edition has shown there were approximately 1,200 patients with arrhythmias, all with diagnostic studies.
No repeats. I continue to rely on this scanner for all our arrhythmic patients."

Dr. Gladys Lo, Hong Kong Sanatorium & Hospital, Hong Kong, China

Cardiac Arrhythmia

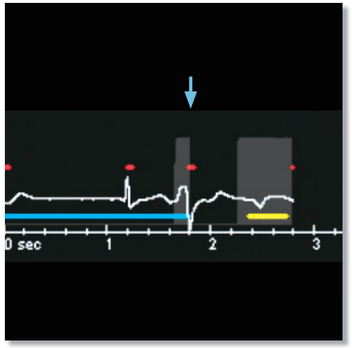
Volumetric single-shot scanning of the heart is a unique feature of the Aquilion ONE. Routine cardiac acquisitions are of consistently high quality due to the excellent temporal uniformity along the entire scan. In addition, in heart rate controlled patients, a small exposure in the mid-diastolic phase of the cardiac cycle is sufficient to obtain a perfectly motion-free image, with radiation doses below 1 mSv. However, not all patients' heart rates can be effectively controlled by medication, and approximately 10% of the patients examined are in sinus arrhythmia.

The Aquilion ONE virtually eliminates the challenge of imaging patients with cardiac arrhythmias. A sophisticated arrhythmia detection algorithm is incorporated into the acquisition software, taking full advantage of the system's volumetric scanning capabilities. The system monitors the cardiac rhythm in real time and aborts exposure if an arrhythmia is detected. Furthermore, the software is trained to recognize different arrhythmias and can adjust the exposure window to ensure a diagnostic scan.

Example of an unexpected short heartbeat during acquisition. The exposure is aborted and repeated in the next normal heartbeat.

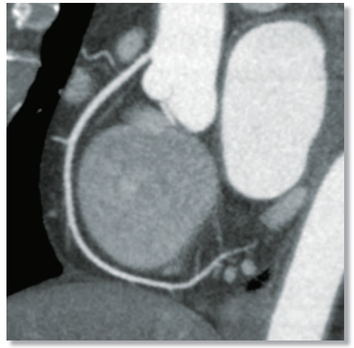
Premature Atrial Contraction

A 61-year-old woman presented with chest tightness.



A premature atrial contraction (arrow) occurred during the scan. The heart rate during the scan was 59-80 bpm.

The right coronary artery arises from the aorta just superior to the coronary cusp.



This anomaly is considered to be benign.

"CT myocardial perfusion imaging with the Aquilion ONE, as validated by the CORE320 study, has the ability to change the diagnostic pathways for patients with symptoms of chest pain."

Associate Professor Richard George, Johns Hopkins University, Baltimore, USA

Myocardial Perfusion

The unique ability of the Aquilion ONE to acquire the entire heart in a single temporally uniform volume ensures that the entire myocardium is captured at the exact same phase of contrast enhancement. Therefore, normally perfused myocardium is uniformly contrasted to areas of ischemia or infarction. This is a distinct advantage compared with the helical scan technique, which may need several seconds or more to cover the entire heart.

Volumetric scanning with the Aquilion ONE therefore provides the ability to accurately assess the blood flow to the myocardium from any coronary CTA examination.

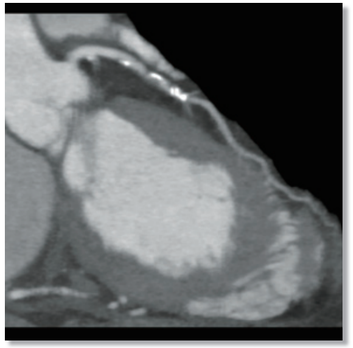
Several different algorithms have been developed for quantifying the severity of myocardial perfusion defects in volumetric cardiac CT. These include calculation of the perfusion index (PI) and transmural perfusion ratio (TPR).

Images acquired at rest and during pharmacological stress permit the comprehensive assessment of the effects of coronary artery stenosis on blood flow to the myocardium. This "one-stop shop" examination reduces the need for patients to undergo multiple examinations, saving time and money and resulting in an overall reduction in radiation dose.

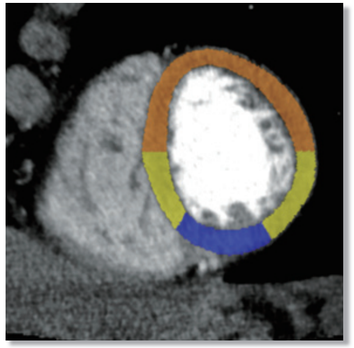
Aquilion ONE workflow permitting the complete assessment of cardiac morphology and function in one examination.

Myocardial Ischemia

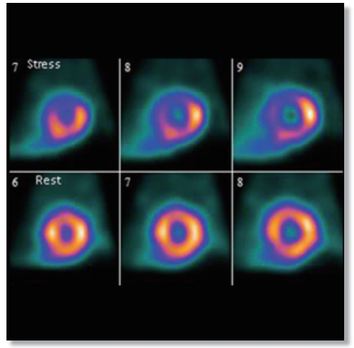
This 62-year-old woman presented with chest pain, typical angina, dyslipidemia, a history of smoking, and a family history of CAD. She was enrolled in the CORE320 study.



A mixed lesion causing 70% stenosis is seen in the proximal LAD.



A perfusion defect is demonstrated in the anterior wall. The location of the defect corresponds to the vascular territory supplied by the LAD.



The perfusion defect is also demonstrated in stress SPECT images.

"With the Aquilion ONE /VISION Edition volume scans of the elbow or wrist are performed as easily as taking a plain X-ray. No longer is it necessary to carefully restrain the patient in an uncomfortable position for minutes. This scan is performed with the patient comfortably seated in less than a second."

Professor Mathias Prokop, Radboud University Medical Center, Nijmegen, the Netherlands

One Shot Extremities

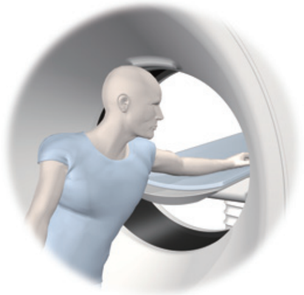
The 16 cm detector coverage afforded by the Aquilion ONE /VISION Edition provides an array of opportunities in perfusion and functional imaging.

In a busy trauma center, the 16 cm coverage brings another more basic but very important advantage for patients. Entire joints can be imaged in just half a second, in a single super-high-resolution volume acquisition. Not only is this much more comfortable for patients, but the images are superior, as there is no longer the need to remain motionless for several seconds, as with a helical scan technique.

On a conventional CT system, wrist and elbow scans are particularly difficult examinations for patients, as the semiprone position with the arm outstretched on the couch is a difficult position to maintain, especially in patients with fractures.

However, with the Aquilion ONE /VISION Edition, performing a CT scan of the wrist or elbow is as simple as obtaining a standard X-ray image.

Patients can be positioned sitting comfortably at the rear of the gantry, with their extremity placed and centered in the scan field. No localizing scanogram needs to be performed, and a single volume scan in just half a second provides an isotropic dataset that can be viewed in any plane or in 3D.



Volumetric CT scans of the wrist or elbow can be performed with the patient in a comfortable sitting position.

Traumatic Fracture of the Elbow

A 57-year-old female technologist was referred for a suspected elbow fracture after tripping over an ultrasound cable.

The fracture of the lateral aspect of the proximal ulna is clearly shown in this 3D image.

Removing the humerus allows detailed evaluation of the radial head fracture.

An undisplaced hairline fracture of the lateral epicondyle is shown in this multiplanar reconstruction, seen here in a high-resolution bone algorithm.

"Dynamic liver perfusion analysis provides an ideal noninvasive and well tolerated procedure for quantifying the effectiveness of treatment for liver tumors."

Dr. Chien-Fu, Hung, Chang Gung Memorial Hospital, Taiwan, R.O.C.

Liver Perfusion

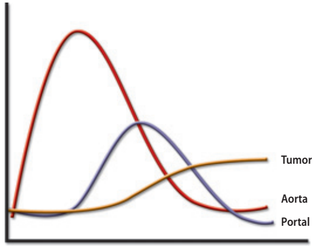
4D dynamic volume perfusion analysis provides new and exciting possibilities for calculating regional blood flow values in the liver and other organs in the body.

The definitive classification of tumors will be achievable by quantifying perfusion in these lesions, reducing the need to perform invasive biopsy.

Volumetric liver perfusion is already established at Chang Gung Memorial Hospital as a robust method for assessing the response of tumors to nonsurgical treatment such as transarterial chemoembolization (TACE) and selective internal radiation therapy (SIRT).

The scan protocol consists of a series of intermittently acquired volume acquisitions over a period of 75 seconds after the injection of IV contrast medium. Since a single breath-hold is impractical, patients are instructed to breathe very quietly during the acquisition.

The excellent deformable volume based registration software compensates for patient motion, permitting accurate perfusion analysis to be performed.

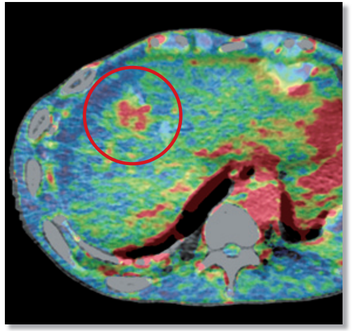


Analysis is performed using the Dual Input Maximum Slope algorithm, providing arterial flow and portal flow measurements as well as the perfusion index.

Hepatocellular Carcinoma (HCC) Treatment Assessment

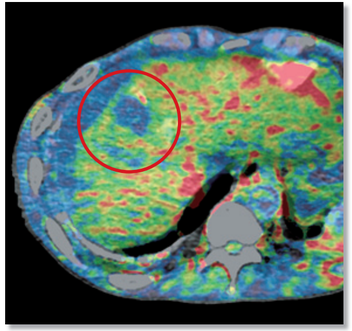
A 52-year-old man with HCC treated by TACE was examined using the 4D dynamic liver perfusion protocol.

Arterial Perfusion Map



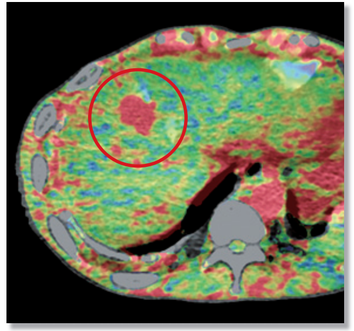
There is increased arterial flow in the tumor bed of the previously treated HCC.

Portal Perfusion Map



As expected for an HCC, there is significant reduction in blood flow from the portal venous system.

Perfusion Index Map



The high PI of the entire HCC demonstrates that the tumor is perfused predominantly by arterial blood flow, indicating viable tumor regrowth.

"CT perfusion carries the potential to evolve as a clinically valuable tool in the diagnosis of pancreatic disease, especially for patients with malignancy."

Professor Patrick Rogalla, Toronto General Hospital, Canada

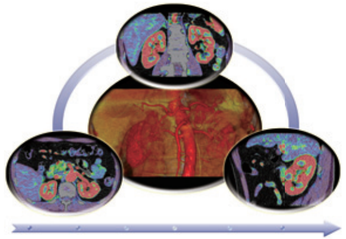
Pancreas Perfusion

The pancreas is the 10th most common site for cancers, but pancreatic cancer is responsible for 6% of all cancer deaths. It is also very difficult to diagnose in the early stages, when treatment can have the greatest effect.

Perfusion changes often occur before anatomical changes can be detected on CT. The ability to combine perfusion information with high-resolution anatomical detail in a single scan is advantageous for diagnosing and staging tumors of the pancreas.

An 80-second intermittent dynamic volume scan performed during the injection of IV contrast provides perfusion maps of the pancreas perfectly registered to the anatomical information.

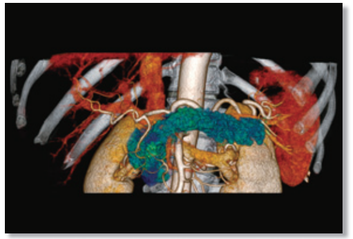
Adenocarcinoma of the pancreas appears as an area of low blood flow when compared to the surrounding normal pancreas.



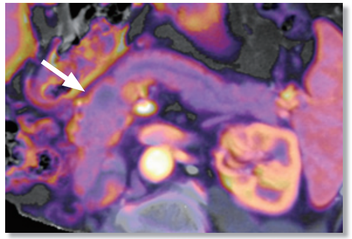
Dynamic volume imaging performed on the Aquilion ONE provides temporally uniform 3D volumes with Sub-millimeter isotropic resolution. The resultant images can be viewed in any plane.

Pancreatic Adenocarcinoma

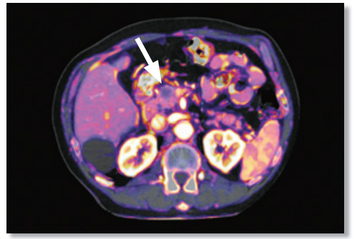
A 69-year-old male patient with weight loss and right upper quadrant pain for the previous 6 months underwent perfusion CT combined with a staging CT to rule out malignancy.



Three-dimensional reconstruction provides excellent anatomical detail of the vascular supply to the pancreas from the dynamic scan data.



A well-defined 1.4 cm mass in the pancreatic head (arrow) with upstream ductal dilatation is shown in this curved reconstruction.



Perfusion analysis demonstrated low blood flow within the lesion, with values around 0.56 mL-1. A Whipple procedure was performed, and pathological examination confirmed a pancreatic adenocarcinoma (T2N1M0).

"Dynamic volume imaging heralds in the next frontier for the evaluation of patients with orthopedic pain."

Professor Alain Blum, Centre University Hospital Nancy, France

Dynamic Orthopedic

Patients who suffer pain during movement in a variety of everyday activities often have no obvious structural abnormalities. As such, many of these patients are largely diagnosed and treated based only on a clinical examination. Often, the patient's symptoms remain unresolved.

Until the introduction of the Aquilion ONE, there were no imaging modalities able to provide high-fidelity 3D images of mechanical motion demonstrating the exact cause of a patient's pain.

Continuous or intermittent dynamic volume scanning is performed while the patient repeats the exact motion to reproduce their symptoms. It is imperative that the patient motion be active and under load, which is why static imaging is insufficient for demonstrating functional abnormalities.

The often complex rotational movements between bones can be appreciated with unprecedented clarity with 4-dimensional viewing.

Continuous or intermittent dynamic volume scanning is performed while the patient moves to reproduce their symptoms.

Snapping Scapula

A 39-year-old woman experienced pain with a grinding sensation in her left shoulder when carrying shopping bags.

Dynamic volume images clearly demonstrate the abnormality of the scapulothoracic joint. During shoulder rotation, the superior angle of the scapula is seen to impinge on the 2nd and 3rd ribs, explaining the reason for the patient's pain.

Identification of the exact mechanical abnormality in this scan allows more precise treatment planning.

"Dynamic volume CTA with subtraction provides highly detailed images for accurately assessing the extent of tumor involvement within cortical bone."

Professor Alain Blum, Centre University Hospital Nancy, France

Bone Tumor Perfusion

Dynamic volume CTA with accurate bone subtraction provides information never before available for the assessment of a wide variety of bone tumors.

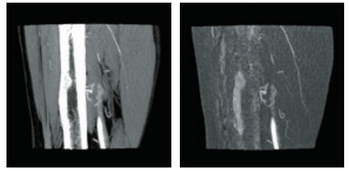
The Aquilion ONE performs this examination using its unique intermittent dynamic volume scan mode, with images acquired during contrast infusion over a period of 2 minutes. The first volume in the series is used as a mask for subtraction.

Voxel-perfect subtraction is absolutely essential for the accurate assessment of tumor enhancement within the cortical bone.

Toshiba's SURESubtraction software includes a newly developed deformable subtraction algorithm that performs extremely well in these cases.

Dynamic bone tumor perfusion certainly has the potential to become the modality of choice for the diagnosis and preoperative assessment of bone tumors.

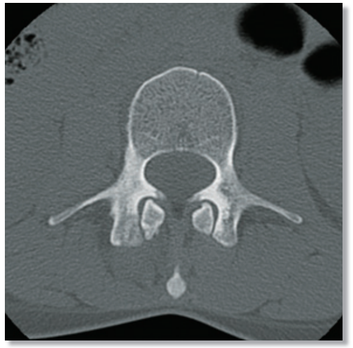
Original **SURESubtraction**



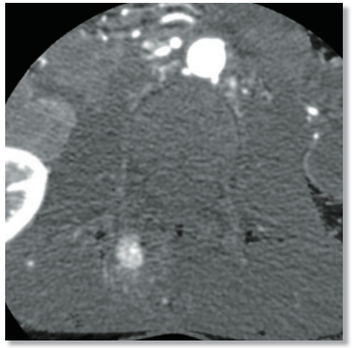
Voxel-perfect subtraction is the key to performing dynamic volume bone tumor perfusion studies.

Osteoid Osteoma

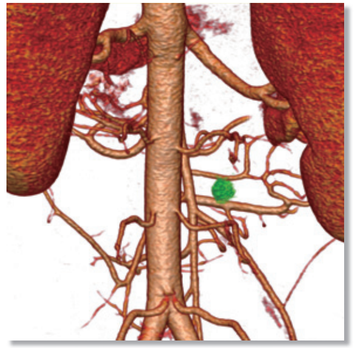
A 32-year-old woman with localized back pain.



The lesion in the right pedicle of the L3 vertebra is difficult to identify.



Dynamic subtraction clearly shows the enhanced nidus of the osteoid osteoma.



Voxel-perfect subtraction provides incredibly detailed images of the lumbar arteries and the enhanced tumor highlighted in green.

"Easily performed without any significant impact on the workflow, CTA subtraction is now a mature technology suitable for routine clinical work. Besides a radical reduction in reading time, particularly in the case of CTA studies with calcified atherosclerosis, the major benefit of subtraction in our practice is to assess the patency of small stents and to track down low-volume endoleaks in complex endovascular stent grafts.

CTA subtraction brings clear benefits, valued by our referring physicians."

Professor Catherine Roy and Dr. Mickaël Ohana, University Hospital of Strasbourg, France

SURE Subtraction — Aorta-Runoff

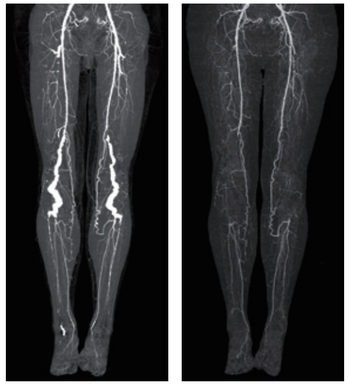
CTA has become a mainstream examination and is considered to be the gold standard in the evaluation of the aorta and peripheral artery occlusive disease.

Interpretation of these examinations can be time consuming, particularly with the presence of extensive atherosclerotic calcification. Blooming artifacts associated with highly attenuating calcium can lead to an overestimation of stenosis or even a false positive diagnosis of occlusion.

While bone segmentation algorithms have continued to evolve, these algorithms are unreliable when high-density bone is located against the vessel wall. In addition, segmentation algorithms are inadequate to accurately segment calcification in the vessel wall. Careful interpretation on MPR and CPR images is necessary to ensure an accurate diagnosis.

Toshiba's subtraction algorithm (SURE Subtraction Ortho) eliminates these limitations. The advanced deformable registration algorithm is able to accurately register a low-dose pre-contrast scan to the CTA then perform subtraction, producing a CTA dataset free from bone and calcific plaque.

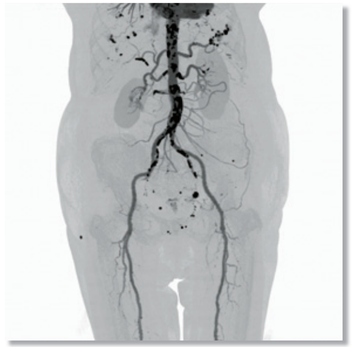
CTA with SURE Subtraction is therefore faster to interpret and most importantly provides superior diagnostic accuracy in the evaluation of luminal stenosis.



Segmentation | **SURE Subtraction**

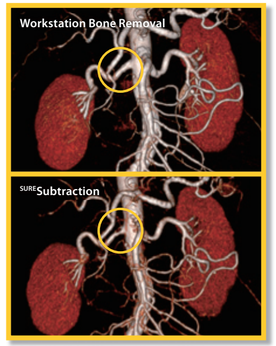
Aorta-Runoff

A 76-year-old woman with previous implantation of renal artery stents bilaterally presented with worsening hypertension and claudication. A CTA scan was performed with subtraction.



Workstation Bone Removal
Automated bone removal is sufficient, but the presence of calcium and stents prevents visualization of the vessel lumen.

SURE Subtraction
Excellent subtraction of bone, calcium, and stents provides an unobstructed view of the arterial system.



An in-stent restenosis at the origin of the right renal artery is clearly shown in the subtracted image.

"Reducing the utilization of general anesthesia or sedation for pediatric ENT patients has been a major advantage of the Aquilion ONE /ViSION Edition, due to the low acquisition time of the volumetric scan. Instantaneous exposure control with Handy Snap further reduces motion artifacts."

Dr. Stefan Steens, Radboud University Medical Center, Nijmegen, the Netherlands

Handy Snap Pediatric Imaging

Imaging pediatric patients presents a unique set of challenges in comparison to imaging adult patients. Young children are often frightened and therefore uncooperative and infants simply cannot understand what is required of them. Until recently, general anesthesia or sedation was often required to obtain motion-free imaging in these patients, which is not without risk and subjects patients and their parents to additional stress. In addition, anesthetic procedures are costly and slow down productivity.

Volumetric CT with the Aquilion ONE /ViSION Edition has significant advantages in imaging small children. An entire scan of the temporal bone can be performed in as little as 275 ms, which is fast enough to capture motion-free images in the majority of patients without the need for general anesthesia or sedation.

Toshiba's Handy Snap exposure controller further reduces motion artifacts as it permits the exposure to be performed at exactly the right moment. This controller, which operates just like an X-ray hand-held exposure switch, is attached to the gantry with a spiral cable, permitting the operator free range of movement from right beside the patient to 3 meters away.

To date, the combination of these innovative technologies has eliminated the need for general anesthesia or sedation in almost all of our pediatric patients undergoing temporal bone scans.

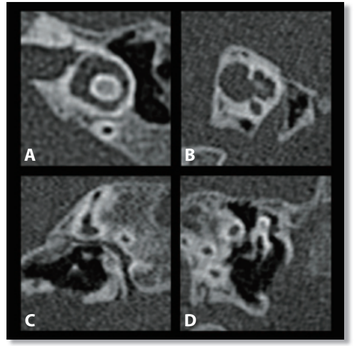
Handy Snap provides instant exposure control right by the patient's side.

Hearing Loss

A 6-month-old boy presented with bilateral congenital perceptive hearing loss. CT of the temporal bones was performed on the Aquilion ONE ViSION without anesthesia or sedation, using a vacuum cushion. The child was awake and alert. Utilizing the Handy Snap, the technician standing next to the patient could perform CT acquisition at exactly the moment the child was not moving. High-resolution images for the evaluation of the middle and inner ear were obtained with a low exposure dose (CTDIvol of 5.50 mGy and DLP of 33.20 mGy·cm).

Original axial image at the level of the horizontal semicircular canal and labyrinthine facial canal on the left with the head slightly tilted.

Axial MPR of the left mastoid with middle and inner ear structures clearly visible.



Zoomed multiplanar reconstructions of the left ear showing the horizontal semicircular canal (A), the cochlea with modiolus (B), the tympanous and mastoid facial nerve canal (C), and the ossicular chain (D).

"A CT scanner in which examinations can be performed in as little as 350 ms, with no table motion and 16 cm of coverage, while simultaneously reducing radiation exposure and the chance of patient and respiratory motion, is important for ensuring high image quality and patient safety and should be considered by any pediatric radiology department."

Dr. Daniel J. Podberesky, Cincinnati Children's Hospital Medical Center, USA

One Rotation Pediatric

The rapid increase in the number of CT scans performed on pediatric patients in recent years has highlighted the risks to children undergoing these examinations.

In general, ionizing radiation exposure is considered to be the most important risk to children undergoing CT examinations, and many techniques are employed to reduce radiation exposure As Low As Reasonably Achievable (ALARA).

However, radiation is not the only risk to pediatric patients undergoing CT. Helical CT scans last for several seconds and are sensitive to patient and respiratory motion. It is often necessary to sedate children to ensure an optimal study and prevent the added radiation of a repeat scan should the examination prove to be nondiagnostic.

The Aquilion ONE delivers state-of-the-art technology that has revolutionized pediatric CT imaging, as many examinations can be performed in a single gantry rotation.

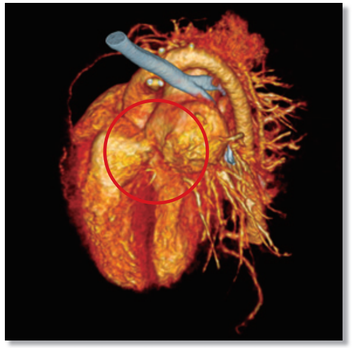
The superfast acquisition times (down to just 350 ms) with no table movement dramatically reduce the risk of image quality degradation due to patient motion during the scan. Therefore, the use of sedation can be reduced or even eliminated completely in appropriate clinical situations.

The reduction in the use of anesthesia for pediatric CT examinations not only streamlines the scanning process, but more importantly, reduces a major contributor of acute risk to the patient.

One-rotation volume scanning is perfectly suited to imaging children in a wide variety of clinical situations.

Tetralogy of Fallot

A 1-month-old baby born with tetralogy of Fallot was sent for preoperative assessment by CT.



A congenital stenosis is shown at the origin of the main pulmonary trunk.

Massive poststenotic dilatation is seen in the right and left pulmonary arteries.

Severe narrowing is shown in the right main bronchus and bronchus intermedius as they course between the dilated right pulmonary artery and right-sided descending aorta.

"The Aquilion ONE has been ideal for evaluation of pediatric cardiovascular disease, providing excellent image quality and reduced radiation compared to helical techniques. Dynamic, multiphase pulmonary imaging has revolutionized the evaluation of combined cardiopulmonary disease in children."

Dr. Bruce Greenberg, Arkansas Children's Hospital, USA

One Rotation Cardiac

Cardiac diseases in children are often very complex and involve the chambers of the heart as well as the great vessels. When imaging the heart in children, the anatomy of the chambers and relationships to the vessels are most important. Rarely is small plaque in the coronary arteries a reason for performing these scans.

Radiation dose is a very important consideration when performing CT scans on children. The ability to acquire ECG-gated scans of the chest in one rotation provides detailed information of the anatomy of the heart and vessels at the lowest dose possible.

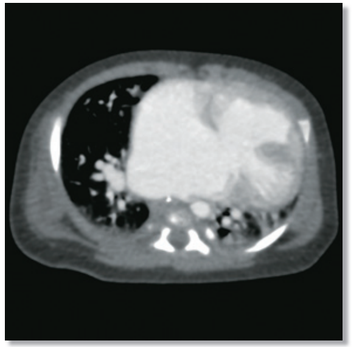
The Aquilion ONE's unique ECG-gated volume scan mode provides up to 16 cm anatomical coverage with no table motion, and the scan can be triggered anywhere within the cardiac cycle.

A single-rotation scan provides superior images free from misregistration along the z-axis, making diagnosis considerably easier. More importantly, the ECG-gated volume scan mode can be performed with no more dose than is required for a non-gated volume scan, and with a dramatic reduction in dose compared to an ECG-gated helical technique.

A scan of the heart is acquired in just one rotation with ECG gating. Only a portion of a single heartbeat is needed to diagnose cardiac disease in children.

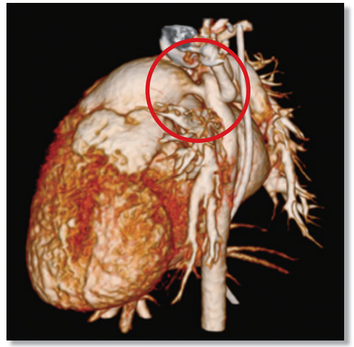
Complex Congenital Heart Disease

A 3-week-old girl with a complex developmental cardiovascular abnormality was referred for detailed examination of the heart and great vessels. A one-shot gated volume scan was performed.



An enormous common atrium and a large ventricular septal defect are shown in this image.

The kink in the aortic arch suggests a possible coarctation.



A moderately large patent ductus arteriosus supplies the aortic arch and descending aorta. Note that there is severe hypoplasia of the ascending aorta (not shown in this image).

"Volumetric CT enables four-dimensional assessment for pediatric tracheobronchomalacia without intubation or sedation, and at a low radiation dose. The infant simply lies on the CT table and imaging is performed during normal respiration. This procedure provides excellent non-invasive diagnosis and is well tolerated by infants and neonates."

Professor Michael Ditchfield, Radiologist, Monash Health, Melbourne, Australia

Tracheobronchomalacia in Children

The accurate assessment of tracheobronchomalacia in neonates is challenging. Bronchography and bronchoscopy have traditionally been the gold standard for assessing this condition, but both are invasive and require general anesthesia and intubation. The role of CT has been limited by the volume of airway that can be imaged dynamically.

The use of Aquilion ONE's 16 cm coverage allows the entire airway to be imaged in a single gantry rotation. Utilizing the dynamic volume scan technique, images can be acquired over one to two respiratory cycles with a total scan time of just less than 2 seconds. As the infant is breathing normally during the short acquisition, anesthesia and intubation is not required, resulting in a more comfortable examination with dramatically less risk to the patient.

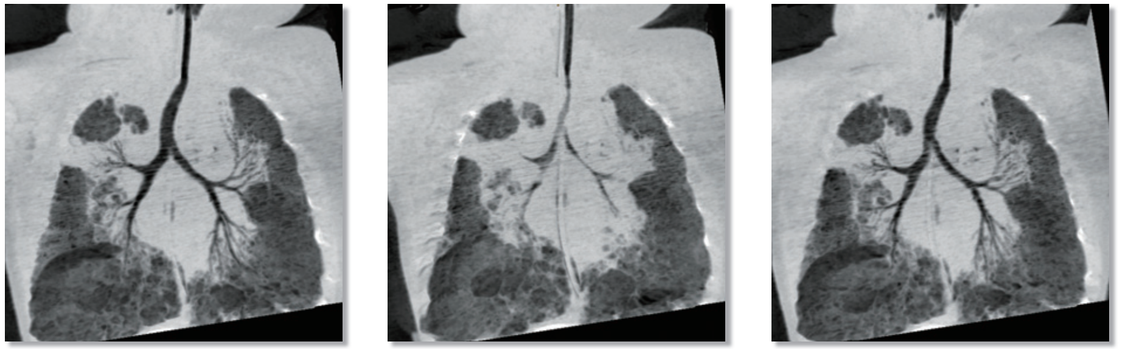
The use of low kV and mA settings with AIDR 3D iterative reconstruction ensures that the radiation dose is as low as possible, and within the range of bronchography.

Dynamic imaging throughout the entire respiratory cycle provides accurate determination of the end-inspiratory and end-expiratory phases in 3 dimensions. This enables the degree of luminal collapse to be accurately determined.

Dynamic imaging of the airways in one to two respiratory cycles with a total scan time of 2-3 seconds.

Tracheobronchomalacia

This 6-month-old premature infant in the neonatal intensive care unit with bronchopulmonary dysplasia could not be extubated, raising the possibility of coexistent tracheobronchomalacia. A dynamic scan was performed to evaluate the airways.



Volumetric CT demonstrates severe tracheobronchomalacia during expiration (center image), with collapse of the entire airway.

Suggested Reading

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WARNING: Any reference to X-ray exposure, intravenous contrast dosage, or other medication is intended as a reference guideline only. The guidelines in this document cannot replace the judgment of a healthcare provider. Each scan requires medical judgment by the healthcare provider regarding exposure of the patient to ionizing radiation.
Use the As Low As Reasonably Achievable (ALARA) radiation dose principle to balance factors such as the patient's condition, size and age; region to be imaged; and diagnostic task.

Disclaimer: In clinical practice, the use of the AIDR feature may reduce the CT dose to the patient, depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

Due to local regulatory processes, this product may not be available in all countries. Please contact your local Toshiba sales representative for the latest information.