visions

MAGAZINE FOR HEALTH PROFESSIONALS
European Edition // No 41 // September 2023

Discover the New Alphenix / Evolve Edition

Canon

Cover image: Photo from Canon Medical's Interventional X-Ray brochure about our new product the Alphenix / Evolve Edition. Read more about this new product in this VISIONS edition #41.

VISIONS magazine is a publication of Canon Medical Systems Europe and is offered free of charge to health professionals.

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// EDITORIAL

Dear Readers,

After the Summer break, life returns to its normal pace. Children have returned to school, offices have assumed full function, and hospitals are offering healthcare to an increasing number of patients.

Over the Summer, we moved the Canon Medical European Headquarters to Amstelveen, the Netherlands. Alongside traditional headquarters function, we have created the 'Canon Medical Academy Europe' at our new premises. In this highly innovative environment, we are able to clearly demonstrate the support that we can offer our customers with the challenges they are facing.

As you will know, the last few years have shown that the pressure on healthcare is increasing by the day, and while the waiting lists that rose during COVID-19 are not yet dissolved, the limitation of healthcare professionals is growing. This apparently common trend, combined with growing budget constraints, leads to disruption of basic healthcare service and will not disappear by itself - It will take a different approach to resolve.

Whereas in the past, thinking on a smaller part of the process was sufficient, a more overarching approach is required nowadays. Together with our customers, and based on Canon Medical's "Made for Life" philosophy, we are developing efficiency improving workflows by combining our clinical solutions with Healthcare IT and AI to achieve an overarching patient-centric workflow.

I am delighted to invite you to visit the Canon Medical Academy to experience the broad spectrum of solutions and trainings that Canon Medical Systems Europe has to offer.

We look forward to welcoming you soon.

Kind regards,

GIO TETTERO
European Senior Director IT & Business Development
Canon Medical Systems Europe

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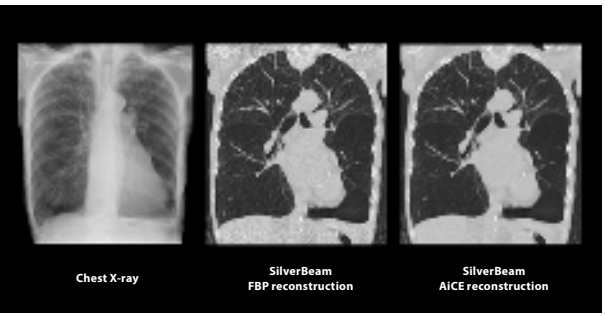

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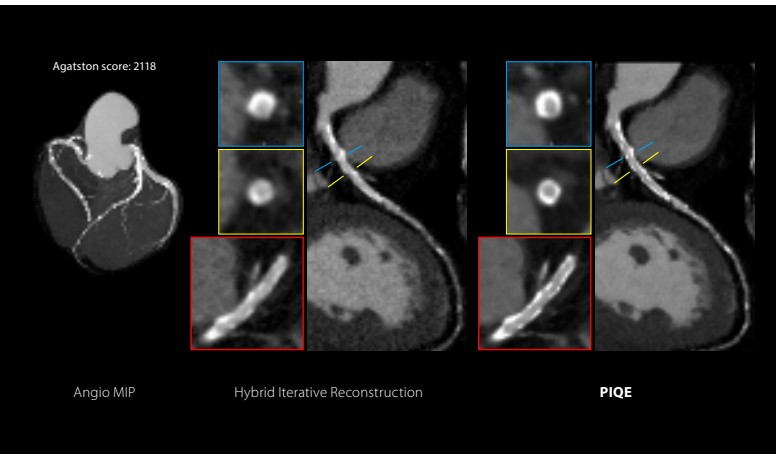

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Canon Medical Recognized with iF DESIGN AWARD

The Aquilion Serve, our newest CT scanner, has been selected as a recipient of this year's prestigious iF DESIGN AWARD. Also recognized with a Good Design Award in 2022, the Aquilion Serve continues to draw attention with its easy-to-use, patient-centric system design that supports intuitive operations.

Built using Canon Medical's new INSTINX workflow solution, the Aquilion Serve performs simple, safe, and high-quality CT exams. The redesigned workflow, auto-positioning via the built-in cameras, automatic scan planning with Anatomical Landmark Detection and the intuitively designed operation system contribute to a better operator workflow. The Aquilion Serve guides operators, regardless of their experience level, through complex and disease-specific diagnostic operations for efficient, accurate, and consistent CT results.

Owned by the certified non-profit iF Design Foundation, which promotes design and its social significance, the iF DESIGN AWARD is truly independent. Moreover, international design experts guarantee a transparent and fair jury process, allowing equal chances of winning for every participant.

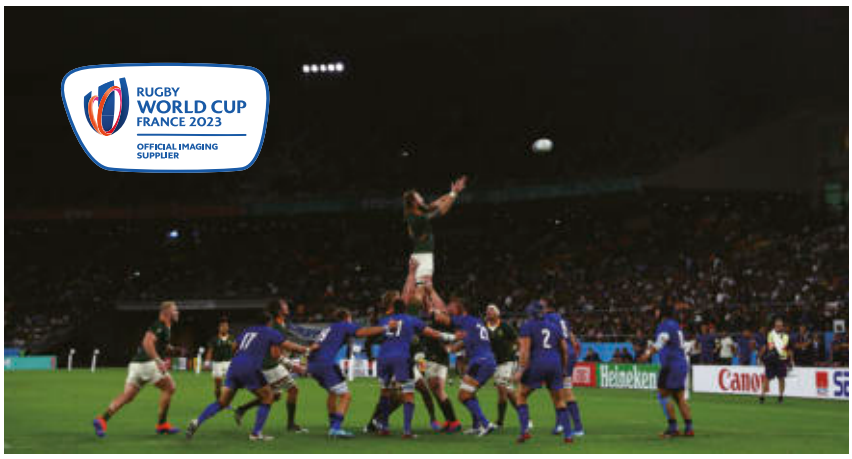
The iF DESIGN AWARD

The iF DESIGN AWARD is one of the most prestigious design awards in the world - with entries from more than 4,700 participants from 56 countries in 2023.

Scan the code or click HERE for more information about the iF DESIGN AWARD.

Canon is Proud to be Supporting Rugby World Cup 2023

Canon is proud to be supporting Rugby World Cup 2023. The sporting event started with a spectacular opening on September 8, 2023, at the iconic Stade de France in Saint-Denis. The 10th edition of the event opened in style, showcasing the very best of French culture, while kick-starting rugby's 200th birthday celebrations. The event is set to be the most popular and eagerly anticipated Rugby World Cup ever with the final to be held on Saturday, October 28, 2023.



Canon Medical Systems supports the elite-level sports teams with transfer of health, injury, and rehabilitation learnings to routine clinical practice. Leveraging this knowledge, in combination with the use of readily available imaging technology, clinical skills and experience, we and our partners develop knowledge and techniques allowing healthcare professionals to support sport enthusiasts to maximize their sporting enjoyment, whether amateur or professional, young, or mature.

Scan the code or click HERE to go to the RWC web page.

Canon Medical Systems Opens New European Headquarters and Launches Canon Medical Academy Europe

Canon Medical Systems Europe is thrilled to announce the move of its European headquarters to Amstelveen, the Netherlands, along with the introduction of the state-of-the-art ''Canon Medical Academy Europe''. The impressive 8642 m2 headquarters and academy were officially opened on September 14, 2023, by Mr. Toshio Takiguchi, President and CEO of Canon Medical Systems Corporation.

The decision to move to Amstelveen is driven by a forward-thinking approach that aligns with the post-pandemic new way of working. Recognizing the evolving needs of our workforce, we embrace the fresh approach to office spaces that prioritize ergonomics, collaboration, and adaptability. Furthermore, we acknowledge the challenges that our partners are confronted by, and it is our responsibility to offer them the utmost assistance, a commitment exemplified by our ongoing expansion strategy.

Scan the code or click HERE to read the full press release on our website.

From left: Mr. Prinsze (Head of CENV & SVP Business Operations of CENV), Mr. Kawagishi (President and CEO of CMSE), Mr. Takiguchi (President and CEO of CMSC), Mr. Ishizuka (President and CEO of Canon Europe Ltd.) and Mr. Poppens (the Mayor of Amstelveen, the Netherlands).

Sake ceremony during the official opening of the new headquarters and the Canon Medical Academy Europe.

EuroPCR 2023: Canon Medical Systems Hosts Successful Symposium at Prominent International Academic Course in Interventional Cardiology

EuroPCR is an internationally prestigious academic society for interventional cardiology, and this year it was held from May 16th to 19th in Paris. Every year (with the exception of the COVID-19 pandemic period), the conference attracts about 12,000 medical professionals from all over the world.

Physicians specializing in cardiac catheterization gather at the conference in Paris and delegates learn about the world's most advanced cardiac catheterization and minimally invasive treatments.
This year, in addition to the exhibition at our booth, Canon hosted a successful industry sponsored symposium at EuroPCR, taking another meaning step toward AI-powered deep learning fluoroscopic image technology integration to our Angiography system, Alphenix, developed for the interventional cardiology market.
Canon invited a prominent moderator and three speakers (Advanced Alphenix users) who are active not only in Europe but also globally. The symposium presented on the theme of "Advanced deep learning real-time imaging technologies and efficient tools to conduct PCI* and SHD* procedures while minimizing dose for patients and healthcare professionals."
The seminar was chaired by Prof. Stephan Windecker (Chairman and Professor of the Department of Cardiology at Bern University Hospital and Vice-Dean of the Medical Faculty of the University of Bern, Switzerland), who is a world-leading authority on cardiology including also cardiac intervention. Prof. Windecker as a practiced moderator succinctly summarized to the audience the value of each presentation, demonstrating his deep knowledge of the daily

challenges in interventional cardiology procedures.
The three presenters, all current users of Canon angiography systems were invited to deliver lectures: Dr. Masahiko Asami (Interventional Cardiologist of the Department of Cardiology at Mitsui Memorial Hospital); Dr. Sanjeevan Pasupati (Interventional Cardiologist of the Department of Cardiology and Director of Structural Heart Disease & Cardiovascular Research Unit at Waikato Hospital, New Zealand); and Dr. Nicolas Amabile (Interventional Cardiologist of the Department of Cardiology at Institut Mutualiste Montsouris (IMM), France).

Dr. Masahiko Asami, *Interventional Cardiologist Mitsui Memorial Hospital, Tokyo, Japan.*

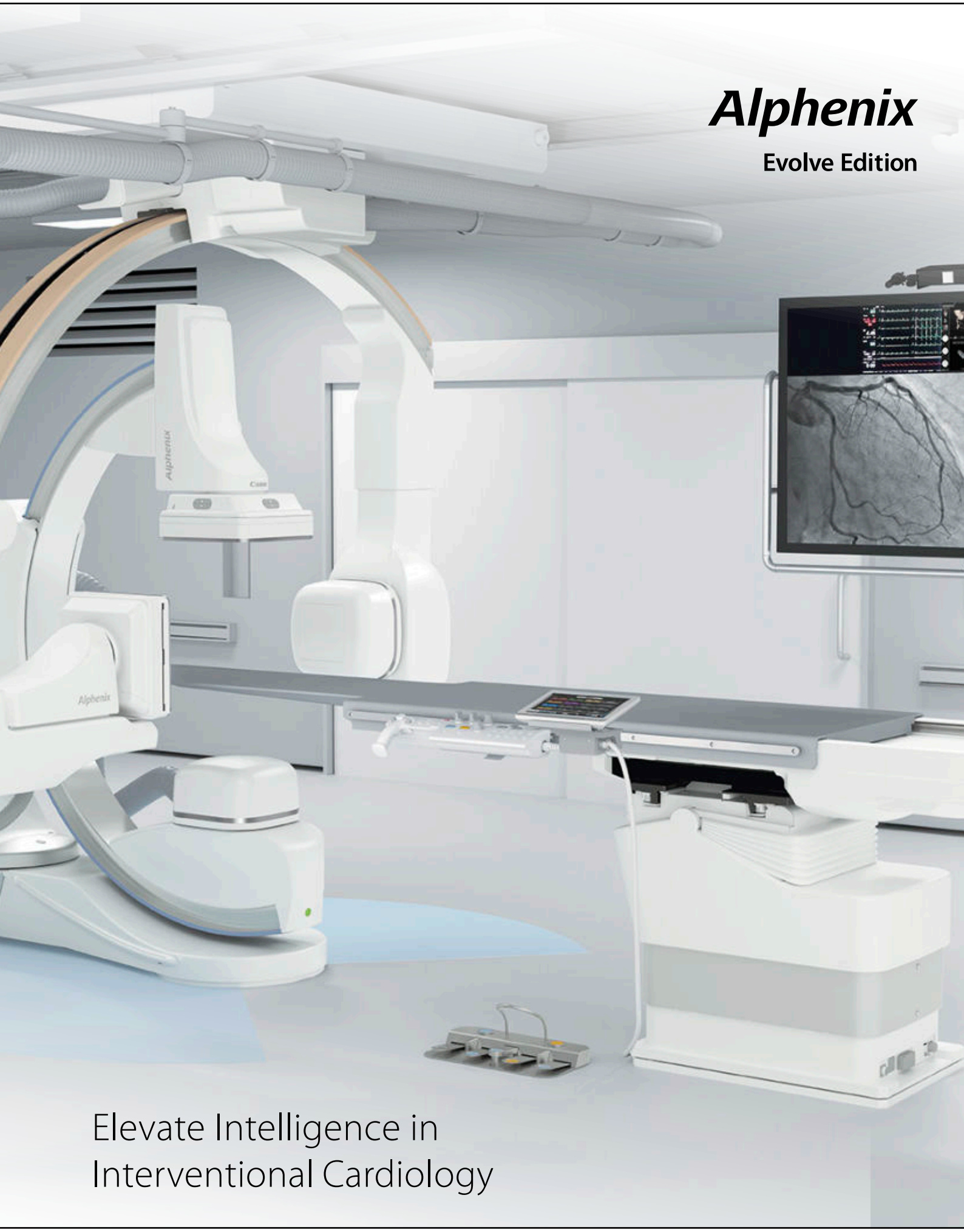
Dr. Asami introduced the deep learning technology-based coronary fluoroscopic imaging produced by Canon's new product which will be commercially available as Alphenix Evolve Edition. Although other

modalities like CT and MR still require post-processing time for deep learning-powered image processing, the new Alphenix edition provides a “real-time” noise-reduced fluoroscopic coronary images for interventional cardiologists. He also presented on how he overcame one of most complicated TAVR (transcatheter aortic valve replacement) cases while utilizing the Alphenix system.
Dr. Pasupati demonstrated the clinical benefits of our new AI-boosted technologies, DDS (Dynamic Device Stabilizer, a feature for stabilizing and enhancing stents for PCI* treatments) and EchoFusion (a feature that overlays an echo ultrasound image on the live fluoroscopic image for structural heart disease procedures), expertly presenting to the audience actual clinical images from his facility.
Dr. Amabile explained how he overcame a challenging chronic total occlusion (CTO) case in the coronary artery, and introduced unique dose reduction tools on Alphenix systems called DTS (Dose Tracking System) and Spot ROI*.

Due to the expertise of Prof. Windecker and the eminent speakers who delivered meaningful lectures, there was an enthusiastic reaction from the audience, with the symposium hall venue almost full. In addition a further positive reaction to the symposium is that is now one of the most viewed sponsored sessions on the EuroPCR YouTube channel.
After the symposium, Prof. Windecker, who is currently not a user of Canon technology , made the following inciteful comment following the symposium: "I was impressed with the technologies incorporated in these angiography systems. I would definitely consider Canon's systems as candidates for purchase."
Canon aims to build on the success of this important symposium to further expand our suite of solutions for Alphenix system in the cardiovascular market. //

**KOL=Key Opinion Leader*
**PCI=Percutaneous Coronary Intervention*
**ROI=Region of Interest*
**SHD=Structural Heart Disease*

July 14, 2023,
Vascular Systems Marketing and Promotion Department /
VL Global Marketing Group


Alphenix
Evolve Edition
Elevate Intelligence in
Interventional Cardiology

The Alphenix / Evolve Edition – Setting New Standards in Interventional Cardiology

Canon Medical's new Alphenix / Evolve Edition Angiography system, which was introduced in Europe in August 2023, has opened new windows of opportunity for Interventional Cardiologists. Unique Deep Learning technology with real-time application enables users of the Alphenix / Evolve Edition to enhance imaging and reduce the time and radiation dose required for routine and complex Interventional Cardiology procedures, such as Percutaneous Coronary Intervention (PCI) and Structural Heart Disease (SHD) treatments. The results are increased success in these intricate procedures and improved safety for clinicians and patients.

Imaging plays a crucial role in PCI and SHD interventions, from preprocedural evaluation and device size selection to treatment and follow-up. With the number of patients requiring these interventions growing rapidly on a global level, Canon Medical's Alphenix / Evolve Edition Angiography System supports these complex procedures and enables clinicians to advance further with them than ever before.

"Interventional Cardiology departments are faced with growing clinical demands, financial pressures, and the need for improved efficiency, as the number and complexity of cases increase," remarked Kunitoshi Matsumoto, Global General Manager of Canon Medical's Vascular Systems Division. "To meet these challenges, Canon Medical has introduced the Alphenix / Evolve Edition."

Technology that supports progress

The new Angiography system features Canon Medical's most advanced Deep Learning technology, powered by Altivity* - αEvolve Imaging – which includes a whole new suite of AI-technologies developed to provide instantaneous, real-time assistance for key diagnostic and therapeutic decisions without interrupting workflow. αEvolve Imaging utilizes Deep Learning based noise reduction and multi-frequency processing to provide cleaner, sharper, more defined images. Its complex algorithm enables outstandingly clear fluoroscopic imaging, which can deliver a two times higher contrast-to-noise ratio compared to conventional image processing.

αEvolve Imaging has been developed by Canon Medical and tested in several leading centers of healthcare expertise, including Kumamoto University Hospital (Japan).

"We have rigorously tested our new AI technologies in both development and clinical phases and are extremely confident that they will have a big impact on clinical success in Interventional Cardiology," said Kunitoshi Matsumoto.

Altivity

Canon Medical's Altivity

Introducing Altivity, our bold new approach to AI innovation that uses smart technologies to make a whole new level of quality, insight and value across the entire care pathway possible. Designed specially to address the growing complexities of interventional cardiology we developed Evolve Technology. Leveraging Artificial Intelligence, Evolve provides innovative solutions to support high quality, safe and efficient diagnosis and treatment while improving the experience for patients and healthcare workers.

"By deploying AI expertise to the field of interventional cardiology, we have full confidence that this will offer impactful tools to physicians and, most importantly, enhance patient care."

Erwan Ladsous, European Director Interventional X-ray, Canon Medical Systems Europe.

"Those involved in the clinical evaluation of αEvolve Imaging on the Alphenix / Evolve Edition recently presented their initial experiences at EuroPCR 2023[1] in Paris with very positive results."

Better image quality with minimal dose is particularly valuable in intricate Interventional Cardiology procedures, such as those required during PCI for maneuvering devices and confirmation of coronary blood circulation. It is also to obtain a deeper or improved perception of structure or anatomy, and gain better image comprehension in challenging situations, such as where steep angulation is required, as well as examinations for obese patients.

With basic image quality so drastically improved, the use of contrast media and X-ray dose can be minimized. As an example, Kumamoto University Hospital in Japan succeeded in reducing X-ray dose by up to 30% compared to the normal system settings with use of αEvolve Imaging.

Building on existing strengths

The Alphenix / Evolve Edition leverages the strengths of existing Alphenix technologies, such as the ergonomics of the C-arm with a range of C-arm positions that provide coverage from head-to-toe and fingertip-to-fingertip. It can be moved to pretty much anywhere required without having to move the catheter table. The system's 12x12inch Flat Panel Detector (FPD) technology also supports complete procedural flexibility.

And the integrated cardiac-optimized technologies help deliver the best possible outcomes to patients. These include tools to simplify procedure planning, technology to help users see and navigate in confidence, and better protect patient and clinical staff with a comprehensive suite of dose optimization technologies, such as the Dose Tracking System (DTS) that provides real-time information on radiation dose.

Advanced tools for specific procedures

In addition, the Alphenix / Evolve Edition features a number of new AI-based tools that offer a new level of support for complex Interventional Cardiology procedures.

The Dynamic Device Stabilizer (DDS) is trained with Deep Learning algorithm to automatically detect balloon markers in real-time, magnifying and stabilizing the image on a separate screen to assist visualization and assessment during complex PCI.

Echo Fusion supports better visibility for SHD procedures such as Left Atrial Appendage Closure (LAAC), by tapping into Deep Learning intelligence to automatically identify the echocardiography probe and efficiently fuse the fluoroscopic and echo image without additional operator input.

"We are very proud to bring these meaningful innovations to the market," said Erwan Ladsous, Canon Medical's European Director Interventional X-ray. "By deploying Canon Medical's AI expertise to the field of interventional cardiology, we have full confidence that this will offer impactful tools to physicians and, most importantly, enhance patient care." //

"Canon's Dynamic Device Stabilizer technology has been a great addition to our department. Using Deep Learning it automatically detects balloon markers in real time, without any manual input. It is also available even with Fluoroscopy."

Dr. Sanjeevan Pasupati, Interventional Cardiologist of the Department of Cardiology at Waikato Hospital, Hamilton, New Zealand.

References

1 ***Scan the code or click HERE to view Canon Medical's presentations during the Symposium at the EuroPCR 2023 congress in Paris***

*Improved **patient care***

*Improved **workflow***

*Improved **cost-efficiency***

*Advanced **AI technology***

*Easier **collaboration***

Meet the New Aplio flex and Aplio go!

Canon Medical's two new ultrasound systems, which were launched in July, have been welcomed by healthcare professionals throughout Europe. The Aplio flex and Aplio go are designed to meet new requirements emerging in the healthcare landscape, such as even greater pressures on footprint, time, resources, workflow and user wellbeing, as well as the continual need for improved image quality and better image processing. Both ultrasound systems are compact, highly maneuverable, technologically advanced and offer solid performance across a wide range of applications.

The Aplio flex and Aplio go leverage the strengths of the high-end Aplio i-series ultrasound and build further on the foundation of breakthrough advancements that it features. Since their commercial introduction, many healthcare facilities across Europe have requested one of the latest Aplio ultrasound systems.

"The launch of Aplio flex and Aplio go intends to significantly transform the healthcare industry and address the changing requirements of medical professionals," said Frank Alsemgeest, European Director Ultrasound at Canon Medical Systems Europe. "As technology advances, the need for smarter, smaller, more portable systems has become increasingly significant. Canon Medical has proactively responded to this trend, aligning its new designs by leveraging artificial intelligence (AI) and prioritizing energy efficiency."

The Aplio flex and Aplio go are both ideal for small and medium-size hospitals, satellite clinics, general practitioner, physiotherapists and veterinary clinics.

Improved patient care

Both new Aplio systems are designed with the best possible patient care in mind. With their powerful applications, users can achieve comprehensive and rapid exams that provide high clinical capability and productivity, allowing for a confident diagnosis. As an example the innovative Attenuation Imaging (ATI) feature on the Aplio flex, enables the analysis of liver fat content as a routine part of patient care, to ensure the best possible outcomes.

Improved workflow

Aplio flex and Aplio go streamline workflow for maximum efficiency. Features like the redesigned control panel and the Aplio flex' Touch Command Screen, ensure efficient and intuitive operation from the moment the machine is installed. With a new control panel, direct operation is simplified, promoting ease of use and productivity. Everything needed is conveniently accessible at the users' fingertips.

Their light and compact design makes these systems easy to move quickly, enabling a seamless scanning experience. And with AI-enabled measurements, time-saving while delivering accurate results is achievable.

Improved cost-efficiency

Both new systems offer high value at an affordable cost, making it a perfect fit for any clinical usage or department.

Advanced AI technology

With new AI technologies that utilize deep learning and machine learning, powered by Altivity, Canon Medical's bold new approach to AI innovation, Aplio flex and Aplio go feature smart technologies to achieve a whole new level of quality, insight, and value across the entire care pathway.

Auto IMT can automatically trace the intima-media thickness (IMT) of the common carotid artery in any area in a shorter time than in the past. Similarly, Auto EF (Ejection Fraction) with GLS (Global Longitudinal Strain) was developed using AI algorithm technology.

Easier collaboration

Both Aplio flex and Aplio go can be equipped with ApliGate, an innovative technology that enhances collaboration. Whether you work at a large university or local hospital, in a private practice or imaging center, or even away from your workplace, this tool for remotely sharing images enables you to directly connect with fellow professionals or Canon experts. You can seek advice, share discoveries, and engage in online collaboration with subject matter experts or colleagues. //

Aplio flex

Scan smart. Ignite your potential.

Pristine images, automated functions, intelligent workflows – Aplio flex truly is as sharp as it looks. The system excels with unmatched mobility, high efficiency and imaging quality. Loaded with smart imaging and workflow functions, Aplio flex is the ideal system to handle a wide variety of imaging needs in a busy clinic. Its versatile design ensures consistently high performance across the entire imaging portfolio.

Aplio go

Surprisingly compact. Incredibly smart.

Aplio go is compact and agile. With its optional battery, it can be easily transported and placed anywhere. Its smart performance supports a wide variety of tasks with outstanding reliability, balanced workflow and unmatched image quality. The versatile system architecture of Aplio go allows you to expand your clinical applications and workflow if required.

Aplio flex

Aplio go including ApliGate option

Advantages of Canon Medical's new Aplio flex and Aplio go

- Compact and maneuverable ultrasound systems.
- Integration of powerful AI-enabled applications for efficient examinations.
- Energy-efficient systems aligned with Canon Medical's CSR objectives.
- High image quality and faster throughput for routine examinations.
- Improved user experience with a redesigned control panel.
- Reduced training time and enhanced workflow efficiency.

I would like to thank you for using our products and services. Your continued support is deeply appreciated.

Our beloved cherry blossoms are in full bloom here in Japan. It has coincided with the relaxation of the government's request to wear masks as a COVID-19 prevention measure, and for the first time in several years we see many people strolling around without masks, enjoying the blossoms. As our company has also adopted a policy in which personal decisions regarding mask-wearing in the workplace are respected, we are again seeing the cheerful smiles of employees.

This In April, we welcomed a total of 143 new recruits. For the first time in four years, we were able to hold a face-to-face initiation ceremony, bringing everyone together and with no restrictions on admission to the venue. I expect our new employees to have a deep understanding of the meaning behind our management slogan "Made for Life", grasp the challenges facing healthcare in a changing environment, find solutions, and provide new value.

Aiming to achieve "high quality medical care for everyone", we are conducting research and development of products that support smooth workflow, quick decision-making, optimal quality medical care for each individual patient by utilizing AI linked with cutting-edge diagnostic imaging solutions, and integrated healthcare IT that bundles clinical information.

For our diagnostic imaging systems, Precise IQ Engine (PIQE) is introduced in our CT systems. PIQE is an ultra-high resolution image reconstruction technology that was developed using deep learning technology, with Canon's high-resolution images used as the teaching data. With PIQE, detailed understanding of lesions as well as healthy structures is possible. This technology is now introduced in our MRI systems, allowing higher resolution without the need for longer examination times, and more reliable diagnosis regardless of the clinical department.

We will continue to provide solutions that reflect our desire to contribute to improving the lives of all patients by offering technologies and products that are clinically valuable to our customers and to patients as we face the challenges of healthcare.

TOSHIO TAKIGUCHI
President and Chief Executive Officer
Canon Medical Systems Corporation

Canon Medical at Euroson 2023

The Euroson congress is a leading international event in the field of medical imaging that brings together professionals, researchers, and experts from all over the world to discuss the latest advancements in ultrasound. The Euroson 2023 was held in Riga, the capital city of Latvia, and was an exciting and informative event.

We were proud to have a strong presence at the conference's exhibition hall, displaying our ultrasound systems featuring innovative technology designed to enhance image quality and patient outcomes. Attendees had the opportunity to take a close look at our products and learn how they can benefit their patients.

From left to right : Katrina Kuma (Amedical, Latvia), Enrico Vendraminelli (Canon Medical), Eva Rubene (Canon Medical), Ruslan Suvorov (Semetron, Estonia), Katja Schnitzler (Canon Medical).

Our team was not only present to share our products, but also to engage with attendees and encourage valuable relationships with other medical professionals. We pride ourselves in having a friendly and knowledgeable team, and it was a source of great satisfaction for us to hear that our commitment and knowledge impressed the attendees.

The Euroson Congress had an outstanding turnout this year, with 990 participants from 46 countries attending the event. As a leading provider of ultrasound solutions, our booth was one of the most visited exhibits at this congress. We were happy to see so many medical professionals taking a big interest in our Aplio i800 ultrasound systems. Our team was kept busy.

Overall, it was an incredible experience, and we look forward to continuing to be a part of this exciting event in the future.

Lunch Symposium

Ultra-high resolution ultrasound of the Fingers: Approaching the Limit Before Microscopy.

On May 25, 2023, medical professionals from around the world gathered for a special lunch symposium on ultra-high resolution ultrasound of the Fingers, led by a renowned expert in the field, Prof. Martinoli from Genoa, Italy.

Throughout the course of the symposium, Prof. Martinoli explored the latest developments in ultra-high resolution imaging on our Aplio i800 ultrasound system. He explained how these advancements are pushing the limits of what is possible with ultrasound imaging. The focus of the symposium was on the imaging of fingers, where the resolution of ultrasound imaging is approaching the level of microscopy.

Attendees were shown examples of the incredible level of detail that can be achieved with Canon's ultra-high resolution ultrasound imaging, including the ability to visualize individual nerve fibers and blood vessels within the fingers. This level of detail is opening up new possibilities for medical research, such as the ability to study the underlying mechanisms of certain conditions.

Prof. Martinoli also discussed the potential of ultrasound imaging in a clinical setting, such as in the diagnosis and treatment of musculoskeletal disorders. With the ability to visualize the intricate structures of the fingers and other areas of the body, ultrasound technology could become an essential tool for orthopedic and rheumatology specialists.

Overall, the symposium was a resounding success, with attendees gaining valuable insights into the latest advancements in ultra-high resolution ultrasound. Prof. Martinoli's expertise and enthusiasm for the subject was contagious, and left attendees eager to explore the potential of this technology even further.

Workshop at the Euroson, with Canon Medical's Aplio i-series

The day before the congress, a Euroson School event provided participants with a unique opportunity to learn and familiarize themselves with Canon's ultrasound system in the presence of medical experts. Canon's commitment to innovation and education was evident throughout this event, as we provided participants with the tools and resources necessary. Overall, the Euroson School event was a valuable addition to the congress, providing attendees with the skills and knowledge they need to deliver exceptional patient care. //

Carlo Martinoli is full Professor of Radiology and Director of the Postgraduate School of Diagnostic Radiology at the University of Genoa and Head of the Emergency Radiology Unit at the University-Hospital (IRCCS Ospedale Policlinico San Martino) of Genoa, Italy.

Prof. Carlo Martinoli presenting at our symposium during the Euroson 2023.

Breaking New Ground with Canon Photon Counting CT (PCCT)

Canon Medical Systems is developing a Photon Counting CT (PCCT) with the potential to significantly improve resolution, provide more precise imaging, and reduce radiation exposure compared to conventional CT.

In 2023 Canon Medical installed our first PCCT system at Japan's National Cancer Center (NCC) and recently received regulatory clearance to begin clinical scanning in Japan. Initial research based on patient data has now begun, marking a very exciting stage in the development process. In collaboration with Canon Medical, NCC has started a clinical research program to explore the benefits of PCCT for both new clinical applications, as well as for routine scanning.

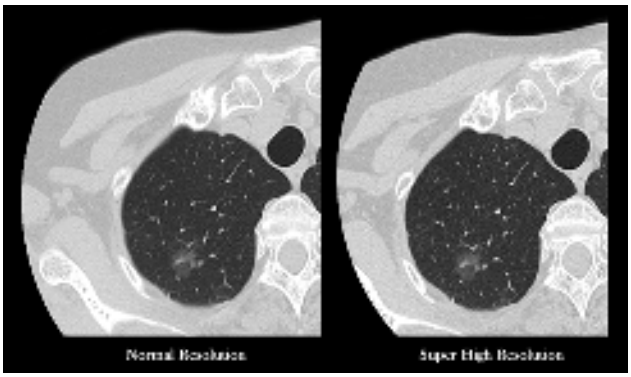
One area in which we expect PCCT to have a significant impact is clinical care in oncology. Canon Medical is working with the NCC's Exploratory Oncology Research & Clinical Trial Center (EPOC) and the NCC Hospital East, in Kashiwa, Japan, to explore new diagnostic methods with PCCT and investigate their clinical value for oncology.

As this research continues, the anticipated advantages of PCCT include significantly reduced radiation exposure at higher spatial resolution levels compared to conventional CT detectors. This increased precision, combined with spectral information, could lead to improved detectability of pathological changes, improved discrimination and identification of various materials in the body, as well as tissue characterization and malignancy assessment based on quantitative image analysis. Advances in these areas would lead to improved diagnostic accuracy throughout all phases of patient care in the field of oncology, from prevention to diagnosis, to evaluation of treatment effects, and to long-term prognosis.

What is PCCT?

PCCT systems are similar in many aspects to conventional CT except they use a photon-counting detector instead of

Kirsten Boedeker is a board certified medical physicist, with 18 years of experience working on the quantification of image quality. She is the chair of the CT Section of the Medical Imaging and Technology Alliance (MITA) and a member of the International Electrotechnical Commission (IEC). She holds a Ph.D. in Physics from the University of California, Los Angeles, USA.



Clinical images of suspected lung cancer obtained by PCCT with on the left side Normal Resolution and on the right side Super High Resolution. Courtesy National Cancer Center Hospital East, Kashiwa, Japan.

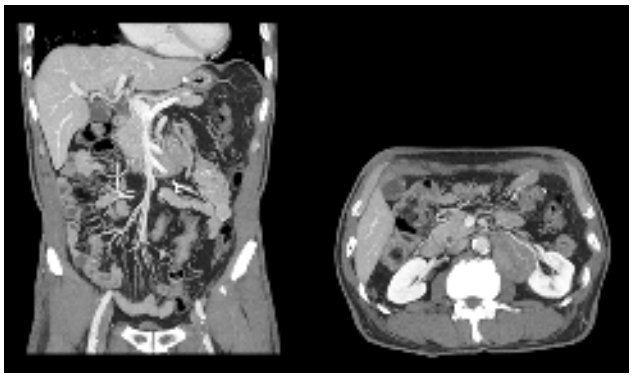
Patient scan at National Cancer Center Hospital East, in Kashiwa, Japan.

a conventional, energy-integrating detector (EID). Unlike EIDs, which only measure the total amount of x-ray energy deposited, PCCT detectors record the energy of each individual photon striking the detector and group them into specified energy bins. These energy bins allow the reconstruction process to take optimal advantage of the beam spectra to form higher quality images than EIDs. In addition, the energy bins can be used to perform routine material decomposition for every scan, with no additional scan time or dose. Finally, because the energy bin thresholds can be tailored for multiple energy ranges, novel reconstruction and material decomposition approaches are possible, opening the door to new clinical applications.

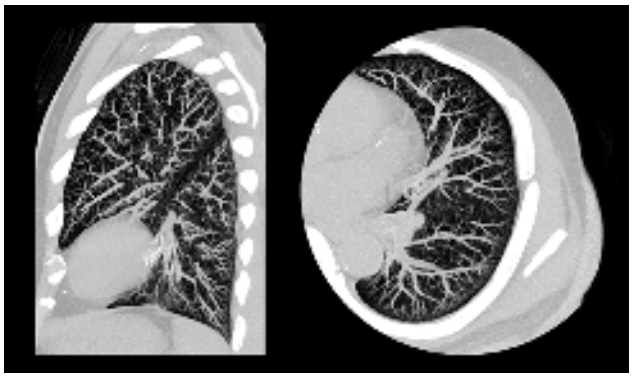
Canon has been in a strong position as a developer of PCCT technology since it welcomed Redlen Technologies as a group company in 2021. Redlen is the global leader in photon counting detector design and manufacturing, suppling photon counting detectors not just for medical imaging, but also for aerospace and security applications.

Multiple Benefits from PCCT

As we have already begun to see firsthand through our research with NCC, PCCT has the potential to deliver considerable benefits beyond what's possible with conventional CT detectors. Improved spatial resolution is one of the key benefits of photon-counting detectors. PCCT uses much smaller detector pixels than conventional detectors and also doesn't require extra septa between detector pixels to prevent cross talk. As a result, PCCT images are fundamentally sharper than conventional CT detectors. PCCT also opens the door to routine Ultra-High Resolution (UHR) scanning.



Thick slab MIP images reconstructed from 0.2 mm PCCT images showing excellent detail of abdominal vessels. Courtesy National Cancer Center Hospital East, Kashiwa, Japan.



Sagittal and Axial Thick slab MIP image reconstructed from 0.2 mm PCCT images showing high spatial resolution and exceptional detail of the pulmonary vessels. Courtesy National Cancer Center Hospital East, Kashiwa, Japan.

PCCT Precision & Area Detector CT Technologies CZT Detector with DLR Technologies.

PCCT is also able to disregard electronic noise, which creates a pulse too low in energy to be counted as signal. Therefore, noise properties, particularly for large patients and low dose applications like screening, are improved with PCCT relative to conventional CT detectors. Alternatively, this noise reduction can be used to significantly reduce radiation exposure to the patient.

In terms of clinical applications, the energy bins of the PCCT system readily enable material decomposition with every scan. This includes routine spectral applications but also allows for pioneering new clinical applications that can take advantage of multiple energy bins. The spectral capabilities of PCCT, particularly when combined with novel contrast agents, can lead to new diagnostic imaging techniques and treatment evaluation methods.

Canon's unique system

Our new PCCT detector is constructed using Cadmium Zinc Telluride (CZT), which increases the detector's ability to capture photons compared to Cadmium Telluride alone, for greater dose efficiency. In addition, Redlen has maximized the active area of the detector to further increase dose efficiency. Finally, because our PCCT detector is compatible with the geometry of Canon Medical's CT platform, it is straightforward to combine the CZT detector with Canon's existing CT features and workflow enhancements for maximum utility.

Canon Medical also has unique experience with Ultra-High Resolution CT, having a significant install base of our UHR scanner Aquilion Precision, which provides a wealth of knowledge to best take advantage of PCCT's UHR capabilities. And, as the industry leader in reconstruction, Canon is in a unique position to best leverage PCCT acquisition advantages in the reconstruction process. //

Kirsten Boedeker
PhD, DABR, Senior Manager of Medical Physics at Canon Medical Systems Corporation.

Reference
https://global.medical.canon/products/computed-tomography/pcct

Click HERE or scan this code to learn more about Photon Counting CT.

Canon
CANON MEDICAL

Made For life

Quickly diagnose, treat and verify with confidence.

Alphenix 4D CT seamlessly integrates our flexible Alphenix interventional system with the advanced Aquilion CT imaging suite into one versatile solution. With the ability to see, diagnose, plan, treat and verify in the same room, Alphenix 4D CT helps you prioritize safety, speed and efficiency, especially during complex interventions.

Seamless integration

Alphenix 4D CT

30th ANNIVERSARY
Alphenix 4D CT

Evolution of Angio CT

1994

Introduction of three-dimensional imaging

3-axis movement C-arm with 3D Angio

1999

Introduction of volumetric imaging

4 row Helical CT

1992

First developments started

Real C-arm w/Digital processor

1996

The concept of Angio CT was born

CT gantry movement

2000

Wider volume imaging possibilty which enhanced the acquisition speed

16 row Helical CT

2015

Launch outside Japan

2003

FPD introduction which increased the imaging field of view for angiographic imaging

64 row CT with Large size FPD

2013

Increased size of CT volume acquisitions

64 slice volume CT

2007

Wider bore permitted easier needle procedure under CT fluoroscopy.

32 slice LB with SUREGuidance

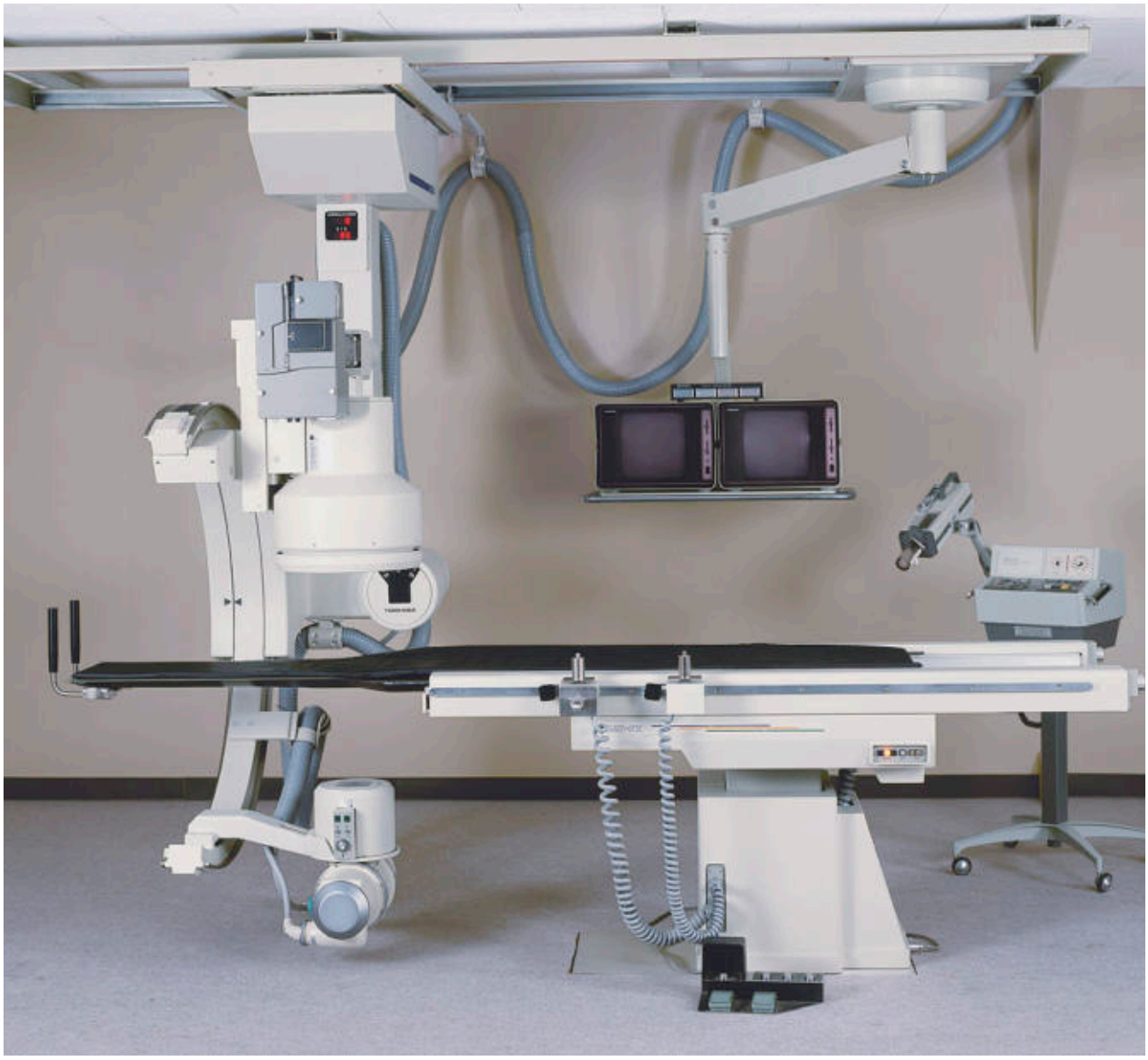
2013

More flexible slice options based on customer needs

80 / 160 slice Helical CT

From Concept to Clinical Practice - Following the Technical Evolution of Angio CT

Angio CT was born from an idea first conceived 30 years ago by Dr. Yasuaki Arai, former director National Cancer Center, Tokyo, Japan. Over the years, its initial technical evolution has been driven by Canon Medical expertise. Mr. Atsushi Gotoh, Former Angio CT team leader at Canon Medical, describes the key features of the system and milestones in the early development period.



Angiography system in 1992.

1992 - The birth of an innovation driven by patient needs

The idea for Angio CT originated from the desire to improve imaging and interventional procedures for patients.

I joined the Angio CT story in (1994) as a member of the development team. Work to create the system had already begun in 1992. One of our starting points was an Angiography system, like illustrated here (Figure 2).

Figure 2.

Let me explain the mechanism of this 1992 system. This is a CT-based system. The first generation utilized a CT-based table instead of a catheter table. The X-ray tube is not visible, because it is inside the CT table. Above there is a large detector called an "I.I.", (Imaging Intensifier) that comprises of a vacuum tube and an X-ray enhance electron. It is amplified, and provides an output image on the fluorescent screen which is suspended from the ceiling. It uses a vacuum tube and is equivalent to the FPD in current systems. At the time, CT systems were floor-mounted and not movable.Three-dimensional C-arm rotation was not possible then.

Dr. Arai (Figure 3) first came up with the Angio CT hybrid idea. This was during the period when he was working at Aichi Cancer Center in Japan. His main focus was to avoid transferring the patient form the CT to the Angio room and vice versa. Dr. Arai has always emphasized the importance of not moving patients in between examination rooms. Moving the patient takes a lot of effort and requires support from a number of hospital staff. For example, there are X-ray tubes, ECG electrodes, other cables, and tubes involved in Angiography systems. If these have to be disconnected to move the patient, it places a great burden on them, as well as the staff members involved. It is also time consuming. Therefore, it is important that all the procedures can be performed while sharing one table between Angiography and CT scan. CT is used to examine the lesion in advance. While the Angiography C- arm is mostly used to confirm the results of the examination, and to evaluate results before and after the examination.

The need to perform Angiography and CT using the same patient table within a single room led to the concept for the world's first Angio CT system. At the time, the initial development was mainly handled by the CT team rather than the VL team.

1994 - Introduction of the C-arm

In this year the C-arm was first introduced in the Angiography system. This C-arm was an ancestor of the Alphenix. Originally, the arm was suspended from the ceiling. This not only allowed scanning of the patient from the front, but also made it possible to perform scanning from various angulations.

However, the CT was still fixed to the floor, requiring a specially designed patient table. This was the reason for a very long tabletop. Unlike current Angio CT systems in which the CT system can move over rails, a CT system fixed to the floor was used in combination with a long tabletop like the one shown in Figure 4 (1996). However, the maximum range how far the tabletop could be extended was limiting the desired patient coverage for CT scanning. Here it is illustrated how the system looked during the period of technological transition.

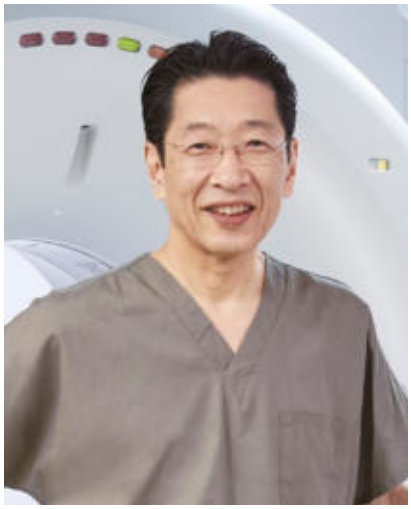


Figure 3: Dr. Arai

Figure 4: The Angio CT system installed in 1994.

figure 5: The Angio CT system produced in 1996. The CT gantry is now movable on the floor rail. The basic design of the well-known Angio CT system was invented at this time.

1996 - First movable CT

We identified that there was a problem in the movement range for the C-arm, and so decided to rotate the ceiling rail layout perpendicular to the catheterization table.

In 1996, we tackled this technical challenge and were able to develop the first movable CT.

The ceiling travel rails are not visible in figure 5 of a system from 1996, the duct hoses are mounted on the ceiling, the system began to resemble the current Alphenix C-arm. Ingenuity was required to create this feature. The layout of this C-arm was designed very carefully. Generally, for the C-arm for Angiography systems, if it is used as a general vascular system, two rails are installed in the longitudinal direction, so that the C-arm can be moved in the patient head/foot direction.

The movement range was wider in the longitudinal direction. As the C-arm suspended from the rails, if it is moved along the rails, it cannot be retracted sufficiently if used as is in combination with the CT system.

To address this problem, the layout was adapted and the direction of the C-arm is perpendicular to the catheter table. This ensured a longer movement range in the lateral direction than the longitudinal direction.

The CT base can move on the floor to realize the helical scan. This unique concept was born by Toshiba/Canon in 1996.

Figure 7: The ceiling C-arm can park perpendicular to the table and CT gantry.
This unique design doesn't disturb patient approach from both right and left side of the patient

In this way, the C-arm can be completely retracted beyond the movement range of the CT gantry. (Figure 7). With this layout design, it was intended that both the Angiography system and the CT system could respectively fulfill their maximum capabilities when used individually. A great deal of thought went into development of the system, with the focus from the very beginning on finding solutions to the multiple challenges. This layout design has basically been maintained up to the present.

This required the most effort. And this was all possible thanks to input from many physicians.

As the Angio CT system was first developed in Japan, where examination rooms are generally small, we considered various ways to design a compact layout that would provide an optimal fit.

Mass production started with the 1996 version of the system.

The Flat Panel Detector was adopted for C-arm in 2003.

After we started mass production, the system was installed at many sites. This seems to have been a key year. For the launch of the "3-axis movement C-arm with 3D Angio".

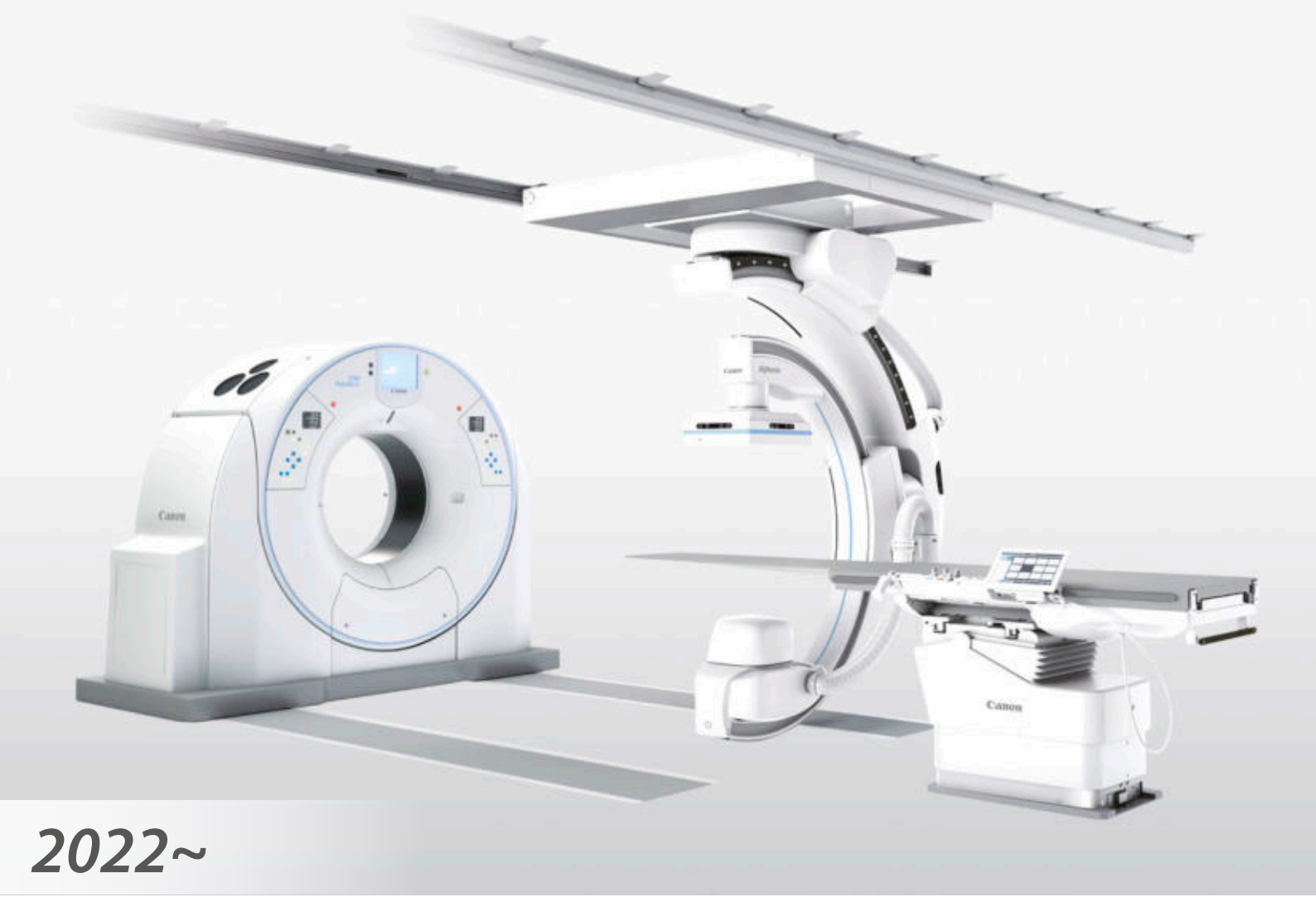
As shown in Figure 7, a common table designed for a helical CT system was first installed at National Cancer Center, Japan in 1996. A multi-angle-approach C-arm and a ceiling-suspended C-arm were installed at NCC Hospital East. Rotational DSA and an Angio CT monitor were also installed.

Angiorex was the original name for the Canon Medical Infinix back then. The present concept was already established by this time, including its structure, movement, and layout.

2003
Launch of the Infinix and Alphenix

The VL BU released the Infinix series, with the name changed from Angiorex. This is now known as Alphenix.

Although it's been 20 years since then, we have provided updates to the CT- and Angiography systems as we continued the development continiously. Progress through this kind of steady effort has achieved a great deal.



Canon's latest Alphenix 4D CT in 2022.
Combination of the Alphenix Sky+ arm and the Aquion ONE / GENESIS edition.

Conclusion

Now, after many changes and improvements, the Alphenix 4D CT has achieved the stage where the features allow users to deliver safer and effective procedures with Hi-Def Angio, ONE-beat Cardiac, Dynamic 4D Brain, Whole Organ Perfusion, Spectral CT and more. All of this under dose management and deep learning reconstruction for efficient imaging and less dose.

The Aquilion ONE combination of the Alphenix 4D CT now provides a full 50 cm scan FOV with up to 16cm of wide Z-coverage, and patient specific mA modulation. Also the recent technology permits to harness the power of deep learning reconstruction that delivers excellent energy separation for spectral analysis with high resolution. These reconstructed spectral images are then delivered directly to your reading station for immediate ans analysis.

This is all possible thanks to Vitrea, our interactive multi-modality workstation, that analyzes the image data including quantification of perfusion data for more confident diagnosis with the wide range of applications. //

VISIONS spoke with Dr. Valentina Virzì (radiologist), Dr. Salvatore Virzì (cardiologist), Dr. Franco Virzì (surgeon and founder of Regina Pacis) and Dr. Giuseppe Virzì (surgeon)

Meeting the Challenges of Island Life

Providing healthcare services on an island with approximately five million inhabitants, and as many visitors each year can be challenging. The Casa di Cura Regina Pacis (Regina Pacis Clinic), in San Cataldo, Sicily, has become one of the leading Diagnostic and Interventional Radiology centers on the Italian island. Dr. Valentina Virzì, Medical Director of the Radiodiagnostic Service at the facility, explains how CT and ultrasound systems from Canon Medical Systems Europe enable advanced imaging techniques at the emerging center of expertise.

The 45-bed Regina Pacis Clinic is located at the center of Sicily, in the city of San Cataldo. From this location, the Clinic provides health services including both diagnosis and treatment for in- and outpatients covering a broad range of specialties from general surgery, breast surgery, reconstructive plastic surgery, gynecology, urology, orthopedics and rehabilitation.

Equipped with a range of Canon systems, the clinic has an Aplio i800 ultrasound system for its Urology Department, an Aplio i800 system for its Internal Medicine Department, and an Aplio i800 for use in the Breast Department, as well as an Aplio i900 ultrasound system in the Cardiology Department. In addition, the Clinic has an Aquilion ONE / PRISM Edition CT scanner which was installed in late 2022.

Dr. Valentina Virzì (Radiologist) with the Aplio i800 ultrasound system.

"Our relationship with Canon began in 2008, with the initial purchase of an Aquilion 64-slice CT scanner," said Dr. Virzi.

"We have subsequently been able to improve our diagnostic ultrasound services with the acquisition of three Aplio i800 ultrasound systems, one of them equipped with a smart-fusion system, and an Aplio i900 ultrasound system which is dedicated to cardio-vascular studies, and most recently, added the Aquilion ONE / PRISM Edition CT scanner."

Improved breast care services

In 2021, the Regina Pacis Clinic became the only first-level Diagnostic Spoke Center with direct functional connection to the Breast Units of the Sicilian region, as well as a reference center for Interventional diagnostics in breast care.

One of the Aplio i800 ultrasound systems is dedicated exclusively to breast care diagnostics and Interventional Radiology treatments. Each year, the Clinic performs approximately 250 ultrasound-guided needle biopsies, ultrasound-guided vacuum assisted excisions (US-VAEs), as well as biopsies under tomosynthetic- and mammography guidance with contrast medium.

"We rely on two breast rooms equipped with digital mammography and dedicated ultrasound with the possibility of performing targeted breast biopsies under ultrasound," explained Dr. Virzi. "The use of the Aplio i800 ultrasound technology in our breast care practice has made the learning curve in breast Interventional techniques much easier, thanks to its excellent high frequency (HF) image quality."

Operating room with the Aplio i800 ultrasound system equipped with Smart Fusion kit.

Dr. Valentina Virzì with the Vitrea Advanced Visualization.

Enhanced Urology services

With advanced ultrasound technology, the clinic is able to implement Interventional techniques for diagnosis and treatment of prostate cancer. Last year, it was identified as the only reference center in the Province of Caltanissetta for implementation of the diagnostic therapeutic assistance pathway for prostate cancer on behalf of the Sicilian Network of Specialist Centers.

"One of the Aplio i800 ultrasound systems is equipped with a Smart Fusion kit and is used mainly in our Urology Department, said Dr. Virzi. "We perform prostate biopsies with the fusion technique. MR images with high anatomical detail are merged with the real-time ultrasound images and, thanks to the biplane probe, samples can be collected and categorized micro histologically in a precise, safe and rapid manner."

Advanced cardiac capabilities

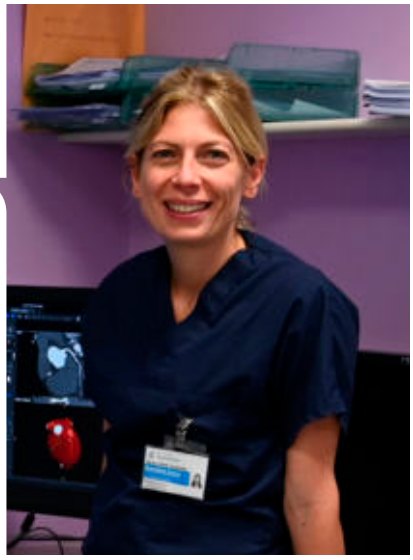
The Regina Pacis Clinic also aims to become a reference center in the diagnosis of heart disease in the area.

The Aplio i900 system is intended for cardio-vascular studies and is used in the Clinic's Cardiac Rehabilitation Department and an External Cardiology Outpatient Clinic.

"Obtaining an echocardiographic framework is essential for us to carefully evaluate the patient's cardiological conditions and structure our rehabilitation programs. The Aplio i900 echocardiograph enables us to study the heart with excellent image clarity and definition, and make fast and reliable diagnoses," remarked Dr. Virzi.

"Lung cancer screening in subjects at risk, and spectral oncological diagnosis certainly wouldn't be successful if we had not decided to acquire the Aquilion ONE / PRISM Edition."

Dr. Valentina Virzi, Medical Director of the Radiodiagnostic Service, (Regina Pacis Clinic) San Cataldo, Sicily, Italy.



Dr. Salvatore Virzì (Cardiologist) with the Aplio i900 ultrasound system.

"The system's automated analysis and measurement tools, including Ejection Fraction with Global Longitudinal Strain, MPI and 2D/3D Wall Motion Tracking, help to identify the early stages of heart disease and quantify heart function."

Delivering our systems in rigorous environments

Teamwork is key to success! In this case, the Cluster Coordinator has had to manage not only the connection with the Clinic, but also the logistics and the human resources related to Canon's equipment installations, such as shipments, service, co-ordination of application specialists. There are not enough service resources actually on the island - the specialists live on mainland Italy, so flexibility and mutual support is crucial. Proper customer management and relationship are very important to ensure smooth operations.

"The 4D features expand the ultrasound imaging capabilities and advanced 2D and 4D views allow the cardiologist to easily conduct complex cardiac imaging exams, useful for developing the clinical picture of the patient on which to structure and individualize the best cardiological rehabilitation path," she added.

The most recent acquisition at the Regina Pacis was a new Aquilion ONE / PRISM Edition.

"We chose Canon's CT system after a careful analysis of our needs," said Dr. Virzi. "We wanted to focus our attention on several precise areas: reducing the dose to the patient, obtaining high quality results, improving diagnostic accuracy in the oncological field, and working on a project that allows us to advance as a regional center of excellence in Cardiology."

Versatile technology

The Aquilion ONE / PRISM Edition is used for CT examinations of all areas, such as oncological, neuroradiological, cardiac and vascular staging exams, virtual colonoscopies and entero-CT, and dental CTs.

Dr. Valentina Virzì (left) with a Radiology technician (right) on the workstation of the Aquilion ONE / PRISM Edition.

Dr. Valentina Virzì with the Aquilion ONE / PRISM Edition.

"The unique 16cm detector, Advanced intelligent Clear-IQ Engine (AiCE) Deep Learning Reconstruction, and post-processing capabilities of Vitrea Advanced Visualization, have made fast and enhanced visualization of structures possible with an unparalleled image definition, even in very difficult cases, enabling us to promptly reach precise diagnostic judgments," said Dr. Virzi.

"AiCE uses Deep Learning innovation to match the spatial resolution and low-noise properties of advanced model-based iterative reconstructions to produce high-quality images at low doses," she continued. "After accustoming our eyes to AiCE, it was impossible for us to go back; the perception of the sharpness of the images, the presence of minimum noise at such low doses are now our everyday practice."

"Assessing the heart in a single beat and with a single rotation is an absolute plus," she added. "And in the pulmonary field, the usage of the SilverBeam filter allows a dose reduction in the study of the lung parenchyma, as the same dose-level of an X-ray exam."

Dr. Salvatore Virzì (Cardiologist) with the Aplio i900 ultrasound system.

Optimized workflow

Working with the Aquilion ONE / PRISM Edition has resulted in many practical improvements for the team at the Clinic.

"We have seen a marked improvement in terms of the quality of the professionalism expressed and in the reduction of daily fatigue,' said Dr. Virzi.

"Outstanding quality and exceptional speed of the diagnostic examinations, as well as the intuitiveness and simplicity of the post-processing with Vitrea Advanced Visualization, allows greater optimization of the workflow, both for our Medical and Technical Staff in daily practice."

New opportunities

The multimodality acquisition from Canon has facilitated several new possibilities for the Clinic.

"The coronary-CT study that can be carried out in borderline clinical conditions, the possibility of proposing lung cancer screening in subjects at risk, and spectral oncological diagnosis are the areas that certainly wouldn't be successful if we had not decided to acquire the Aquilion ONE / PRISM Edition," said Dr. Virzi. //

A Large Number of Radiographers in Ireland Experiencing Work-Related Low Back Pain

With patient and equipment handling, as well as continual movement involved in many roles in radiology, low back pain is an issue that many radiographers experience. Increasing workloads can create an even greater risk of problems. Canon Medical designs all its imaging equipment with the safety, comfort, and convenience of patient and specialist in mind. VISIONS explores how our Aquilion CT systems are equipped with features that can fully protect users from strain and injury.

A large number of people worldwide are affected by some form of musculoskeletal condition during their lifetime, and one of the most common is low back pain (LBP). It can contribute to disability through limitations in mobility and significantly reduce participation in work and leisure activities. With the daily physical burdens of work, radiographers are at risk of developing the condition.

Studies in several countries have investigated the prevalence of LBP among radiographers, but with no studies carried out in Ireland, a group of specialists led by a diagnostic radiographer from the University College Cork set out to determine the prevalence among radiographers in the country. They explored the issue through an online survey distributed through social media and found that 50% of working radiographers in Ireland experienced LBP, 9% were hospitalized, 37% required treatment for it, 25% of those affected had to reduce their work activity, and 43% reduced leisure activities. In addition, 16% of the respondents have changed or are considering changing careers from radiography due to LBP[1]. These results statistically mirror the level of problems found in other studies globally.

User safety

Power assisted positioning expedites the set-up of patients and reduces the heavy lifting required by the care team. With an increasing number of cases of obesity and trauma, lifting and maneuvering patients has become an enhanced area of risk for radiology staff, said Cees Verlooij, Senior European Clinical Specialist CT.

Canon Medical integrated design elements in its Aquilion CT systems to enhance the safety and ease of use of the scanners for users. Our Aquilion CT systems incorporate a host of features that enable radiographers to

"Canon Medical strives to provide solutions to protect radiographers from strain and injury."

Cees Verlooij, Senior European Clinical Specialist CT, Canon Medical Systems Europe

reduce the physical burden of scanning on themselves, as well as for their patients, in addition to streamlining the entire imaging workflow," Verlooij continued.

Patient positioning

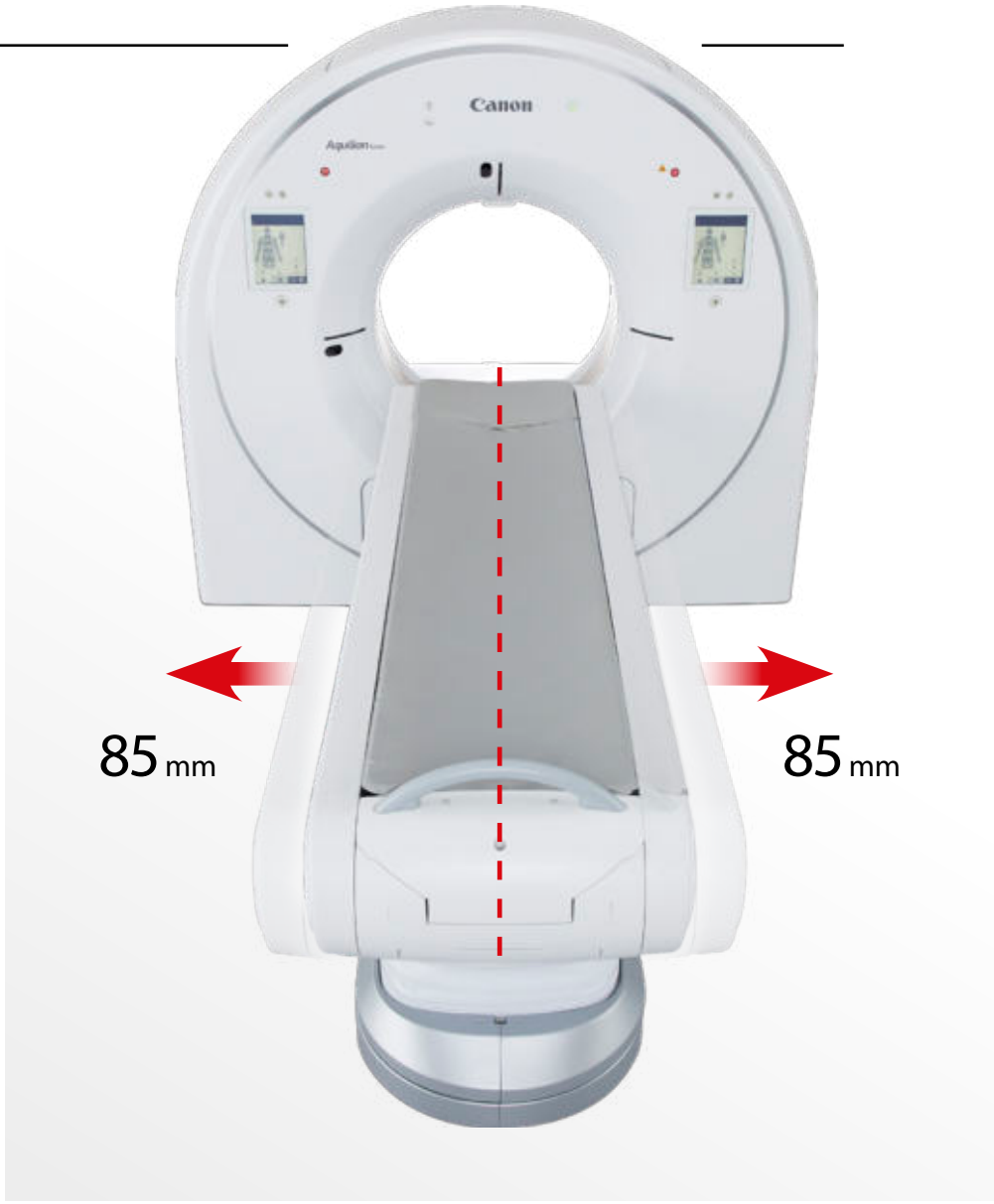
The first step is safe and accurate patient set-up. The Aquilion CT features design innovations improving the scan experience for patients while providing excellent operability and work safety for the radiographer. The couch top can be lowered to a minimum height of 33 cm for facilitating patient loading and transfer from a wheelchair. The spacious (up to) 80cm wide bore and 47 cm wide patient couch allow comfortable scanning of large patients.

The system also features lateral table movement which provides increased safety for radiographers and patients. It is achieved by Tech Assist Lateral Slide, a feature that in addition to the standard table movements, mechanically can move the patient left or right in the gantry to the correct position at the touch of a button. "The patient can be eased into position in the large bore quickly and comfortably, without asking assistance from other staff members, by utilizing the system's ergonomic lateral slide, which can provide up to 17cm lateral movement," said Verlooij. "Tech Assist Lateral Slide ensures safety and comfort by providing motorized positioning of the patient, reducing the risk of injury to the patient and the radiographer."

SURE Position

In addition to the gantry set-up, accurate positioning is assured through Canon Medical's SURE Position which allows patient centering and positioning, with adjustable 'Up-Down' and 'Left-Right' movement at the scan console.

"SURE Position ensures iso-center scanning for the best IQ and lowest dose, and is always performed without re-positioning and re-scanning of the patient," remarked Verlooij.



The Aquilion Serve's "Tech Assist Lateral slide" expedites the set-up of patients and reduces heavy lifting required by the attending care team by the possibility of 17 cm lateral table movement by the touch of a button.

"The system generates a new (virtual) scanogram which means you never have to repeat a scanogram. This not only minimizes the physical burden of moving the patient on the radiographer, because it is required once only, but also helps reduce rescans in time-critical situations."

Enhanced user experience

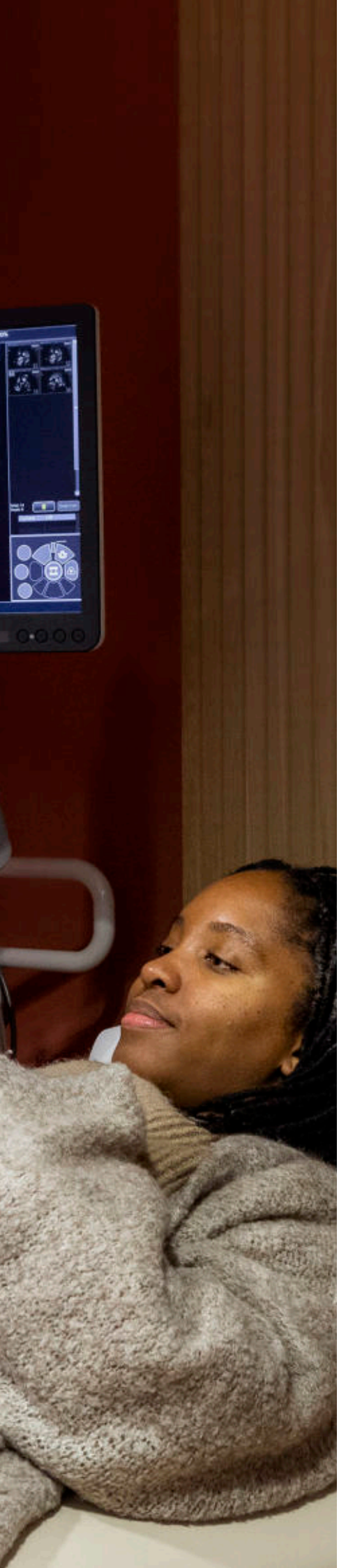
Partnership with users fuels Canon Medical's continual innovation. By working together in close collaboration with users to gather their experiences and their feedback as to what may help them and their patients even further, issues such as low back pain and shoulder injuries among radiographers became apparent as one area where further improvements could be beneficial.

"Canon Medical continually develops new technologies to improve its product performance, in this case, towards enhancing the daily practices of the user, improve their workflow experience, safeguard their long-term health and functionality, and tackle an issue that can potentially reduce the availability of radiographers in the already stretched workplace," said Verlooij. //

Reference

[1] *Journal of Medical Imaging and Radiation Sciences https://www.jmirs.org/article/S1939-8654(23)00006-1/fulltext*


Canon



VISIONS spoke with Joan Jorink and Deborah Maks, Senior Obstetric Sonographers at the Verloskundigen (Midwifery) Heemskerk, in the Netherlands, about the Aplio i700 WHC ultrasound systems.

A Clearer Picture of Pregnancy

Prenatal ultrasound is an established standard in antenatal care to assess fetal health and to confirm the expected date of delivery. Offering excellent image quality, high-frequency probes and ease of use, Canon Medical's Aplio i700 has been welcomed by obstetric centers around the world. VISIONS spoke with Joan Jorink and Deborah Maks, Senior Obstetric Sonographers at Verloskundigen (Midwives) Heemskerk, in the Netherlands, who use the system on a daily basis.

Time for a change for the 'Verloskundigen Heemskerk'. Before we focus on the Verloskundigen Heemskerk and the brand new Aplio i700, we first have a look at the organizational structure. It is a collaboration between three midwiferies, Beverwijk, Castricum and Heemskerk.

It is a high-quality ultrasound center with an enthusiastic and professional team comprising of five sonographers and four assistants. A strong women team. The practice performs approximately 4,000 ultrasound scans per year.

Optimizing the experience of pregnancy

Today's pregnant women highly value the experience of pregnancy and there is an increasing demand for more convenience in antenatal programs. Most want their care to be close by and preferably in one place.

Verloskundigen Heemskerk has, therefore, recently started offering both obstetric care and ultrasound scans at one location to reduce the burden on the pregnant woman and her partner.

In addition to the dating scan, which is carried out between 10 and 12 weeks of pregnancy, Verloskundigen Heemskerk also offers their clients a 13- and 20-week ultrasound (after counseling, of course). If, for medical reasons, a midwive decides to perform diagnostic ultrasound, the pregnant woman may also undergo a vitality scan, a growth ultrasound, a placenta localization or a fetal presentation ultrasound. Scans for non-medical indication, a so-called 'fun ultrasound', are also possible at the center.

A clear choice

Previously, the practice used Canon Medical's Xario 200 for its examinations, but the practice had to replace it - not for quality reasons but purely on basis of legislation surrounding the maximum permissible life span of such devices.

"We weighed up all possible suppliers, device specifications and services, but decided without hesitation to purchase three Aplio i700 systems," said Joan Jorink. "The image quality of the Aplio i700 WHC is unmatched."

"We tested several brands, but quickly returned to Canon Medical", added Deborah Maks. "Within their portfolio we have again tested various products from the Aplio range. All excellent devices, but for us the Aplio i700 WHC really stood out above the other versions."

Deborah Maks, Senior Obstetric Sonographer.

Benefits of Canon Medical's Aplio i700 WHC for obstetrics

- *Detailed, high quality images*
- *Wideband transducers*
- *SMI (Superb Micro-vascular Imaging) to visualize low velocity microvascular blood flow*
- *Dynamic Micro-Slice technology*
- *Intuitive workflow*
- *Ease of use*

"Our clients make their friends jealous of the quality of ultrasound images we provide."

Joan Jorink, Senior Obstetric Sonographer at Verloskundigen Heemskerk, the Netherlands

Close-up of the foot.

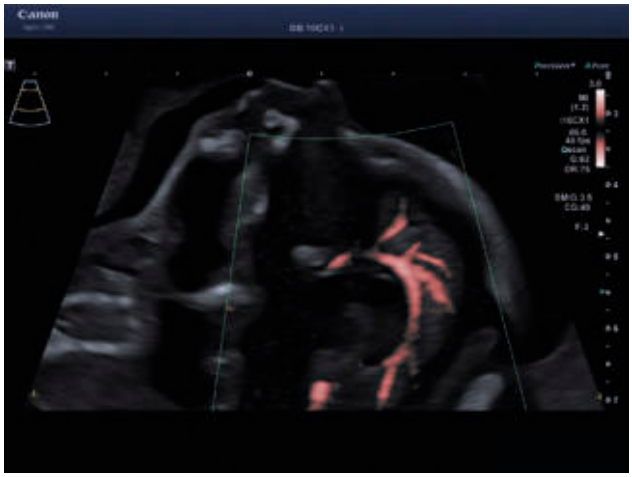


Image of the a. pericallosum using Superb MicroVascular Imaging (SMI).

The preference of Verloskundigen Heemskerk for the Aplio i700 was not only based on the outstanding specifications of the system that guarantee great image quality, sharp visualizations of microvascular blood flow at low speed thanks to Superb Microvascular Imaging (SMI), as well as ease of operation, but also on the advice and support during the entire purchasing process that was provided by Canon Medical.

Team support

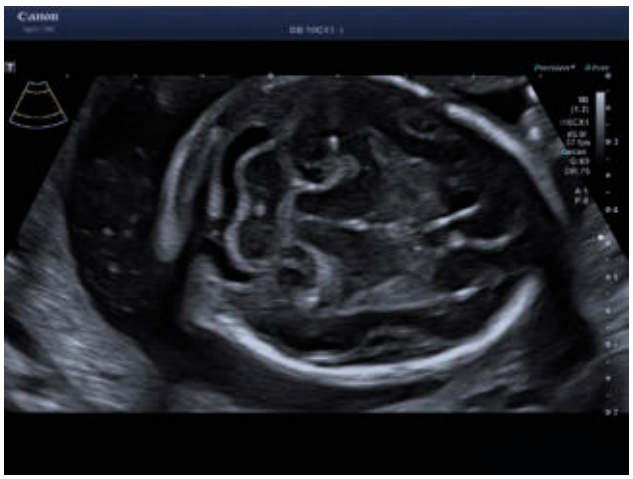
An entire team from Canon Medical is involved in the purchase of equipment at a customer site.

Each customer has a regular contact person in Canon Medical's Sales Department, who is familiar with the customer's history, knows exactly what they used before, and what their needs are for now and for the future. In the case of Verloskundigen Heemskerk, Paul Kassenaar, Regional Sales Manager at Canon Medical Systems Netherlands provided initial assessment and advice in the Ultrasound upgrade process. After tailor-made system demonstrations, development of a more detailed proposal based on the wishes of the user and the actual purchase of the equipment, the Application Specialist comes into the picture along with prompt assistance by the Service Engineers for installation and training.

For Verloskundigen Heemskerk, the Application Specialist was Fred Bijvoet, who smoothly transferred the settings from their Xario 200s to the Aplio i700s.

"Fred showed us the many possibilities of the system in just over an hour," said Joan Jorink. "The first week after installation, he was with us all day at the practice and together we evaluated the ultrasounds and the procedures, reviewed best practices and were able to ask questions."

"From our experience with our previous Canon Medical devices, we know that the Service Engineers are 'cut from the same cloth'" she added.



Detailed view of the cerebellum showing multiple cerebral structures.

Measurement of the lateral ventricle, unparalleled imaging capabilities accurately assess this measurement.

Joan Jorink and Deborah Maks, Senior Obstetric Sonographers at Verloskundigen Heemskerk, the Netherlands.

"If we have any questions, all we have to do is call. If they don't have the answer ready immediately, which doesn't happen often, you will be called back with the solution as soon as possible. You can tell from everything that there is a well-oiled team here that delivers an optimal service to their customers."

Much admired

Even though ultrasound machines are fairly standard devices that many people often see up close, the Aplio i700 WHC has turned out to be an exceptional addition at the Verloskundigen Heemskerk.

"Without exaggerating, I don't think we've ever seen so many admiring glances as those that we get in response to the Aplio i700s WHC", said Deborah Maks. "A visiting doctor from a nearby academic center, who is probably used to many things in terms of equipment in her department, couldn't get over how beautiful the device and the image quality were.

And during a live demo with the Aplio i700 WHC at the Heart Center of the Leiden University Medical Center (LUMC) in the Netherlands, all those who attended, including seasoned professionals, were still very surprised by the high-quality image quality. However, the best example of the superior quality of the Aplio i700, in my opinion, is the fact that we hear from several clients that the image quality of our ultrasounds is so high that their pregnant friends are jealous of the pictures they show." //

Image of the renal arteries using Advanced Dynamic Flow.

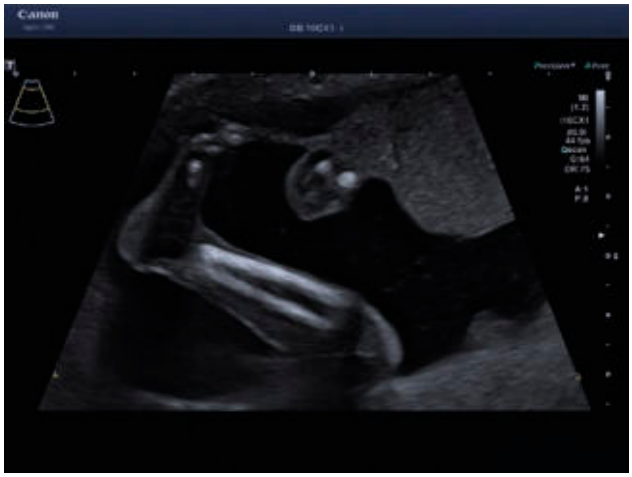


Image of the lower extremity.

Maximizing the Potential of Artificial Intelligence (AI) - Based Diagnostics

Dr. Ken Sutherland , Jamie Keena, Prof. Sotirios A. Tsaftaris

From its offices in Edinburgh, Scotland, UK, Canon Medical Research Europe, develops transformative Deep Learning technologies that have potential to improve medical diagnostics. Canon's team of computer scientists, software engineers and clinical researchers work together with some of the world's top healthcare experts on this emerging field. VISIONS talked to Dr. Ken Sutherland, President of Canon Medical Research Europe and Professor Sotirios 'Sotos' Tsaftaris, Chair in Machine Learning and Computer Vision at The University of Edinburgh, and the Canon Medical/ Royal Academy of Engineering Research Chair in Healthcare AI, about the prospects for AI in meeting new challenges in healthcare.

Research into leveraging the benefits of Deep Learning technologies has gathered even more momentum with recent changes in the healthcare landscape. While AI is still emerging, it offers potential to improve workflows, support better image quality, enhance accuracy and speed of diagnosis and treatment, as well as enabling new strategies in disease prevention and patient management.

"The challenges within healthcare are bigger than they've ever been," remarked Dr. Sutherland. "People are living longer but they're not always healthy and many need ongoing or additional care. They are dependent on receiving help from what is essentially a diminishing number of individuals delivering healthcare. And the requirement is to try and provide healthcare as efficiently as possible in terms of cost because of cost pressures in both publicly and privately funded healthcare systems."

"In addition, the Covid-19 pandemic is still happening, as we speak, and we also still have a backlog of people who've unfortunately not been able to get care, because care facilities have been focused on responding to the pandemic for the last two years. We also have new patients with long-Covid. So the situation that we are in today, compared to two years ago is even tougher with considerable pressure on the individual clinicians and the healthcare system."

Diagnostic tools

Canon Medical is already developing solutions in image analysis and AI to directly help diagnose and understand disease better.

"We've identified some opportunities where we can apply AI solutions to 'capture low-hanging fruit', as it were. These are in fairly well-understood patterns of disease which we are training the computer to recognize," said Dr. Sutherland. "A recently published example is on the cancer, mesothelioma, which is a type of lung cancer that's related to exposure to asbestos1. It creates a very unusual lesion around the lung. It's very debilitating and there's sadly no treatment for it. It generally affects older men who have been previously exposed to asbestos through their work career before regulations came into force."

Canon Medical Research Europe is working with clinical experts to see if they can find treatments, or if the disease progression can be delayed in any way.

"A critical part of working out if a treatment works is to see the impact on lesions. Mesothelioma lesions are very oddly shaped and have previously been notoriously very difficult to measure. We've created an AI-based system that can measure these lesions and give the clinician some feedback on whether the treatment they're attempting is actually having an effect positively to reduce the tumors or not."

Training AI requires a lot of examples provided quickly. In disease, characteristics are more complex to categorize. That's why radiologists are so precious – they are able to do this type of pattern recognition by training and by their experience."

Professor Sotirios A. Tsaftaris. University of Edinburgh, UK.

How does a computer see differently to a human?

"Using an analogy of dogs, it's easy to talk about dog breeds, because everybody sees them and understand them…we know the characteristics that make, for example, a Golden Retriever or a Labrador.

However, if you think about a lesion of the brain, particularly if a patient has had a stroke and there is some sort of hemorrhage in their brain, the hemorrhage can be a variety of locations it will have a variety of appearances…. It is like actually having billions and millions of combinations of possible 'breeds'.

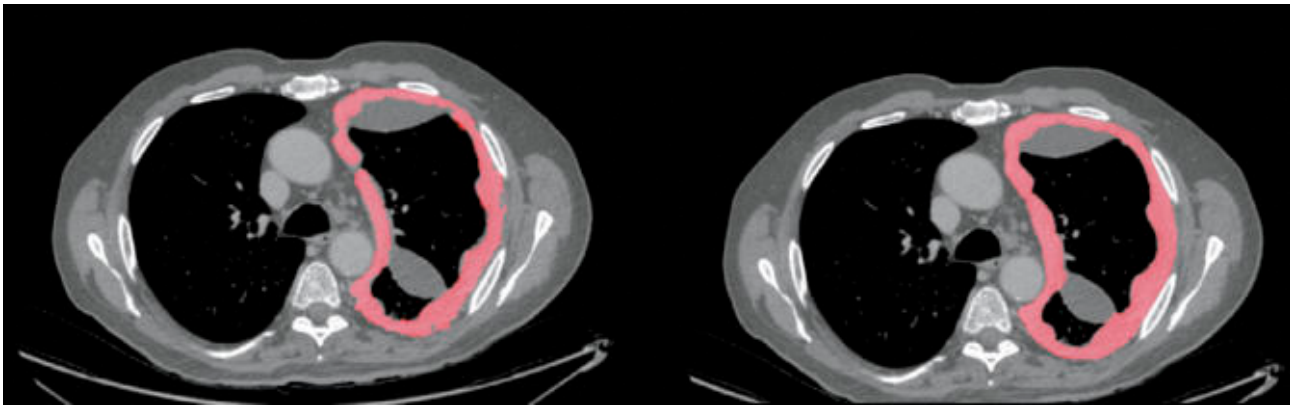
Challenges in AI

AI is built by feeding large amounts of data through a 'Deep Learning network' - a computer model. Statistical processes enable the computer model to slowly find correlations in the data that can indicate clinically significant patterns. The process of feeding data automatically through the model is called 'training' the AI. To be successful, Deep Learning requires a lot of data – in some cases, from thousands or millions of examinations.

"Over the last few years, we have seen a 'rebirth' of what we call 'neural networks'. These are very big computer programs that learn patterns through examples. To devise models for these networks these programs take lots of data and lots of computation," remarked Prof. Tsaftaris. "Bringing all that data together is just one of the many challenges in this arena, but there are wonderful examples of its success, such as how AI-based programming has provided algorithms that can detect a suspicious mole on somebody's skin from a non-suspicious mole."

Access to patient data with accurate diagnostic or outcome information is essential in creating effective AI solutions. This data is available in hospitals and healthcare facilities, but making it available to others for innovation, has, up until now, presented significant challenges in protecting patient privacy and ethics.

"We have to take genuine responsibility for control and appropriate use of data because it involves very personal information, for example, scans of an individual's body," said Dr. Sutherland. "With proper security and data use in place, I believe we can all play a role by giving permission to allow our data as citizens to be used for scientific research for the 'greater good'. The only way AI is going to work widely is if we apply good, rigorous science that is accepted by patients, healthcare professionals and the general public."



"Part of the validation process for these technologies also involves clinicians engaging with these systems to help us try and improve their quality and validate that they work in a useful way, "he said. "What computers will never replace is the actual decision-making, in my opinion."

"They may provide a kind of decision support. For example, the AI may be able to provide a measurement of a lesion that indicates to the doctor whether a treatment is working or not, but the interpretation of what that measurement means is still the key role for the clinician, as well as the communication of that information to the patient and others," he continued. "What we're doing hopefully is 'turbocharging' clinicians, enabling them to do more of what's really important, which is providing care with some of the drudgery done by computers."

"More data and easy access to this data for academic research is very important," said Professor Tsaftaris. "This will allow for more rapid development of solutions that then the some of the industry then can really try to translate and integrate."

Talent requirement

Professor Tsaftaris believes that there are a great many opportunities in using AI to help with the societal challenges that we all face but emphasizes that one critical element that is often not fully appreciated is that talent is required to develop algorithms.

Watch a YouTube video of the full discussion with Professor Tsaftaris and Dr. Sutherland here

Scan the code to watch the video

"We need to be able to attract talent. We need to attract software engineers, data scientists, AI experts, AI graduates, and so on. We compete for talent between industries too. So, we need to attract and retain this talent within the healthcare industry," he said. "There is also a tremendous opportunity for our fellow colleagues and clinicians to play a very important role in this. However, all of this takes time. There is development behind this. Our partners are open to the idea of testing new things and perfecting them while en route to a better future with AI." //

Professor Sotirios A. Tsaftaris
Royal Academy of Engineering Research Chair in Healthcare AI, University of Edinburgh, UK

Jamie Keenan
Associate Director Health Unlimited London, UK

Dr. Ken Sutherland
President of Canon Medical Research Europe

This article is a reprint from the Global VISIONS Special Edition vol.2, published by Canon Medical Systems Corporation.

References

[1] https://www.canon.co.uk/view/ai-fighting-cancer/

VISIONS spoke with Stijn Bollen, Radiologist, and Melissa van den Bos, Medical Physicist Expert at the Groene Hart Ziekenhuis (GHZ) in Gouda, the Netherlands.

Leveraging Additional Layers of Intelligence

Research-led advances in healthcare practices sometimes requires the acquisition of new technology. One recent example is the adoption of new guidelines on stroke assessment protocols in the Netherlands following integration of results from the MR CLEAN study[1] – a trial of intra-arterial treatment for acute ischemic stroke, and the MR CLEAN-LATE study[2]. These studies provided new insights in the treatment of ischemic stroke made possible through the use of CT brain perfusion after brain infarctions. This imaging technique was found to give a good indication of brain tissue status before deciding the best options for neuro intervention or thrombolysis.

With the introduction of new protocols across the Netherlands in 2021, the Groene Hart Ziekenhuis (GHZ) in Gouda, the Netherlands, was able to fulfill the new guidelines thanks to Canon Medical technology. Stijn Bollen, Radiologist, and Melissa van den Bos, Medical Physicist Expert at the GHZ, explain how the systems and software assist their work.

GHZ is a general hospital that offers state-of-the-art medical care from four different locations, from which Gouda is the main location (Gouda, Bodegraven, Schoonhoven, and Zuidplas) all of which lie within the "Groene Hart" (Green Heart) area of the Netherlands. It has two Canon Medical Aquilion Prime SP CT scanners with Vitrea Advanced Visualization and Automation Platform.

"At the end of 2021, we implemented the brain perfusion CT protocol in addition to CT angiography for detecting acute infarctions and calculating the percentage of penumbra and core, to follow the new updated Dutch guidelines," said Stijn. "With implementation of this new protocol, we also started to use the Automation Platform from Canon Medical to confirm the diagnosis of ischemic stroke and to estimate tissue viability."

"During the day and night, we scan patients with symptoms of brain infarction, therefore, we make use of Canon Medical's Automation Platform," added Stijn.

New perspectives

GHZ opted for the Automation Platform because it helps their radiologists obtain brain perfusion maps for direct assessment, and enable fast indication of Large Vessel Occlusion (LVO) and detection of Intracranial Hemorrhage (ICH).

"After performing a CT brain perfusion scan, the CT slices are sent to the Automation Platform for analysis. The analyzed brain perfusion maps, including indication of large vessel occlusion or intracranial hemorrhage, are saved and shown in PACS, consistent with normal workflow for CT imaging," explained Melissa.

"The greatest impact of the Automation Platform for the team is seen during night-time, due to the quick availability of the images."

Stijn Bollen, Radiologist, the Groene Hart Ziekenhuis (GHZ), Gouda, the Netherlands.

"They provide observer-independent analysis/volume determination," continued Melissa. "The analysis of brain perfusion maps created by Automation Platform correspond with manually analyzed brain perfusion images of patients."

GHZ have undertaken their own studies to assess the results obtained by the Automation Platform. They compared the penumbra and core volumes analyzed by the Automation Platform with manual analysis using the Vitrea Advanced Visualization workstation and found no large differences.

The neuroradiologists at GHZ also use the analyzed brain perfusion maps from the Automation Platform.

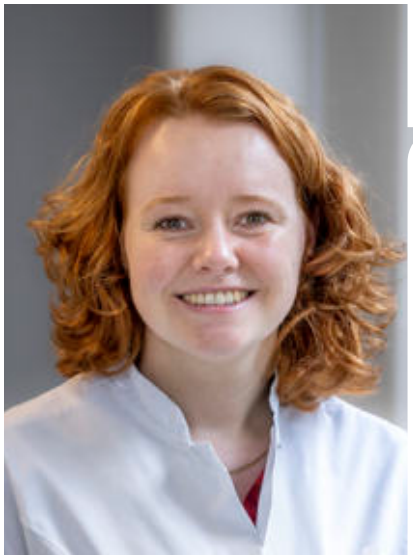
Benefits of ICH and LVO algorithms

Previously, radiologists could only rely on analysis of the unenhanced CT brain scan for evidence of an infarction, mass, or hemorrhage, and CT Angiography of the brain from which to find vessel occlusions or other abnormalities.

The introduction of Canon Medical's Automation Platform provides extra tools to exclude hemorrhage and large vessel occlusion through its ICH and LVO algorithms.

"Within the context of 'time is brain' in diagnosing patients with symptoms of brain infarction, Automation Platform has definitely improved the speed and quality of diagnosis in acute stroke," said Stijn. "The main diagnostic advantage is the LVO/ICH indication on the native and CTA images."

"It gives an additional value in the level of confidence for the radiologist, "continued Stijn. "When there is a perfusion defect, with no acute occlusion or spasm, the radiologist is more focused on finding alternative causes, such as spasm or smaller peripheral occlusions."



"Vitrea and Automation Platform are stable and reliable software systems within the hospital."

Melissa van den Bos, Medical Physicist Expert, the Groene Hart Ziekenhuis (GHZ), Gouda, the Netherlands.

Perfusion maps

Using the systems, the radiologists are able to obtain CT Perfusion (CTP) maps that show CBV (Cerebral Blood Volume), CBF (Cerebral Blood Flow), MTT (Mean Transit Time), and Tmax (Time to maximum).

"The CTP maps gives an indication of whether an endovascular therapy, such as intra-arterial thrombolysis in a later time window would still be useful," explained Stijn. "The maps are accurate. The workflow improves because there is no need to open the Vitrea Advanced Visualization to obtain the perfusion maps."

Full training

When the Vitrea Advanced Visualization and Automation Platform were initially installed, the radiologists at GHZ received training on the brain perfusion maps and calculating volumes. Training on the Automation Platform was provided to the hospital's radiologists and some CT technicians when it was operational. And the radiologists received additional training in learning how to access and interpret the extra images, which include Large Vessel Occlusion (LVO) and Intracerebral Hemorrhage (ICH) indication. The CT technicians also received training for the scan protocol for perfusion scans.

"We have a good relationship with the Canon Medical Team," remarked Melissa. "The technicians gave good support when the Aquilion Prime SP CT, Vitrea Advanced Visualization and Automation Platform systems were introduced, and they continue to provide great support, for example, when we have questions. We were able to transfer their know-how in the form of excellent support."

Making new protocols easy

Canon Medical's Vitrea Advanced Visualization and Automation Platform systems have not only enabled GHZ to integrate the new Dutch guidelines on assessment of stroke patients into clinical practice, but they provide ease of use that has improved workflow and diagnostic confidence. //

References

1 *Scan the code or click HERE to view the article of the New England Journal of Medicine*

2 *Scan the code or click HERE to view the article of the ResearchGate.*

Empowering High-Quality Minimal Radiation Exposure CT Lung Scans with SilverBeam and DLR

Canon Medical's SilverBeam introduces a novel X-ray filtration system specifically developed for CT imaging. This innovative solution capitalizes on the physical properties of silver, leveraging its outstanding ability to optimally filter low energy X-rays. Combined with Advanced intelligent Clear-IQ Engine (AiCE), a pioneering Deep Learning Reconstruction (DLR) algorithm for CT, SilverBeam elevates the potential for high-quality imaging with significant utility in scenarios that necessitate dose minimization. In particular benefits are observed for larger patients and challenging anatomical regions in the context of lung cancer screening.

CT in Lung Cancer Screening

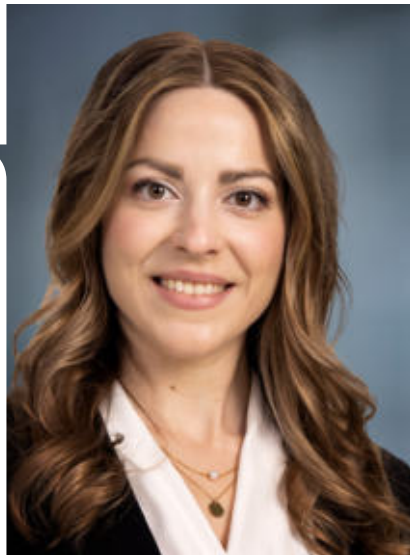
Lung cancer remains the leading cause of cancer-related deaths worldwide, responsible for over 270,000 deaths annually in Europe alone. Despite long-standing interest in the European medical community for lung cancer screening with low-dose computed tomography (LDCT) to reduce lung cancer mortality, supportive European data has only recently become available from a European Randomised Controlled Trial (NELSON). The use of LDCT in NELSON was associated with a significant reduction in lung cancer mortality, ranging from 26% in men to 39-61% in women[1,2] leading to advocacy for LDCT screening implementation in Europe.

Because of the high mortality rate associated with lung cancer, earlier detection through screening programs could significantly improve patient outcomes, such as survival rates, treatment options, and overall prognosis. LDCT lung cancer screening is an increasingly important screening tool, and its potential benefits in Europe are being seriously considered[1].

Although CT is widely used for its high spatial resolution and detailed anatomical information, CT scans always pose risks from ionizing radiation. Therefore there is a growing interest in developing techniques that reduce radiation exposure, such as low and ultra-low-dose CT (ULDCT) protocols.

"This novel CT technology demonstrates the ability to produce images of exceptional quality while minimizing patient radiation exposure, within the realm of plain chest X-rays."

Christiana Balta, Ph.D.
Science & Product Manager, Canon Medical Systems Europe.



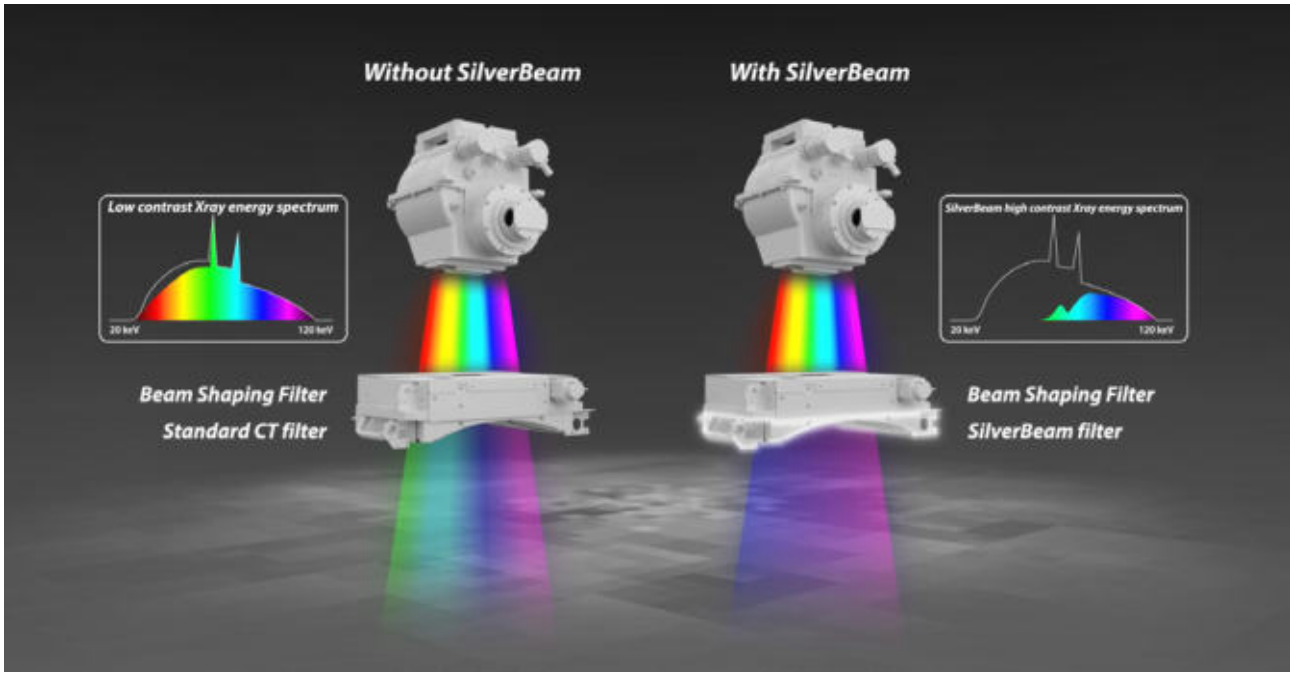


Figure 1: SilverBeam is an energy filter that utilizes the photo-attenuation characteristics of silver to selectively eliminate low-energy photons from a polychromatic X-ray beam. This process results in the formation of an energy spectrum shifted toward higher energies.

These protocols have shown promise in clinical applications such as pulmonary nodule evaluation and lung cancer screening, but their use requires balancing radiation dose and image quality. While the term "ultra-low dose" typically refers to protocols that aim to match the radiation dose of a chest X-ray, the definition of "low dose" may not be consistent over time, leading some clinicians to prefer the term "reduced-dose" protocols.

Despite the benefits of reduced-dose CT, in general, lowering the radiation dose can lead to increased image noise, decreased image quality, and reduced sensitivity to pulmonary pathologies. Therefore it is critical to optimize the imaging chain to ensure both patient safety and diagnostic accuracy.

It has been shown that reduced-dose CT with conventional filtering and hybrid iterative reconstruction (HIR) is more effective than chest radiography in detecting chest pathologies[3]. However, there is potential for further improvement of image quality and accuracy using advanced filtering techniques and deep learning reconstruction algorithms. By applying beam filters made of materials with high atomic numbers, such as silver, and utilizing deep learning reconstruction (DLR), it is possible to enhance the images acquired at reduced- dose and achieve even higher sensitivity and specificity in detecting subtle abnormalities.

SilverBeam

Canon SilverBeam is a new silver-based filtration that selectively eliminates low-energy photons from a polychromatic X-ray beam. The outcome of this process is the generation of an energy spectrum that exhibits a shift towards higher energies, as depicted in Figure 1. As a result, the X-ray energy spectrum becomes narrower, featuring a reduced number of quanta at lower energies, thereby leading to an overall increase in the mean energy. SilverBeam can help to achieve the desired image quality while minimizing the amount of radiation dose received by the patient. Because it enhances the signal-to-noise ratio, SilverBeam is especially useful for lung cancer screening. Due to its inherent high contrast and low absorption properties, SilverBeam proves advantageous for non-contrast chest CT scans. By effectively diminishing photon starvation, it proves particularly beneficial in challenging, high-attenuation scenarios such as the shoulder region of all patients. Moreover, SilverBeam can improve detectability of anatomical areas, that are difficult to detect, such as lung apices, with lower tube voltages due to the high attenuation of photons by the shoulder bone for reduced-dose CT screening.

SilverBeam and Deep Learning Reconstruction

The novel reduced-dose SilverBeam plus AiCE scanning method, results in an improvement in image quality, and further reduction in noise, ultimately resulting in superior SNR values compared to the conventional filtration and HIR approach.

Figure 2: Clinical images of low dose Lung Cancer Screening CT scan acquired with SilverBeam Filter and reconstructed with AiCE Lung. CTDIvol=0.9 mGy, DLP = 38.7 mGy E= 0.54 mSv (k=0.014 mSv·mGy^{-1}·cm^{-1}). The yellow circle indicates a lung nodule.

Clinical Example

A clinical example of the SNR properties is provided in Figure 2, which shows a small lung nodule well-demonstrated in the upper right lung using reduced dose, at a CTDIvol of 0.9 mGy, chest CT combining SilverBeam with DLR. The dose-length product (DLP) was 38.7 mGy • cm. With a conversion factor (k) of 0.014 mSv • mGy-1 • cm-1, the effective dose (E) equals 0.54 mSv.

The dose used in this CT scan is 11-16 times lower than the typical European effective doses for chest CT (~5.5 mSv)[4].

SilverBeam, the novel silver-based filtration, selectively eliminates low-energy photons from a polychromatic X-ray beam, thus offering numerous advantages that position it as the preferred approach over other filtration materials for specific applications, like reduced dose lung screening. When combined with AiCE technology, SilverBeam demonstrates the ability to produce images of high quality while minimizing patient radiation exposure. By leveraging this innovative solution, patients can now experience the benefits of a safe and effective diagnostic tool. This significant advancement in CT technology represents an important milestone and may contribute to the ongoing battle against this horrible disease. //

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[2] *G. Veronesi et al., "Recommendations for implementing lung cancer screening with low-dose computed tomography in Europe," Cancers (Basel)., vol. 12, no. 6, pp. 1–24, 2020, doi: 10.3390/cancers12061672.*

[3] *L. J. M. Kroft et al., "Added value of ultra-low-dose computed tomography, dose equivalent to chest x-ray radiography, for diagnosing chest pathology," J. Thorac. Imaging, vol. 34, no. 3, pp. 179–186, 2019, doi: 10.1097/RTI.0000000000000404.*

[4] *European Union, "Diagnostic Reference Levels in Thirty-six European Countries. Part 2/2," Radiat. Prot. N° 180, pp. 1–73, 2014.*

CT Lung Screening at the Radiation Dose of a Chest X-ray

Patient history

An 80 year old woman with a long smoking history presented with a 3 month history of shortness of breath and weight loss. She was referred for a chest X-ray and then a CT scan of the chest.

Technology

The examination was performed with the latest energy filter technology called SilverBeam. This filter, specifically designed for Aquilion CT scanners, optimizes the x-ray beam by filtering out the low energy photons. Low energy photons do not contribute to image quality but increase dose and scattered radiation.

When combined with Canon Medical's Advanced intelligent Clear IQ Engine (AiCE) technology, SilverBeam filter can harness the power of artificial intelligence to deliver high-resolution and low-noise images for applications such as lung screening.

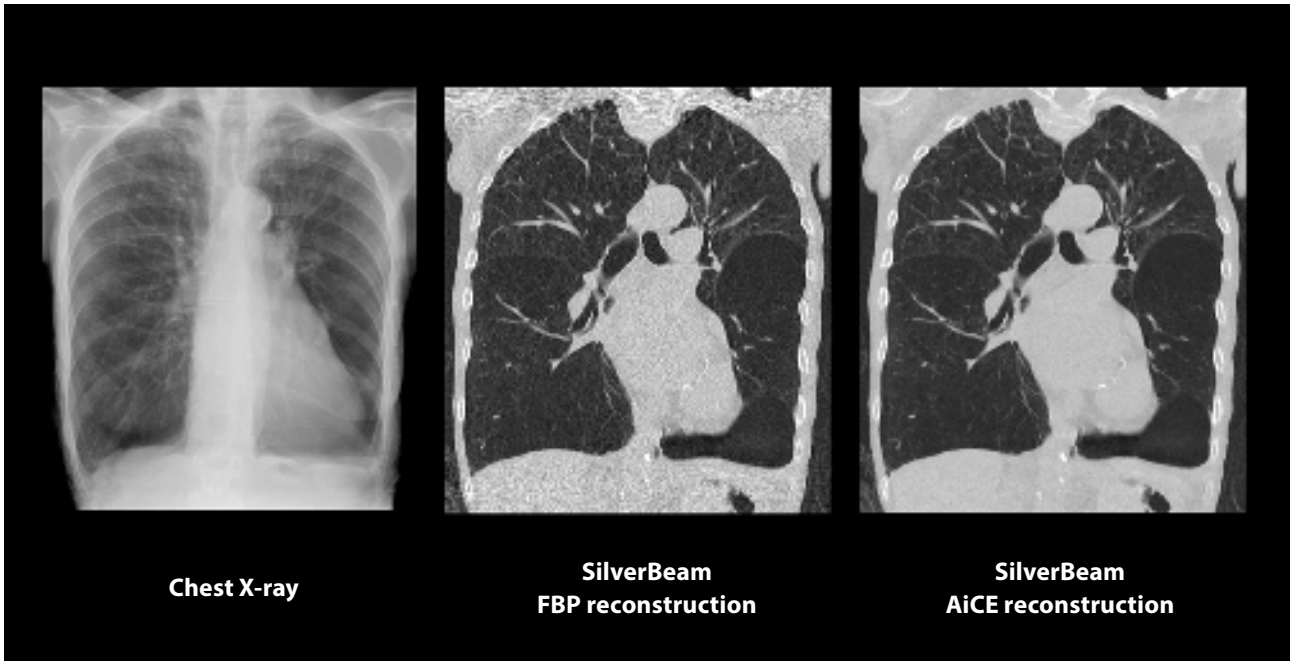
Findings

The chest X-ray demonstrates hyperexpanded lungs. It is not possible to exclude malignancy or emphysema.

The SilverBeam scan provided excellent image quality, and the use of AiCE resulted in a significant improvement in image quality compared to FBP. The SilverBeam AiCE images demonstrate severe generalized emphysema, particularly affecting the lower lobes bilaterally which was not seen on the chest x-ray. Lung malignancy can be confidently excluded and no further investigations were needed.

"SilverBeam combined with AiCE Deep Learning Reconstruction could mark the end of the chest x-ray."

Dr. Russell Bull,
Royal Bournemouth Hospital,
Bournemouth, UK



Acquisition

SCANNER MODEL:
Aquilion Serve

SCAN MODES:
Scano and Helical scan

COLLIMATION:
0.5 mm x 80

EXPOSURE:
120 kV, 50 mA

ROTATION TIME:
0.5 s

TOTAL CTDI VOL:
0.22 mGy

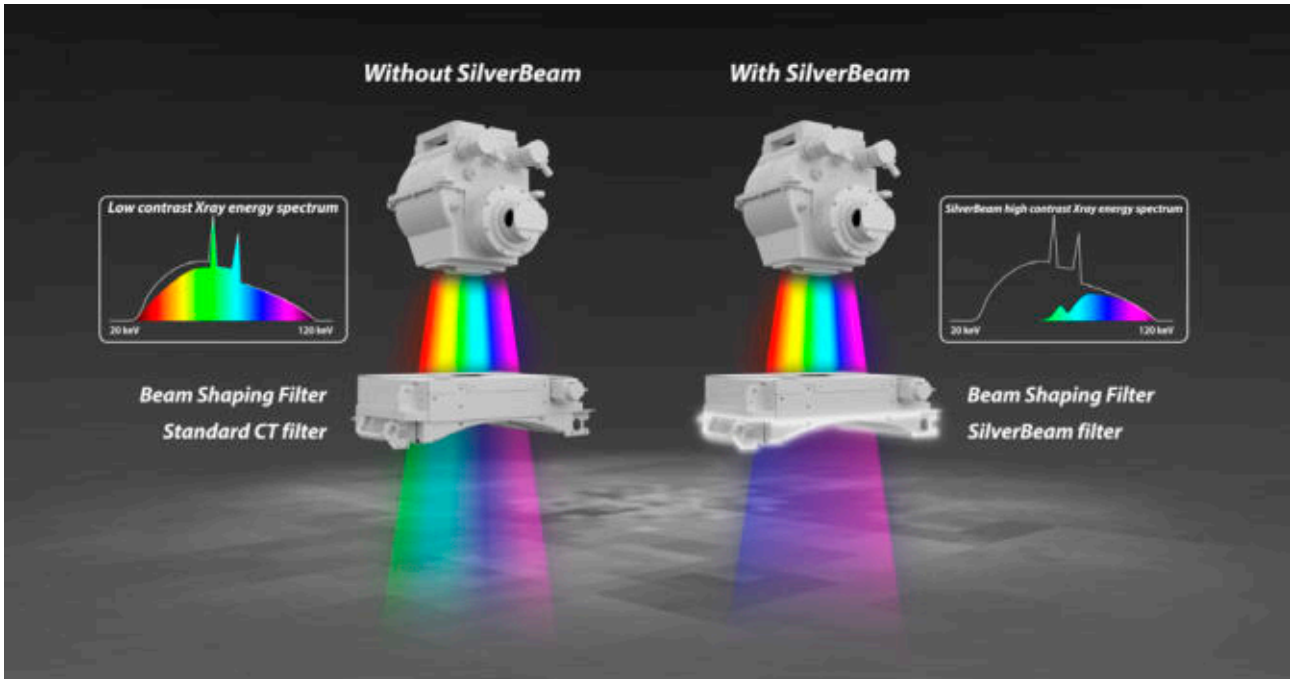
TOTAL DLP:
8.69 mGy-cm

TOTAL EFFECTIVE DOSE:
0.12 mSv

K-FACTOR:
0.014*[1]

Reference

[1] American Association of Physicists in Medicine (AAPM) Report 96, 2008.



SilverBeam, leverages the photo-attenuating properties of silver to selectively remove photons from a polychromatic x-ray beam leaving an energy spectrum designed for low dose lung screening as shown in the image above.

Celebrating Five Years of Inspiring Education in Vascular Ultrasound Imaging

Specialists from all over the world have been trained in advanced vascular ultrasound techniques through the tailored courses provided by Wessex Diagnostic, UK, for many decades. They enable medical specialists, including vascular scientists, sonographers, radiologists and vascular surgeons, to learn new techniques or develop their existing skills. For the last five years, Canon Medical Systems has equipped the courses with ultrasound systems. Providing delegates with access to state-of-the-art ultrasound technology has enhanced and inspired their learning experience. VISIONS spoke to some of the organizers, tutors, and attendees of the independent courses to find out more.

Answering unmet training needs

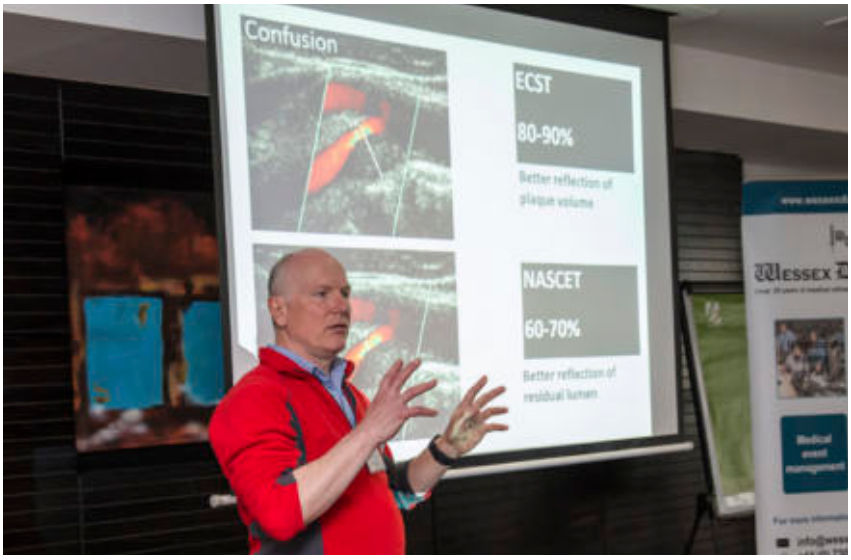
The first Wessex Diagnostic vascular ultrasound courses started in the 1980s as: "Blood vessel imaging using ultrasound techniques" in the UK and "Ultrasound Angiography" in Monaco, the latter was organized in conjunction with the British Medical Ultrasound Society (BMUS) and European Federation of Societies for ultrasound in Medicine and Biology (EFSUMB). Wessex Diagnostic now organizes an annual program of vascular ultrasound courses.

"Wessex Diagnostic is a family-run academy. My father, Mr. Keith Humphries, Consultant Clinical Scientist, identified a need for targeted vascular skills development within the sector, at a time when there was nothing similar available," explained Helen Humphries, Programme Director of Wessex Diagnostic. "The idea behind establishing Wessex Diagnostic was to ensure that there was a training course available that demonstrated the full potential of Doppler ultrasound techniques in arterial and venous disease and in doing so provide practical training of investigation protocols to optimize the diagnostic accuracy of these tests."

Advanced practical vascular ultrasound

The courses aim to provide a comprehensive insight into the techniques and latest developments in vascular ultrasound, in a friendly and supportive learning environment. The scanning workshops allow individual scanning time on live models, under the careful supervision of the experienced ultrasound faculty – this opportunity for hands-on scanning is often omitted from other courses.

In addition to specific carotid and venous courses, Wessex Diagnostic also run a endovenous ablation masterclass, vein mapping and an introduction to obstetrics ultrasound.



Tim Hartshorne, Clinical Vascular Scientist at the University Hospitals of Leicester, UK. Teaching the theoretical part.

Matthew Bartlett, Senior Clinical Vascular Scientist and Head of the Vascular Laboratory, Royal Free Hospital, London, UK. Teaching during a practical session.

They also provide on-site courses that are tailored to specific team requirements.

"Our target audiences are medical specialists wanting to learn ultrasound techniques or those wanting to develop their skills, particularly vascular scientists, sonographers, radiologists and vascular surgeons. We have a flexible structure and practical sessions allowing those of a similar skill set and level to learn together," continued Helen. "For the last five years, the ultrasound systems for the practical workshops have been provided solely by Canon, which means we have a higher standard of equipment available for our delegates to learn their vascular skills. Canon provides the full range of ultrasound equipment up to the high-end comprehensive systems."

Canon's contribution

Dianne Hanson, European Clinical Market Manager Ultrasound at Canon Medical Systems Europe, and Sally Davey, Ultrasound Product Manager at Canon Medical Systems UK, were instrumental in consolidating Canon's involvement in the courses five years ago. Both are trained sonographers with decades of experience at Canon, including specialist ultrasound applications expertise from previous roles.

Canon has, along with other ultrasound manufacturers, provided equipment in support of the Wessex Diagnostic courses, for many years. "Five years ago, we realized that both parties could benefit from a collaboration that would see us being the sole providers," said Sally Davey.

"I think the main value to the people that attend the course is that it's not a "tick box and gain a certificate" type course."

Matthew Bartlett, Senior Clinical Vascular Scientist and Head of the Vascular Laboratory, Royal Free Hospital, London, UK.

Tim Hartshorne, Clinical Vascular Scientist Vascular studies unit at University Hospitals of Leicester, UK. Teaching during a practical session.

"Vascular ultrasound is invariably undertaken in dedicated departments or as part of other clinical specialties, such as neurology and cardiology. Having spent time as clinical sonographers and application specialists in this field, we became familiar with what others require from their equipment – how they want it to perform, how to get the best imaging from it, and how further developments can support and enhance existing services."

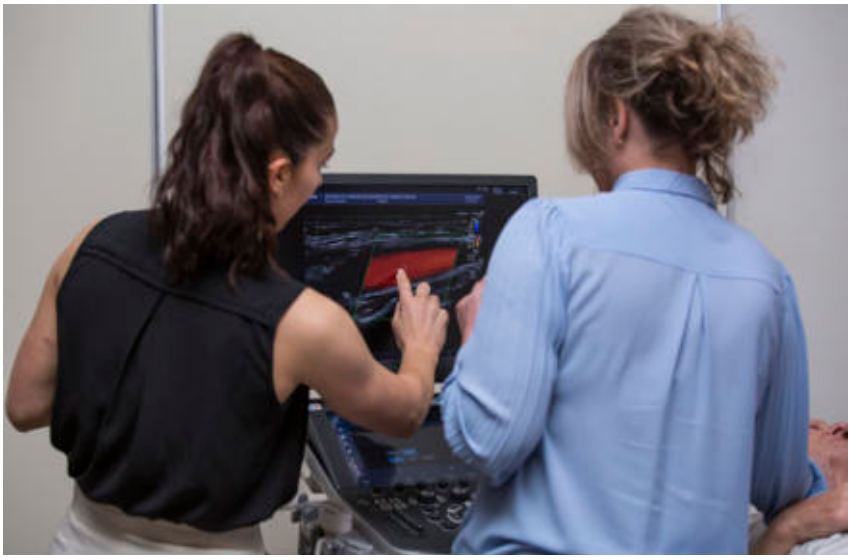
"We were also aware of the need for quality training, supported by practical experience in optimizing scanning techniques and manipulating image settings. An additional benefit is the feedback we receive, from the faculty delivering the training and the delegates receiving it."

"During the two-day courses, Canon sponsors a dinner for the attendees and tutors. This social element allows people to share their experiences and working practices in a relaxed environment, which all helps with the, collaborative approach we envisaged from the start. With delegates from all over the UK, Europe and beyond it is the perfect opportunity to look outside our immediate workplaces!"

Each course is held with maximum 30 attendees to ensure a good delegate: faculty ratio that maximizes individual learning in the practical sessions.

"The two-day courses are part theoretical, part practical," remarked Dianne.

"The theory is first presented by the expert tutors, and then the delegates get the chance for the hands-on implementation of the theory taught them, on a Canon ultrasound system. There are six stations, which means that there are not too many people per station. So, everyone gets the chance to scan by themselves. It's very important to gain experience actually on the system, to learn to do ultrasound. It is vital to get that hands-on experience in the vascular part. There are different courses, held four times a year; a carotid course, a venous course, and two vascular courses."



Hannah Lord; Clinical vascular scientist, St. Georges University Hospital London, UK. Teaching during a practical session.

Christina Svensson, Medical Technician/Sonographer at the University Hospital Linköping, Sweden. Delegate of the course during a practical session.

Regarding the dinner for attendees and tutors, there is also a social element which is very important for cross talks, for example. It's very collaborative in the end. The delegates come from all over Europe, and outside.

Access to renown expertise

Expert tutors on the course include Matthew Bartlett, Senior Clinical Vascular Scientist and Head of the Vascular Laboratory, Royal Free Hospital, London, UK, and Mr. Tim Hartshorne Clinical Vascular Scientist at the University Hospitals of Leicester, UK.

Matthew has over 17 years of experience in vascular ultrasound. In addition to teaching at Wessex Diagnostic, he lectures on Ultrasound Physics at City University London, and is actively involved with the UK's Society of Vascular Technology Education Committee, providing national teaching and exam revision workshops to trainee scientists. Matthew is also heavily engaged in research, with an interest in complex hemodynamics and vascular remodeling in dialysis access fistulae.

Tim has worked for many years in the Vascular Studies Unit at University Hospitals of Leicester, and has more than 38 years' of experience in vascular ultrasound. He is actively involved in teaching and training and more recently, have been supporting the National Abdominal Aortic Aneurysm Screening Programme as their Professional Clinical Advisor. He has also co-authored a book on Vascular Ultrasound: How, Why and When (2023) and contributed to many other publications.

"I think the main value to the people that attend the course is that it's not a "tick box and gain a certificate" type course," remarked Matthew. "Delegates leave with a grounded understanding that they can take back to their workplace and learn how to improve and really use an ultrasound machine to the maximum, really get the most out of it and use it safely and appropriately."

"From my experience, it's very useful to have one system on the course, rather than multiple different systems or a machine type, because it means participants can focus. It's very consistent from that point of view," he added.

"I have used many different machines over the years, but I think Canon's is fantastic with its exceptional resolution, it is very ergonomic and easy to work with."

Christina Svensson, Medical Technician/Sonographer at the University Hospital Linköping, Sweden. Delegate of the course.

"It means that within a session the delegates can get accustomed to using all the key functions. We receive many delegates who say: "Yes, I use ultrasound all the time in my clinics." And then you start teaching them and they say: "Oh wow! I didn't know ultrasound could be this good. I didn't know this was possible."

And it's partly because the training and education isn't there and partly because people are using less capable machines. On the course, they are sitting down at a high-end machine for the first time and receive the combination of being shown how to use the machine properly, use all of the features, and actually see what a good optimal system can do. I think even people that use ultrasound regularly in their clinics are often really surprised."

"In addition, we also cover reporting in the course," said Matthew. "With guidance on how to report, and also when reporting can become ambiguous, or even unhelpful."

"Having access to a number of different tutors and demonstrations on the course helps a lot to ensure that the delegates can get views and perspectives from three or four different experts in the field," said Tim. "They then get the benefit of learning from a range of tips, tricks and techniques that the various experts use. And so that instead of just relying on one individual, they get the benefits of multiple demonstrators."

Delegate of the course during the theoretical session.

"I think the course is also realistic in terms of what we demonstrate ultrasound can do, because we can discuss some of the areas of potential pitfalls and where errors can be made and how to avoid those, and also importantly perhaps limitations where maybe complementary imaging or alternative imaging may be required," Tim added. "So I think it's very realistic, very practical. We have the scope to explain the essential functions and controls of the machine and there is the capacity to spend a bit of additional time with delegates who may need a little bit more support. The practical groups are organized according to experience level. We can tailor the demonstration and hands-on, to the level of skill and knowledge that the delegates have. That benefits everyone."

"For the last five years, the ultrasound systems have been provided by Canon Medical, which means we have a higher standard of equipment available for our delegates to learn their vascular skills."

Helen Humphries, Programme Director Wessex Diagnostic, UK.

Left to right: Anne Farrell; Clinical Vascular Scientist Vascular laboratory University Hospital of South Manchester; tutor, Laura Devonshire, Vascular sonographer Russells Hall Hospital Dudley; tutor, Tim Hartshorne; Clinical Vascular Scientist Vascular studies unit at University Hospitals of Leicester; tutor, Sally Davey; Ultrasound Product Manager at Canon Medical Systems UK, Helen Humphries; Programme Director Wessex Diagnostic, Matthew Bartlett; Senior Clinical Vascular Scientist and Head of the Vascular Laboratory, Royal Free Hospital, London; tutor, Dianne Hanson; European Clinical Market Manager at Canon Medical Systems Europe, Hannah Lord; Clinical vascular scientist, St Georges University Hospital London; tutor, Lisa Wright; Ultrasound Clinical Product Specialist at Canon Medical Systems UK.

Delighted delegates

Christina Svensson is a Medical Technician/Sonographer, and recently graduated PhD, at the University Hospital Linköping, Sweden. She recently attended the two day Wessex Diagnostic course in Birmingham. Mikael Brusberg from Canon Medical Systems Sweden, together with some other delegates from Sweden, joined her on her trip to Birmingham.

Wessex offers two free spots per course for Canon representatives to improve their skills and knowledge in the vascular ultrasound field, therefore Mikael took the chance to attend this time's course.

"I have worked at the University Hospital for many, many years, actually since 1987" Christina explained. "I work in a clinic in the Clinical Physiology Department, in which we carry out a lot of other exams like lung function tests, stress tests with treadmills, and ECG, but the majority of my work is focused on vascular ultrasound. My role also includes research work, for example into inflammatory diseases, such as arteritis, and the use of vascular ultrasound to ascertain if the disease is active or not."

"What I found valuable on the course was learning about how others work with the Canon ultrasound systems and see the other's exam protocols, the workflow, and the machine's settings. The course was very nice when you get inside in different pathologies and diseases. And you can change group if you want to see more about specific things."

"We have two Canon ultrasound machines in the department, " she continued. "I have used many different machines over the years, but I think Canon is fantastic with its exceptional resolution, it is very ergonomic and easy to work with. I love it. I particularly like the SMI (Superb Microvascular Imaging) tool and there are also very nice transducers. We have all the available transducers on our machine. The hockey stick probe is fantastic." //

Programme 2023

The next two-day courses are:

October 10-11
Carotid and Vascular Ultrasound Course (14 CPD)
Manchester, UK

November 18
Venous Ultrasound Imaging Course (7 CPD)
London UK

Scan the code or click HERE to subscribe

Dr. Sanjeevan Pasupati,
Director of Structural Heart Disease & Cardiovascular Research,
Waikato Hospital, Hamilton, New Zealand.

Pushing the Boundaries of Interventional Cardiology with Alphenix

Dr. Sanjeevan Pasupati, Director of Structural Heart Disease & Cardiovascular Research at Waikato Hospital in Hamilton, New Zealand, is an interventional cardiologist specialized in angioplasty and percutaneous interventions for valvular and structural heart disease. As one of New Zealand's leading cardiologists in structural heart disease, he has mentored many international and local sites in the development of Transcatheter Aortic Valve Implantation (TAVI). Dr. Pasupati is internationally renowned for testing and developing new devices for structural and coronary disease and is widely published in this area. He is also a speaker at interventional meetings around the world and sits on the scientific advisory boards of various cardiac device companies.

Waikato Hospital was the first comprehensive structural heart centre in New Zealand. It performs over one thousand PCIs a year and the number of complex PCIs and high-risk cardiac interventions is continually increasing. Dr. Pasupati attributes this increase to improvements in devices and pharmaceuticals, an increased understanding of equipment, and innovations in imaging technology.

"All of these advancements have an impact on the outcomes of angioplasty and have brought angioplasty indications more and more on par with bypass surgery for a lot of the cases we perform," he says. "Now very seldom does a patient who comes with an acute cardiac coronary event go to a cardiac theatre. And if you want to push the boundaries, you need the right Cath Lab and ultrasound imaging."

The hospital's Alphenix system features a range of advanced technologies that help operators deliver the best possible outcomes to patients.

"I would confidently recommend Canon interventional systems to any site looking to grow their interventional cardiology service, most importantly because they are the most reliable systems I have used."

You really can push the boundaries with the right Cath Lab and echo imaging.

Dynamic Device Stabilizer (DDS) for real-time AI-assisted stent imaging

"Dynamic Device Stabiliser technology has been a great addition to our department. Using deep learning it automatically detects balloon markers in real time, without any manual input," claims Dr. Pasupati. "Once detected the markers are held stable and surrounding structures such as stents are magnified and enhanced to allow easier assessment of device placement and deployment."

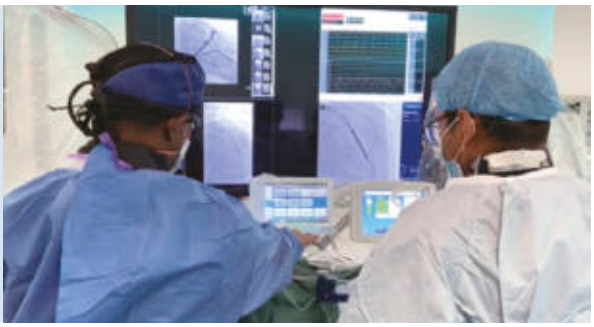
DDS, powered by Altivity, utilises deep learning to automatically detect balloon markers within an image. Once activated, DDS functions in an "always on" capacity and will detect and enhance any fluoroscopy or acquisition images when balloon markers are detected.

"DDS is a great compliment to my live fluoroscopy and digital acquisition, "Dr. Pasupati adds. DDS uses AI intelligence to give live stent enhanced images. Image quality lies between digital acquisition and stent enhanced (boost). This is obtained with radiation similar to live fluoroscopy with no processing delay which significantly improves workflow, accuracy and radiation."

Echo fusion technology

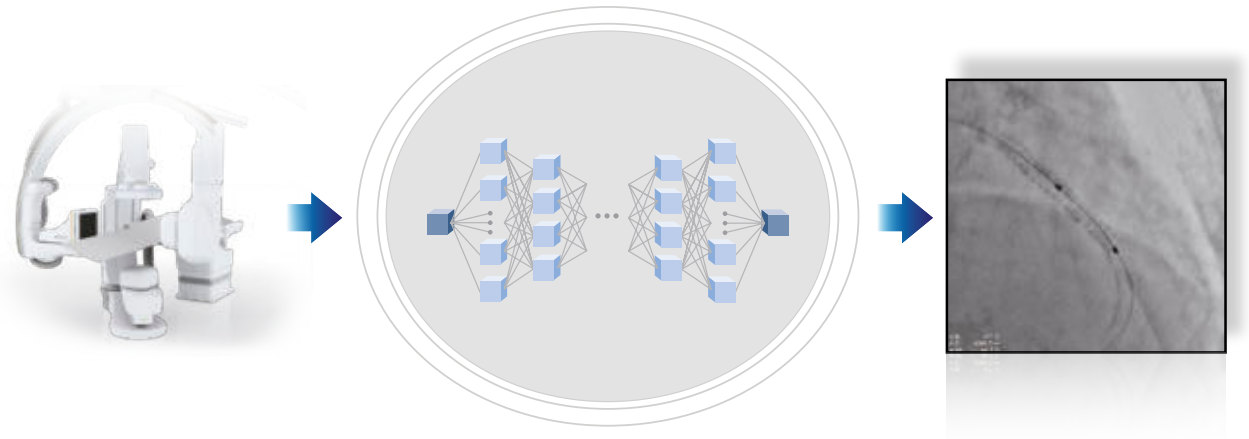
"The latest addition in advanced technology is to bring live echo fusion to the Cath Lab. Canon uses AI technology to automatically track the echo probe to maintain the accuracy of the fused images on the screen. This means we can better concentrate on the case without spending time to

- DDS uses deep learning to display stable stent-enhanced images that support decision-making in treatment.
- DDS provides live enhanced images not only in DA, but also in fluoroscopy to support treatment while reducing radiation exposure.
- An automatic display function offers seamlessly enhanced images for smoother procedures.



powered by Altivity

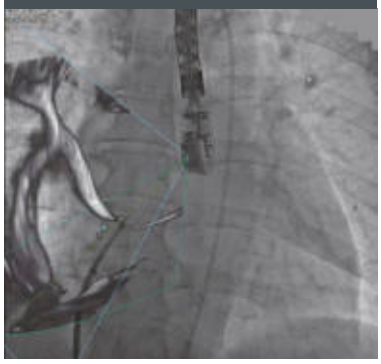
Dynamic Device Stabilizer



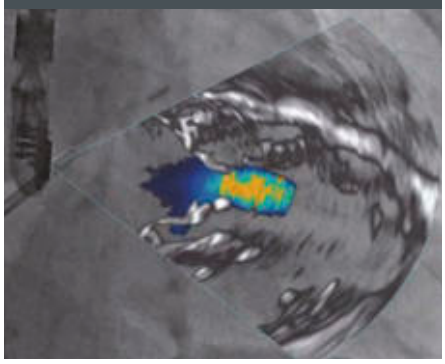
*: Dynamic Device Stabilizer is an option of Angio Workstation. Angio Workstation contains the technologies that are powered by AI. The AI technology was trained during the development phase. When implemented into the product, the AI function no longer self-learns.

Zero click probe detection or Automatic probe detection

Marker display



High quality 2D and color display



highlight the probe position with the orthogonal fluoro imaging. It also gives us more confidence knowing there is a higher degree of accuracy of the fused images because of the continuous re-registration when the c-arm is moved. This is a unique feature for Canon advancing in this space."

Canon's Echo Fusion, powered by Altivity, uses deep learning for automatic probe detection within 5 seconds of pressing the fluoro pedal.

The system operates as a function within the AlphaWorkstation and provides a 3D roadmap of the TEE overlaying live fluoroscopy. The marker and color Doppler are also displayed in parallel to the main image display.

AI is used for automatic detection of the probe position, reducing the number of workflow steps and increasing examination speed.

High-Definition (Hi-Def) imaging – successful magnification for bypass patients

Canon's High-Definition imaging is a valuable tool when performing interventions on patients who have previously had bypass surgery. With additional metal on the chest wall, stent enhancing technologies are unable to segment the stent. Most detectors work on 150-200 micron pixels but the High-Def panel reduces the pixel size to 76 microns to minimize distortion when images are optically magnified. This allows stents to be better visualized when traditional enhancers or boosts fail. "This is great when I need to check if a stent is adequately expanded or when I am trying to cross through a side hole when intravascular imaging can't be used or not available."

Alphenix interventional systems feature the world's first high-definition detector within the 30 × 40 cm detector panel. The high-definition part displays at 76-micron pixel imaging modes. At more than twice the spatial resolution of conventional flat panel detectors (FPD), the unique Hi-Def imaging mode allows you to effortlessly zoom up to 4 cm (1.5") without losing image quality. This helps clinicians visualize fine details and anatomical structures and deploy devices with accuracy and confidence. While Waikato Hospital doesn't perform paediatric structural heart procedures, Dr. Pasupati comments that Hi-Def imaging would be an asset to sites with paediatric service, as it would help visualize and position the smaller paediatric devices without increasing total procedural dose.

I'm a control freak and Alphenix gives me greater control and flexibility.

"The tableside tablet is a game changer in the Canon lab that significantly improves workflow," Dr. Pasupati assures us. "I've configured it to what I like for diagnostic, interventional and structural procedures everything I need is in front of me with a click of a button." Cardiac Cath Labs often operate with skeleton staff and the radiographers are often busy. So having easy access to all necessary functionality I need improves the workflow and helps complete cases faster.

"The Alphenix systems have great flexibility to support me in complex cardiology procedures. With resource restriction it's becoming imperative to be autonomous to manage the Cath Lab functions by the operator." he continues. "Canon have been the pioneers with detectors moving fingertip to fingertip and head to toe without any table movement. The detectors remain self-aligned to the patient independent of C-arm movement. This improves the work flow

"The 30 × 30 cm detector configuration means our lab is truly multi-purpose; well suited for structural and interventional procedures."

Dr. Sanjeevan Pasupati,
Director of Structural Heart Disease & Cardiovascular Research,
Waikato Hospital, Hamilton, New Zealand.

"The Alphenix is the most reliable interventional cardiology system I have worked with."

Dr. Sanjeevan Pasupati,
Director of Structural Heart Disease & Cardiovascular Research,
Waikato Hospital, Hamilton, New Zealand.

with safe radial and other peripheral access. This is extremely valuable for supporting safe radial access. I'm a control freak and I like to control things myself. The Alphenix's flexibility and range of patient access allows me to stay focused on the patient."

There is an increasing need for structural procedures to be performed under anaesthesia with or without TOE guidance. The Alphenix allows us to position the C-arm offset at 45 degrees to the table, providing enough space for the echo system and giving the ICU and anaesthetic teams with keeping better visibility and communication between the teams.

"Most Cath Labs use the 20 cm × 20 cm panels for coronary interventions. With the growth of the structural interventions performed in the same lab, the detectors have increased to 30 cm × 40 cm which can be bulky for day-to-day coronary use. Canon has a 30 cm × 30 cm detector which is a great compromise for both coronary and structural procedures. Canon also has one of the slimmest detector housing which eliminates the bulkiness and provides a greater field of view when needed.

The 30 × 30 cm configuration is a perfect balance and means that our lab is truly multi-purpose; well suited for structural and interventional procedures."

The automatic cine replay function and additional reference monitor are extremely useful, particularly for structural work. "We utilise it almost daily for TAVI procedures," he says. "When we are deploying a valve, I have one hand holding the valve and if you need to let go to access your previous run, the valve may move. On the Alphenix I don't need to do anything; I can always visualize the last view on my second screen. This is a superior feature of the Alphenix, one that helps with clinical confidence and workflow in complex cases."

During deployment of Evolut core valves, Dr. Pasupati now does what is called a cusp overlap technique, which involves a deep RAO caudal view. His team then rechecks the valve at the other end with an LAO projection. Having an additional reference monitor allows them to store and access both images, which makes life much easier.

With more complex cases being treated in the cath-lab, DTS is a critical tool for operators to ensure that long cases are safe for patients.

"With more complex cases being treated in the Cath Lab, Canon's Dose Tracking System is a critical tool to help ensure that long cases are safe for the patient. It is extremely valuable in long procedures like mitral clip implantation, CTO procedures and complex multivessel PCI. These procedures require a lot of fluoroscopy, it is common to remain in the same view for an extended period of time and they can involve high radiation doses. As an operator you are very focused on the patient and the case and the real time patient dose feedback that DTS provides becomes critical. It provides alerts and allows me to modify my approach to ensure that dose thresholds are not exceeded and helps minimise the patient's risk of radiation injuries."

"Cardiac catheterization labs need to be reliable and the Alphenix is the most reliable interventional cardiology system I have worked with," claims Dr. Pasupati. "Canon provide the best service and support in New Zealand. Downtime on our Alphenix interventional systems is minimal and Canon take a pro-active approach to ensuring that we are well supported."

"We are now on the 3rd generation of Canon Cath Labs at Waikato Hospital, and the latest image quality, workflow and range of advanced technology along with their impressive service made it an easy choice for us." //

Canon Medical Belgium Launches First CT User Meeting

The first CT User Meeting in Belgium was a roaring success among Belgian medical imaging professionals, who used the opportunity to share their experience with the system in daily practice. VISIONS spoke with one of the organizers, speakers and participants to discover how this unique event can help professionals better face current and future challenges in medical imaging.

The number of Canon CT systems has increased significantly over the past three years in Wallonia, the French speaking part of Belgium. Conversely, few training courses or conferences are organized for radiographers in the country.

Those were the two drivers behind the organization of the CT User Meeting, Charles Delaplace, Clinical Application Specialist for CT at Canon Medical Systems Belgium, explained.

Charles Delaplace, CMSB, one of the organizers of the CT User Meeting.

"We wanted to propose a meeting of our users, with the aim of sharing the different work experiences, through scientific presentations. All the radiographers present responded favorably to the continuation of this annual meeting."

'We wanted to offer a meeting for our users to let them talk about their work experience through scientific presentations, and highlight the new expectations of modern imaging,' he said. 'The main objective was to ask our users for their feedback, and have them share examination protocols, patient management methodologies and procedures used in their department.'

The event was organized on Thursday, April 20, 2023 in the evening, at a central location in Brussels, to enable a maximum number of professionals to come. After the presentations, participants were able to exchange experiences with their colleagues.

Excellent feedback

'Many participants gave us a very positive response after the meeting, and said that they had learned new possible uses for their system or ways of optimizing protocols,' he said. 'We will therefore repeat this meeting next year.' Based on the success in Wallonia, the board also decided to organize a CT User Meeting for the Flemish radiographers in fall.

Alexandrine Dubois, from Vivalia, attended the meeting with her team to learn more about the equipment. 'We have been using an Aquilion ONE / PRISM Edition scanner for a little over a year and

Alexandrine Dubois, Vivalia, attended the CT User Meeting.

"This event was useful for us, in order to improve the management and the quality of the CT examinations performed in our center."

we will work with the Aquilion Lightning SP system in a few weeks,' she said. 'Many of us were interested in attending the meeting in order to learn more about this scanner.'

Alexandrine Dubois discovered the stroke protocol, which they had never used before. 'It is not a typical management that exists between our department and the emergency department,' she said. 'It was interesting to learn more about it and have a concrete example of how it is being used in another hospital, in order to potentially implement it in our hospital.'

Jean-François Adam, Centre Hospitalier de Mouscron, discussing the Variable Helical Pitch scan protocol.

Alexandrine Dubois and her colleagues were also pleasantly surprised by the comparative dose examples given by the head of the imaging department at the Children's Hospital (Hôpital Universitaire Des Enfants Reine Fabiola) and, as a result, would like to adapt the pediatric CT protocols to use the lowest possible dose in children while still having a good examination that the radiologist can interpret.

'We were also able to learn more about the different types of artificial intelligence that Canon offers on its scanners, including PIQE. This event was useful for us, in order to improve the management and quality of our CT examinations,' she added.

Jean-François Adam, Head Nurse in the medical imaging department at Mouscron Hospital (CHM), was approached by Canon at the JFR 2022 in Paris and decided to join in at once. 'We immediately liked the idea and wanted to participate actively, by giving a presentation,' he recalled. 'We agreed on the theme that we could address, namely vHP, an option that we have been using for several years.'

Jean-François Adam, Centre Hospitalier de Mouscron, speaker at the CT User Meeting.

"Having the chance to collaborate with a very dynamic team, we immediately liked the idea (of a CT user meeting) and expressed to Mr Delaplace our great motivation to participate actively, in particular by making a presentation."

Showcasing a new protocol

At the CT User Meeting, Jean-François Adam described the variable Helical parameters (vHP) option and how its possible applications - vHP Optimal Gating, vHP Optimal speed and vHP Optimal SUREExposure - have allowed his team to obtain important benefits for both patients and staff.

With the help of Canon, the CHM, which recently became the first general hospital in Europe to have received Diamond level accreditation by Accreditation Canada, an independent organization that evaluates the quality and safety of healthcare services, has created a thoracic-adomino-pelvic CT acquisition protocol called vHP-onco.

Timotée Delchambre, Head radiographer 'Medical imaging', from Children's Hospital Huderf.

A delegation from Centre Hospitalier EpiCURA with their newly acquired CT User Meeting attendance certificate.

The protocol adapts its table speed and 3D SUREExposure to the anatomical zone approached during a single acquisition: Helical Pitch (HP) Fast and SUREExposure 3D Low Dose in the thorax; HP Standard and SUREExposure 3D High Quality in the upper abdomen; and HP Fast and SUREExposure 3D Standard in the pelvis.

Compared to a standard thoraco-abdominal protocol, which requires two acquisitions, vHP-onco reduces the need for a separate acquisition over the upper abdomen, by injecting the iodinated contrast at a low rate (1.5ml/s) and starting the acquisition 65 seconds from the start of the injection.

'We obtain a hybrid arterial and portal injection in a single acquisition, which brings certain ergonomics to the radiologist, who no longer has to juggle between the different series of images to be loaded in the MPR (MultiPlanar Reformation) application for review in different planes,' he said. 'The vHP protocol enables optimization of dose and image quality according to the anatomical region studied, and avoid an additional acquisition in the upper abdomen compared to a standard thoraco-abdo-pelvic protocol, which is not negligible during repeated CT scans in oncological follow-up,' he added.

The protocol also enables a 25.11% decrease in average DLP compared to a standard thoracic-abdominal-pelvic CT protocol, and helps reduce the iodinated contrast injection rate for more safety and comfort.

'A care pathway has been set up in collaboration with the day hospital, which prepares our patients with an IV Catheter for the injection,' Jean-François Adam said. 'This improves comfort for the patient and the team, with better fluidity in the scanner department and making the display of MPRs more ergonomic for the radiologist.'

The team representing Canon Medical Systems Belgium at the CT User Meeting.

Providing care in a safe, effective, efficient and respectful manner remains a challenge in daily practice, he explained. 'We need to be able to adapt to the needs of the population and ensure equal access to care to all,' he added.

The medical and nursing team is dynamic and constantly looking for innovative ways to optimize workflow and patient care. To do this, 'continuous training, updating, discovering different practices and horizons, particularly through events such as the CT User Meeting, are mandatory,' he concluded. //

PIQE: Reach a New Peak in Image Quality for Heavily Calcified Coronary Arteries

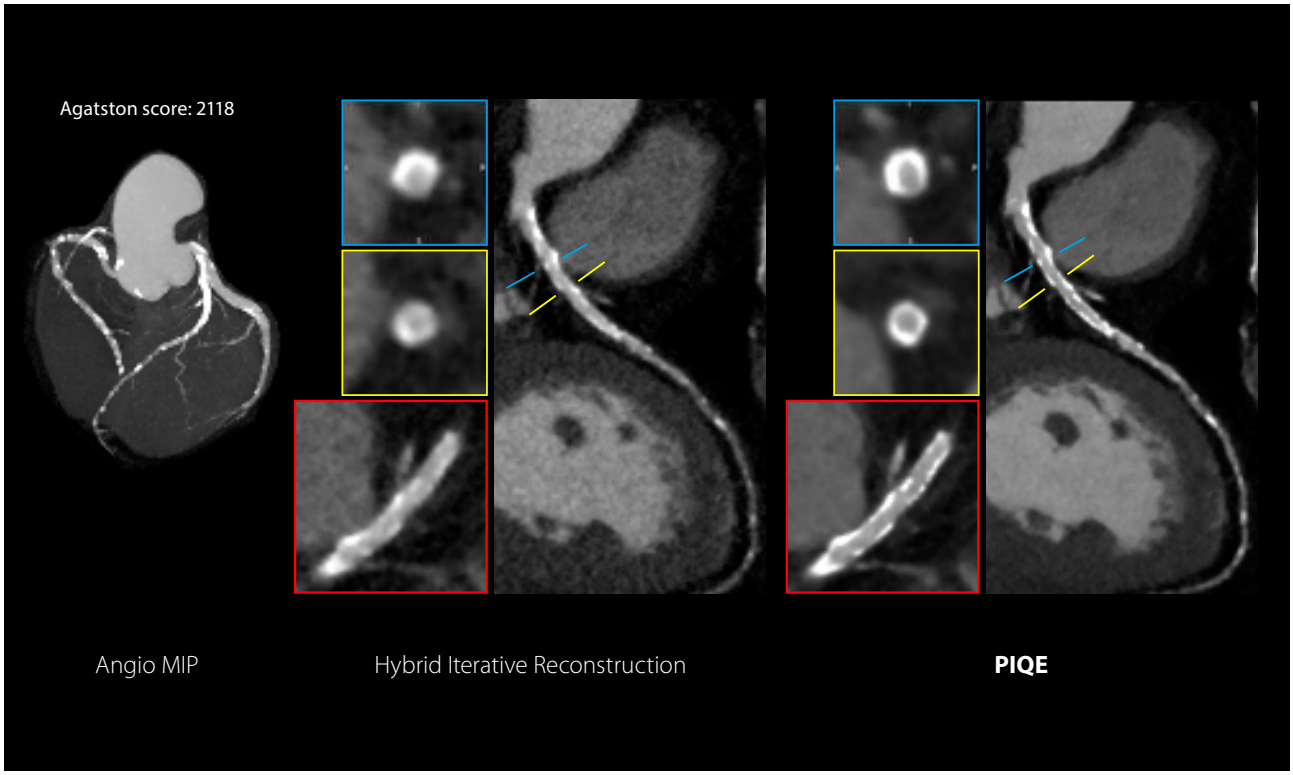
Prof. Mickaël Ohana

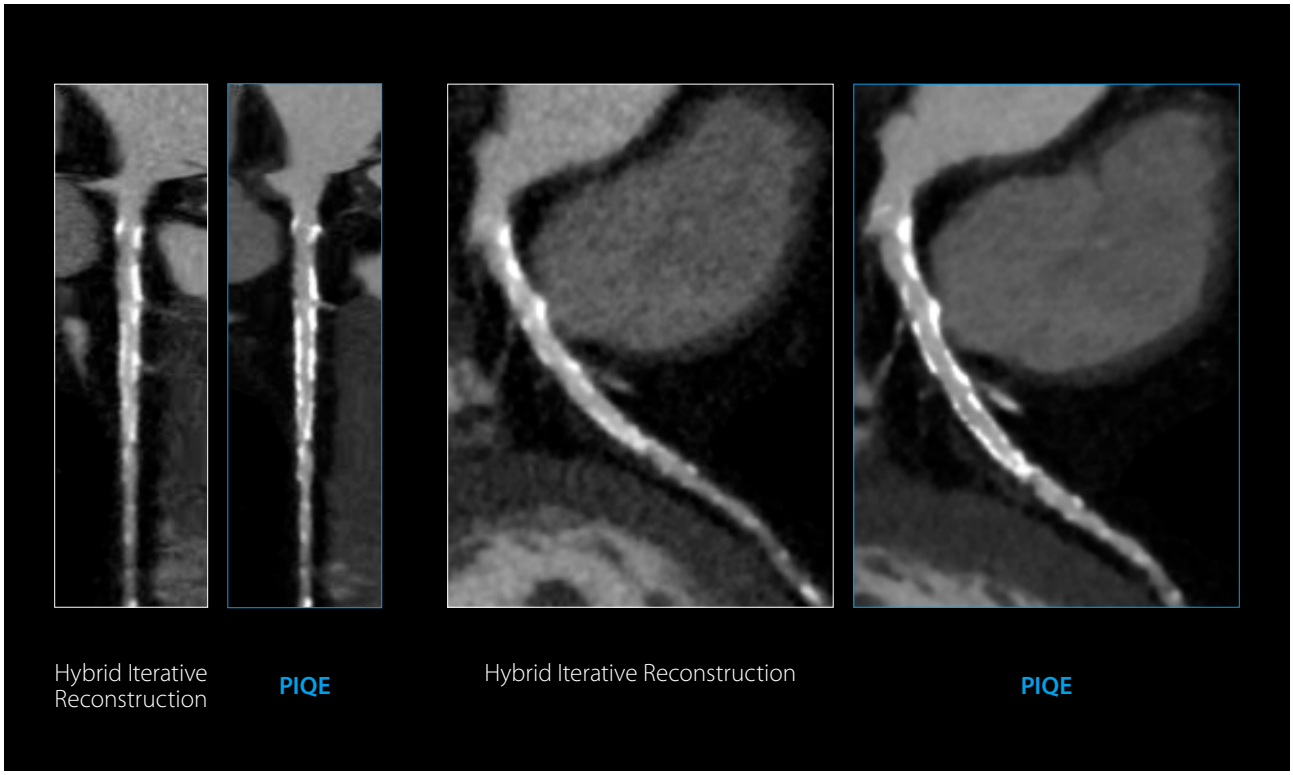
"The first time I saw Precise IQ Engine (PIQE) images, I was surprised by the unexpected combination of high resolution and low noise. Cardiac CTA is traditionally limited in patients with heavily calcified coronary arteries due to blooming artifacts. PIQE overcomes this by providing sharper boundaries and better delineation of the calcifications, thus allowing a more confident evaluation of these difficult cases. PIQE is undeniably a valuable AI technical innovation for challenging coronary CTA."

Patient history

This 82-year-old patient with a prior diagnosis of COVID-19 underwent a chest CT scan which demonstrated severe coronary calcifications. The patient was referred to the cardiologist who requested a calcium score and a coronary CTA scan due to nonspecific ECG changes. The coronary CTA images were reconstructed with Precise IQ Engine (PIQE) Super Resolution Deep Learning Reconstruction*[1].

Results





The calcium scoring scan showed extensive Coronary Artery Disease (CAD) with an Agatston score of 2118. In the CTA scan, the Left Main coronary artery (LM) and the proximal and mid-segments of the Left Anterior Descending artery (LAD) show significant wall calcifications with 25-49% stenosis in all these segments.

PIQE provides better depiction of the vessel lumen which is sharper and less noisy compared to Hybrid Iterative Reconstruction. In this patient, the increased spatial resolution resulted in less blooming artifacts, allowing a more confident assessment of the lumen patency even in the presence of circumferential calcified plaques.

Conclusion

PIQE enables excellent visualization of calcified plaque and improves evaluation of potential luminal stenosis. In addition, PIQE is combined with the already proven advantages of wide-area detector CT with one-beat cardiac acquisition and high temporal resolution to achieve robust coronary CTA images at a low radiation dose. Heavily calcified coronary arteries were demonstrated in this clinical example where PIQE improved the assessment of the calcified plaques and made it possible to confidently exclude a significant stenosis, avoiding the need for an invasive coronary angiogram.

Acquisition

SCANNER MODEL:
Aquilion ONE / PRISM Edition

SCAN MODE:
ECG gated Volume

COLLIMATION:
0.5 mm

EXPOSURE:
100 kV, SURE Exposure

ROTATION TIME:
0.275 s

RECONSTRUCTION:
PIQE

CTDI VOL:
11.1 mGy

DLP:
177.2 mGy-cm

EFFECTIVE DOSE:
2.48 mSv

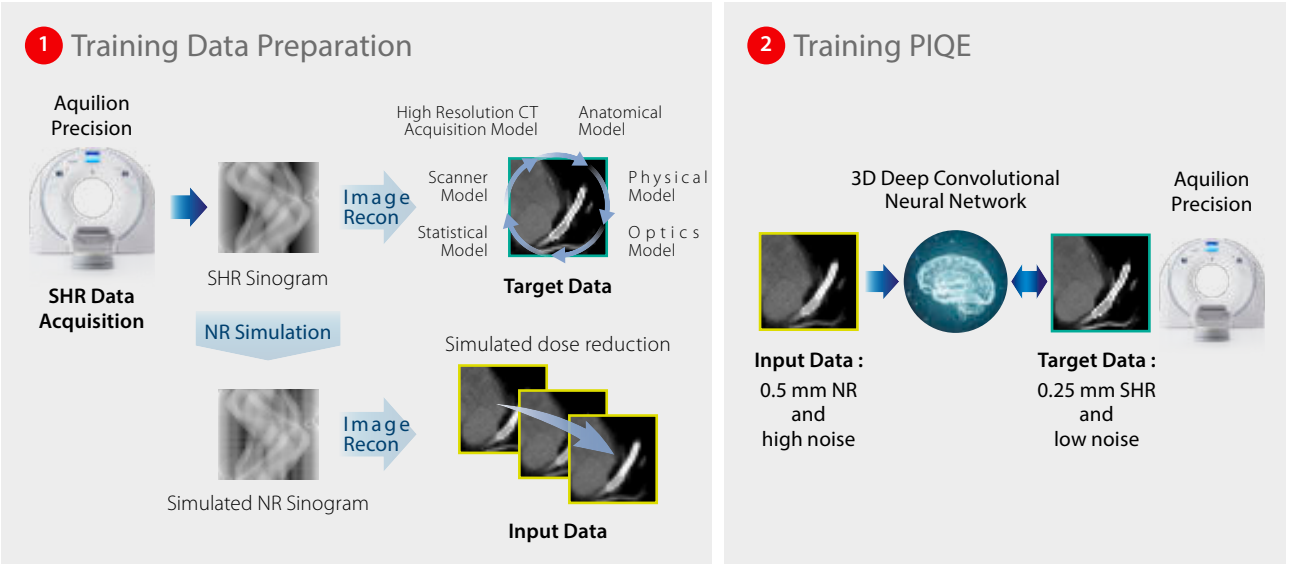
K-FACTOR:
0.014*2

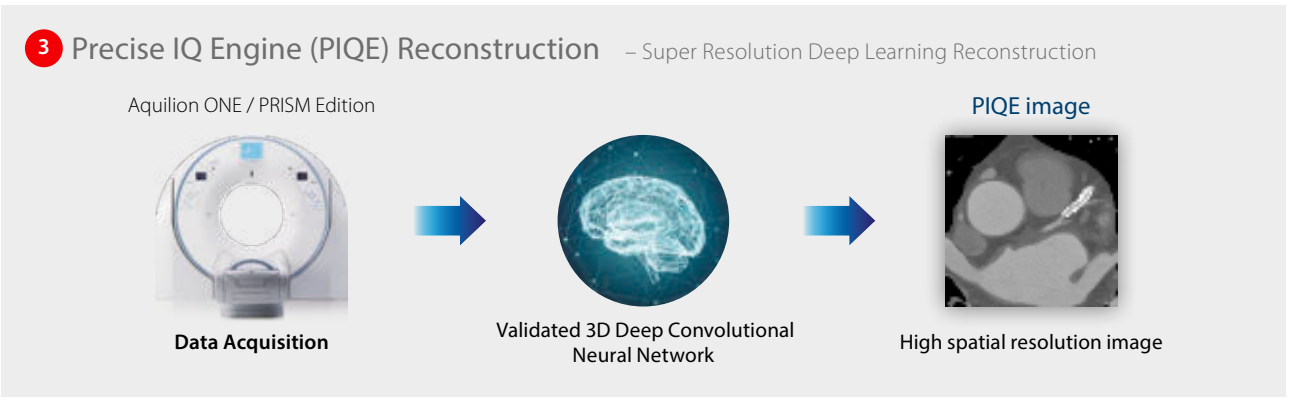
Benefits of PIQE

- Sharper anatomical detail
- Reduced calcium blooming
- No additional dose

Altivity

Altivity is Canon Medical's new approach to AI innovation. It is a multimodality, overarching brand, which pulls together all the AI technology that Canon Medical provides under one name.





Technology

PIQE maximizes the inherent spatial resolution of Cardiac CTA examinations performed with a one-beat scanning technique provided by the 16 cm coverage of the Aquilion ONE CT scanner.

1 Training data preparation

PIQE's 3-Dimensional Deep Convolutional Neural Network (DCNN) is trained using high quality cardiac cases acquired on the Aquilion Precision, which is equipped with a 160 row × 0.25 mm detector, able to resolve anatomical detail as small as 150 microns. From this Ultra-High Resolution (UHR) CT scanner, pairs of 0.25 mm UHR and 0.5 mm simulated Normal Resolution (NR) images can be produced from a single acquisition and have perfect spatial alignment, ideal for training the neural network.

2 Training PIQE

Simulated NR images (0.5 mm) correspond to the input data to the DCNN and the corresponding UHR images (0.25 mm) are used as the gold standard target data. The 3D DCNN learns to maximize the inherent resolution possible with NR images and enhance resolution further while decreasing noise.

3 Clinical implementation

Once trained the network is validated and installed in the Aquilion ONE / PRISM Edition, where it does not continue to learn.

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MD, PhD
Nouvel Hôpital Civil, Strasbourg University Hospital, Strasbourg, France.

References

[1] PIQE is designed to fully utilize the maximum resolution of the detector.

[2] American Association of Physicists in Medicine (AAPM) Report 96, 2008.

Assessment of Pelvic Floor by Ultrasound: A Useful Tool

Dr. José Antonio García Mejido[a,b], Prof. José Antonio Sainz Bueno[a,b]

Introduction

The application of ultrasound for the study of pelvic floor disorders is a widely accepted diagnostic tool in clinical practice (as described in the AIUM/IUGA review published in 2019), being useful for managing almost all the pelvic floor dysfunctions.

Among the ultrasound methods applicable for pelvic floor examination, we outline perineal pelvic floor ultrasound (4-8 MHz curvilinear transducer), as it reduces patient discomfort and does not modify the anatomy during the examination, opposite to what may occur with the endocavity probes.

The advantage of perineal pelvic floor ultrasound over physical exam lies in reducing possible confounding factors, such as:

- Evaluation of rectal or bladder filling.
- Evaluation of Levator Ani Muscle (LAM) coactivation.
- Establishment of Valsalva manoeuvre duration.

Pelvic floor ultrasound instrumentation

Perineal pelvic floor ultrasound requires a 4-8 MHz curvilinear transducer and a default configuration of the ultrasound defined by (Fig. 1):

- Maximum width of the image window captured by the transducer (the closest to 90º).
- Optimal depth to visualize all pelvic organs, normally less than 10 cm deep.
- One or two focal zones in the centre of the studied structure.
- High frequencies.
- Optimisation of gain and dynamic range to obtain a high-quality image that carefully discriminates each anatomic structure.
- Proper preparation of the probe (abundant ultrasonography gel and a protective cover), avoiding the appearance of air bubbles.
- Placement of the transducer to the perineum applying the least possible pressure and without reducing image quality.

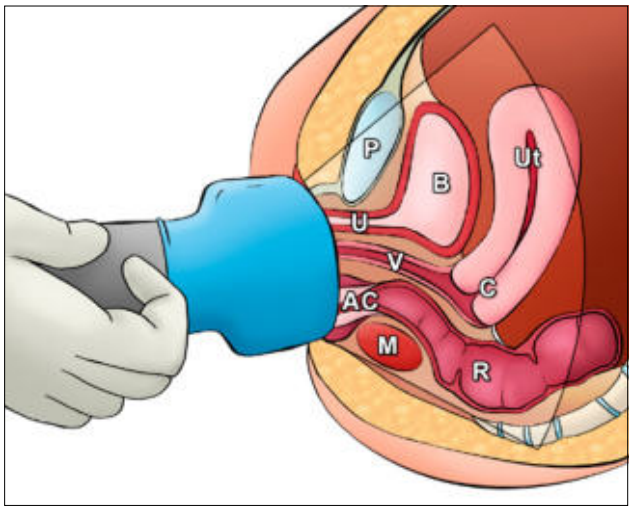

Figure 1, Schematic drawing of transducer and pelvis. P: Pubis, U: Urethra, B: Bladder, V: Vagina, C: Cervix, Ut: Uterus, AC: Anal Canal, R: Rectum, M: Levator Ani Muscle.

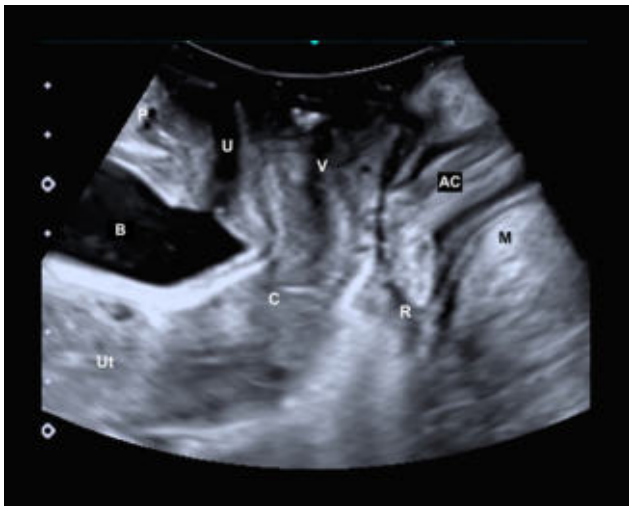

Figure 2, Midsagittal plane. P: Pubis, U: Urethra, B: Bladder, V: Vagina, C: Cervix, Ut: Uterus, AC: Anal Canal, R: Rectum, M: Levator Ani Muscle

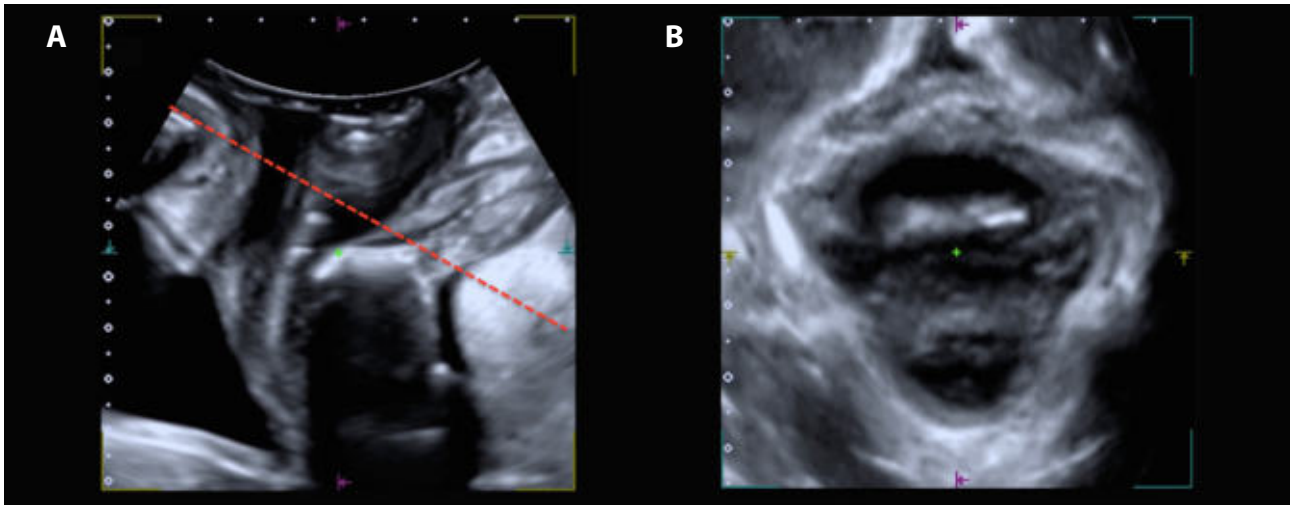

Figure 3, It displays the references of the plane of minimal hiatal dimensions (red line), which is defined by the caudal portion of the pubic symphysis and the anorectal angle (A). Plane of minimal hiatal dimensions (B).

Two-dimensional pelvic floor ultrasound

The reference plane for the two-dimensional pelvic floor ultrasound examination is the mid-sagittal plane, whose ideal orientation is leaving the cranio-ventral region on the left and the dorso-caudal region on the right (Fig. 2). The anatomic structures included in that plane are, from left to right: the pubic symphysis, the urethra and the urinary bladder, the vagina and deeper the uterus, the rectum, the anal canal and the centre of the LAM (Fig. 2).

During contraction, the LAM approximates to the pubis causing the elevation of the pelvic organs, and during Valsalva, the opposite effect triggers the descent of those structures.

Three-dimensional pelvic floor ultrasound

The axial study of the LAM focuses on the plane of minimal hiatal dimensions, delimited in its anterior part by the region and caudal portion of the pubic symphysis, and on its posterior part by the anorectal angle, accentuated by the central part of the LAM (Fig. 3A). The three-dimensional pelvic floor ultrasound enables the visualization of the axial plane allowing the assessment of the LAM and the urogenital hiatus (Fig. 3B).

The 3D ultrasound is performed with transducers with an image capture-scanning angle of 85° (to acquire the complete volume of the LAM). The volumetric inspection consists of three orthogonal images and a "rendered image" (a semi-transparent representation of the voxels from a definable box). The implementation of the four-dimensional study allows a dynamic assessment of the pelvic floor in real time.

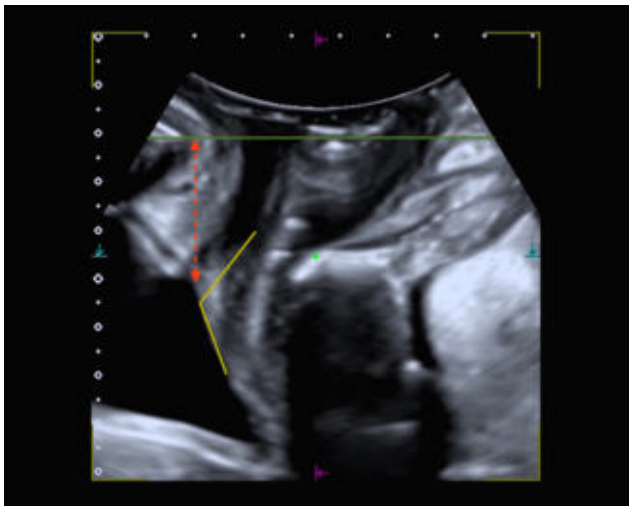

Figure 4, It includes the bladder neck-pubic symphysis distance (red) and the retrovesical angle (yellow).

Ultrasound evaluation of stress urinary incontinence

Stress Urinary Incontinence (SUI) appears whenever there is an imbalance between the abdominal pressure and the contraction strength of the detrusor muscle, produced by an insufficient support at the base of the bladder, causing the urethra-bladder junction to move during Valsalva manoeuvre. The main measures used to evaluate urethral hypermobility are:

- Bladder neck-pubic symphysis distance: vertical distance (dashed red line in Fig. 4) between the bladder neck and an imaginary horizontal line (green line in Fig. 4) passing by the posteroinferior edge of the pubic symphysis (Fig. 4). This constitutes the most analysed and reproducible parameter for the evaluation of the urethra mobility in patients with SUI. Nevertheless, it is difficult to establish a definable cut-off point to diagnose SUI; therefore, it must be studied considering the clinical context of the patient.
- Retrovesical or posterior urethrovesical angle: angle defined in between the proximal axis of the urethra and the closest portion to the urethra of the posterior bladder wall (yellow lines in Fig. 4). This parameter does not have a definable cut-off point either to determine SUI. However, it is useful in the diagnosis of Pelvic Organ Prolapse (POP) of the anterior compartment.

Other criterion used to diagnose SUI:

- Bladder neck funnelling: consists in the opening of the bladder neck during stress. It may suggest a possible intrinsic aetiology: the urethral sphincter as the cause of SUI.

Pelvic floor ultrasound applied to Pelvic Organ Prolapse (POP)

POP is defined as the descent of the pelvic organs from the pelvic cavity, which can involve the anterior wall of the vagina or bladder, posterior or rectal vaginal wall, uterus or vaginal arch. For ultrasound assessment of POP, measurements are taken from a reference point established by the imaginary line (red line in Fig. 5) passing by the posteroinferior edge of the pubic symphysis. A POP is significantly symptomatic when it surpasses that reference line by 10 mm in the anterior compartment (yellow line in Fig. 5) or by 15 mm in the middle (orange line in Fig. 5) and posterior compartment (blue line in Fig. 5).

Anterior compartment assessment

The urethral mobility is the main variable used in the ultrasound differential diagnosis of anterior compartment pathology:

- Single cystocele (Green Type III): vertical descent ≥10 mm (dashed yellow line in Fig. 6A) and retrovesical angle < 140º (blue line in Fig. 6A).
- Cystourethrocele (Green Type II): vertical descent ≥10 mm (dashed yellow line in Fig. 6B) and retrovesical angle ≥ 140º (blue line in Fig. 6B).

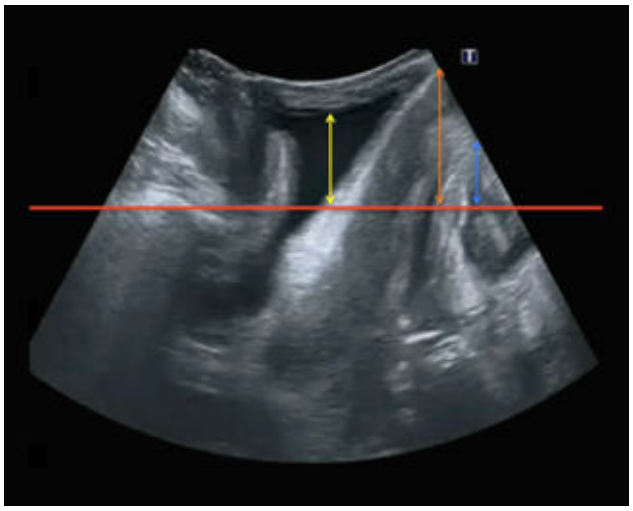

Figure 5, Baseline that passes by the posteroinferior edge pf the pubic symphysis (red line). Pelvic Organ Prolapse (POP) of the anterior (yellow arrow), middle (orange arrow) and posterior compartments.

Middle compartment assessment

In the ultrasound evaluation of the middle compartment, it is crucial to assess uterine mobility to differ between uterine prolapse and cervical elongation without uterine prolapse. The parameter that best allows the diagnosis of uterine prolapse is the difference, between the resting condition and the Valsalva manoeuvre, of the pubic-uterine fundus distance (red line in Fig. 7) of more than 15 mm.

Posterior compartment assessment

The ultrasound differential diagnosis of the posterior compartment pathology should be performed with checking for the following:

- Rectocele: anterior rectal wall herniation towards the vagina (Fig. 8A).
- Rectoenterocele: rectocele herniation combined with small bowel herniation or other abdominal content towards the vagina (Fig. 8B).
- Enterocele: protrusion of the anterior abdominal content towards the anorectal angle separating the vagina from the rectal ampulla (Fig. 8C).
- Rectal intussusception: invagination of the rectal anterior wall in the anal canal at the level of the anorectal canal angulation (Fig. 8D).

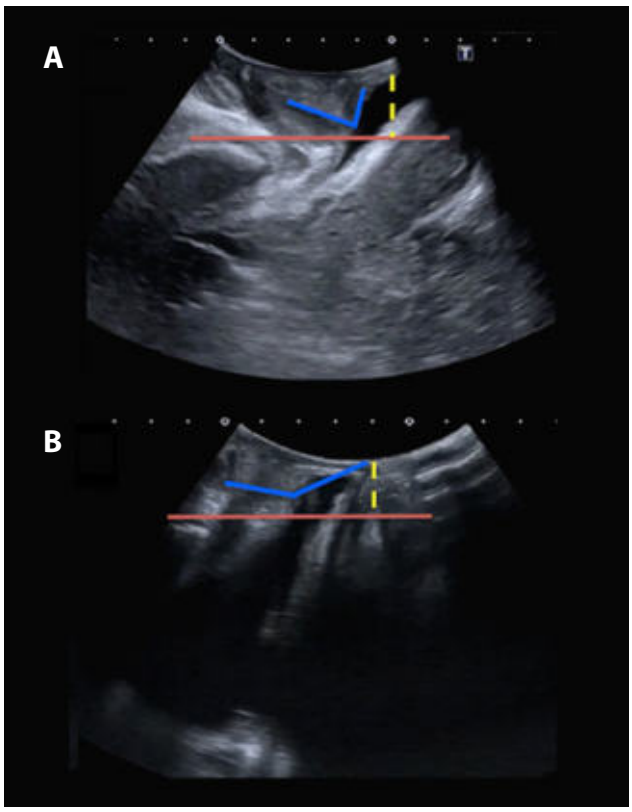

Figure 6, Midsagittal image during Valsalva manoeuvre of a single cystocele (A) and a cystourethrocele (B).

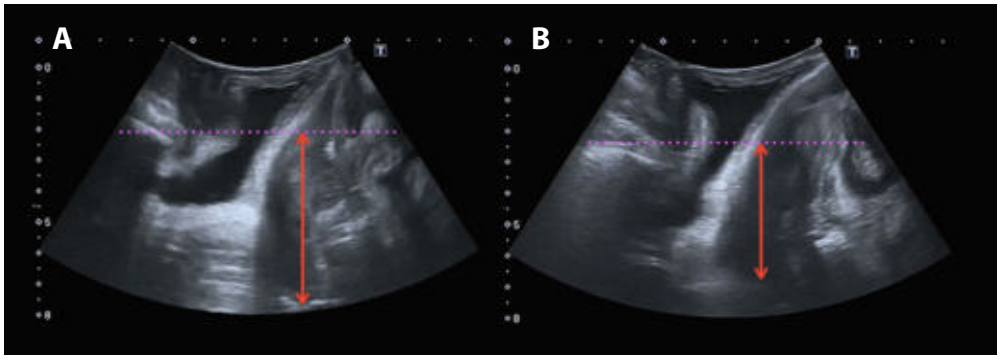

Figure 7, Diagnosis of uterine prolapse with a difference between rest position (A) and Valsalva (B), of the pubic-uterine fundus distance > 15 mm.

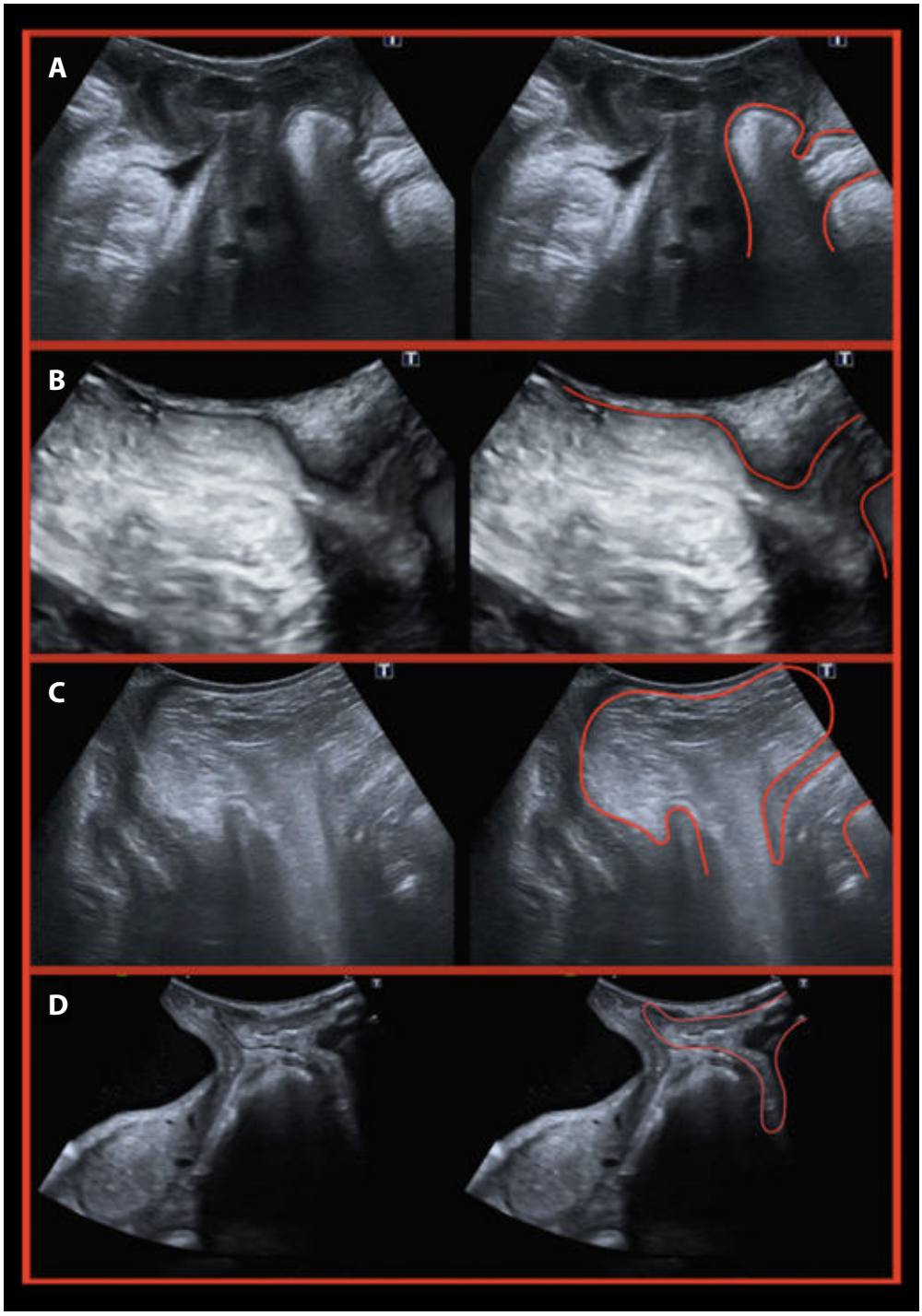

Figure 8, Ultrasound differential diagnosis of the posterior compartment: Rectocele (A), Rectoenterocele (B), Enterocele (C), Intussusception rectal (D).

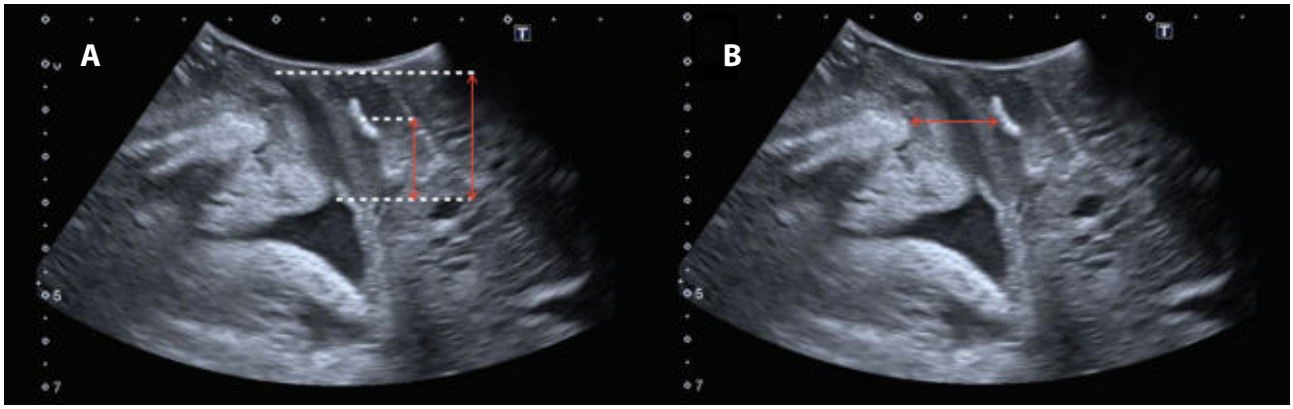

Figure 9, Positioning of the sling in relation to the urethra (Figure A, up). Sling-pubis gap (Figure B down).

Surgical pelvic floor implants

Stress Urinary Incontinence (SUI) affects a large number of patients, causing a severe impact on their quality of life. This has led to an increase, over the past decades, in the appearance of surgical procedures for its correction. Anterior compartment meshes are located between the urinary bladder and the vagina. Different forms of mesh failure in this compartment have been described, such as mesh migration, apical failure, and the association of apical and lateral failure. In the ultrasound evaluation of anti-incontinence meshes, a study of different parameters should be carried out, being the most studied the positioning of the mesh with respect to the urethra and the measure of urethral mesh compression:

- Location of the sling in relation to the urethra: It is carried out measuring the length of the proximal urethra, divided by the total length of the urethra. This parameter ranges from 0% to 100%. A 0-percentile value indicates that the sling is close to the neck bladder and a 100-percentile value indicates that it is close to the external meatus of the urethra. The optimal positioning of the sling is in between 40th and 70th percentile (Fig. 9A).
- Measure of urethral mesh compression: the most important parameter is the sling-pubis gap. It is defined as the distance between the centre of the sling and the posterior edge of the pubic symphysis. The bigger the sling-pubis distance, the lesser the mid-urethral compression and the sling tension (Fig. 9B).

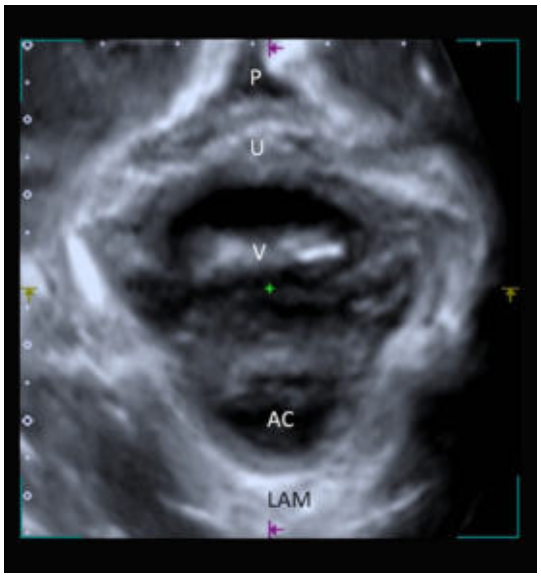

Figure 10, Plane of minimal hiatal dimensions. P: Pubis, U: Urethra, V: Vagina, AC: Anal Canal, LAM: Levator Ani Muscle.

Levator Ani Muscle (LAM)

The multiplanar reconstruction from the plane of minimal hiatal dimensions (Fig. 10) is the standardised and reference mode of evaluating LAM avulsion. The axial planes are obtained with 2.5 mm intervals (5 mm caudal and 12.5 mm cranial), evaluating a total of 8 planes (Fig. 11). The exact location of the 8 planes is established from the three central planes (yellow dashed line in Fig. 11):

- 1st plane (on the left): the pubic symphysis arches are separated.
- 2nd plane (central): the pubic symphysis arches are closed.
- 3rd plane (on the right): the pubis should not be displayed, being replaced by an acoustic shadow.

LAM avulsion is defined as the disinsertion of the muscle from the pubic area. It is complete when it is present in the three central planes, and partial when there is muscle damage in other planes without meeting the criteria for complete avulsion. It has also been defined as LAM avulsion type I (Fig. 12A) when there are well inserted muscle fibres in the most lateral regions of the pubovisceral muscle, and LAM avulsion type II (Fig. 12B) when there is a complete detachment of the pubovisceral muscle from its insertion in the pubis.

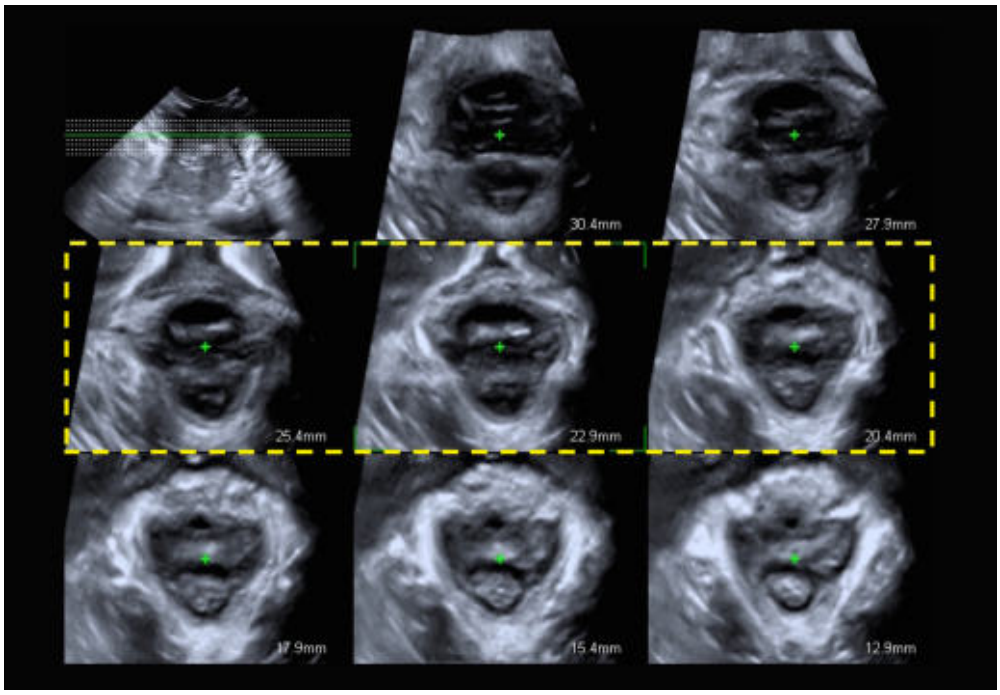

Figure 11, Multiplanar Levator Ani Muscle (LAM) reconstruction with the three central planes highlighted in yellow.

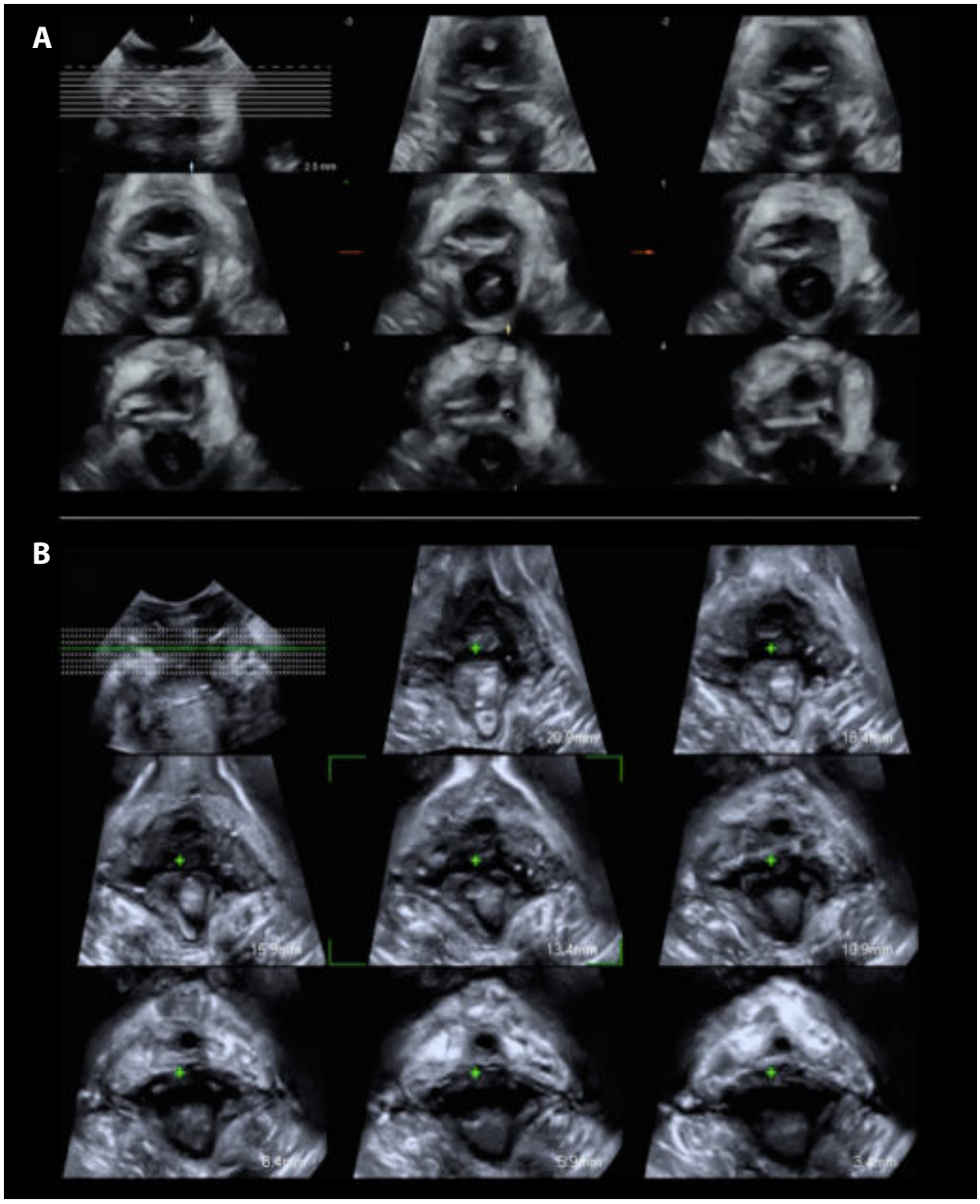

Figure 12, Right Levator Ani Muscle (LAM) avulsion type I (A), and bilateral LAM avulsion type II (B).

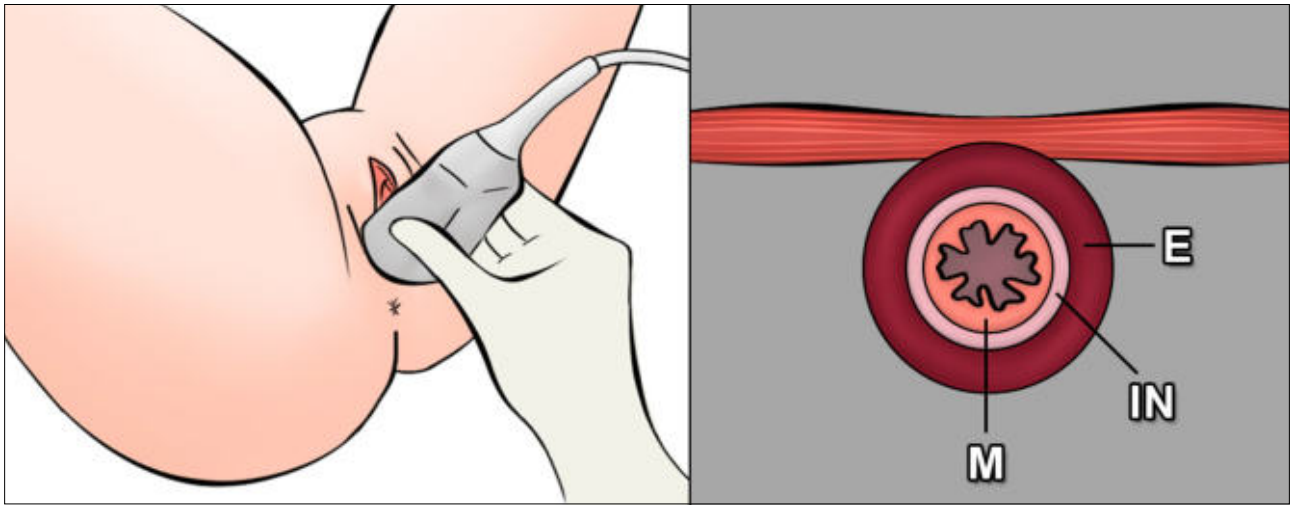

Figure 13, Adding an additional schematic drawing how to place the transducer. LAM: Levator Ani Muscle, IN: internal sphincter, E: external sphincter, M: rectal mucosa.

Vaginal delivery constitutes the main risk factor for LAM avulsion. However, the association of different factors may influence in the trigger of avulsion, such as, maternal age, body mass index, duration of second stage of labour, fetal head circumference, neonatal weight, obstetric perineal injuries, Kristeller manoeuvre, episiotomy or epidural analgesia. Operative vaginal delivery represents the main risk factor: a recent meta-analysis has determined that the estimated joint odds ratio for vacuum delivery vs. normal vaginal delivery was 1.93 (95% CI: 1.31-2.86), for forceps delivery vs. normal vaginal delivery was 5.33 (95% CI: 3.78-8.11), and for forceps delivery vs. vacuum delivery was 2.36 (95% CI: 1.46-3.84).

Anal sphincter

For the evaluation of the anal sphincter, the transducer should be placed transversally over the perineum with the probe tilted towards the anal canal (Fig. 13).

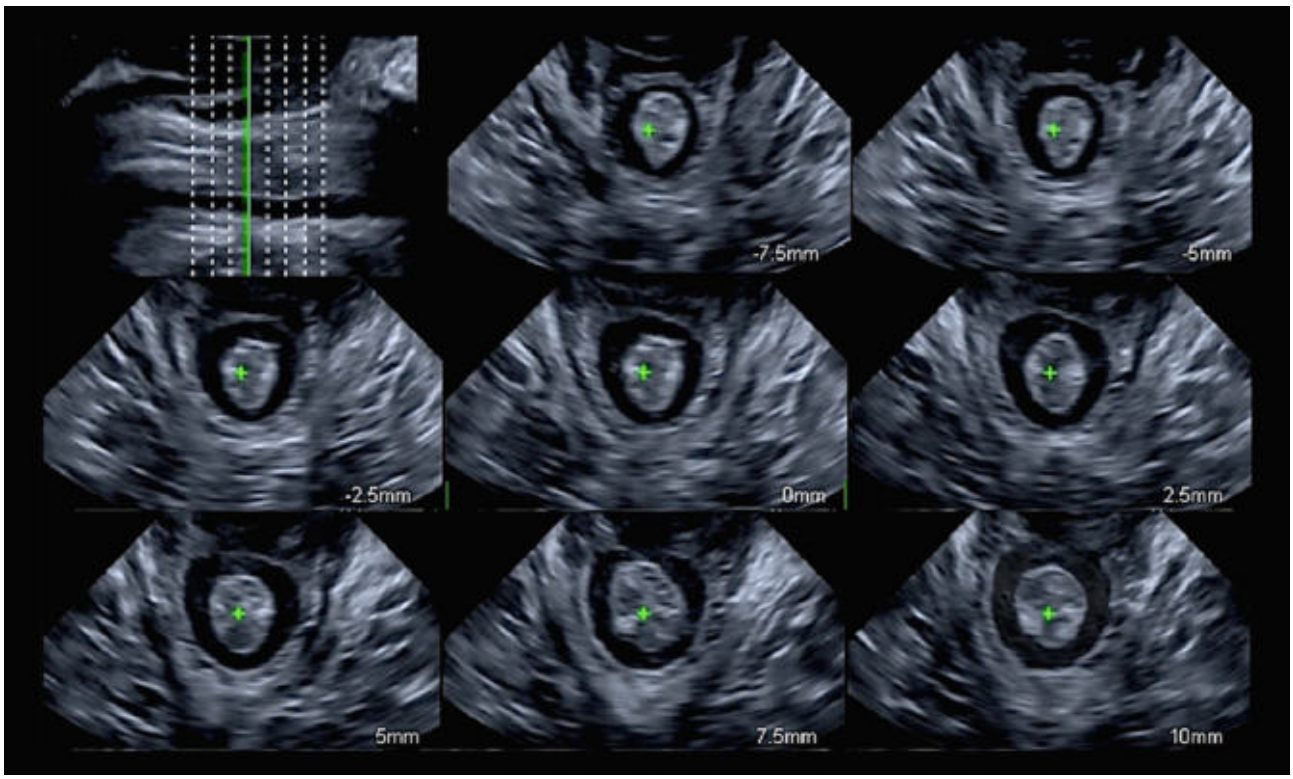

Figure 14, It shows a multiplanar study to analyze the sphincter complex.

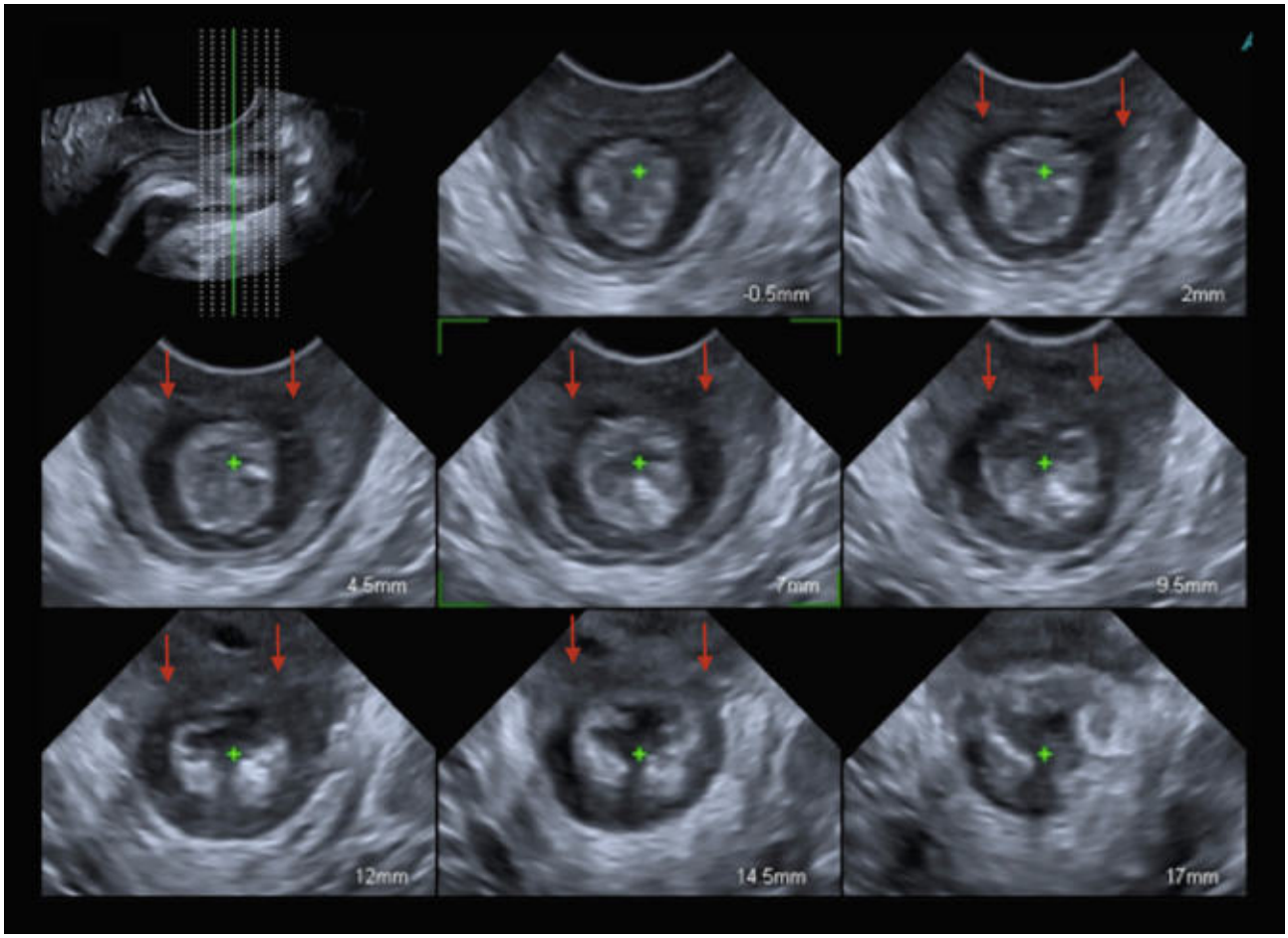

Figure 15, Internal and external anal sphincter injury at 12 o'clock (Red arrow).

It is advisable to capture the volume in contraction to enable a better tissue discrimination. The multiplanar assessment allows the analysis of the whole sphincter complex, locating the first plane on the puborectalis muscle, and the last plane on the anal verge (8 planes in total) (Fig. 14). The distance between the planes depends on the length of the anal canal and permits the study of the sphincter complex continuity (red arrow in Fig. 15), as well as its thickness, discontinuity, the location of the defect and the anal mucosa changes. //

Dr. José Antonio García Mejido[a,b]

Prof. José Antonio Sainz Bueno[a,b]

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European Customer Survey Results

At the end of 2022 we conducted our first Generic Survey among more than 20.000 customers in Europe and we got feedback from almost 1600 customers. The research objective of this new Generic Survey was to achieve optimum customer satisfaction from our European customers that have never been contacted via the other Customer Surveys (or at least not the last two years). Meaning: customers that received one of our continual monitoring in 'real-time' surveys on either Procurement, Delivery & Installation, post-installation Training, and SOS Service (system down) in the past two years.

We conducted this Generic Survey to make sure that our products and services are in line with our customer's expectations and requirements. The survey results enable us to gain better insight into customers' needs and the responses provide us with input for possible improvements.

Thanks to their feedback, we were able to learn and grow as a company, resulting in very high satisfaction scores once again.

In the questionnaire of this Generic Survey, we asked the customers:

- If they would recommend us to others (NPS).
- About their expectations and to what extent these expectations are met.
- How they experience their customer journey.
- What their image is of Canon Medical.
- And what the strengths are of our company and what could be improved according to the them. //

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2 **Product Quality**

3 **Service Quality**

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Customer Quotes:

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"Good customer service, value for money, products, listening to customers, and good tech support."

"All the departments are very competent, and the training and technical assistance is very satisfactory. The equipment is of good quality."

"Excellent image quality, low radiation exposure, and consistent results."

"I have always been impressed with the service and how friendly and professional the team is."

"Good support, engineering, and sales staff. Knowledgeable and courteous team."

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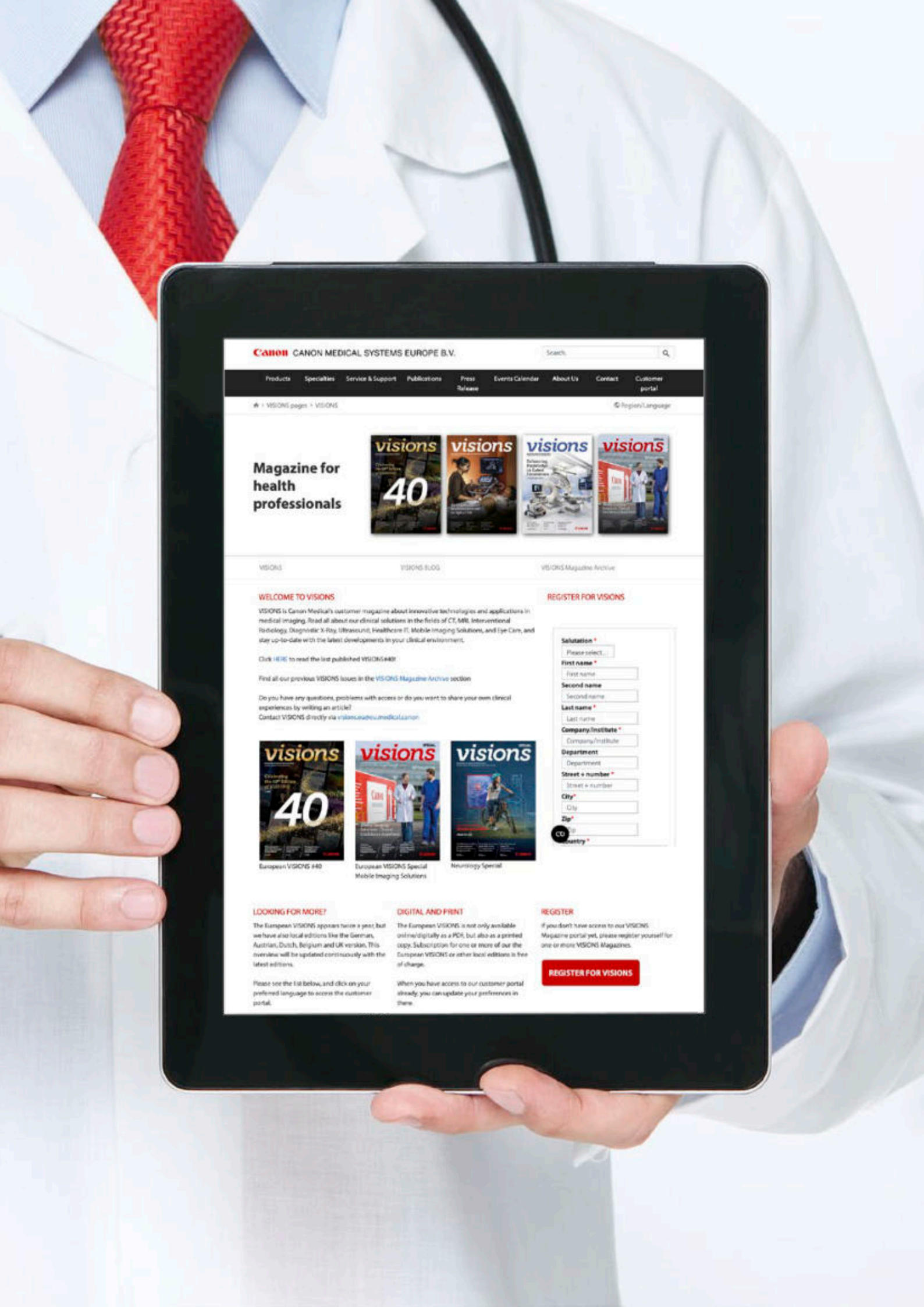
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