

# Supporting Specialist Strengths

Amongst the 295-strong Radiology Department at the Rigshospitalet Copenhagen are three professors, 35 senior consultants, 12 consultants, nine PhD. students and 20 physicians in specialist training. Organized into five specialist departments in Body Imaging, Breast Imaging, Neuro radiology, Ultrasound and Vascular Intervention, they collectively deliver world class diagnostic results in both clinical practice and research. VISIONS explored the new Trauma Center and met with Klaus Kofoed, (M.D., PhD., DMSc.) Cardiologist Clinical Associate Professor, and Karen Damgaard (M.D., DMSc.), Consultant Radiologist in Pediatric Radiology, to find out more about the specialist work carried out at the hospital and how partnership with TOSHSCAN Denmark and Toshiba benefits it.

Equipped with a large proportion of imaging systems from Toshiba, the specialists at the Radiology Department have access to a wide range of options with dedicated machines for specialist diagnosis and treatment, as well as research.

## EXCELLING IN EMERGENCY CARE

The Rigshospitalet's new Trauma Center is a brand new facility to diagnose and treat injuries in adults and children sustained through accident and emergency. On completion, it will be equipped equivalent to Trauma Level I US standards and will be the only facility of this level in a public hospital outside the United States (US). It will be used to treat up to 12,000 serious trauma cases per year, including 1,000 seriously injured, 450 acutely ill and 250 burns patients. The Radiology Department led development of the Center, and key radiologists from various specialisms form a key part of the operational team.

Seconds count in Trauma care. Extremely speedy expert diagnosis and treatment, as well as minimal patient movement during examination and treatment are vital. To transport patients to the Trauma Center efficiently and easily, the Rigshospitalet has its own helipad, located on the roof above the facility and a dedicated elevator. Once inside the Center, many specialists may be required to examine the patient immediately and simultaneously, so it has been specially designed with ease of movement, continual observation, and workflow efficiency in mind. All equipment for diagnosis and treatment is located for optimal convenience in the same area.

Critical in the Trauma Center are two Toshiba Aquilion LB 32-slice Sliding Gantry CT scanners, the first system of its kind to be installed in Europe. TOSHSCAN Denmark and Toshiba provided the concept and planning for the installation in close collaboration with the Radiology Department and the Trauma Center.

"We didn't think this type of tailored solution would be possible, but TOSHSCAN Denmark and Toshiba developed the proposal and successfully installed the systems," said Ilse Vejborg, Head of the Radiology Department. "It has been a challenge to develop the CT system for this facility, but through dedicated support our unique solution is now operational. This is a big achievement. The systems provides key functionality in the new suite, which will enable us to save lives."

## PIONEERING ADVANCES IN CARDIOLOGY

Klaus Kofoed trained as a cardiologist at the Rigshospitalet and worked in close contact with the Radiology Department after obtaining his PhD. in 2005. He was appointed to introduce Cardiac CT at the Cardiology Department. Since then, Klaus has pioneered new ways of exploring the heart with CT examinations alongside his clinical responsibilities, and has helped raised the profile of the Radiology Department work's in the global cardiology spotlight. His inspiration comes from finding new techniques with potential to advance clinical practice and his work now comprises of a large proportion of research.

"When I started working at Rigshospitalet, I recognized the potential for CT examination in cardiology, but did not know a great deal about the technicalities involved in radiography," he explained. "Thanks to the supportive research environment here, the extensive knowledge of the Radiology Department staff, the well-defined culture of mutual respect for each discipline, the acquisition of advanced systems, such as Toshiba's Aquilion 64-multi-slice CT scanner and the Aquilion ONE 640 slice Dynamic Volume CT, and the cooperation with research and development specialists at TOSHSCAN Denmark and Toshiba, I have had the freedom to explore the potential of this possibility."

The Department acquired its first Toshiba Aquilion 64-multislice CT system - made possible by a grant from the John and Birthe Meyer foundation - for dedicated research purposes in 2007.

"With the acquisition of the 64-slice CT scanner, we were able to start really building the department," said Klaus. "It was initially just me, one radiographer and one PhD. student. CT had been explored in the context of cardiology since 2000, so we were not the very first to investigate its benefits, but when our small team published the very first Danish thesis on cardiac CT, others researching this field quickly realized that we were serious about this approach and could offer a valuable contribution to global advances in this field."

Adding an Aquilion ONE 640 slice Dynamic Volume CT scanner in 2009 - made possible by a grant from the danish foundation A.P. Møller og Hustru Chastine Mc-Kinney Møllers Fond til almene Formaal - meant the research activities of the department could be expanded and opened the doors to joining global randomized trials, which Klaus insists are a top priority in exploring if new procedures have potential as valuable additions to clinical best practice. Klaus's team has grown exponentially and now includes five PhD. Students and ten medical students.

#### GLOBAL RESEARCH PLATFORMS

After a short period of time, the team were invited to participate in the Coronary Artery Evaluation Using 320-Row Multidetector CT Angiography (CORE320 trial) – The first prospective, multicenter study to examine the diagnostic accuracy of CT for assessing blockages in blood vessels and determining which of those blood vessels may be preventing the heart from getting adequate blood supply. The study, which was sponsored by Toshiba Medical Systems Corporation, assessed the diagnostic performance of combined non-invasive CT coronary angiography (CTA) and myocardial perfusion (CTP), as compared to traditional assessment of flow-limiting stenosis by means of SPECT-MPI and invasive coronary angiography (ICA). The results of the trial, which were presented at the European Society of Cardiology (ESC) annual congress in 2012, found that combined CTA and CTP with 320-detector row CT allows accurate identification of flow-limiting lesions requiring revascularization.

"We were delighted to be a part of the CORE 320 trial, with a significant number of patients from the Rigshospitalet Copenhagen," said Klaus. "We were able to do so because of the unique abilities of Aquilion ONE™, the dynamic volume CT system used in CORE320, which acquires the entire heart in a single temporally uniform volume and permits accurate myocardial perfusion analysis. The perfusion technique developed for Aquilion ONE™ provides perfusion images at the lowest possible radiation dose when AIDR 3D, iterative reconstruction, is applied."

The team has already concluded a randomized, controlled trial study into cardiac CT guided treatment

strategy in patients with recent acute-onset chest pain. The results of the Cardiac CT in the treatment of acute Chest pain (CATCH) study were published in the Journal of Cardiology in July 2013. They concluded that Coronary CTA may be used successfully in a subset of patients.

A second study organized by the team – the CATCH 2 study - which started in October 2013, will investigate the effectiveness of CT with perfusion techniques in the treatment of acute chest pain.

"Both research projects clearly focus on exploring the effectiveness of techniques and how they can be translated into improved outcomes for patients," emphasized Klaus. "We aim to carry out large scale clinical trials that illustrate better outcome, or benefits in important parameters in healthcare, because we believe that the advanced technology we are using can improve healthcare in all senses of the word."

*"We were delighted to be a part of the CORE 320 trial."*

#### OTHER RESEARCH PRIORITIES

An important element of utilizing diagnostic imaging equipment in cardiology, as most other specialist areas, is not only creating accurate images, but obtaining comprehensible results quickly. The team is working together closely with TOSHSCAN Denmark and Toshiba to explore the possibilities with Vitrea® software - Vital Imaging's advanced visualization solution that creates 2D and 3D images of human anatomy from CT and MRI image data. "Fantastic images are very interesting, but if they are not accessible within a very short space of time, they are of little use in clinical practice, particularly in cardiology when minutes count in saving lives," said Klaus. "Our equipment also needs to be user-friendly and easy to work with in both clinical practice and research. Vitrea® is the best emerging system at this time. It offers flexibility and versatility. We are working hard with Vital's US R&D technicians to test and improve specific features, but the system has already expanded our options so much. It is really amazing."

Klaus believes that key developments in improving software will enable a greater range of staff to carry out critical diagnostics and that this will contribute to better healthcare.

The team also constantly explores new possibilities in other specialisms with the dedicated systems that they use.



Dr. Klaus Kofoed



Dr. Karen Damgaard

"We are lucky to have dedicated equipment for our research and so we explore all that can be done with the equipment, carrying out as much basic scientific research as possible," said Klaus. "Alongside the benefits for cardiac research, we often notice great potential for using the systems for

other areas, such as oncology. We aim to extract as much information as we can from our skilled staff and advanced resources to maximize the opportunities. It could be many years before healthcare providers see the full implications of this, but this does not discourage us. We are hoping to expand this functionality even further in the future."

*"Pediatric CT can now be carried out largely without the need for anesthesia."*

#### SHARING FINDINGS GLOBALLY

Klaus's team has hosted a number of high-level, international workshops with the support of Toshiba and TOSHSCAN Denmark. They provide a chance to promote the new techniques they have pioneered, demonstrate the capabilities of Toshiba technology and raise the profile of the hospital internationally. The basic and advanced courses, also offer opportunities to gather feedback, ideas and experience from other specialists. In October 2013, the seminar on CT Myocardial Perfusion performed on 2nd generation 320 Row Detector CT attracted 80 participants, and following its success, two more courses have been already scheduled for 2014.

#### CHANGING PRACTICES

Klaus firmly believes that another major advance in the future will be in integrating imaging equipment into the cardiology treatment suite.

"This would change the practice of cardiology and enable many more lives to be saved," he remarked.

#### CREATING NEW POSSIBILITIES IN PEDIATRICS

Karen Damgaard, Consultant Radiologist, has led the Rigshospitalet's pediatric diagnostics program since 1989. Amongst other developments in this growing area of medicine, access to the Radiology Department's Toshiba Aquilion ONE VISION 640 slice Dynamic Volume CT scanner has created new possibilities for clinical practice and research.

"Some of the features of the system, such as the speed of examination, low dose and physical suitability of the equipment make it an excellent tool for working with children, and a very good way to avoid many of the clinical problems in this patient sector posed by MRI," she remarked.

With the system, the radiographers no longer have to rely on anesthetics for pediatric patients. Previously, they would frequently examine children that had been prepared for anesthesia. The children would have a needle inserted in their arms and would often require sedation. The anesthesia department would be on standby, on certain allocated days, in case required.

"When the system arrived, it was marvelous," continued Karen, "Pediatric CT can now be carried out largely without the need for anesthesia, because it is fast, efficient and creates high quality, artifact-free images, just by talking to the young patients and relaxing them. We have used the system to perform pediatric cerebral-, trauma-CT and chest-CTs."

#### NEW EXAMINATIONS

In pediatric pulmonary examinations, the system has enabled visualization of lung structure and air trapping by volume investigations through spirometry guided CT performed by a dedicated research group from the Danish CHILD Center, Pediatric Pulmonary Service, Rigshospitalet and the department has now replaced conventional HRCT with spirometry guided CT in children with cystic fibrosis.

"This gives a true state of respiration and is particularly important in many long term situations - such as examining children with congenital lung diseases, where it is important to make the CT in exactly the same manner from year to year, to find any progression in disease of the bronchial system," she explained. "Radiographers from the pediatric team have visited and are working together with Great Ormond Street Children's Hospital in London to further explore the technique."

"Ten years ago, the media created a negative image of CT in pediatrics that we now know is incorrect," she continued. "The advantages in pediatrics in terms of reduced cost, enhanced efficiency, increased safety, reduced dosage and complications make it ideal for this increasingly important specialism. Systems like Toshiba's advance the clinical and practical possibilities to a new level and I would advocate for the use of CT in pediatrics at any time when detailed imaging is indicated."

#### CLEAR BENEFITS

Through its long term partnership with TOSHSCAN Denmark and Toshiba and effective strategy that utilizes Toshiba's advanced imaging technology in an optimum clinical and research environment, the Rigshospitalet Copenhagen is better equipped to meet the inevitable challenges of advancing medicine and delivering specialized diagnostics and patient care.