SPECIAL

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Interventional X-ray Imaging

Infinix-i 4D CT: The Future of Today in Interventional Radiology

Monitor in Real Time the Skin Dose of your Patient

High Speed 3D Anywhere with Infinix-i Sky +

TOSHIBA MEDICAL

VISIONS Special:
Interventional X-ray Imaging

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Dear reader,

Interventional procedures are becoming more and more complex, which could result potentially in an increase in fluoroscopic time. This means that the interventional landscape is looking for new technologies and innovations to help physicians to reduce radiation, increase image quality and improve workflow.

During the last two years, we observed a new, double market trend in the interventional landscape. The Cone Beam CT (CBCT) market segment remains the largest market segment, however, based on new clinical challenges, especially in interventional oncology, trauma, stroke and complex procedures in general, there was a spectacular increasing demand for Angio CT concept.

Toshiba Medical is investing a lot in R&D and developing both segments at an extremely high level in parallel. This strategic approach combined with unique and very advanced dose reduction features makes us the preferred partner for many high-profile sites.

This special edition of VISIONS magazine highlights the personal experiences of European key opinion leaders, but also reflects our knowledge, experience and expertise in the field of Interventional X-ray Imaging.

Enjoy reading!

Kind regards,

René Degros
Business Unit Manager X-Ray Europe
Toshiba Medical Systems Europe BV

To download the digital version of this Interventional X-ray Imaging special, visit: www.toshiba-medical.eu/eu/visions-magazine

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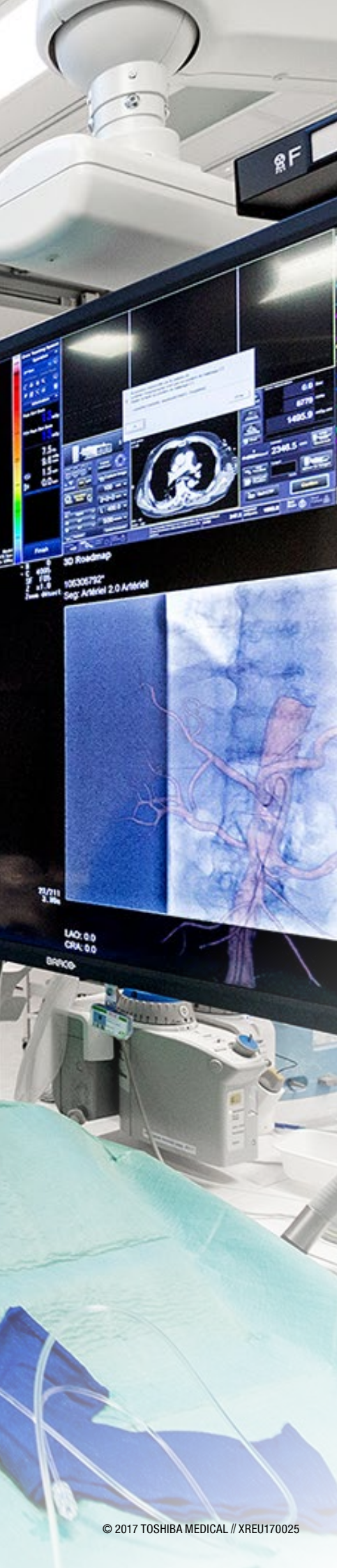
Prof. B. Guiu
Head of the Radiology Department



Infinix-i 4D CT

Advanced Interventional Radiology Techniques for Treatment of Primary Liver Cancer in France

The University Hospital in Montpellier, France, is a unique regional health center specialized in the treatment of patients with liver cancers. The center contributes to developing new treatments of these cancers through advanced Interventional Radiology techniques. With a growing Radiology Department, the center has recently acquired an Infinix™-i 4D CT system from Toshiba Medical. Mr. Le Ludec, General Manager of the Hospital and Prof. B. Guiu, Head of the Radiology Department describe how the new system has enabled the hospital to bring innovative new Interventional Oncology techniques, such as tumor thermoablation, into daily practice.

New treatment options for liver conditions are emerging fast. Public health issues including rising levels of obesity and type 2 diabetes have created an increase prevalence of metabolic liver diseases, such as Non-Alcoholic Fatty Liver Disease (NAFLD). Research into treatment of these conditions has also enhanced our knowledge of other liver diseases including primary liver cancers, which are often complex. Interventional Radiology has an important role to play in effective treatment of liver disease. Minimally invasive techniques, such as liver ablation, are recommended for almost 50% of primary liver cancer cases.

The University Hospital in Montpellier has a strong, dynamic and diverse team of committed, specialized professionals, who strive to provide the best care for cancer patients in the region, including transplant surgeons, liver disease-, anesthesia- and resuscitation specialists, and Interventional Radiologists. The team of five senior radiologists, six interns and 28 technicians will be expanded with three additional physicians, who will join the team next year. All radiologists in the department are active in Interventional Radiology.

"Our expert team works continually towards improving patient care," said Mr. Le Ludec. Direct recruitment of radiologists in hospitals can be difficult in France, as many prefer to be self-employed, but the opportunity to practice Interventional Radiology has encouraged many of our specialists to stay within the hospital system."

Interventional Radiology - An Emerging Field

"Our use of Interventional Radiology has increased by 400% over the last three years," said Prof. Guiu. "Our current priority is to develop techniques on thermoablation of tumors of the liver using multi-modality imaging, which combines CT scan, ultrasound and angiography. Nearly 40% of liver tumors are not detectable with ultrasound and 20% cannot be picked up with CT scanning. The combination of these imaging modalities, as well as the ability to mark the tumors endovascularly, has enabled us to perform three times more thermoablation treatments over the last three years with subsequent Interventional follow-up.

"We had been using a single dedicated scanner for diagnosis and treatment of these complex procedures. However, high demand for procedures created waiting times of more than six weeks for patients. This is not acceptable in oncology." Mr. Le Ludec explained. "With a realistic assessment of the number of patients that our center could treat and by weighing up the costs and benefits, we decided that investment in an Infinix-i 4D CT system

Prof. B. Guiu

"It has increased workflow and significantly reduces waiting times for patients."

from Toshiba Medical and re-equipping the angiography room would be the way forward. The new Angio CT system is located in the operating room to facilitate access to anesthesiology and for patient security. Our team have been fully trained in using the new system."

Superior Image Quality

Prof. Guiu and his team find the image quality of the angio system excellent. The very low radiation exposure is a real bonus. They find the tools for reduction of radiation exposure with the Infinix-i 4D CT really efficient and easy-to-use in daily practice.

The team were also particularly impressed by the ease and speed of performing a CT acquisition during angio procedures, as compared to their previous system, which was a Cone Beam CT (CBCT) based system. They were convinced that image quality was better and the field of view size larger than CBCT.

"Image quality of CT-arteriography using only one rotation with 16cm spatial coverage is much better than any Cone Beam CT system," he said. "By comparison, the speed of acquisition in the workflow of angio procedures is also surprising."

Prof. B. Guiu
Prof. Guiu studied Radiology at the University Hospital of Dijon, then in the Interventional Radiology departments of the Gustave Roussy Institute and the University Hospital of Lausanne in Switzerland. He was appointed Professor and Hospital Practitioner at the University Hospital in Montpellier in September 2014 and became Head of the Department of Diagnostic and Interventional Radiology of the St-Eloi Hospital. He is an expert in both percutaneous and endovascular hepatic Interventional Radiology and research into Interventional treatment of tumors of the liver, in which, he coordinates several Phase I and Phase II trials. The University of Montpelier has four Radiology departments that cover all sub-specialties. The Radiology Department is highly specialized in digestive imaging.

Mr. T. Le Ludec
Mr. T. Le Ludec has been Managing Director of the University Hospital of Montpellier in France since 2016. He has worked in many medical facilities in France: at the University Hospital (CHU) in Lille, the public hospices (hospices civils) of Lyon, and also in management at the North Seine and Marne (Nord Seine et Marne) Hospitals. During his career, he has also been the Director for improvement of quality and safety of care at the French national health authority (HAS).

Minimal Training

Even with such high-level technical capabilities, the team at the hospital find the Infinix-i 4D CT very easy to handle in daily practice. However, some training in combining the dual modalities offered by the Infinix-i 4D CT system was required.

"Using the new system is not simply a question of adding a new angio suite and a CT system. We had to learn how to extract the right information from the CT for the angio. However, ease of use of the system was surprising; most functions are very easy to use in daily practice, and we were already able to use the most advanced functions of the system after one month," remarked Prof. Guiu. "We have created a group of intensively-trained radiographers that can work with the system's full range of functions, including reconstructions. The group shares information on using the system - overnight and at weekends too - to continuously advance our knowledge of the system and ensure that users have a minimum competence level."

A True Hybrid System

The Infinix-i 4D CT is not only the consolidation of two modalities, but a true hybrid system with a permanent communication between these two modalities.

"With the new system installed, we are now able to perform a wider range of Interventional procedures, including liver ablations, chemoembolization, radioembolization, implantation of ports for hepatic arterial infusion of chemotherapy, biliary drainage and stenting, and portal- and hepatic vein embolizations," said Prof. Guiu. "The 4D capabilities enabled by Toshiba Medical's Aquilion™ ONE technology are fascinating and will change our treatment evaluation practices; pre-, during and post-therapy. The large spatial coverage (16cm) provided by the CT allows coverage of the full liver in only one rotation. It opens the gate to true 4D imaging through many applications. We are working to replace the classical workflow of angio procedures with two 4D acquisitions, providing information, such as liver vessel anatomy, tumor-feeding vessels, tumor perfusion and flow, with less radiation exposure than classical techniques. Equally importantly, it has increased workflow and significantly reduces waiting times for patients."

"Having the chance to acquire the first Infinix-i 4D CT system in Europe with Aquilion ONE has been very exciting, but was also a difficult choice to make in the absence of external advice or reference point with relevant activities similar to mine," said Prof. Guiu.

Indisputable Reliability

The Radiology team have found the support provided by the Toshiba Medical to be excellent from the beginning of the acquisition of the new system.

"The support and information provided by Toshiba Medical has been amazing, and in retrospect, I must say that everything that they promised has turned out to be true in practice," added Prof. Guiu. "We benefited from a pre-training course and a very close multidisciplinary application follow-up in the early stages and were ready to start with full use of the system within two weeks."

Mr. T. Le Ludec

"We have formed a great collaboration with the company in the development of new tools and hardware upgrades."

"Toshiba Medical has provided very efficient support in system acquisition and installation of the Infinix-i 4D CT, and the partnership continues to strengthen," added Mr. Le Ludec. "We have formed a great collaboration with the company in the development of new tools and hardware upgrades. The reliability of this collaboration is indisputable and is a particularly strong indicator for success."

A Unique Imaging System

The new room that was installed in the operating room enabled the hospital to free up time that was dedicated to Interventional Radiology on the scanner of the Department of Radiology at St-Eloi. This enabled shortening of the waiting time for diagnostic scanners and also increases the profitability of this machine. With optimization of anesthetic resources in the operating room, more patients can be treated and waiting times before treatment reduced.

"Finally, it has been possible to increase our Interventional Radiology activities in compliance with the ISO Human Resources standards, with an imaging system that can do everything!" said Mr. Le Ludec. "The Infinix-i 4D CT technology allows development of innovative minimally invasive care for tumors of the liver and shorter durations of stay for the patient. Any medical center that wants to renew an angio-suite should at least consider the Infinix-i 4D CT as an option instead, given the additional possibilities offered by this technology."

"Having all imaging modalities in the same interventional suite located in the operating room allows the development of any percutaneous, endovascular or combined treatments within a secure context. The limitation is only that of your imagination." added Prof. Guiu. //

Experience with a Real Time Patient Skin Dose Distribution Estimator for Interventional Radiology

Source: Poster: ECR 2017 / C-0774
E. Vano, R.M. Sanchez, J.M. Fernandez, J. Ignacio Ten, J.V. Mendez, J. Armijo, M. Leyva, C.J. Gonzalez

During Interventional Radiology practices, it might be necessary, in some cases, to deliver high radiation doses to the patient's skin[1,2]. When procedures are complex or when various procedures are necessary to treat patients, high Peak Skin Doses (PSD) may produce several degrees of skin lesions, from a transient erythema with low PSD (2-5 Gy), to the most severe moist desquamation and necrosis when PSD are greater than 15 Gy[3-5].

To avoid or minimize skin lesions in patients during procedures, interventionalists have limited information. In most interventional laboratories, only dose indicators like fluoroscopy time, dose area product (DAP) or air kerma at the patient entrance reference point (AK) are displayed on the interventional laboratories screens during the procedures. These indicators give specialists a general summary on patient dose, but they are not directly related to the patient skin dose maps[6]. Some authors have estimated the patient PSD by using photo-stimulated plates and slow and radiochromic films, a method that results both expensive and time consuming[7-9]. The DICOM radiation dose structured report (RDSR) is currently available on updated X-ray units. That report includes detailed information at radiation event level and can be used to estimate the patient skin dose distribution. Unfortunately, X-ray units deliver the RDSR at the end of the procedure, so that no actions can be taken to minimize the PSD during the procedure. What is more, in many cases, manufacturers do not include all the event parameters necessary to accurately calculate the patient PSD in the RDSR.

In this work, an evaluation of a skin dose distribution estimator in real time is presented and pros and cons are discussed. The PSD estimation is compared with a measurement performed using radiochromic films on an anthropomorphic phantom. The PSD delivered to patients over a period of 10 months is analysed.

Methods and materials

The system developed to estimate the patient skin dose distribution is commercially available under the name Dose Tracking System (Toshiba Medical)[10-11] and has been installed in a new Interventional Radiology laboratory at the Hospital Clínico San Carlos (Madrid, Spain).

The system captures, in real time and for every radiation pulse, the information relative to all physical parameters during patient irradiation, i.e. C-arm position and angulation, couch height and position, tube and generator settings as kV, mA, pulse time, filtration, beam collimation and compensator wedges. Finally, the system computes the skin dose using an anthropomorphic model and displays the

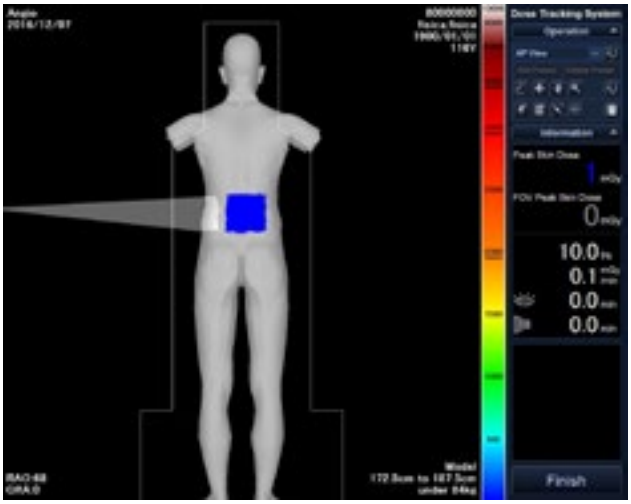


Figure 1: System display located in the angiography room. In blue the dose map (with a PSD of 1 mGy). The beam direction (light grey) is angulated to avoid the irradiated area. The parameter FOV Peak Skin Dose shows the skin dose in the area where the C-arm is pointing.

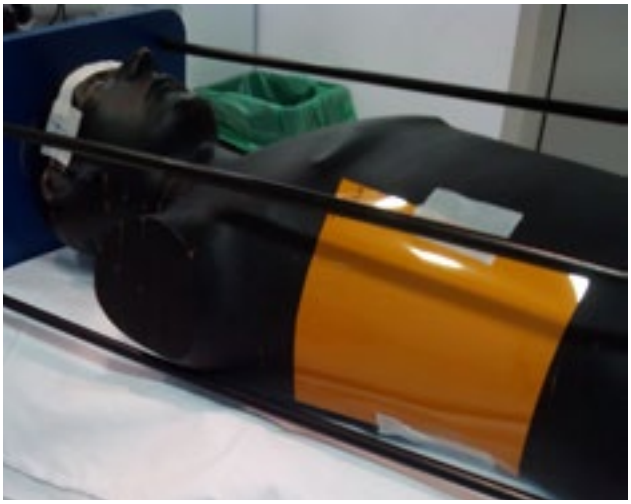


Figure 2: The anthropomorphic phantom over the examination couch with a radiochromic film to measure the skin dose distribution.

results on one of the screens inside the interventional laboratory. Along with the skin dose map, the system shows the patient region where the C-arm is pointing, the beam eye view and also the maximum skin dose in the beam area (figure 1). The user can select the anthropomorphic model to fit as close as possible to patient actual dimensions, including male and female models and also paediatric patients.

The system was tested using a Rando anthropomorphic phantom (Radiology Support Devices, USA). Several pieces of radiochromic films (GafchromichXR RV3 (ISP, USA)) were located at phantom surface covering the back and the right side (figure 2). The film was calibrated for the beam quality of the X-ray unit used with DSA (digital subtraction angiography) runs of 80 kV and 0.1 mm Cu of added filtration and using an ionization chamber Radcal 20x60 (Radcal Corp, USA). Films were digitized using the scanner Epson Expression 10000XL and the images were processed to transform digitized images into patient dose distributions, following manufacturer recommendations. The phantom with the films was positioned at the examination couch and irradiated like a patient. Two cases were created, a simple one with two projections using just the DSA beam quality and rotating the C-arm, and a second one for a more complex procedure using several beam qualities (DSA and fluoroscopy runs) and with many projections moving the couch and the C-arm.

Since the system was installed, skin dose distribution reports for every patient have been stored in html format in an independent server as the current version still does not integrate this information into the RDSR or into the folder study stored in the PACS. A summary of the results showing PSD values is presented. The correlation with the main dose indicators (PDA, AK) is analysed.

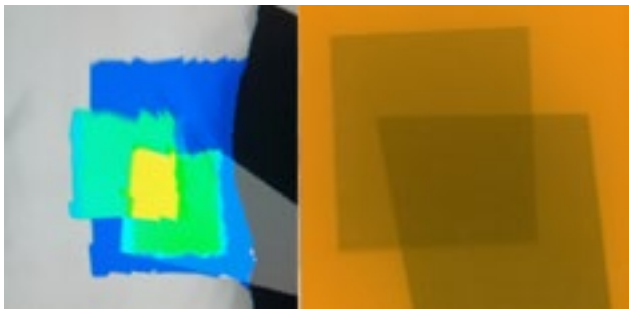


Figure 3: The dose map at system report (left) and at film measurement (right). Simple case with 2 DSA projections. The PSD at radiochromic film was 1593 mGy. The system reported 1514 mGy (-5%).

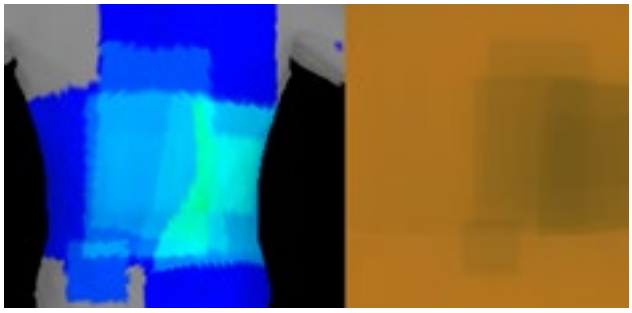


Figure 4: The dose map at system report (left) and at film measurement (right). Complex case with many projections (fluoroscopy and DSA) with different beam qualities and couch movement. The PSD at radiochromic film was 820 mGy. The system reported 743 mGy (-10%).

Results

Figures 3 and 4 show a comparison between the dose distribution measured with the film and the system estimation for the simple (figure 3) and the complex (figure 4) cases. In the simple case, the difference in peak skin dose between the estimator and the film was -5%. For the more complex procedure, the difference was -10%. Taking into account the uncertainty of radiochromic films[12-14], the differences found may be considered as not significant in comparison with other sources of inaccuracies deriving from coupling film-phantom surfaces or the different film response to different beam qualities.

Figures 6 and 7 presents, for the cases of high PSD (>1000 mGy) the correlation between the PSD and the DAP and AK, the two main dosimetric indicators given by the majority of modern interventional C-arms. Both indicators shows a bad correlation when analyzing the most interesting cases with high PSD.

After the system had been installed and over a period of 10 months, a sample of 410 skin dose maps were recorded. Table 1 summarizes the main results extracted from the sample. The average PSD was 151 mGy, with the majority of procedures (90%) with PSD under 315 mGy. Most of the low PSD values resulted from the low complexity procedures performed in this room. But a 2% of patients received PSDs greater than 2 Gy, the threshold dose that could produce skin lesions: the maximum value of PSD recorded was 3.9 Gy in an abdominal angiogram, followed by a complex upper mesenteric artery angioplasty (figure 5). The air kerma at the patient entrance reference point displayed by the angiography room was only 2.2 Gy, almost half of the peak skin dose, showing that this parameter is not always sufficient (or a good indicator in all the cases) to discriminate high PSD values. In this case, the PSD was almost double the cumulative AK, as in the lateral projection the skin was closer to the X-ray tube focus than to the reference point (15 cm from isocenter towards X-ray focus). Patient was proposed for ulterior angioplasty with stent to be performed two months later. Interventionalists needed to deliver 1.6 Gy of AK, but they took into account the skin dose information from the previous procedure to avoid the skin region previously irradiated and thank to this, the patient did not develop skin lesions during the clinical follow-up.

Conclusion

The system evaluated shows interventionalists real time PSD with enough accuracy (around 10%). The parameter air kerma at the patient entrance reference point can underestimate the skin doses when lateral projections happen to be predominant. The graphic

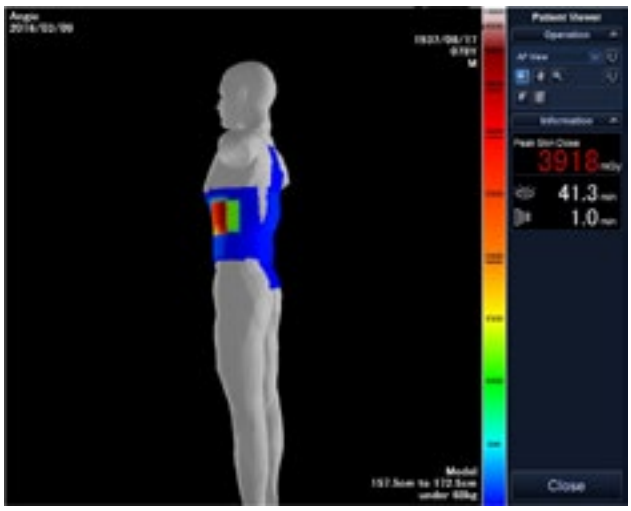


Figure 5: Case with the maximum peak skin dose.

interface allows specialists to change the beam orientation and optimize the dose distribution to reduce the peak skin dose if clinical conditions permit. Most of the procedures recorded were under 500 mGy of PSD, but a 2% of the sample in our survey resulted in PSD greater than 2 Gy. The system helps identify high dose procedures with better accuracy than would the analysis of the global DAP or AK and it also helps assess the appropriateness of a follow-up of possible skin injuries. The aspects to be improved in the future should be the integration of this information in the RDSR and the possibility to generate automatic alarms suggesting clinical follow-up at the end of the procedures.

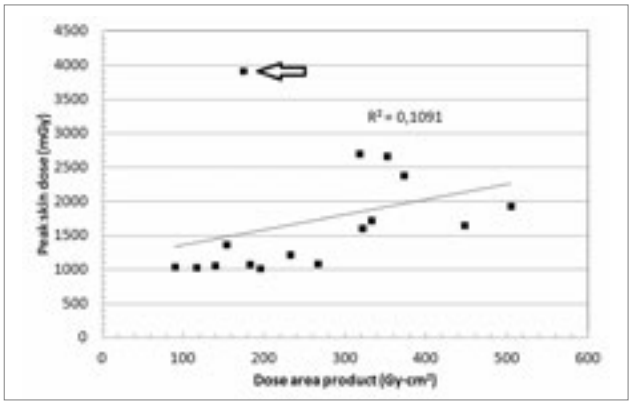


Figure 6: The peak skin dose versus the dose area product. The arrow points to the case shown in fig. 5.

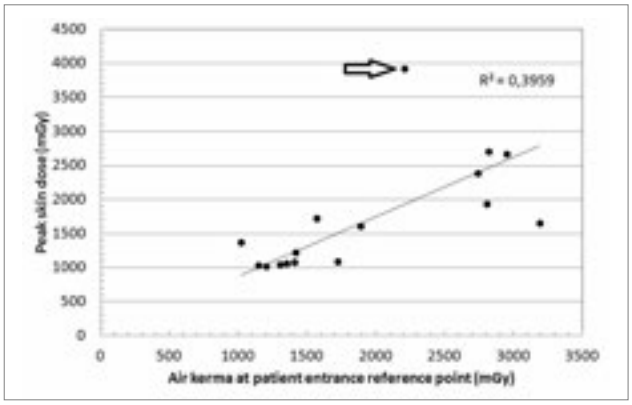


Figure 7: The peak skin dose versus de air kerma at patient entrance reference point. The arrow points to the case shown in fig. 5.

N=410	PSD (mGy)
Min	1
Max	3918
Average	151
Std Deviation	407
P25%	6
Median P50%	19
P75%	91
P90%	315

Table 1: Main statitistics from the PSD in the sample.

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From left to right

Prof. Eric de Kerviler
Head of the Radiology Department

Aurélien Delmelle
Radiographer

Céline Rodriguez
Radiographer

Cyprien Ferrier
Radiographer

Dany Houillon
Radiographer

Infinix-i 4D CT Supports Pioneering Interventional Radiology in France

The Saint Louis Hospital in Paris, France, part of the city's public hospital system (Assistance Publique – Hôpitaux de Paris - AP-HP), is emerging as a global center of excellence in oncology. With a new Infinix™-i 4D CT system from Toshiba Medical, it is pioneering new interventional radiology techniques. Mrs. Eve Parier, General Manager of the hospital and Prof. Eric de Kerviler, Head of Interventional Radiology, explain how the new system supports progress in interventional radiology and oncology.

Saint Louis Hospital is recognized as a leading cancer center in France worldwide. It has developed expertise in the treatment of patients with breast-, skin-, colorectal-, and urinary tract cancers in particular.

"Our three main missions are care, research and teaching. We are dedicated to further developing complete care for patients and strengthening our expertise in oncology," Mrs. Parier remarked. "Our challenge is to support our experts and provide the best services possible for the patient. In radiology, the main development focus is on advancing interventional radiology. We have been committed to this field for several years."

New facilities

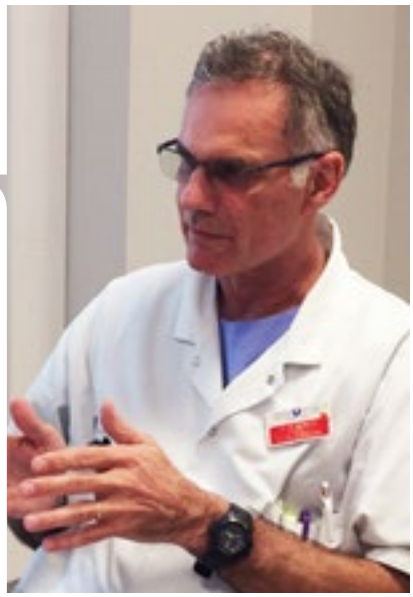
To advance its interventional radiology capabilities, the radiology team recently redesigned and renewed their radiology suite.

"We had to renew two CT scanners in the department, one of which was mostly dedicated to interventional radiology," said Prof. De Kerviler. "I initially considered installing a new, regular CT, leaving some room between the patient table and the gantry, and to use an additional mobile C-arm – A hybrid solution. At the time, I was convinced that this was the optimal solution. However, at the CIRSE (Cardiovascular and Interventional Radiological Society of Europe) congress in Lisbon, Portugal, back in 2015, I became aware of Toshiba Medical's Infinix-i 4D CT, and realized that this was exactly what I needed."

First impressions

impressed by the Infinix-i 4D CT, Prof. De Kerviler wanted to know more about how the new system performed in clinical practice. "Initially, I was not entirely convinced that it was a good idea to put two imaging assets - an angiosuite and CT - in the same room. It was difficult to imagine how to move from modality one to another and to see how flexible the system could be," he said. "However, I had the opportunity to visit some facilities in Japan already using the system, including the Shizuoka Cancer Center, an oncology facility in the Shizouka

"It takes less than one minute to move from the CT system to the C-arm, and vice versa."



Prefecture and the Saitama Jichi University Hospital, a research hospital serving the Saitama Prefecture, which was an outstanding experience. It was great to see the teams in action. Of course, they were well-trained, but I could see how easily they could place a catheter using the C-arm, carry out a CT scan with the catheter in place, and move back to the C-arm: it was really great, very impressive, flawless: the Infinix -i 4D CT seemed very easy to work with."

Flexible & compact

Compared with other systems, the Infinix-i 4D CT offers the possibility to move automatically from one modality to the other.

"I was absolutely astonished by the outstanding image quality obtained with the C-arm in fluoroscopy. The system provides a very good trade-off between dose and image quality. It takes less than one minute to move from the CT system to the C-arm, and vice versa," he remarked. "I was also impressed by the width of the bore of CT system that I saw during my visit to Japan. For interventional procedures, free-movement of instruments within the gantry is very important. It is best if we can place the needle and re-orientate it without having to moving the patient in- and out of the scanner. With the large bore of the Infinix-i 4D CT, we can carry out all procedures easily inside the gantry. That's what's great about the system. It is very convenient for all interventional radiology procedures."

Compact enough for small imaging rooms, the Infinix-i 4D CT is a flexible option that can support a wide range of interventional radiology settings and procedures.

"When you see the scanner in a picture, you might think that you need a very big room to accommodate it, but it is not the case. While our scanning room here at the hospital is quite spacious, I think the average interventional room in Japan is smaller - every square meter of space is very expensive in Japan," Prof. De Kerviler continued. "So, for many medical centers with limited space, it is very reassuring that the system can fit completely in quite a smaller room. However, I knew that in our new radiology room, we would still have plenty of room alongside the new system for TACE (transarterial chemo-embolization) guidance systems, resuscitation equipment and everything required for the anesthesiologist. This was quite a plus point."

Groundbreaking research

The new Infinix-i 4D CT system from Toshiba Medical, installed at the beginning of this year, contributes to the team's efforts to extend the boundaries of interventional radiology. Most recently they have pioneered a new technique in the treatment of liver- and pancreatic conditions.

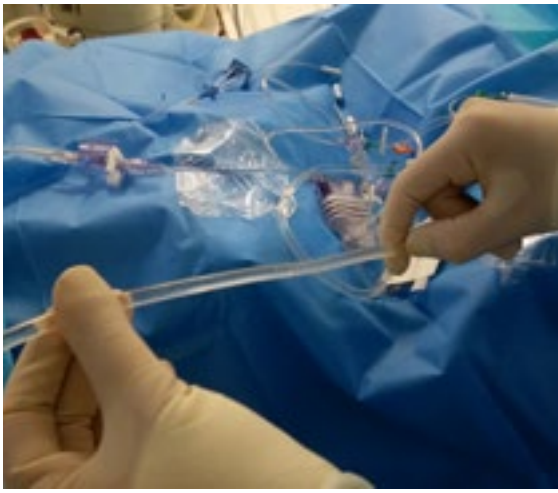
Mrs. Eve Parier

Mrs. Eve Parier has worked in hospital management for more than 20 years. She is the General Manager of the Saint Louis Hospital and the CEO of three hospitals in the Paris public hospital system (Assistance Publique – Hôpitaux de Paris - AP-HP).

Prof. Eric de Kerviler

Prof. Eric de Kerviler has more than 20 years experience in radiology. He studied and trained in Medicine, Nuclear Medicine and Radiology at the University of Paris, France and worked for most of his career in the Saint Louis Hospital. He is now the Head of the Radiology Department and specializes in interventional radiology and tumor research.

Islet cell transplantation technique
The islet cell transplantation technique for Type 1 diabetes treatment involves several steps. Firstly, the pancreas of a deceased organ donor is excised by surgeons. Then, the islets cells of this pancreas are isolated and processed. Lastly, purified the islet cells are infused through a catheter placed into the portal vein of the recipient patient by the interventional radiologist. The procedure is carried out under local anesthesia and is completed in around one hour.



"Islet cell transplantation is a very smart technique that involves injecting a suspension of islet cells within the hepatic portal vein of a recipient and then grafting the islet cells in the liver. Subsequently, the liver of the recipient will be able to secrete insulin by itself. This is very useful in patients with refractory diabetes, who have a lot of resistance to insulin," Prof. De Kerviler explained. "It's a very promising technique that we began working with a few years ago, but until now, the procedure was carried out in the operating room by catheterizing the mesenteric vein section of the hepatic portal vein. Now, we are able to perform this technique in our new interventional radiology suite using the Infinix-i 4D CT in one hour. We carried out our first successful islet cell transplantation on this system very recently."

Development partnership

Another reason that lead to his decision to opt for the Infinix-i 4D CT was Toshiba Medical's collaboration program.

"Following my trip to Japan, I felt that Toshiba Medical had a strong will to collaborate with us and offered real partnership in development," he said.

The visit inspired Prof. De Kerviler to think of further applications for the system.

"My only concern at the time, was that while we already carry out quite a range of interventional procedures here one of the most important diseases in Japan is hepatocellular carcinoma, or HCC, which is not currently our major focus," he said.

"This made me think about how I could use the new tool for other procedures in other organ systems: for example, urinary- or ablation procedures."

With these experiences in mind, Prof. De Kerviler changed his plans for the new interventional radiology suite.

We started another story. Investing in an Infinix-i 4D CT is different to investing in a regular CT system," he remarked. "The framework of the collaboration with Toshiba Medical provided a good deal, and my colleagues also became convinced of the potential benefits of investing in the Infinix-i 4D CT. We started with a 'blank sheet of paper', so to speak - we were able to completely designed a new room especially for the CT.

"The Infinix-i 4D CT and collaboration with Toshiba Medical have contributed towards enabling us to meet the growing challenges in oncology."

This is always easier than fitting equipment into an existing room. We designed our new imaging suite to our exact needs in direct collaboration with Toshiba Medical. We were able to create an environment very similar to that of an operating room – sterile, with different pressure between rooms to ensure renewal of the air. We worked closely with Toshiba Medical, starting directly at the shipping of the equipment from Japan, which was exactly on time. The installation was completed without any delays - We started on the exact day that we agreed upon."

"We were impressed with the efficient installation of the Infinix-i 4D CT system and the medical team is very pleased and satisfied with the system," Mrs. Parier remarked. "So far, training of the technicians and the radiologists has gone very well and the continued support of the Toshiba Medical team has been outstanding.

Integrated into clinical practice and research

The radiology team and clinicians initially found the new system a bit more complex

than a regular CT to use, but they quickly became confident in using it. The system is in use for a variety of procedures, such as biopsies, tumor ablation, drainage and nephrostomies. For procedures, such as spiral requisition and cryoablation in particular, the Infinix-i 4D CT offers the advantage that the system can be maneuvered without interfering with the equipment required.

"Everyone is now happy very pleased to work with the Infinix-i 4D CT and can see the potential of it," remarked Prof. De Kerviler. "With our previous system, we were focused on CT procedures. The Infinix-i 4D CT has opened up a new field of possibilities in fluoroscopy. Following installation, we have steadily increased the number of fluoroscopy-guided procedures. With this, we are able to treat new indications and develop and use new procedures. We anticipate moving towards performing an equal number of CT- and fluoroscopy-guided procedures, and in some cases, we may be able to combine both techniques. With this new clinical concept, we are now convinced that we will be able to push the boundaries of interventional radiology, and develop and perfect more involved techniques, such as fluoroscopy-guided placement of PEG LINES and gastrostomies."

With the success of the recent islet cell transplantation technique, the next focus for the interventional radiologists at Saint Louis Hospital is to use the Infinix-i 4D CT to advance the treatment of metastatic liver cancer.

"While we have few patients with HCC - a primary liver cancer - we often have to treat patients with metastatic liver cancers, because of the tendency of other types of cancers, including breast-, and colorectal cancer and malignant melanoma, to spread to the liver," Prof. De Kerviler said. "We are hoping to increase the number of treatment options for the treatment of metastatic liver cancer by testing new clinical applications using the Infinix-i 4D CT. If patients have solitary metastases, we can ablate the tumor. When the patient has several metastases, we plan to develop techniques to place a catheter in the hepatic artery and inject chemotherapy-agent directly into the liver through this. In case, we will need to change the anatomy of the liver, because sometimes we want to expand one side of the liver and decrease the other side of the liver, we should be able to embolize the portal vein or some segments of the portal vein, we hope to achieve this in the next six months."

Growing challenges

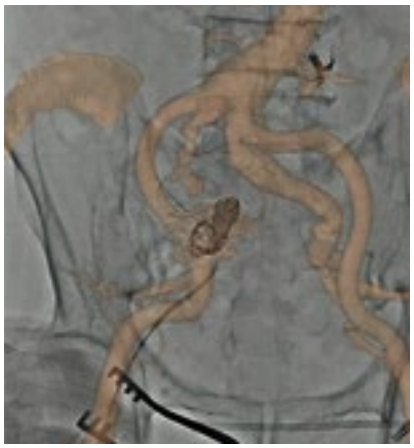
In addition to developing pioneering new interventional radiology techniques, Saint Louis Hospital, of course, faces the same challenges as other medical facilities: growing demand for interventional procedures, increasing complexity of interventional procedures and pressures to treat patients sooner.

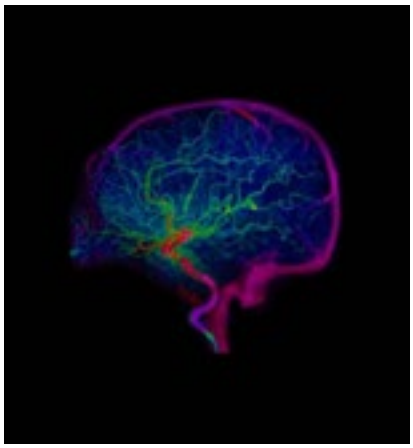
"Despite the fact that our radiology team grows annually with the addition of approximately six interventional radiologists, we face challenges not only in terms of number of interventional procedures required, but also in terms of increased complexity of procedure. This means that for some procedures the average time that is needed is higher," explained Mrs. Parier. "Our team still have to push boundaries and to extend their working hours to be able to cure and to manage the patient within a reasonable amount of time. In addition, as life generally speeds up, we must be able to react faster, in the best interests of the cancer patient too. The Infinix-i 4D CT and collaboration with Toshiba Medical have contributed towards enabling us to meet the growing challenges in oncology. It is a good partnership and I think it is a good investment for the Radiology Department and for the Saint Louis Hospital." //

Infinix-i Sky + – 3D Anywhere in Angiography

The world's fastest, most flexible angio suite

Around the world, providers of Interventional systems are being challenged to improve ergonomics, patient comfort and dose efficiency while at the same time reducing the cost of ownership and environmental impact.





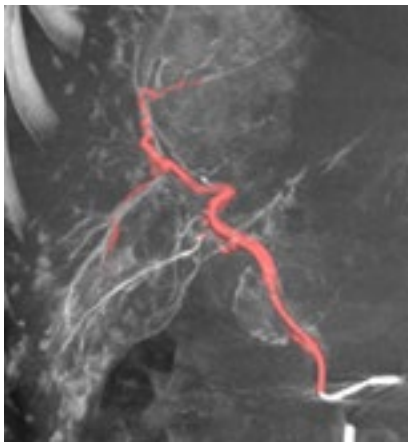
By fulfilling all these demands Toshiba Medical is proud to introduce the world's fastest and most flexible angio suite; the Infinix™-i Sky +, a new member of the Infinix™-i Rite Edition family.

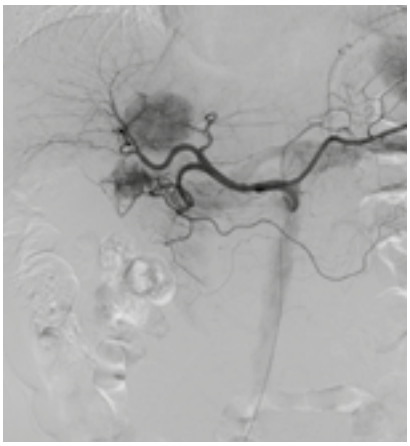
As its new flagship, the Infinix-i Sky + incorporates state-of-the-art technologies allowing whole body coverage, from head to toe without any patient or table movement and free head access, which is a strong demand from interventional radiologists and anesthetists during complex procedures, is realized through 270° isocentric C-arm rotation. The unique lateral C-arm stroke expands and simplifies your access for radial approach, shunt angio, venography and port implants.

"Our approach is simple: it's the equipment that moves around the patient and not the other way around. This translates into optimized visualization and positioning in the examination room", says René Degros, Business Unit Manager for X-Ray with Toshiba Medical about this new "3D anywhere" system as it is already being called among physicians.

The system provides full automatic synchronization between the flat panel detector & collimator for correct head up display regardless of C-arm position, developed for the most challenging clinical procedures.

Infinix-i Sky+





DoseRite

As procedures are getting more complex, advanced 3D acquisition becomes a strong requirement. With the introduction of the Infinix-i Sky +, you will discover new horizons in 3D imaging.

The outstanding 3D rotation coverage of 210 degrees with C-arm at table left/right side in combination with an amazing speed of 80 degrees per second is the key enabler for the unmatched image quality delivered by the Infinix-i Sky +. Especially its unparalleled rotational speed will result in a significant reduction of breathing artefacts and contrast media.

Benefit from Toshiba Medical's DoseRite Philosophy which brings together what belongs together: dose saving technologies & dose awareness tools. Drastically reduce radiation dose to your patients and yourself by applying state of the art dose saving techniques available such as Live Zoom, Spot Fluoroscopy, Spot ROI and our real time Dose Tracking System. //

TOSHIBA MEDICAL

Canon
CANON GROUP

Made for Partnerships. Made for Patients. Made for You.

At Toshiba Medical we partner with our customers to truly understand their needs in imaging and beyond.
We develop a full range of imaging solutions, including CT, X-Ray, Ultrasound and MR that address time pressures, workflow constraints, patient comfort and imaging precision to deliver true efficiency coupled with best in class tools for diagnosis.
Together, we work on an education plan and develop service solutions that meet your every need.

Our goal is to work hand in hand with our partners to deliver optimum health opportunities for patients through uncompromised performance, comfort and imaging accuracy. Together we complete the image.

www.toshiba-medical.eu

Dr. Bell
Interventional Radiologist

First Infinix-i Sky + in Europe

The Christie is an Oncology centre recently recognized as the UK's top specialist hospital. It offers comprehensive cancer care to patients from Greater Manchester and Cheshire (a catchment area that includes more than 44,000 people) with 26% of its patients referred from other areas of the UK. It is also globally renowned for its oncological research and is considered one of the world's most technologically advanced cancer centres. The Christie has opted to equip its new Integrated Procedures Unit with an Infinix™-i Sky + alongside a Ultimax™-i system, both from Toshiba Medical. With the new systems installed, The Christie's Interventional Oncology team can use advanced techniques to treat cancer. Dr. Jon Bell, Interventional Radiologist at The Christie, explained how this combination of state-of-the-art technology enables his team to push the boundaries of what they can do further.

"Interventional Oncology is a rapidly advancing speciality," said Dr. Bell. "It is the fourth pillar of cancer care and a massive growth area. There is a huge amount of interest and there is also lots of collaboration between different centres, data gathering and clinical trials. There are many Interventional Oncology meetings and growing attendance at both national and international meetings. Experts travel in from all over the world to share their expertise."

New Unit

The Christie's Integrated Procedures Unit (IPU) is a new facility that brings together five different teams: endoscopy, pain management, procedure team, plastic surgery and Interventional Radiology. It is a major investment towards advancing the hospital's capabilities in cutting-edge cancer treatment techniques.The creation of the £7.6m IPU has been made possible by part funding of £4.99m from The Christie charity. The project has helped to raise awareness of the value and further potential of Interventional Oncology.

"We strive to achieve the best outcomes for our patients. Obviously, we aim to achieve a cure if that is possible," added Dr. Bell. "We offer palliative and disease-modifying procedures. Functions that we take for granted such as swallowing can be restored to enable patients to eat and drink and at the other end of the spectrum, we can achieve a cure using techniques such as ablation. Treating such a diverse range of patients enables us to advance techniques even further. We see new problems emerging in patients returning to us, because they survive longer, as treatments deliver better initial outcomes, enabling us to work on overcoming new challenges with new Interventional Oncology treatment options."

Innovative Team

The team of Interventional Radiologists has recently increased from four to six. The Integrated Procedures Unit at The Christie is the first site in Europe to acquire an Infinix-i Sky + from Toshiba Medical.

"We consider ourselves to be Interventional Oncologists - a young group of enthusiastic consultants, who are very innovative and radiographic and nursing teams dedicated to pushing the service further," Dr. Bell continued. "We carry out a comprehensive range of vascular and non-vascular procedures and are embracing and developing new techniques in Interventional Radiology. Towards that, we need to work with state-of-the-art equipment. Before the team expanded, we shared a high volume of work between the four of us. We are very good at what we do, but we could be better with the right equipment. We want to use the latest technology, such as that provided by Toshiba Medical, and to reach our maximum potential."

"When I joined The Christie four years ago, our equipment had reached the end of its functional lifetime," he continued. "We are one of only ten centers in England performing radioembolization, which is

"I want to work with the best and for me the Infinix-i Sky + is the best on the market for Interventional Oncology."

a complex procedure, in addition to more routine intervention that would be commonplace in most university hospitals. We needed a more advanced technical system for our very advanced vascular work and a second multifunctional room to perform more routine procedures. The Infinix-i Sky + was included in our plan at the outset.

When I arrived, the idea was to procure the equipment later down the line. While we were focused on the whole concept of building the new unit - a big undertaking - I started the process to procure the systems that we wanted from an early stage, so that we could mould the rooms to best fit the systems and to ensure that they were optimally functional. I drove going out to tender at an earlier stage than originally planned – fitting equipment into existing spaces can be fine, but we were in the ideal position of being able to design the space the best way with Toshiba Medical on board. We've been fortunate to have the opportunity to establish the unit in this new building."

It was important to the team to acquire both high-end machines from the same company during the procurement process.

"The Ultimax-i has the functionality we need for doing routine work, as well as high-end Interventional Oncology work. We needed a system with multipurpose functionality to replace our older unit," Dr. Bell explained. "The Ultimax-i, which is probably Toshiba Medical's most popular system, fitted the bill. It was installed here about a month ago. It's a good work horse system producing good quality imaging, so it's similar to our old system, but obviously with seven years of technological advances. There are not many companies out there that can provide high end, multipurpose solutions -

Toshiba Medical is one of the few that can. Not only that, but they've given huge support over the last two years in terms of planning the layout of the rooms and listening to our needs as customers. Their innovation and involvement has been exceptional. We have built specific relationships with Toshiba Medical people whose enthusiastic engagement in the whole process has produced the perfect result. They have been brilliant in everything that they have done. Over the last few months, the engineers have been here on site, and that will continue going forwards. The commitment to aftercare and support that we've experienced has been excellent, because they want to make sure the image quality and the patient experience is the best that it can be."

First Clinical Procedures

While price is important to the team, they are most impressed by the quality and capabilities of the Infinix-i Sky +.

"It is really a pleasure to work in the new suite and it is great to see the whole team enthused by the new system. The Infinix-i Sky + is working extremely well for radial access and all the cases have been absolute success."

"The image quality is infinitely better. The monitor enables us to see the anatomy and our instruments with unparalled clarity. We've not had cone-beam CT before, although we've experienced it at different centres and heard other practitioners talking about it. There have been a few cases when we really would have found it useful, but now we have that facility and we can use that technological advancement to achieve better outcomes and to perform more intricate procedures such as prostate artery embolization."

"The crucial element is that the C-arm gives access to the limbs, and with this system, we can do that very easily," he continued. "We at The Christie recognize that there's a need for more educational opportunities in Interventional Oncology and we want to share our expertise. We felt that we were not in an ideal position to lead in this, but with these cutting-edge systems from Toshiba Medical, we can now contribute on a world stage."

"I want to work with the best and for me the Infinix-i Sky + is the best on the market for Interventional Oncology," he continued.

"The Infinix-i 4D CT from Toshiba Medical would be desirable for the future, and that is something that we will look at, having a positive experience with Toshiba Medical with this project. It would really help our ablation service, as that starts to grow. Sometimes we think less about price and want to be more focused on the best system, but actually, Toshiba Medical offered both the best price and performance. In their favor was also the strong, long-established relationship that we have with their sales and technical experts. In speaking to other centers and clinicians, they spoke positively about their experiences. Toshiba Medical have a big foothold in the UK market and this is growing as they lead the way with innovative technology. I am sure that our partnership will grow further and I'm proud of that with very high-end state of the art equipment, such as the Infinix-i Sky +, we can fulfil our goal to do our best for patients nationally and internationally. As a centre of excellence, in partnership with Toshiba Medical, we are able to push the boundaries of what we can achieve and there are no boundaries to what is possible." //

DoseRite

Spot Fluoro - A Novel, Promising Approach to Reduce the Dose in Interventional Procedures

Dr. Borota, Dr. Shalabi, Prof. Gerwins, Prof. Larsson, A. Patz, T. Sakaguchi

The Infinix™-i Biplane installed at the Department of Radiology, University Hospital in Uppsala, Sweden. Main clinical applications are interventions in the cerebrospinal blood vessels and cerebral angiographies. Additionally, peripheral AVM's and neurosurgical interventions,nerve root blockades and spinal myelographies were performed.

The system was designed to be very robust, but highly ergonomical and user-friendly. This system is characterized by superior mobility of the C-arms and unique, flexible lateral isocenter, which enables an optimal combination of biplanar working projections, regardless of the size and position of the region of interest.

The 'jewel in the crown' of the Infinix-i is, however, the Spot Fluoroscopy function, which is, according to Toshiba Medical's Development Team, an innovative system, designed to save dose in interventional procedures.

Interventional procedures have become increasingly complex, which results in a significant prolongation of the fluoroscopic time during endovascular procedures. That is why, dose-saving techniques have gained more significance than ever before for patients and medical staff.

Spot Fluoroscopy is a Toshiba Medical's-patented function that is based on:

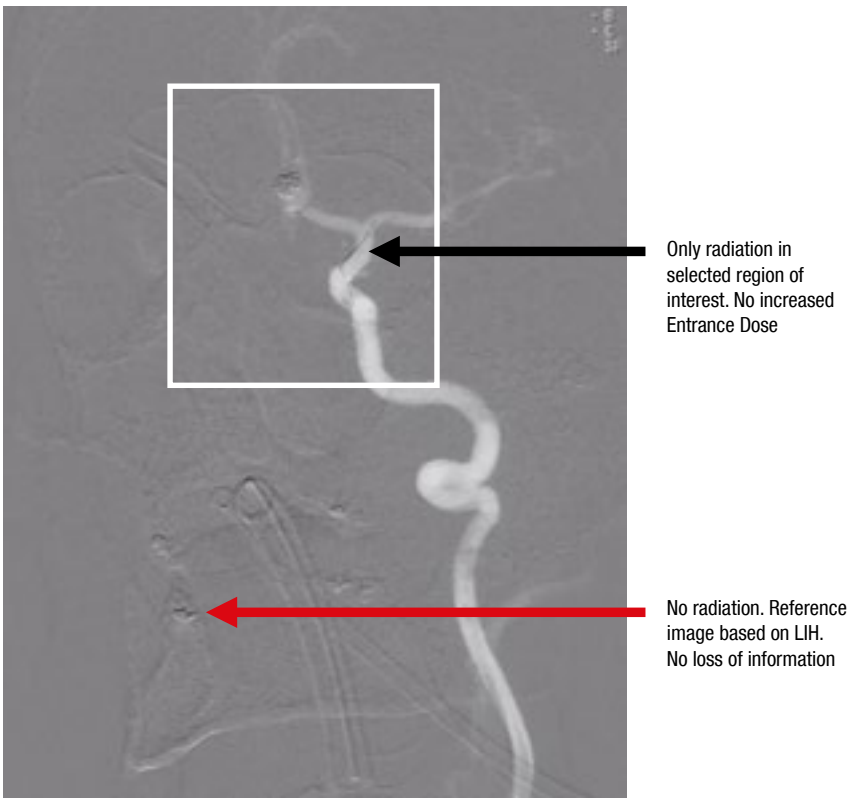
1. Asymmetric Virtual Collimation that allows a free definition of any desired collimation based on Last Image Hold.
2. Superimposition of Last Image Hold information to keep anatomical or device relevant reference information visible during Fluoroscopy.
3. Novel Automatic Brightness Control (ABC) technique that avoids a dose increase, regardless of collimation.

The core of the new function is the flexible sensing area of the ABC that adapts instantly to the predefined collimated field of view. The activation of the Spot Fluoroscopy by a simple, double mouse-click for each projection is enough to define the area of interest, required for exposure during Fluoroscopy.

The localization, shape and size of this area can be redefined as many times as necessary using LIH (Last Image Hold). Since the last image hold is superimposed over the collimator blades, important anatomic landmarks are not lost during Fluoroscopy. This easy-to-use function reduces both the dose directly delivered to the patient and the scattered radiation that the staff is exposed to. Spot Fluoroscopy, coupled with the live zoom function, enable superior visualization of the target vascular structures, without requiring an increased dose.

The Neurointerventional Team of the Uppsala University Hospital, together with Toshiba Medical's engineers, performed large-scale measurements of various dose parameters, analyzed these and explored their impact on daily work.The results of the analysis showed statistically highly significant reduction of the Dose Area Product (DAP) and Dose Area Product Rate (DAP Rate)[1]. The analysis also showed that activation of the Spot Fluoro function did not lead to any prolongation of the total Fluoroscopy time or, in other words, that

Spot Fluoro advantages



activation of the Spot Fluoro did not have any negative impact on daily work[1]. The image quality was assessed by two experienced neuroradiologists. It was concluded that the steep angles of working projections and massive bony structures of the skull base surrounding the target might cause marginal degradation of image quality.

Our results have clearly shown that reasonable combination of conventional Fluoroscopy and Spot Fluoroscopy can provide satisfactory image quality during neurointerventional procedure with the lowest possible dose to the patient and staff. //

Dr. Ljubisa Borota
Unit of Neurointervention, Centre for Medical Imaging, Uppsala University Hospital, Sweden

Andreas Patz
Toshiba Medical Systems Europe BV, Zoetermeer, The Netherlands

Takuya Sakaguchi
Toshiba Medical Systems Corporation, Otawara, Japan

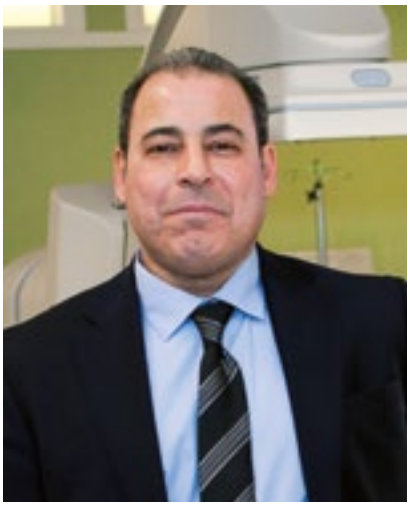
Reference
[1] *Borota L., (Uppsala, SWEDEN); Patz A. (Zoetermeer, NETHERLANDS); Sakaguchi T. (Otawara, JAPAN): Spot Fluoro – A novel innovative approach to reduce the dose in interventional Procedures, Advantages and Drawbacks, ECR, Vienna, 7 – 10 March, 2014*

Dr. Shalabi leads the Imaging and Functional Medical Centers (BFC) at Akademiska University Hospital in Uppsala, Sweden.

When I became Head of the Centers in 2010, I put a focus on developing our Neuro-section. We changed our way of working and I have been lucky enough to be able to recruit expert competence. Our vision is to contribute to good health and good quality of life, and involves making the patients an integral part of the process.

Since 2011, we have seen extensive development of Neurointerventional Radiology at the Centre for Medical Imaging. The number of interventions performed by the Neurointerventional Team has increased tremendously. This increase corresponds with the installation of Toshiba Medical's Infinix i-Biplane system. During the first phase of development in this specialist department, the Neurointerventional Team focused on acquiring the knowledge and skills necessary for treating a wide range of cerebrospinal vascular diseases. Despite the fact that the team was understaffed, they achieved amazing results. The number of interventions increased by 300% compared to before 2010. Toshiba Medical's team of engineers contributed significantly to fast development of The Center's neurointerventional service. It could be said that the Neurointervention Team and Toshiba Medical's engineers 'grew up together' during this time.

The Neurointervention Team and Toshiba Medical's Development Team worked hard on the clinical implementation of Spot Fluoroscopy - a new innovative approach for reducing dosage in interventional procedures. This represented a new phase in the development of the neurointervention at The Center. During the phase, Toshiba Medical's Development Team played a very important role. I am proud that the first results of this common project have already been successfully demonstrated at the ABC/



Dr. Adel Shalabi
Head of Department, Centre for Medical Imaging, Uppsala University Hospital, Sweden

WIN (Anatomy Biology Clinical Correlations Working Group in Interventional Neuroradiology) Congress 2014, in Val d'Isere, France, and now, in extended form, at the ECR (European Congress of Radiology) in Vienna, Austria. I really hope that the scientific collaboration between my department and Toshiba Medical will continue in the same vein and with even better scientific results.

Throughout 2013, The Neurointerventional Team has performed numerous demonstrations of the equipment for other potential customers by performing neurointerventions and complex examinations of the cerebral blood vessels, along with presentation of detailed descriptions of the system. I have received very positive feedback from this. I also hope that the future relations will continue to be based on mutual benefit and be as pleasurable as they have so far proved to be.

Reducing Healthcare Queues in Sweden

Toshiba Medical Infinix-i Biplane Vascular X-Ray

Uppsala is the only county council in Sweden that does not qualify for the Swedish Government's financial incentive designed to reduce hospital waiting-times. This is because it was not able to provide patients with healthcare within the 90 days stipulated by the incentive. Despite this, the Medical Imaging Center (MIC) at Uppsala University Hospital has succeeded in both improving efficiency and reducing waiting times. A major reorganization and adoption of new technology were key to its success. Installation of Toshiba Medical's Infinix-i Biplane Vascular X-Ray suite in the unit has contributed towards increasing the range, capacity and speed of examinations and improving patient safety and throughflow. Staff using the MIC explain more.

Dr. Adel Shalabi, Head of Department, Centre for Medical Imaging, Uppsala University Hospital, Sweden

The MIC has become more efficient after reorganizing its operations according to the organ involved in examination, rather than the method, or technology used. Now, it is divided into four organ-specific sections: musculoskeletal and children; abdominal; neuroradiology, molecular and thorax. A total of 350 staff now work at the Center, which is operational around the clock. The new organization enables definite results for acute analyses to be generated within 24-hours, and results for elective studies within five working days.

"The new approach improves patient flow and reduces response time," said Dr. Adel Shalabi, Head of Department. "Advanced technology also makes a major contribution towards improving our capacity to deliver results fast. We like to keep up-to-date and have the latest technology in all X-Ray modalities."

Safer Treatment for Patients

The Infinix-i Biplane, installed at the neuroradiology section two years ago, has facilitated work for the staff and provided safer treatment for patients. Dr. Shalabi notices a big difference between the older and the newer equipment.

"The newer equipment delivers images quicker with better quality," he remarked. "The techniques applied not only show how an organ looks, but also how parts of it are functioning, with respect to blood flow and metabolic activity. This is useful in, for instance, tumour diagnosis and neuro-intervention."

The neuro-angiography laboratory treats bleeding in the brain or spinal cord caused by aneurysm, or vascular malformation. The method used involves inserting catheters through the groin and further to the aneurysm, or vascular malformation, guided by imaging. Aneurysms are then closed using coiled platinum wires inserted through the catheter. This stops the blood flow and reduces the risk of re-bleeding. Injecting various types of adhesive via the catheters closes vascular malformations. The same equipment is also used for patients with acute stroke caused by thrombosis. With endovascular thrombectomy, the blood clot is pulled out through a catheter introduced via the groin. Successful results of such sophisticated and complex treatments are highly dependent on high quality angiography equipment, excellent image quality and appropriate post-processing of the images obtained. Neuro-intervention work also requires a rapid equipment response. The hemodynamics display of the Infinix-i Biplane has been significantly improved, facilitating both intervention and diagnosis.

"The time factor plays a very important role in our work," said Dr. Ljubisa Borota, Senior Physician responsible for interventions at the neuro-angiography lab. "Thanks to this system, and the image quality it provides, we can perform our interventions with the speed they require."

Sharper Image Quality

Since better images enable more definitive diagnoses, Dr. Borota cites good image quality, and the feature that sharpens the X-ray images, as key attributes of Toshiba Medical's Infinix-i Biplane.

Significantly Lowered Dosage

Thanks to the Infinix-i Biplane's better image quality, several series of images are no longer required. This significantly lowers radiation doses and also saves on contrast agents.

More User-Friendly

In addition, those who have worked with the equipment greatly appreciate its ability to video an intervention sequence.

Dr. Borota finds the system very easy to use, with logically designed menus and balanced mechanical and electronic control components. The new lab is characterized by modern solutions, such as adjustable lighting, ergonomic placement of shelves and medical equipment cabinets, and improved workspaces. Altogether, this has led to improved patient flow with shorter waiting times.

Dr. Elna-Marie Larsson, Professor of Neuroradiology, also praises the new lab and the opportunities that it offers:

"In Uppsala, we have very advanced equipment, highly competent personnel, and very skilled clinicians and researchers," she adds. "One must remember, however, that everything we do must ultimately benefit the patient. This is why integration and collaboration is so important. Vascular imaging is not just plumbing! We must always consider the end organ, which is the brain. The new angiography lab gives us very high-quality images, but we also have other methods for looking at blood vessels and vascular malformations. An optimal combination and utilization of our methods – neuro-angiography, MR, CT and PET – will also be optimal for the patient."

Improved Brain Vessel Imaging Creates Great Opportunities

To benefit cutting-edge research. Treatment as a matter of life and death. The tasks assigned to the new neuro-angiography lab in Uppsala are far from insignificant. Both clinicians and researchers have great expectations of the equipment and so far, they have not been disappointed.

With the Infinix-i Biplane in place, it is now possible to perform diagnoses and treatment with much greater precision than before. Senior Physician Dr. Borota is responsible for interventions at the neuro-angiography lab, where the work often, if not always, requires quick reactions.

"The time factor plays a very important role in our work, and thanks to the new system we can perform our interventions with the speed they require. For example, haemodynamics is presented much better than before, making it easier to both diagnose and carry out the actual intervention. Ultimately, this can mean the difference between life and death. For us, this is a new technology with many innovative solutions which promises evolution and improvement of the analysis of the blood flow, 3D reconstructions, and dynamic visualization of cerebral vascular structures. But despite its many new features, the system is intuitive and easy to use".

Dr. Borota is convinced that the sharp, high-quality images now produced result in more reliable diagnoses and treatment. The primary aim is to treat acute bleeding caused by ruptured aneurysm using a coiling methodology – thin platinum wires are inserted into the vascular bulge, thereby stopping the blood flow. This reduces the risk of re-rupture or prevents it completely. Patients with acute stroke may also benefit from the new equipment, as it allows for endovascular thrombectomy, by which the thrombus is pulled out through a catheter introduced through the groin.

"Our new angiographic apparatus has relatively low irradiation dose which is of paramount significance not only for patients but also for the staff with is daily exposure to radiation. The amount of contrast is also significantly lower than before. And thanks to the exceptional image quality, we do not need to run several series, which in itself results in significantly lower radiation dose and the use of less contrast agent."

According to Dr. Borota, other major advantages include better workspace and more rapid patient flow, resulting in shorter waiting times.

Dr. Borota and colleagues also have high expectations of what the new X-ray lab can lead to in terms of research. Elna-Marie Larsson is Professor of Neuroradiology, and although her focus is not primarily angiography, she looks forward to the new opportunities.

Uppsala occupies a leading position in both clinical work and research in the area of neuroscience, and the future looks bright. This is not least due to the fact that everyone strives towards the same goal, says Prof. Larsson. She particularly mentions the importance of two colleagues in making the operation work so well, namely Assistant Professor Johan Wikström, head of the Neuroradiology section, who has a special interest in neurovascular research, and Dr. Adel Shalabi, Head of Department, Centre for Medical Imaging.

"In Uppsala, we have very advanced equipment, highly competent personnel, and very skilled clinicians and researchers.

Media attended the opening of the new Infinix-i Biplane for neuro-angiography

"One must remember, however, that everything we do shall ultimately benefit the patient. This is why integration and collaboration is so important. Vascular X-ray is not just plumbing; we must always consider the end organ, which is the brain."

Senior Physician Ljubisa Borota and Elna-Marie Larsson, Professor of Neuroradiology

One must remember, however, that everything we do shall ultimately benefit the patient. This is why integration and collaboration is so important. Vascular is not just plumbing; we must always consider the end organ, which is the brain. The new angiography lab gives us very high quality images, but we also have other methods for looking at blood vessels and vascular malformations. An optimal combination and utilization of our methods – neuroangiography, MR, CT and PET – will also be optimal for the patient."

There are many examples of exciting research and clinical work where the new X-ray lab plays an important role, even across different disciplines.
Prof. Pär Gerwins area of research is vascular biology. He is also responsible for Sweden's only multi-disciplinary clinic, which receives patients with vascular anomalies from all over the country.

"Patients with vascular malformations are often misunderstood by conventional healthcare, not out of malice but simply because they are very rare. Our multi-disciplinary centre in Uppsala brings together a variety of specialties, such as ENT physicians, plastic surgeons, vascular surgeons, dermatologists and paediatric surgeons who, after conferring, make decisions concerning diagnosis and treatment. The new lab, with its high image quality and rotation abilities, is a very good supplement when it comes to treatment," says Prof. Pär Gerwins.

The treatment involves injecting substances that shrink the malformation. Especially when the defects are close to airways or large vessels, it is of utmost importance to ensure that the needle tip is correctly positioned. And by also running a 3D rotation afterwards, it is possible to determine how much of the deformity was actually reached.

It may also happen, however, that a vascular malformation is so badly located in the brain that it cannot be reached with catheter techniques. Uppsala has a unique opportunity to treat such cases with stereotactic proton radiotherapy. Here, the new neuro-angiography equipment can determine exactly where the abnormality is located. This information can be transferred to the proton beam device, thereby creating very exciting future opportunities in this area as well. //

Prof. Pär Gerwins area of research is vascular biology

Infinix-i Core +

A Flexible Solution to Meet the Needs of Today and Tomorrow

The Attikon University Hospital is a large tertiary hospital in Athens, Greece, associated with the University of Athens. Interventional Radiology is one area of special interest for the hospital, which has acquired an Infinix™-i Core + Interventional Radiology Suite from Toshiba Medical. Prof. Kelekis, Associate Professor of Interventional Radiology carries out clinical practice and research at the hospital. He explains how the system is ideal for a variety of non-vascular Interventional Radiology techniques.

Prof. Kelekis: "We use the Infinix-i Core + daily to perform numerous vascular and non-vascular minimally invasive techniques. I use the system for a variety of techniques in my work, which is largely focused on non-vascular Interventional Radiology, specifically interventions for pain management, spine and oncology."

Flexibility For a Wide Eange Of Interventional Radiology Techniques

"We perform spine- and peripheral skeleton augmentation (by means of cement injection, implants and combined hybrid techniques), neurolysis and denervation techniques, biopsies, infiltrations and intra-articular injections, percutaneous disc de-compression techniques, and tumor ablation procedures in MSK (including spine- and peripheral bones), as well as parenchymal organs," he said. "We also use the system for nephrostomies, bile duct interventions and cyst sclerotherapy."

Additionally, Prof. Kelekis also uses the Infinix-i Core + for planning and targeting non-vascular lesions with difficult radio-anatomy, to confirm needle positioning in a variety of MSK and other non-vascular interventions.

Fine Detail With Minimal Dose

What Prof. Kelekis values most about the Infinix-i Core + system is its ability to produce uniform images with significant noise reduction and the ability to optimize image display in order to visualize fine details with minimum dose.

"All these are prerequisites that augment efficacy and especially safety during cement injection," he remarked. "The multi-axis technology makes life much easier, especially in peripheral skeleton interventions during percutaneous screw- or implant placement and cement injection. The ability to perform parallel processing and to automate procedures reduces the session's duration. Last, but not least, the control of the radiation dose with the DoseRite software reduces radiation exposure to patients and especially to the staff who work every day in this environment."

Evolving Segment

Looking ahead at the evolution of the non-vascular Interventional Radiology segment in the future, Prof. Kelekis has clear ideas.

Infinix-i Core+

- Multi axis positioner
- Unique 270° C-Arm rotation including FPD synchronization
- Unique lateral C-arm movement
- Three possible detector sizes
- Unobstructed head-end access
- DoseRite: Better protection for patient and staff

Prof. Kelekis, Associate Professor of Interventional Radiology at the Attikon University Hospital in Athens, Greece.

"The use of 3D imaging and MPR, combined with fluoroscopy, facilitates the treatable cases."

Figure 1

Figure 2

"The use of 3D imaging and MPR, combined with fluoroscopy, facilitates the treatable cases in the angiography suite, as it allows for better spatial visualization," he said. "Cone Beam CT is an important tool that has changed the approach in a multitude of non-vascular interventions and will continue to revolutionize the imaging approach in IR. The use of 3D imaging for pre-planning, image fusion and post-imaging confirmation will create a whole new generation of software, able to integrate both the 3D and 2D-live capabilities of the system. In the future real 4D imaging (on the fly 3D acquisitions) will enhance surgical capabilities and number of percutaneous interventions. Real time 4D acquisitions will allow Minimal Interventional Surgeries to become true keyhole interventions."

Case

Case representing Microwave Ablation of a lytic breast metastasis of the femoral neck with multi-planar reconstruction (1), using Infinix-i Core + to verify optimal microwave placement, followed (2) by microneedle and cement augmentation using the Re-Bar technique for structural support.

René Degros
Business Unit Manager X-Ray Europe

VISIONS spoke with René Degros, Toshiba Medical's Business Unit Manager X-Ray Europe, about how its X-Ray offer provides solutions for current and future imaging needs through consistent ground-breaking innovations.

Revolutionize Intervention

Just over more than one hundred years since it first started research on X-ray tubes, Toshiba Medical is continuously discovering new possibilities in X-ray imaging that consolidate its value in diagnostic imaging and treatment. As the oldest medical imaging modality, X-ray has saved the lives of millions, enhanced medical knowledge and benefitted healthcare professionals all over the world.

Consistent development of unique, high value innovation has ensured that Toshiba Medical continues to retain market leadership in X-ray, as it has done already for many decades. Its offer expands to not only include X-ray systems and additional devices, but also tailor-made solutions for specific clinical situations. The product spectrum comprises a complete new range of powerful diagnostic systems and technologies, headed by the powerful and versatile Infinix-i Rite Edition. Toshiba Medical's continual R&D efforts in this modality have resulted in many market firsts.

"Toshiba Medical has always produced high quality X-ray solutions, but our innovation is being driven at an accelerated pace by the needs and demands of our customers, changes in healthcare, rapid development of new treatments, techniques and practices, as well as the continual growth of our expertise and knowledge," said René. "Currently, the greatest opportunities for further development of our X-ray offer are in interventional radiology - cardiology, oncology and hybrid procedures, although bucky- and remote multi-functional systems hold sustained clinical value. Alongside ongoing efforts to enhance image quality, we are focused on expanding the utility of X-ray systems, from diagnostics to treatment that plays a major role in the interventional environment, in response to advances in clinical practice. We are finding solutions for key clinical issues through brand new treatment-oriented options, further dose reduction, and fusion of modalities, as well as cost reduction."

Clinical freedom

Optimal patient access has become crucial. Increasingly complex procedures can increase the risk of emergencies and difficult interventions are now frequently performed under anesthesia. In addition, the use of hybrid procedures is growing with widespread introduction of new techniques. Unlimited patient access without angulation restrictions has become key in interventional imaging.

Clinical Freedom

Clinical staff can access the patient readily and comfortably. Flexible design, optimal angle, with focus on patient comfort.

"DTS enables us to measure in real time the skin dose of radiation that patients are exposed to for the first time in history."

"Toshiba Medical's Infinix™-i's C-arm has the highest flexibility on the market," confirmed René. "Its multi-access, floor- and ceiling mounted C-arm positioners give optimal patient access from all sides without moving the patient. This benefits patients' and healthcare professionals alike, and is well appreciated by our customers. It is valued across the entire interventional spectrum and easily supports the uptake of new techniques and procedures."

It facilitates, for example, the use of the 'radial approach', in which catheterization occurs through the radial artery, as opposed to the femoral artery. Many customers prefer this method. The superficial location of the radial artery allows easy access and significantly reduces the risk of bleeding and complications. Mechanical compression devices safely obtain hemostasis, and personnel use is minimized. Patients are ambulatory immediately after the procedure and the length of stay in hospital is significantly reduced. Compared to the femoral approach, there is substantial economic benefit because of reduced vascular complications and shorter hospital stay.

New trends in Interventional Oncology

Modality fusion providing image fusion of other modalities within the Infinix-i Rite Edition platform creates new opportunities to enhance Clinical Freedom. Toshiba Medical is developing several products that combine various modalities that not only offer new software, but also bring multi-modality function into the same room.

Image Quality

One of our basic principles is that what you see is all there is to make critical decisions easier and interventions safer with absolute accuracy.

Oncology is a key therapeutic area that continues to grow significantly. The World Health Organisation (WHO) reported that there are approximately 14 million new cancer cases globally each year. And the trend is only worsening. WHO predicts that the global burden of cancer will grow by 70 percent over the next two decades, with an estimated 22 million new cases and 13 million deaths due to cancer anticipated each year by 2032.

The healthcare industry is responding with growing reliance on increasingly sophisticated technologies and procedures in diagnosis and treatment. Targeted and personalized medicine is becoming widespread. For example, Transarterial Chemo Embolization (TACE) therapy, which involves administration of chemotherapy directly to the liver tumor via a catheter to 'kill' blood supply to tumor with the expectation of eventually, killing the tumor. With this technique, the chemotherapy targets the tumor, while sparing the patient many side effects of traditional chemotherapy that is administered to the whole body. An even newer technology developed to treat cancer is Selective Internal Radiation Therapy (SIRT) - a form of radiation therapy used in interventional radiology for selected patients with unresectable cancers (those that cannot be treated surgically), especially hepatic cell carcinoma or metastasis to the liver. The treatment involves injecting tiny microspheres of radioactive material into the arteries that supply the tumor to target it directly and reduce the impact of chemotherapy on surrounding healthy tissue.

"We have observed a double market trend in interventional oncology," René continued. "One part of the market is requesting clinical solutions that are based on a monoplane equipped with Cone Beam Computed Tomography (CBCT) functionality, enabling the customer to achieve CT-like imaging, while high profile facilities that perform more advanced and complex procedures prefer to have a real CT in the same examination room to avoid patient transfer and reduce patient risk.""We are extremely proud that we our approaching the market with two very high-end clinical solutions that satisfy both market trends," he continued.

Based on the CBCT approach, Toshiba Medical has just launched the Infinix-i Sky +. With 3D imaging anywhere, the Infinix-i Sky + combines a unique sliding double C-arm design to deliver unprecedented flexibility and quality. With an innovative C-arm flip and a high-speed 3D imaging from anywhere, head-end, left or right side at 80° per second, the system is ideal for advanced interventional radiology and interventional oncology procedures.

For high profile facilities that require a real premium Angio-CT concept, Toshiba Medical offers the Infinix-i 4D CT. This system seamlessly integrates the interventional lab, together with a Dynamic Volume CT (640 slice CT) that covers an entire organ in one rotation. This clinical concept allows clinicians to plan, treat and verify in a single setting during high-risk procedures without patient transfer.

Dose Reduction

While X-ray generally involves lower radiological dose compared to other modalities, the biggest focus in X-ray for interventional procedures remains, nevertheless, on dose reduction, not only for the benefit of patients, but increasingly for medical staff exposed to equipment daily and who spend day-in, day-out in a potentially-radiated environment. One of Toshiba Medical's latest innovations is Spot Fluoroscopy – a unique new feature that can reduce dose by up to 62%. Spot Fluoroscopy is based on unique Asymmetric Collimation that allows a free definition of any desired collimation based on Last Image Hold (LIH), superimposition of LIH information to keep anatomical or device relevant reference information visible during Fluoroscopy and novel Automatic Brightness Control (ABC) technique that avoids a dose increase regardless of collimation. Spot Fluoroscopy can be used for any anatomical area, and in any interventional discipline. The feature, which has been available for Toshiba Medical's Infinix-i systems since 2012, has been found to reduce dose by up to 62%2. A dose reduction of 45% was achieved using Spot Fluoroscopy to perform various neurointerventions on the Infinix VFi Biplane by Dr. Ljubisa Borota, MD, PhD at the Department of Neuroradiology, University Hospital of Uppsala, Sweden. Several high profile interventional doctors heralded Spot Fluoroscopy as the 'biggest innovation in the interventional world in the last ten years.'

Dose Reduction

Our innovative dose control tools enable clinicians to minimize radiation exposure to patients and staff, significantly, with one touch.

Dose Detection

Enhanced dose detection provides a key to managing procedures in the X-ray room to reduce dose further. The Dose Tracking System (DTS) is a unique new feature that enables the skin radiation dose of the patient under examination or treatment to be measured and monitored in real time. This is particularly important as the length of interventional procedures increases, particularly with adoption of advanced and more complex techniques.

"DTS enables us to measure in real time the skin dose of radiation that patients are exposed to for the first time in history," said René. "Acceptable thresholds of dose exposure are discussed and agreed with the hospital in advance. They are defined by customer and EU regulations. Once the system is set to these thresholds, it uses a color coding to indicate skin dose. Blue indicates minimal dose and then the scale increases from green, to yellow, to orange, to red, with red indicating a high and potentially problematic dose. A screen which is visible to all health professionals present displays the results clearly. The system creates enhanced awareness of in situ dose exposure and health professionals can then act to reduce skin dose to the patient. While they do not have to stop the procedure, they can change angulation or reduce frame rate for example. DTS doesn't directly reduce dose, but provides the information to then take appropriate action and to create awareness. The market has been eagerly anticipating this functionality for a long time."

As well as working in close collaboration with its customers, leading healthcare professionals and academic hospitals, Toshiba Medical also joins forces with other commercial companies to develop groundbreaking solutions for key market issues like dose reduction. For example, with Fluke Biomedical to offer a new dose monitoring and management tool for Infinix-i cardiovascular X-ray systems. RaySafe™ i2, a state-of-the-art, real-time, dose-monitoring solution developed by

Case study

We examined the dose reduction effects of Spot Fluoroscopy in atrial fibrillation ablation (Fig.1). The subjects were divided into a Spot Fluoroscopy group consisting of 10 cases and a non-Spot Fluoroscopy group consisting of 31 cases, and comparisons were made between the two groups for fluoroscopy time and dose area product. As a result, there were no significant differences observed in ablation fluoroscopy times for the left pulmonary vein, right pulmonary vein, or cavotricuspid isthmus between the Spot Fluoroscopy and non-Spot Fluoroscopy groups. On the other hand, dose area product significantly decreased to 181.4 cGy•cm² in the Spot Fluoroscopy group in contrast to 683.3 cGy•cm² in the non-Spot Fluoroscopy group during ablation of the left pulmonary vein (Fig.2). Dose area product also decreased significantly, from 414.6 cGy•cm2 to 92.15 cGy•cm² for the right pulmonary vein, and from 819.7 cGy•cm² to 211.2 cGy•cm² for the cavotricuspid isthmus. On the basis of these findings, Spot Fluoroscopy is considered to be extremely useful for reducing exposure with respect to atrial fibrillation ablation.

Figure 1: Spot fluoroscopy image in atrial fibrillation ablation.

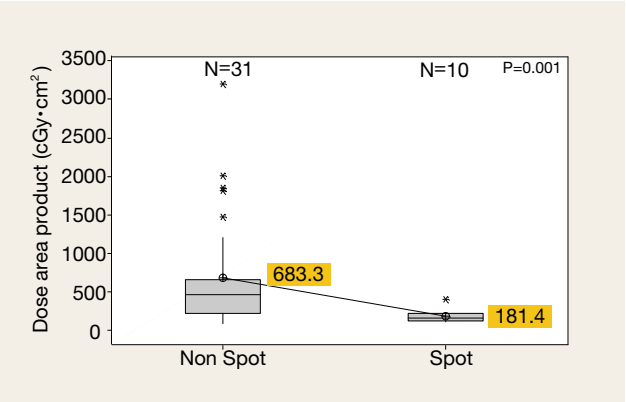


Figure 2: Comparison of Dose Area Products for Left Pulmonary Vein Ablation.

"We are proud to take X-Ray forward."

RaySafe, allows medical staff to monitor their exposure while in the X-ray room, thus helping to make examinations safer. With the system, each staff member is assigned a digital, real-time dosimeter, which is wirelessly connected to an in-room-mounted screen displaying radiation exposure. The dosimeters are small, unobtrusive badges that transfer received dose exposure for each individual. The RaySafe i2 system not only helps staff view radiation exposure level during procedures, but also archives dose exposure history for future analysis.

"Clinical staff safety is a top priority for us, and making the RaySafe i2 technology available on Infinix-i Rite Edition systems further expands our comprehensive set of dose management tools," said René. "With increasingly complex interventional procedures, the ability to accurately monitor radiation exposure in real time will enable hospitals to identify protocols and educate clinical staff members on ways to make procedures safer."

Strengthened team

Toshiba Medical's innovations are derived with input from its own experts, customers, medical professionals and commercial companies from all over the world. Over the past year, the X-ray Business Unit has undergone a radical redevelopment to reflect its alignment with tackling key healthcare issues.

"We developed a stronger and more focused strategy that prioritizes the wide reaching functionality of our products and services," remarked René. "It incorporates: Clinical Freedom, Optimized Workflow, Image Quality, Dose Reduction, Patient Safety, Connectivity, Clinical Applications, Service and Education. This not only helps focus our own development and promote understanding of the value and quality of Toshiba Medical's unique X-ray offer amongst customers, but helps focus the whole industry on addressing key healthcare challenges."

In addition to the existing high quality features and groundbreaking new functionality, which will be available on the Infinix platform shortly, the system itself has a new, contemporary design to accommodate the wide range of new features and improved ergonomics. And to implement its holistic approach to continual improvement and innovation, the Business Unit has not only expanded the size of its staff, but has reorganized the specialist talent to ensure that it 'speaks the language of its increasingly specialized customers' at every level.

"After one hundred years of dedicated focus on this modality, we are proud to take X-ray forward, extending its major and long-lasting contribution to saving lives and meeting the global healthcare challenges of the future." concluded René. //

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[2] *Spot Fluoro – A Novel Promising Approach to Reduce the Dose in Interventional Procedures – Dr. Ljubisa Borota[1], MD, PhD., Andreas Patz[2], Takuya Sakaguchi[3]. 1. Unit of Neurointervention, Center for Imaging, University Hospital, Uppsala, Sweden. 2. Toshiba Medical Systems Europe, Zoetermeer, The Netherlands. 3. Toshiba Medical Systems Corporation, Otawara, Japan.*

New Branding for Infinix-i Rite Edition Family

Toshiba Medical has recently introduced new and renamed legacy systems, so customers can easily identify the technology that matches their clinical and patient situation.** With head-to-toe and fingertip-to-fingertip coverage, a 270-degree C-arm pivot, as well as offering the ability to maintain a heads-up display during complex angles with synchronized rotating collimators and flat panel detectors,* the Infinix™-i line-up features the following systems:

Infinix-i *Core*

R C

Infinix-i *Core+*

R C

Infinix-i *Sky*

R C

Infinix-i *Sky+*

R

Infinix-i *Hybrid*

H

Infinix-i *Hybrid+*

H

Infinix-i *Dualplane*

H

Infinix-i *Biplane*

R C

Infinix-i *4D CT*

R Interventional Radiology

C Interventional Cardiology

H Hybrid OR

** Not including the Infinix-i Core system.*

*** The Infinix-i Core is the INFX-8000F (SP), the Infinix-i Core + is the INFX-8000V (SP), the Infinix-i Sky is the INFX-8000C with 830 c-arm, the Infinix-i Sky + is the INFX-8000C with 930A c-arm, the Infinix-i Dual-Plane is the INFX-8000F (DP), the Infinix-i Biplane is the INFX-8000V (BP).*

"Toshiba Medical has an XRVL legacy of helping clinicians provide the ultimate in patient access, care and safety," said René Degros, X-Ray Business Unit Manager, Toshiba Medical Europe. "We've been able to continue that legacy with the recent launch of the Infinix-i Sky +, which allows clinicians to move the C-arm around the patient, rather than the other way around." //

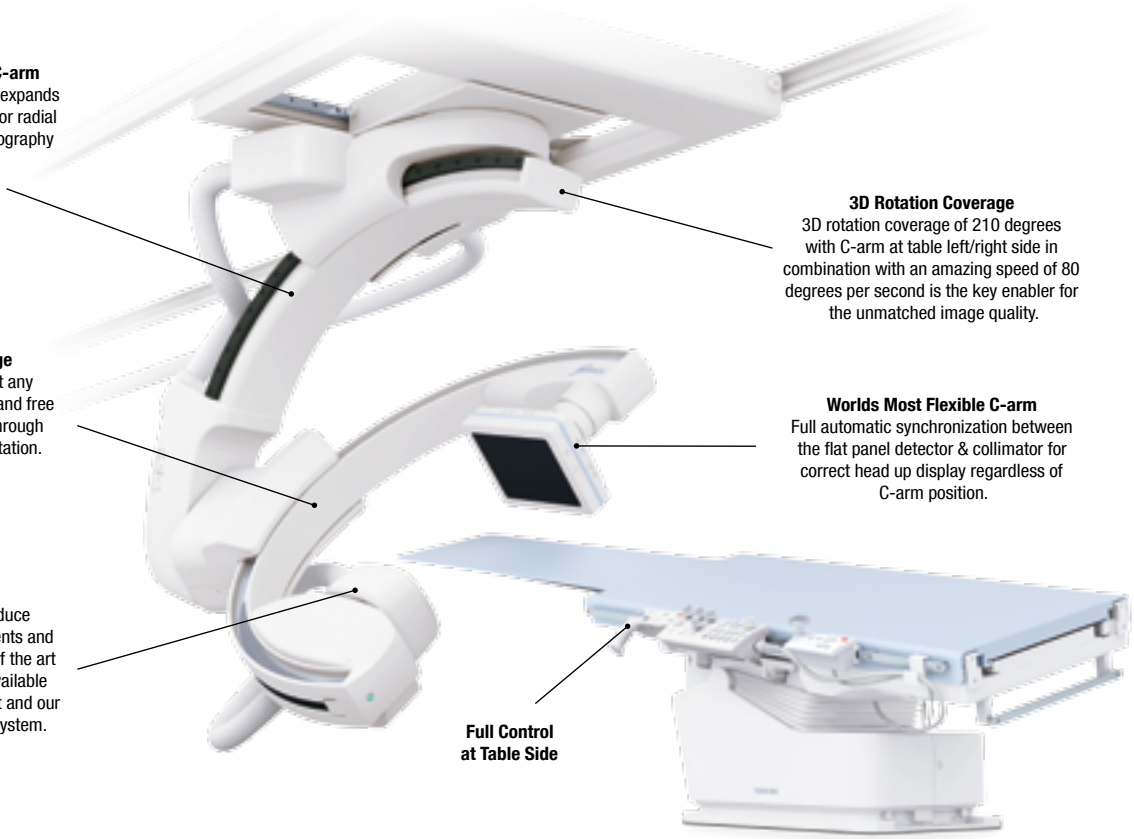
Infinix-i Sky +

Enjoy the Freedom to See More and Do More

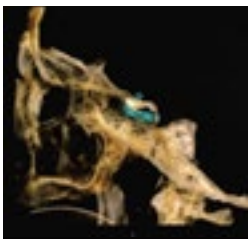
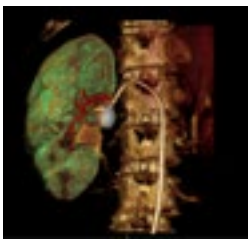
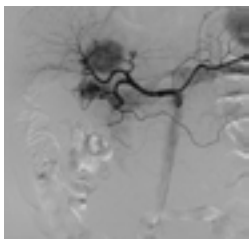
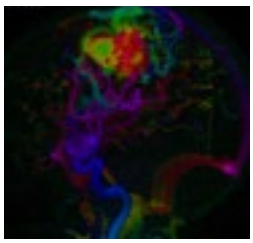
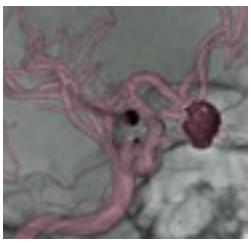
The world's fastest, most flexible angio suite

Providers of interventional imaging systems are being challenged to improve clinical outcome, patient comfort and dose efficiency while reducing cost of ownership and environmental impact. With its unique sliding dual C-arm Infinix™-i Sky + provides ultrafast whole body coverage, free head access and a unique lateral C-arm stroke for better ergonomics, improved productivity and stunning 3D images from head to toe.

With 270° isocentric rotation, Infinix-i Sky + provides unparalleled flexibility and patient access even for the most challenging procedures. Its dual C-arm design with 210° coverage and ultrafast rotation of 80°/s enables shorter breath hold times, reduced contrast medium and outstanding 3D imaging from head to toe without the need for moving the patient or the table. //



Infinix-i Sky+

Planning a Hybrid Lab

Whilst it may seem a simple task to combine an imaging suite with a surgical one, there are many challenges that have to be met to achieve an environment that works well for all.

Advanced technology is changing the way surgery is being performed, with minimally invasive techniques being applied to many areas. To undertake these complex procedures a new 'Hybrid' operating and imaging environment has been developed which combines a full operating theatre with high level surgical facilities and advanced imaging equipment.

There needs to be a great deal of thought given to whether it is even appropriate, so there should be detailed analysis of what procedures will be undertaken, in what numbers and by whom, to ensure that the maximum use will be made of such a major financial investment. In some cases it may be more appropriate and financially prudent to install separate facilities.

If the clinical and financial indications are positive, then all the stakeholders must be identified at a very early stage, their input sought and a room usage plan developed. These high technology rooms require too large an investment to be used on a part time basis, so care should be taken to maximise use.

Clinical indications for a hybrid lab

Cardiac

Initially developed for Paediatric Cardiology, use of hybrid labs has expanded into adult surgery with coronary revascularisation, trans catheter valve replacement (TAVI) and repair, left ventricular assist devices (LVAD's) and aortic stent placement ideally performed in such an environment.

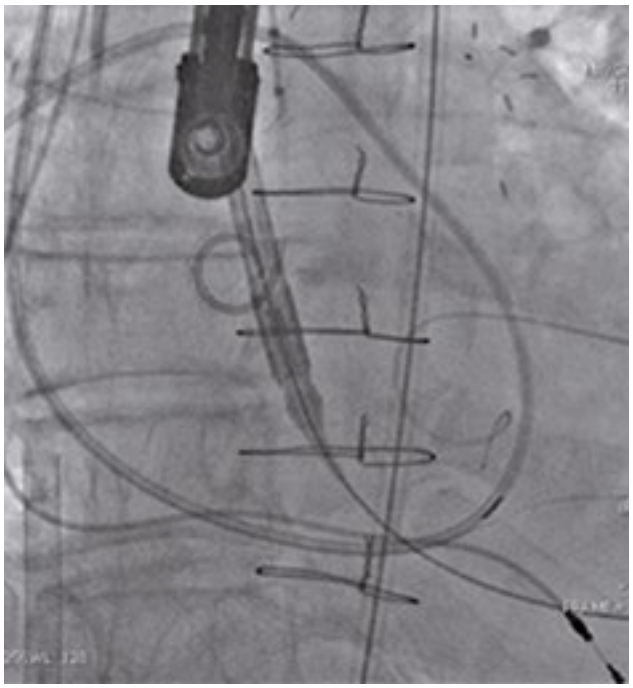


Figure 1: Tavi procedure picture

Figure 2: Evar procedure image

Tavi
Trans catheter replacement of aortic valves is still limited to patients at high risk during conventional surgical techniques. The European Societies of Cardiac Surgery and Cardiology have recommended the hybrid environment as the ideal for these new less invasive techniques.

Congenital heart disease
In certain groups of patients and conditions the combination of imaging and a percutaneous approach reduces the challenge of navigating complex anatomy, bypass time, overall risk and therefore improves outcomes.

Coronary artery disease
Primary diagnosis will always be via CT or a conventional Cath, but in cases of graft failures research suggests that 13-20% could be diagnosed and then immediately repaired, but currently the two procedures are generally regarded as separate options. A hybrid approach can decrease morbidity and mortality when compared with conventional surgery.

Endovascular aortic repair
Endovascular repair of the descending aorta (EVAR) is a well-established technique with a higher survival rate than open surgery, but only recently has the same technique been applied to the rest of the aorta. This is often combined with open surgery, a situation for which a hybrid lab is ideally suited and minimises risk for the patient.

Pacemaker and icd implantation
The hybrid lab offers better imaging and superior angulation than a mobile unit and higher infection control than a conventional lab, minimising risk.

EP
Theoretically the combined use of surgical epicardial and interventional endocardial approaches for atrial fibrillation can offer advantages over conventional EP treatment.

Non Cardiac
The last two decades have seen a paradigm shift in the treatment of vascular diseases, from traditional open surgical repairs (OSR) to percutaneous interventions. Neither the classic operating room nor the conventional angiography suite is optimal for both.

Thoracic aortic aneurysm
Diseases of the thoracic aorta are currently commonly being treated by transfemoral endovascular procedures, avoiding the inherent morbidity of other more invasive procedures and involving a considerably shorter recovery period.

Abdominal aortic aneurysm
When aortic repairs are combined with revascularisation or embolisation of other vessels the need for a combined imaging and surgical facility becomes essential.

Limb ischaemia
Endovascular treatment has also gaining in acceptance for the treatment of chronic limb ischemia. Many of these patients have multilevel disease so that iliac and femoral revascularisation is often needed, sometimes in conjunction with the popliteal segment.

Neuro-interventional
For Neuro-interventional procedures, a hybrid theatre can provide clinical benefits in stroke, aneurysm, trauma, paediatric and more complex cases. New procedures, such as endovascular neurosurgery, are evolving as the latest imaging equipment can provide advanced image guidance to allow more accurate positioning of Catheters, stents, coils and guide wires.

Planning a hybrid theatre

Addressing all clinical needs
For the successful development of a hybrid lab the roles of each of the stake holding groups need to be understood and taken into account. The key internal people who should be involved on hybrid suite planning committees include the surgeons and cardiologists

who will use the facility, the theatre and imaging lab staff, surgical nurses, IT staff, facilities/estates manager, infection control personnel, hospital engineers and directorate management. External stakeholders are major equipment manufacturers, the architect, M and E consultants, structural engineers, electricians and IT.

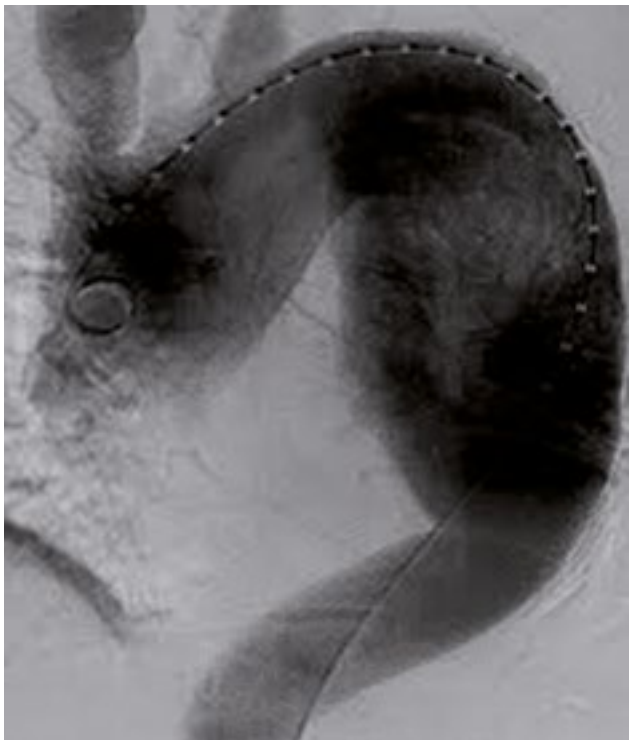


Figure 3: Aortic aneurysm repair

Location, location, location
It is generally simpler to put a hybrid room close to or in an Operating Theatre environment as the infrastructure to support its use is close at hand, rather than try and reproduce a full surgical environment in an open department. In a theatre, positive pressure ventilation, sterilisation equipment, scrubs, etc., are all available so do not need to be duplicated.

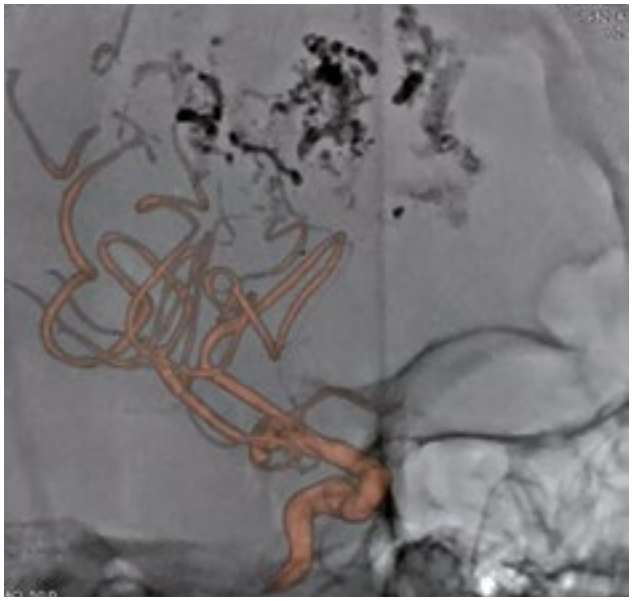


Figure 4: Avm embolisation image

Size does matter
A hybrid lab needs to be substantially larger than either a conventional surgical theatre or an interventional imaging room as, unlike an imaging only room, there needs to be space to park the imaging equipment out of the way of the surgical area.

Physical room considerations
Interventional imaging equipment may suspended from the ceiling, located on the floor, or both, so the floor and ceiling strength needs to be determined, before a choice of equipment is made. Ceiling mounted systems require a minimum and maximum height for installation which may be difficult to achieve in an existing space.

Ancillary rooms
These should include patient preparation and recovery areas, clean and dirty utility, staff areas and offices. If the Hybrid room is located in the same area as other operating theatres, this will allow sharing of some of these facilities, reducing cost and increasing usage rates.

Construction access
Typically the imaging equipment in a hybrid room is delivered in one or two very large pieces which require a delivery route with minimum door and ceiling heights and widths, which should be taken into account when looking at potential locations.

In-room planning

Radiation protection
A radiation protection advisor should be consulted when planning the layout of the area so that they can advise on the level of protection required, which may include lead shielding of wall/doors, radiation warning lights and local rules.

When selecting the imaging equipment for the room, input should be sought from radiology or cardiology staff to look at clinical examination dose levels v image quality and potential dose saving features of each system.

Lighting
There are many different types of lighting that need to be planned in this type of suite – general/ambient, general surgical and procedure specific. The various users of the room should suggest the lighting they need and the project manager and building works contractor will plan a scheme in conjunction with specialists if needed.

Anaesthetic considerations
In an ideal situation the positioning and type of these facilities would suit every surgeon's/anaesthetist's preference and procedure type, but this is rarely possible. Ceiling mounted units will provide the maximum flexibility whilst keeping the floor clear of obstructions, facilitating high levels of infection control and the best access to the patient.

Air conditioning
Full compliance with current codes of practice and guidelines for a surgical theatre will be required. Imaging equipment has an temperature range for optimum reliability and image quality and its heat output and that of other equipment in the room will need to be included in all air conditioning calculations. Specific surgical procedures may also require specialist environmental conditions and these should be taken into account.

It considerations
Hybrid surgical suites are often one of the most technologically advanced rooms in a hospital, so the suite will require multiple network points to access patient records, previous studies and other data, which may also require additional display monitors. External AV conferencing is also frequently required which will need to be planned for – microphone and camera positions, network points, bandwidth etc. all have to be part of the suite specification.

Infection control
It is important that the site's IC department is consulted at an early stage to ensure that their recommendations are incorporated into the design of the suite and possibly the choice of equipment within the lab.

Storage/catheters
Opinion on storage for Catheters, devices, consumables and other theatre items varies widely and will largely depend on local opinion and the predominant use of the room. For imaging there may be a need to store Catheters within the room and appropriate cabinets will need to be installed to comply with local infection controls regulations. If space permits it may be better to have a storage area adjacent to and accessible from the theatre itself.

Additional equipment

Specialized Equipment
The list of additional equipment that may be used in this type of environment is almost infinite and will change over time as new procedures are developed.

C-Arm
For the successful implementation of a hybrid suite the choice of imaging equipment is of vital importance. Increasingly complex procedures require high quality imaging with a choice of acquisition and display modes such as rotational and 3D angiography, CT like images and stent enhancement as well as integration with other diagnostic and treatment technologies. The first choice to be made is between a mobile C-arm and a fixed system.

Mobile systems
This type of C-arm is in common use in Theatres and is used for many surgical applications. However the power output and image quality are insufficient to show the fine vessels and guide wires that are used in hybrid procedures.

Fixed systems
A fixed system has the ability to move quickly and easily to a park position and offers flexibility in positioning, without compromising clinical working. Lateral movement is desirable to allow easy access to both sides of the patient with minimal table movement. The size of the flat panel detector (FPD) and its housing should also to be considered, as there is wide variance which will impact positioning and dose levels.

Mono or biplane system
Any hybrid suite is a very crowded area and a biplane system makes use of the theatre more complex, with reduced patient access. Single plane systems are generally the system of choice for most vascular, cardiac, GI and orthopaedic suites. A biplane system may be considered for dedicated neuroradiology, paediatric cardiology

Procedure Mix Equipment Recommendations

Procedure	Table Type
Majority Endovascular	Hybrid Cath Table/ Tilting Angio Table/ Conventional Angio Table
Primary Pediatric Endovascular	
Primary Neuro Endovascular	
Primary Adult Endovascular Greater than 70%	
Wide Mix of Endovascular, Open Vascular, General Surgeries	Hybrid Cath Table/Conventional OR Table with Vascular and Universal Tabletops
Majority Open Surgical	Conventional OR Table with Vascular and Universal Tabletops

Figure 5: Operation view (tumour arrowed)

or electrophysiology hybrid theatres, but the actual use should be clarified with all stakeholders to ensure that the need for Biplane imaging outweighs the drawbacks of the room complexity.

Floor or ceiling mount

Ceiling mounted systems generally have a greater range of movement, take up no floor space and are easier to park away from the operating table. Floor-mounted systems have no overhead cabling or ceiling tracks above the operative field, reducing the infection control burden. Reconciling these two aspects is an individual choice, but the majority of hospitals decide on ceiling mount as they provide best access to the patient without the need to move the table and the most flexible use of the theatre.

Table

The challenge in selecting a table for a hybrid theatre is the compromise between imaging and surgical needs. Surgery needs a breakable table that can be customised with different tops and accessories to cater for the varying types of procedures that will be undertaken, but imaging requires a radiolucent floating table top which is not available with surgical tables. For 3D and CT like imaging the table needs to be integrated into the imaging system and so the choice of tables is normally limited to the one that is standard on the system and one or two theatre type tables.

Summary

Implementation of a hybrid surgical/imaging suite is a complex process involving many different clinical and non-clinical disciplines with different requirements and priorities. Keys to a successful and economically viable outcome are consultation, accurate understanding of the purpose of the suite and detailed planning. //

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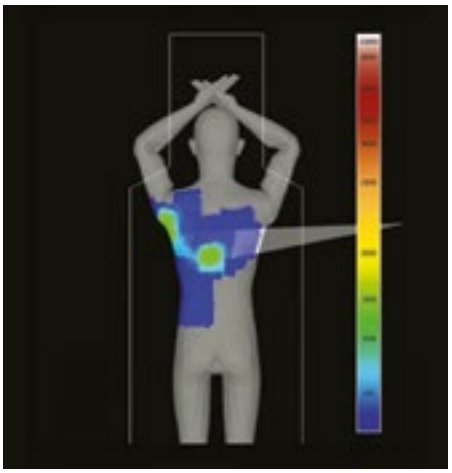

Skin dose is shown in real-time on an easy to understand colour map.

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Real-Time Skin Dose Radiation Monitoring during Interventions

Dr. James Weaver, Mr. Glenn Ison

The collective dose of radiation used in medical investigations and procedures has increased by greater than 700% between 1980 and 2006[1]. Consequently the use of ionizing radiation has developed into an important, yet potentially avoidable, public health threat[2] that deserves considerable attention. This is particularly the case in adult cardiology patients where coronary angiography represents 12% of all radiological procedures but contributes a disproportionate ≈ 48% of their total collective dose[3]. Therefore, coronary angiography and intervention is becoming an increasingly important lifetime source of radiation exposure for patients[4]. Radiation exposure is also an important issue for the proceduralist with an interventional cardiologist exposed to 2-3 times higher radiation per year than that of a radiologist[5,6].

Exposure to ionizing radiation during diagnostic procedures can have dose-related deterministic (eg. cataracts and skin damage) as well as stochastic effects (eg. malignancy)[7,8]. It is currently agreed, based upon the "linear-no threshold" model, that no safe dose of radiation exists[5]. Therefore it is generally accepted that all efforts should be made to minimize radiation dose to the patient and staff[9]. During coronary angiography there are a number of well-recognized approaches to reduce patient and operator radiation dose. It has been demonstrated that adequate radiation protection training and diligent adherence to these radiation minimization techniques can reduce dose by up to 90%[6]. These techniques include low fluoroscopy frame rates, minimize fluoroscopy time, low image magnification, minimize distance between the patient and image detector, collimation and realtime digital fluoroscopy recording[10,11]. Also important is minimizing operator dose by utilizing all available above and below table shielding in conjunction with wearing personal protective equipment such as aprons, lead eyewear and thyroid collars[10].

Until recently there has been no visual cue notifying the operator of a radiation dose that places the patient at risk of deterministic skin effects. We recently assessed the utility of the Dose Tracking System (DTS) (Toshiba Medical, Otawara-shi, Tochigi-ken, Japan) for reduction in patient peak skin and total dose during coronary angiography[12].

The DTS provides a real-time pictorial displayed adjacent to the image, be it DSA, DA, one Shots, 3D or in this case fluoroscopy [Figure 1].

Figure 1: Real-Time peak skin dose monitoring system. The Dose Tracking System (DTS) displays a Real-Time pictorial and numerical value for cumulative and peak skin dose. The fully integrated system is situated adjacent to the fluoroscopy image and hemodynamic monitoring. Reprinted from EuroIntervention 12 / 8, Wilson S.M. et al. Real-time Colour Pictorial Radiation Monitoring during Coronary Angiography: Effect on Patient Peak Skin and Total Dose during Coronary Angiography. e939-e947, 2016 with permission from Europa Digital and Publishing.

The display comprises a colour-coded representation of the cumulative skin dose distribution on a patient graphic as well as the real-time peak skin dose and cumulative skin dose values at the current real-time beam projection. The colour pictorial changes to yellow when peak skin dose reaches 2000mGy and then red when greater than 3000mGy. The DTS calculates the skin dose values using a complex algorithm derived from patient BMI, X-ray tube output, entrance dose and beam angulation.

Systems that provide real-time graphic feedback are designed to prompt alterations in operator behavior and therefore reduce radiation dose. This, and similar real-time systems,[13] make it possible for reactive dose reduction changes to occur during the procedure. It is hypothesized that awareness of the peak skin dose prompts working in a different view to avoid an overlapping field of view. When the new position involves less detector angulation there is likely to be less output from the tube therefore reducing dose area product (DAP) and air kerma.

Study Design

In this study 1011 consecutive patients were prospectively enrolled at a single centre during coronary angiography and/or percutaneous coronary intervention (PCI). Patients were excluded if they underwent structural heart disease interventions, pacemaker implantation or electrophysiology studies. All patients underwent angiography in a Toshiba Medical Infinix™-i angiography suite fitted with the DTS. The study design was a before - after nonrandomized series. The DTS was recording information on all patients enrolled in the study.

Two patient groups were evaluated sequentially for comparison. The control group represented standard clinical practice where the DTS was recording all the procedural variables (including peak skin dose) without the DTS pictorial feedback displayed for the operator. After the requisite sample size in the control group was obtained, a second group, the 'DTS group', was studied with the DTS pictorial feedback displayed for the operator. Coronary angiography and intervention was performed at the discretion of the operator.

The primary endpoint of the study was the peak skin dose, defined as the highest dose at any portion of the patients skin as defined by the DTS. Secondary endpoints were measurements of total dose; reference point air kerma, cumulative dose area product (DAP) and fluoroscopy time. Significant radiation dose level, above which there may be a risk of deterministic complications such as skin injury, was defined as peak skin dose >3000 mGy[4].

Results

From August 2013 to June 2014 a total of 16 operators performed 1077 consecutive procedures on 1011 patients. There were 488 procedures in the control group (45%) and 589 procedures in the DTS group (55%). Of the 1077 procedures, 617 were diagnostic coronary angiography and 460 were coronary angiography and PCI or FFR. Procedures were performed via radial access in 37.6% with the remainder of the procedures performed via femoral access.

When accounting for confounding variables, the use of the DTS significantly reduced mean peak skin dose by 22% ($p < 0.001$) across the entire cohort. There was also a significant reduction in measures of total dose with reference air kerma reduced by 20% ($p < 0.001$), and DAP reduced by 17% ($p < 0.001$).

The most profound effect due to implementation of the DTS was seen in patients undergoing PCI where the peak skin dose was reduced by 46.3% [Figure 2]. Impressive reductions in other measures of radiation dose were seen in the PCI cohort; fluoroscopy time fell by 14% ($p = 0.028$), DAP fell by 35% ($p < 0.001$) and reference air kerma by 41% ($p = 0.004$).

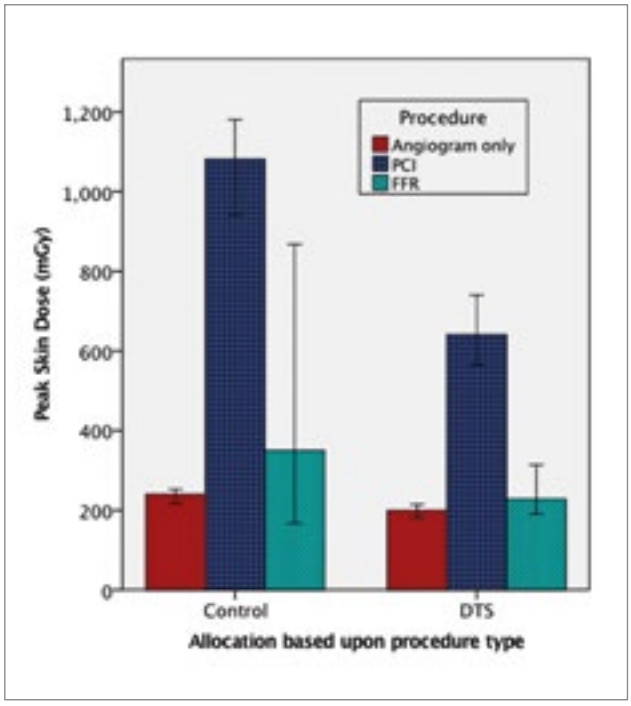

Figure 2: Reduction in peak skin dose due to DTS introduction based upon procedure type. The DTS resulted in an improvement in peak skin dose in patients having both coronary angiography only and percutaneous coronary intervention. Bars represent median and error bars 95% confidence interval. Reprinted from EuroIntervention 12 / 8, Wilson S.M. et al. Real-time Colour Pictorial Radiation Monitoring during Coronary Angiography: Effect on Patient Peak Skin and Total Dose during Coronary Angiography. e939-e947, 2016 with permission from Europa Digital and Publishing.

Lower peak skin dose was consistent across subgroups including radial access procedures ($p < 0.003$), patients with prior bypass surgery ($p < 0.001$) and procedures in patients with a high BMI ($p < 0.001$). Use of the DTS reduced the number of patients identified at high risk of skin damage based upon peak skin dose definition of >3000mGy (control 2.7% vs. DTS 0.7%).

Significance and future directions:

Based on our findings it is proposed that the DTS technology may reduce the incidence of deterministic radiation effects and it supports its more widespread use in the setting of invasive cardiac investigation. The effect of the DTS was not only evident on skin dose but also measures of total radiation dose.

An explanation for these findings was outlined by Dr Ariel Roguin in an editorial by stating "Seeing radiation is believing, causing our work habits to change"[14] Furthermore, it has been recommended that patients receiving substantial exposures during cardiac procedures be counseled before discharge and the appropriate arrangements be made for follow-up and monitoring[15]. Ideally, the institution of the DTS would be accompanied by education on safe dose thresholds, techniques to reduce overall exposure and quantitative scatter plots representing operator exposure.

The complete system of radiation safety in the cardiac catheterization laboratory may include not only the DTS but also real-time monitoring of all health care workers scatter dose.

Conclusion

In this large single center study, it has been demonstrated that the DTS is simple to use and results in substantial reductions in important radiation parameters during invasive coronary procedures.

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Dr. Martin Fähndrich
Head of interventional endoscopy

We Benefit from the High Resolution and from the Many Opportunities to Reduce Radiation

Consultant Dr. Martin Fähndrich is the doctor in charge of interventional endoscopy at the largest hospital in the German state of North Rhine-Westphalia. Around 8,000 endoscopies are carried out in his department each year. Toshiba Medical's Ultimax™-i is used predominantly when additional imaging information is required, alongside the endoscopic image. One further advantage is that several planes can be superimposed using the multifunctional X-ray system. This means that changes in the bile ducts, for instance, can be visualised with more complexity and are therefore treated endoscopically better and more quickly than before.

What is your clinical daily routine like and which patients do you treat?

Interventional endoscopy represents a key focus of my activity. Thanks to the development of new technologies and processes, endoscopy has become increasingly important in recent years in the treatment of diseases that were previously treated with surgery. The minimally invasive procedure in particular is very popular with patients due to the low degree of trauma, and is therefore viewed very positively. But it is not just in primary treatment that our services are required; other key aspects are perioperative investigations and postoperative management of complications, such as in the treatment of insufficiencies and fistulas, for example.

Which particular examinations do you carry out in the Gastroenterology Department using Toshiba Medical's Ultimax-i?

We generally use fluoroscopy when additional imaging information is required, alongside the endoscopic image. This can be necessary in the event of dilatations, stenting or treatment of fistulas, and can go as far as complex necrosectomies or cholangioscopies, whereby the most common examination is still the conventional therapeutic endoscopic retrograde cholangiopancreatography (ERCP). However, we also perform percutaneous procedures such as portal venous pressure measurements, transjugular liver biopsies or percutaneous transhepatic cholangiography drainages (PTCD).

"We benefit not only from the high resolution and excellent imaging quality, but also from the many technical opportunities and settings to reduce radiation. Because of this, we can work with as little radiation as possible, and still obtain good images."

Despite the availability of alternative procedures, these are still required in certain cases. Because of advancements in the fluoroscopy equipment used in endoscopy, we are able to exploit the advantages of fluoroscopy in a very flexible manner, in accordance with the indications and particular situation at hand.

You have been working with the Ultimax-i in your department for approximately one year. In your opinion, what are the particular strengths of this multifunctional X-ray system?
The angiography option is a major advantage for us. As gastroenterologists, we certainly do not take it for granted that we will be able to work with systems that offer multiple planes. We benefit not only from the high resolution and excellent imaging quality, but also from the many technical opportunities and settings to reduce radiation. Because of this, we can work with as little radiation as possible, and still obtain good images. Flexibility and good access to the patient are of fundamental importance for our procedures. The table and pipes in the Ultimax-i can be moved in all directions and positioned well.

What has actually changed in your job since you started using the Ultimax-i? Can you now offer different examinations compared to before?
Previously, we only used one undertable device and could not superimpose multiple planes. Now, we can visualise bile duct changes, for instance, with more complexity in multiple planes, and we can also treat these endoscopically better and more quickly. Thanks to this new system, the quality of our examinations has improved. But we don't offer a different range of examinations through this.

Are you satisfied with the quality of the images and has the system fulfilled your expectations on the whole?
The fluoroscopic images are very good. The settings of the Ultimax-i can be adjusted to the specific needs of the situation. We are also very pleased with the high spatial resolution. Thanks to the numerous possibilities for customised adjustment and image processing, we can achieve an optimal level of flexibility and as I mentioned before, above all, we can work with very little radiation.

Gastroenterology at Klinikum Dortmund:

- *Klinikum Dortmund is the largest hospital in the German state of North Rhine-Westphalia. Every year, more than 245,000 patients (65,000 inpatients, 180,000 outpatients) from the region and surrounding federal territory are treated there.*

- *The hospital, which provides the highest level of medical care, has 1,422 beds. Around 4,000 employees (including 565 doctors and 1,290 nursing staff) look after the patients.*

- *The focus of the Medical Clinic in the Department of Gastroenterology lies on the investigation and treatment of gastrointestinal and hepatobiliary tumours, pre-cancerous diseases and non-cancerous diseases such as gastrointestinal bleeding, acute and chronic pancreatitis, viral, toxic and immunological liver inflammations, liver cirrhosis, biliary tract diseases, bile duct stones, chronic inflammatory bowel diseases and diverticulitis.*

Ultimax-i

Salford Royal Hospital: High Profile Neuro-Interventional Site

Salford Royal NHS Foundation Trust purchased two Toshiba Medical Infinix™-i neuro-interventional Labs, a biplane system and a mono plane system. The Trust's existing systems were over ten years old and it was therefore looking to replace both its bi-plane system, which is almost exclusively utilised for complex neuro interventional cases and the single plane system that was used as a neuro back up and for other general interventional procedures. After a lengthy evaluation process Toshiba Medical was chosen to supply the replacement equipment.

As part of a collaborative agreement, the hospital clinicians are working in partnership with an international team from Toshiba Medical Europe, Japan and the UK, to test new applications and software, specific to the specialised work undertaken at Salford. This arrangement is proving beneficial to both the hospital's neuro radiologists, as well as an invaluable opportunity for Toshiba Medical to work closely with its customers to push product development to meet clinical needs.

With regard to the choice of Toshiba Medical, Dee Patel, Superintendent Radiographer explains, "We looked at all available systems that met our specifications and requirements, and the first thing that impressed us about the Toshiba Medical equipment was the versatility of the multi-axis positioning capability of the C-arm on the Infinix-i system. We have found the unique lateral and vertical movements of the lateral arm on the biplane system to be extremely useful in neuro applications. In addition, our neuro-interventionalists were impressed with the tableside controls, which give them access to the whole imaging system without leaving the patient. "

The Infinix-i Biplane system has what is regarded as one of the most flexible C-arm designs currently on the market, with even the floor-mounted mono plane system being able to achieve fingertip to fingertip coverage of the whole patient without moving the table. This coupled with the unique lateral plane reversibility and height adjustment, means that every patient can be positioned to allow the clinician the best possible access and flexibility. At the same time, unencumbered access to the patient can be maintained for anaesthesia and other support staff, and also ensuring that staff and patients benefit from the dose reduction possible with better positioning.

Dee Patel continues, "Our radiographers are pleased with the user-friendly windows-based interface and find it easy to use. C-arm and tube positioning are easily controlled with the Hyper Handle tableside and the satellite console."

The Infinix-i systems at Salford are equipped with Toshiba Medical's latest 'Spot Fluoroscopy' technology, physicians can use this asymmetrical off-centre collimation technique to the focus on the region of interest whilst maintaining a last image hold of the surrounding area. The use of Spot Fluoroscopy significantly reduces the amount of radiation used, improves image quality and enables the user to focus on a specific area within the field-of-view without having to move the table. The reduction in patient and operator dose is a huge benefit, in addition there is a significant risk reduction in complex procedures from vascular trauma due to inadvertent movement of the devices and catheters in keeping the table still during the procedure. Both systems also utilise Toshiba Medical's unique real-time Dose Tracking System (DTS). This unique feature provides real-time feedback on patient skin dose distribution to the clinical team, allowing them to make informed clinical decisions that benefit the patient at the tableside. As this information can be stored with the patient images, it also allows the clinical team to plan the best approach for those patients that are undergoing multiple, long and very complex procedures, to minimise the risk of any possible side effects.

Shown here left to right, Marc Ivison, Senior Service Engineer X-Ray, Toshiba Medical; Dr. Hannah Stockley, Consultant Interventional Neuroradiologist; Dhiren Patel, Superintendent Radiographer; Graham King, Account Manager CT/MR/X-Ray Toshiba Medical; Rory Dedman, Senior Neuroradiographer and Matthew Solomon, Head of Technical Support Group, Toshiba Medical.

Commenting on DTS, Dee Patel adds, "The real-time graphic patient dose information is very useful during procedures as adjustments can be made in tube positioning during a procedure to minimise skin dose to any one area."

The mono plane system at Salford offers imaging facilities for a range of other interventional specialties including renal-vascular, urology, GI, spinal and MSK. It has all the technological, and design capabilities of the biplane system, which provides the added flexibility of being able to use it as a backup for neuro as and when demand dictates.

From the outset, Toshiba Medical was very keen to assist the Trust in the design of the purpose-built interventional suites, the result being an excellent work space with good patient flow. Dee Patel says, "Technical support has been excellent and service responses very fast. From the start, Toshiba Medical applications specialists were on site, or at the end of the phone, to help us to set up our systems just as we wanted them. Adjustments could be made mid-procedure to aid our interventionalists to the end point."

Salford Royal NHS Foundation Trust is home to the Greater Manchester Neuroscience Centre, offering neurosurgery and interventional neuro radiology to a population of 3.5 million people. It performs around 250 interventional cases and 350

diagnostic cases on the biplane system, with a six-day service. It is also a comprehensive stroke centre for Greater Manchester, offering endovascular intervention to stroke patients. Salford Royal is also part of the Major Trauma Network, offering 24 hour emergency vascular intervention to patients from all over the Northwest. //

Hospital of Castelló: second system for its Interventional Radiology Section

The General University Hospital of Castelló (HUGCS) in Spain, is a mid-size hospital with 574 beds that has all medical and surgical specialties available in public health.

The service develops interventional radiology techniques since 1991. However, the specific treatment of vascular pathology joins its portfolio of services from 1997. In that year, they opened a section of Vascular and Interventional Radiology.

Approximately 200 techniques of interventional radiology, that are currently practiced in this unit, include the treatment of pathologies of the spine such as herniated discs, varicose veins, kidneys, tumors through thermoablation and chemoembolization, revascularization in diabetic foot, obstructions and aneurysms of the aorta and peripheral arterial obstructions and venous thrombosis, as well as bleeding of thorax and abdomen.

The multifunctional "Ultimax™-i" system was chosen considering its capability to perform a wide variety of procedures with high quality standards. Once the system was installed, it was stated that "this new equipment will allow us to continue to make the same interventions than to date, but with more guarantees for patients and professionals, since it has better images and it also allows patients to receive a lower dose of radiation". //

Spire Liverpool Hospital looks forward to offering an expanded service with Toshiba Medical's Ultimax-i X-ray fluoroscopy system

Spire Liverpool Hospital recently replaced its existing X-ray equipment with a Toshiba Medical Ultimax™-i X-ray fluoroscopy system. The new system has enabled the hospital to broaden the scope of examinations it offers and increase efficiency, whilst providing a higher degree of patient comfort than ever before.

Anne Marsh, Diagnostic Imaging Manager comments, "We selected the Ultimax-i because it is a C-arm system with an optional overhead x-ray tube and erect bucky. This gives us more functionality in a general room and allows us to expand our services to include such procedures as spinal injections as well as all the usual fluoroscopic procedures. We have noticed a faster throughput and improved image quality with the new equipment. The Toshiba Medical support was excellent. The project went very smoothly and the staff were extremely helpful throughout."

The Ultimax-i is flexible and versatile, capable of performing multi- purpose imaging with a large image field of view and excellent image quality. Its innovative design with a multi-directional interactive digital C-arm facilitates all gastrointestinal studies, interventional radiology and angiographic procedures with anatomical coverage from head to toe and shoulder to shoulder on even the tallest patients.

Following initial positioning of the patient, the Ultimax-i can be moved in any orientation required. The system has integrated anti-collision technology to protect the patient at all times and a comprehensive dose reduction programme that ensures maximum diagnostic information at the lowest possible dose. //

Shown here, left to right, standing, Graham King, Account Executive CT/MR/X-Ray, Johanna Cotton, X-Ray Sales Specialist, both of Toshiba Medical; Fergus Macpherson, Hospital Director; Nik Codd, Project Manager, Toshiba Medical and Anne Marsh, Diagnostic Imaging Manager. Seated in front, left to right, Alun Evans-Thomlinson, Radiology Team Leader; Maria Punay, Radiographer and Nicola Glover, Assistant Practitioner.

The Royal National Orthopaedic Hospital Acquires A Toshiba Medical Ultimax-i Multi-Purpose Fluoroscopy System

The Royal National Orthopaedic Hospital (RNOH) in Stanmore recently acquired a Toshiba Medical Ultimax™-i X-ray fluoroscopy system. The new equipment, with its innovative design, provides a multi-directional interactive digital C-arm system, which makes it an ideal solution for all patients. It brings all the benefits of flat panel detector technology together with a comprehensive dose reduction programme. Effective dose management is available with a variety of fingertip controls, with three dose modes capable of reducing dose by up to sixty percent and three filters reducing hard and soft X-ray exposure.

The RNOH as a dedicated orthopaedic hospital will be performing exams mainly associated with orthopaedic injury and pathology. Antony Turner, Imaging Services Manager, says, "We chose Toshiba Medical for the RNOH because it ticked all our boxes. The equipment is easy to use, so training was easy to implement with our radiology and urology staff. The table height goes really low, which is a huge advantage for the types of patients we see on a regular basis. We were very impressed with the enabling works and applications specialist support. The image quality is excellent and feedback from both radiographers and radiologists is very positive. I am really pleased we went with Toshiba."

With the Ultimax-i the RNOH has acquired a versatile, flexible system, designed to satisfy a wide range of clinical imaging and interventional needs. In fact the Ultimax-i offers 'three systems in one', with angiography, radiography/fluoroscopy and direct radiography all in the one unit. The C-arm system with a digital X-ray table is provided with remote and local operation, with rapid table and C-arm motion allowing virtually any position and projection whilst capturing high-resolution clinical images.

The tabletop may be lowered to only 52 cm above the floor, this height being ideal to meet the requirements of patients in wheelchairs, significantly reducing the burden on operators and assistants during patient transfer. Once the patient is initially positioned on the table, the quiet, smooth operation of the table-tilt can perform subsequent positioning without additional patient manipulation. In addition, the anatomical coverage from head to toe is in excess of two metres, taking into account the scanning range of 163 cm and the size of the 43 x 43 cm detector. //

Shown here, left to right: Gordon Stewart and Anna Drozdz, Radiographers; Edmond Kinene, Superintendent Radiographer; Jenny Armstrong, Radiographer; Nina Ghodrati, Superintendent Radiographer; Ella Mukherjee, Senior Radiographer; Sujatha Herath, Radiographer; Chi Burt, Account Manager and Dan Parr, Applications Specialist, both of Toshiba Medical, with Antony Turner, Imaging Services Manager.

New neuro reference site in Germany

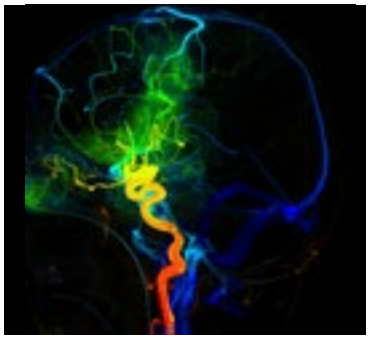
Toshiba Medical Germany was very successful in a big Neuro project in Gemeinschaftskrankenhaus Herdecke.

The installation of the Infinix™-i Biplane went well and an evaluation on Parametric Imaging and Color Coded Circulation will be done by the team of Dr. Ranft. Dr. Alexander Ranft, before Senior Physician of Neuroradiology Department of Klinikum Dortmund (which is the largest municipal hospital in Germany), started in Herdecke on July 1st 2015 as Head of the new founded Department of Radiology and Neuroradiology.

The clinical activity will mainly be based on:

- Stroke patients.
- Interventions on carotids, cerebral arteries, aneurysms and AVMs.
- Thrombectomies.
- Liver tumor treatments are planned as well.

Also a Radrex-i, Aquilion ONE and Vantage Titan 3T were part of this important strategic deal. //



Color Coded Circulation provides Interventional Radiologists better indification of feeding arteries and AV shunts including flow evaluation.

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Infinix-i 4D CT: The Future of Today in Interventional Radiology

13:00-14:00 hrs, Room: Auditorium 15

Chairman: Prof. Y. Arai, National Cancer Center Hospital, Tokyo, Japan

"Interventional oncology beyond liver interventions"

Prof. E. de Kerviler, Saint-Louis Hospital, Paris, France

"Is 3D information enough for sophisticated IRs?"

Prof. Y. Arai, National Cancer Center Hospital, Tokyo, Japan

"Infinix-i 4D CT - new milestone in liver interventional oncology"

Prof. B. Guiu, University Hospital Montpellier, France

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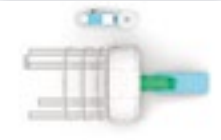

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