

Focus on dose management in endovascular interventions

Experience with CMOS flat detector imaging.

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Introduction:

Pr Sobocinski is collaborating with GE Healthcare on a study to compare latest generation CMOS flat panel imaging with previous platforms. He has shared with us his first experiences with the OEC Elite CFD for the ongoing clinical work.

Can you describe the activity of Vascular Surgery in your hospital?

"The University Hospital of Lille is the biggest University Hospital in France with 2500 beds. My department of Vascular Surgery hosts 50 beds and 3 operating rooms. Two of them are equipped with mobile imaging systems, and the other one is a fixed room. We handle about 2000 arterial cases every year."

What are the main trends in your discipline?

"Endovascular surgery techniques have benefitted from several improvements over the last few years. For each

patient, we tend to prefer a minimally invasive approach, whenever possible."

"We extended the volume of our activity opening a third operating room to be able to offer additional slots for endovascular treatment to aged patients with co-morbidities who couldn't undergo aggressive surgery. This also means that the use of X-rays is required, which is why the philosophy of my department is to perform each procedure using the least possible radiation exposure and contrast media as possible. We apply the ALARA ("As Low As Reasonably Achievable") principles and try to perform the procedure with the best compromise between radiation exposure, use of iodine contrast media, and surgery outcome."

How do you manage the increasing use of X-rays in your daily activities?

"We perform more than two-thirds of our procedures using X-rays. We know that both physicians and patients are exposed to a significant amount of

X-rays throughout their lives, therefore we want to ensure that we perform

procedures with the best compromise between X-ray exposure and image quality. We are very keen to find new interesting tools to reduce the radiation exposure without compromising on the best conditions for each procedure."

From your experience with the OEC mobile C-arms, what are the main contributors for endovascular procedure management?

"I think it is a very important point for the physician to keep a hand on the management of the entire procedure. The physician needs to control the X-ray exposure and also the tools that can help save some radiation dose. I am not able to run a procedure anymore without using a remote user interface because I want to manage the collimation blades, the image series, and the selection of images of the series I just made. Keeping a hand on the system during the whole procedure can have a real impact on saving some contrast media and radiation dose exposure."

Do you perceive any direct benefits for the patient using the OEC Elite CFD?

"There are several benefits of using the new flat panel detector system. For example lower radiation exposure and lower concentration of contrast media during injection. Now we only work with diluted contrast injections.

The workflow is quite easy to handle with the intuitive interface of the flat panel, allowing us to work more efficiently, reducing time spent in the operating room, which is always a positive aspect for the patient. General anesthesia and patient discomfort is automatically reduced."

What clinical benefits have you identified with the use of the motorization during a procedure?

"When we work on the hypogastric artery and we want to make sure that we will keep it open, we position the C-arm in an oblique projection. With the motorized version of the flat panel we can now save this projection angle so we can easily come back to this exact same position. We need to be at zero position for the exchange of material, but when we decide to inflate the balloon or deploy the stent we need to recall this projection to be sure that we will keep open the collateral of the artery we want to treat."

Why do you think the dynamic recording is an interesting fluoro mode during your procedure?

"Dynamic recording in standard pulse is a very helpful fluoro mode to create the map of the arterial system.

We set the cine acquisition at 15 frames per second, so I can recall easily the series with a very good resolution and just select the image I want to put on the reference monitor and use it as a mask afterwards, as a sort of fusion with the roadmap mode.

Images acquired can also be used afterwards to be recalled on the reference video monitor and help





Pr Jonathan Sobocinski:

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during the roadmap mode, to make sure that we will re-enter the artery just after the lesion and not too far in the healthy segment of the distal artery. It can provide a sort of mask fusion to make sure that we are in the right segment of the artery.”

How do you manage when you need to zoom into detailed view?

“We are indeed big fans of the Live Zoom mode and big monitor display because both tools together alleviate the need to use magnification mode which increases dose. In general, Live Zoom gives the perfect resolution with more precision of the challenging segment of the artery that we want to cross, stent, or visualize with less dose compared to magnification mode.

Again, the idea is always to find the best compromise between image quality and radiation dose exposure.”

What is your experience with measurement tools?

“During the intervention, under Live Zoom, we also have the possibility to measure the lesion, and also use the digital pen tool just to mark on the screen the exact position where we want to deploy a stent or inflate a balloon.

We can place marks on the screen, and it's quite easy to delete them. For example, the collateral I wanted to preserve, but I can also mark the lesion I want to treat. If I lose the roadmap, but still have the mark on the screen, I can use this landmark and avoid re-injection.”

Is the measurement tool useful for a vascular procedure?

“The measurement tool is also helpful, in the sense that before we used a ruler under the thigh of the patient just to

have an approximation of the length of the lesion, but the ruler is not on the same plane as the artery so we still had some uncertainty on the measurement of the lesion. Before placing a longer stent, with the flat panel this tool now gives us the possibility to know the length (for example, if I put a balloon is 20 mm long), we can use this tool to measure the distance I want to treat in the artery.”

How does the Bolus Chase profile contribute to managing X-ray dose and image quality?

“The Bolus Chase profile is the perfect tool to make an acquisition of a very long lesion, especially when treating an occlusion of the SFA (Superficial Femoral Artery) or Popliteal Artery. With one acquisition, we can obtain a perfect map of the arterial system of the lower limb of the patient. It allows

a massive reduction in the amount of contrast media because we just make one injection, and with the flat panel detector we can make a diluted injection of contrast media. We use half-half dilution and with this one single injection, one single acquisition, we have the whole artery.

Afterwards, we can select the one

something helpful with obese patients, just to make sure that we are below the renal arteries, or if we want to see specifically the collaterals of the aorta.

For cases of lower limb treatment, I try to ignore this mode because I know that it increases the radiation dose. I try to work using the tools around standard fluoroscopy like the dynamic

reduction of contrast media, and reduction of radiation dose for most of the patients. The flat panel seems to improve our practice, reduce X-ray dose and contrast media both for patients and physicians, according to our first results in our patient cohort.” □

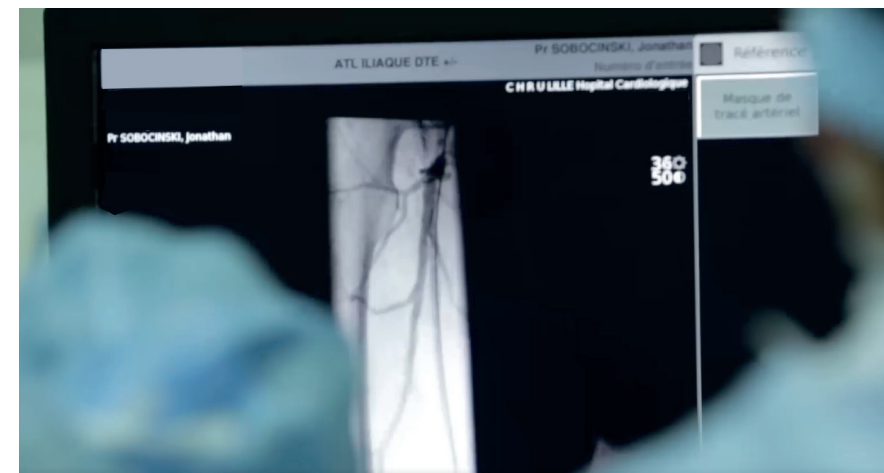


image of interest from the series that we want to recall as a fusion mask and use it as a tool for the roadmap navigation. This way we can find where we want to go into the true lumen of the artery, and where we decide to put the stent.

So the Bolus Chase mode allows you to make only one acquisition of the whole leg and avoid making repeated injections of iodine contrast media and the Digital Subtracted Angiography (DSA) mode allows you to study the artery.”

What about Digital Subtracted Angiography (DSA)?

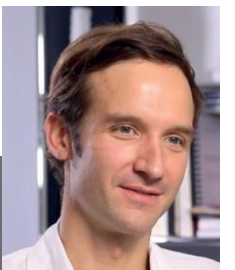
“I am not a big fan of the DSA mode. I try to use it only for aortic cases because this mode provides subtracted image (without bony anatomy) and it's

recording function in standard pulsed mode. It is just a regular fluoroscopy sequence that is recorded and replayed automatically. These sequences are done with small injections of iodine. We can recall an image from the series and avoid using the DSA mode.”

Are there any specific studies you are working on at the moment?

“We are currently working on comparing the benefits of using a flat panel detector C-arm versus an image intensifier for patients with long lesions in the lower limbs. We work in vascular profile using 8 frames per second and the different tools around standard fluoroscopy.

We have previously worked with an OEC 9900, and we already noticed differences in terms of image quality,



Jonathan Sobocinski, MD, PhD., is Professor of vascular surgery and Head of the Department of Vascular Surgery at CHU of Lille (France). He was trained in Endovascular techniques during his fellowship with Pr. Stephan Haulon. He also spent a year as Senior Registrar at St George's Institute, London (UK).

Dr. Sobocinski is a paid consultant for GE Healthcare. The statements by Dr. Sobocinski described here are based on his own opinions and on results that were achieved in his unique setting. Since there is no “typical” hospital and many variables exist, i.e. hospital size, case mix, etc... there can be no guarantee that other customers will achieve the same results.