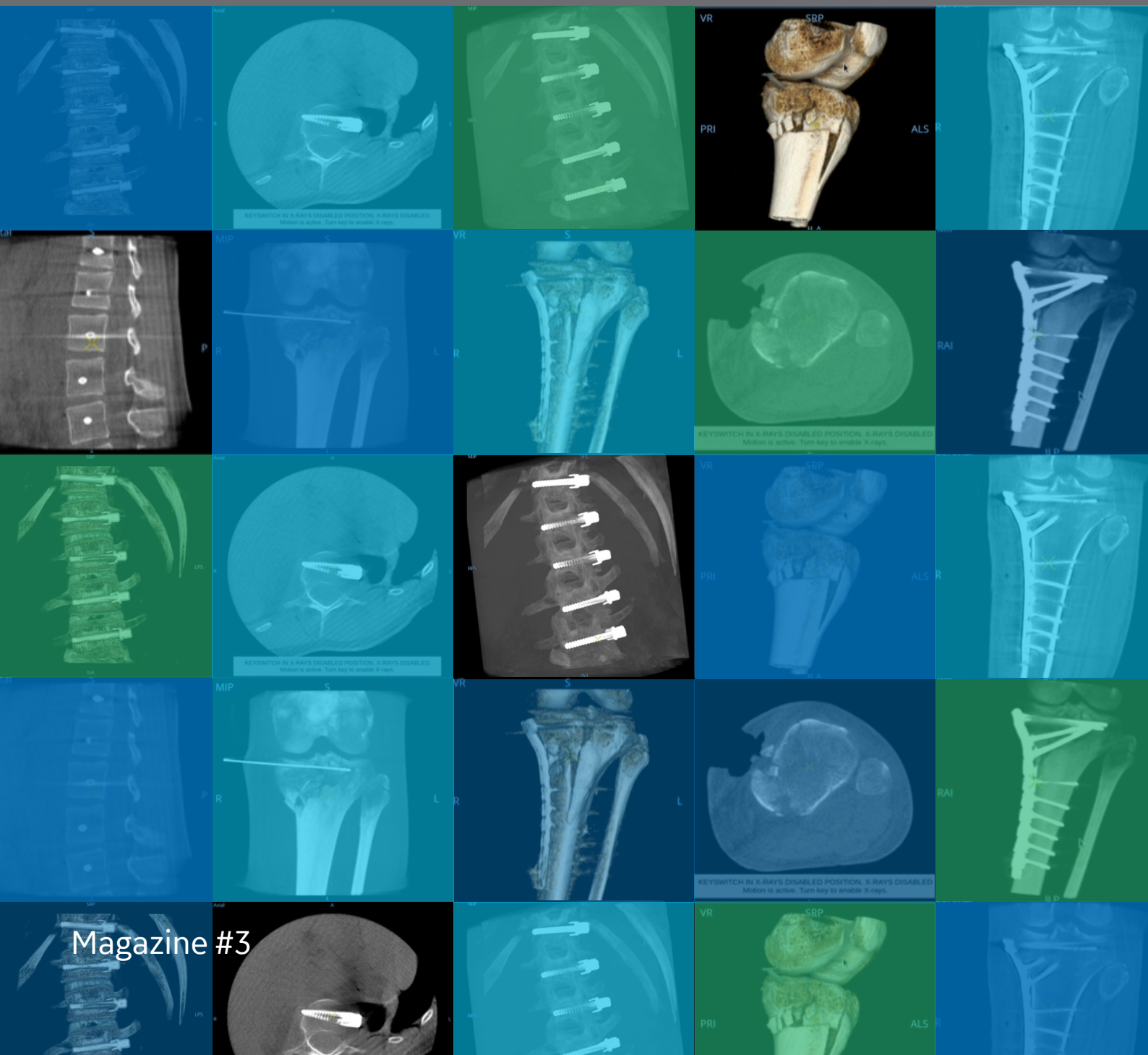
# OEC MAGAZINE

## Innovation in Surgical Imaging with OEC C-arms




Magazine #3

*Dear Reader,*

*Technological advances make it possible to offer guidance and control systems in the operating room that provide human and economic added value aiming at improving surgical outcomes and surgical workflows.*

*Recently in the fields of orthopedics and traumatology, innovative navigation and robotization systems using 3D imaging have been proposed and with the steady increase in minimally invasive surgeries, the need for accuracy, precision and greater clarity of anatomical details is increasingly relevant. Diverse procedures and varied patient types, coupled with dynamic staffing led to added workflow challenges in handling technology and integration with multiple systems within the operating room.*

*To address these challenges GE Healthcare introduces the OEC 3D C-arm designed to provide precision and efficiency. Leveraging insights from expert surgeons and operating room directors across the globe, GE Healthcare has synthesized the latest technological advancements across imaging detectors, computational processing, visualization engines and depth-perception camera technology with the goal of introducing a nimble, reliable intraoperative mobile 3D imaging system that delivers sought after precision and efficiency*

*We are pleased to be able to share with you in this edition first results obtained with our new premium platform, the OEC 3D as well as testimonials with the OEC Elite CFD. In the different surgical fields, 2D and 3D precision imaging is again demonstrated in this edition through articles by our contributors, specialists in trauma / orthopedic/ spine, cardiology, vascular surgery, ERCP, bariatric surgery, and endourology.*

*We would like to thank our clinical partners for sharing their best practices in this edition and wish you a good reading!*

*With our best regards,*

**Cécila Felix**
Director Europe
Image Guided Therapy

**Christoph Obermeier**
Surgery Marketing Manager
Europe

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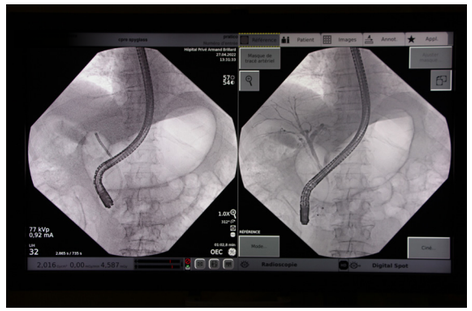





# First experiences in Spine Surgery with 2D and 3D intraoperative imaging

## with OEC 3D

The hospital of Halmstad from the county of Halland is located on the southern west coast of Sweden that offers beautiful nature comprising of beaches, forest and lakes. Serving the county to population of 300,000, Halland Hospital Halmstad  offers a full range of specialized care to the population. Thus the orthopedic clinic of Halland Hospital Halmstad has developed a unit dedicated to spine surgery which launched the process of evaluating mobile C-arms for 2D and 3D intraoperative imaging.

The main motivation for the acquisition of a 2D/3D mobile C-arm is to obtain, in addition to traditional 2D images, comprehensive 3D volumetric images in the operating room for intraoperative clinical decision making. The team also wanted to assess the possibility to streamline the patient's pathway by eliminating the postoperative CT scan confirmation, based on the 3D imaging control performed in the operating room at the end of the intervention.

Dr. John Pak and Dr. Dan Christensson, consultants in spine surgery, provide their perspectives on OEC 3D, illustrated through their experience during a case of spine arthrodesis.

## 3D Imaging Every Day

The OEC 3D is a true 3D/2D C-arm with the flexibility to acquire both precise 3D and 2D images without switching systems. Transitioning quickly and easily provides greater efficiency and versatility for a wide range of clinical applications from spine and orthopedics.

## Precise Images

The OEC 3D enables to see more levels during a spinal fusion, or more of the pelvis or femur during an orthopedic procedure. With a 19 cm x 19 cm x 19 cm volume, OEC 3D captures a 67% greater volume than other 3D C-arms*.

The 3D acquisition designed for capturing as much data as possible is critical in creating highly detailed images. The OEC 3D delivers a true 200° isocentric orbital sweep, 35° more than other 3D C-arms*, for comprehensive 3D volumetric images.

The OEC 3D leverages GE Healthcare's proven AW image fabric technology to provide a premium 3D imaging experience. Analyze images with the Volume Viewer suite of 3D imaging tools including Multi-Oblique Mode, viewing all five image perspectives (Axial, Sagittal, Coronal, Volume Rendering, Maximum Intensity Projection) through all 512 slices, window leveling, zoom, and more.

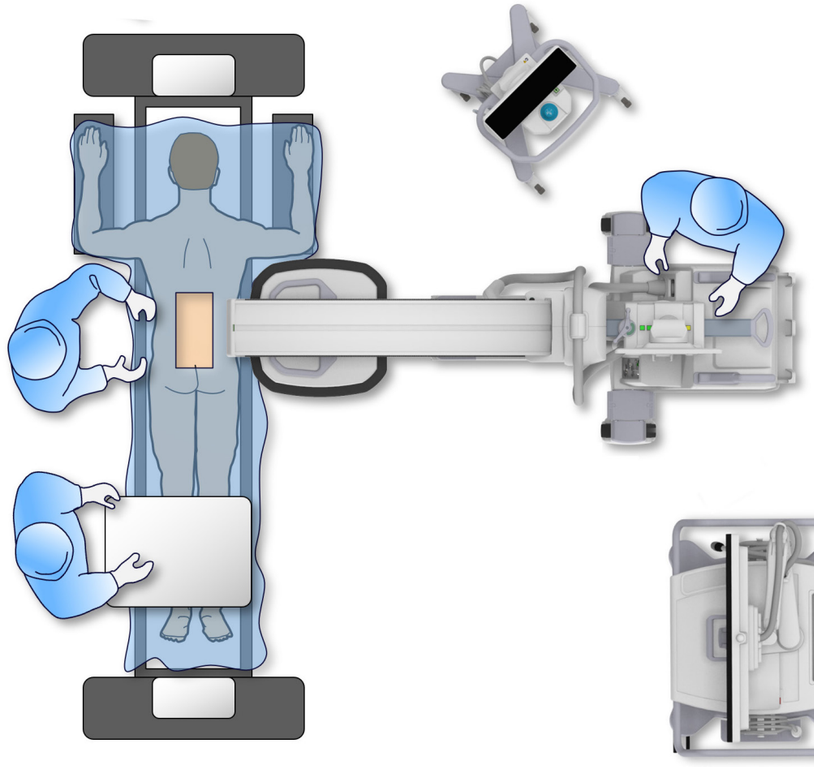
*Compared to other 3D C-arm published specifications.

**L4-S1 FUSION BY POSTERIOR APPROACH WITH 2D AND 3D IMAGING**

Courtesy of Dr. Pak and Dr. Christensson, Neurosurgeons, Spine Unit Halland Hospital Halmstad (Sweden)

PATIENT AND C-ARM SET UP

Patient is positioned in prone. The C-arm is placed perpendicularly to the patient table.

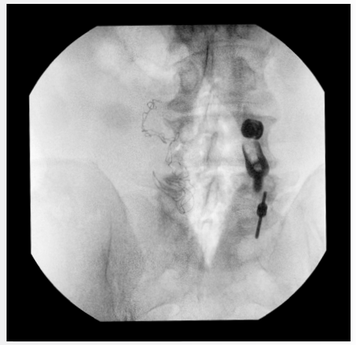


Operating room set-up for spine 3D images acquisition

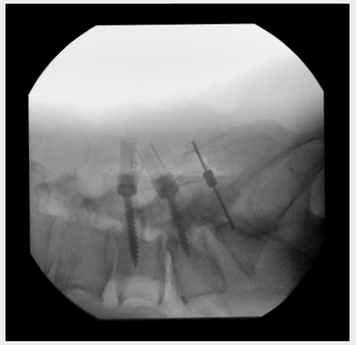
## 2D INTRAOPERATIVE IMAGING

Anatomical imaging profile is set to Spine. Fluoroscopy mode is set to standard continuous. A first fluoroscopic image is taken to confirm the vertebral level to treat. Further 2D imaging centering is done using the Live View camera of C-arm to limit the number of image acquisition and manage dose radiation level.

Lateral view – definition of incision level on L4



Antero Posterior view



Lateral View

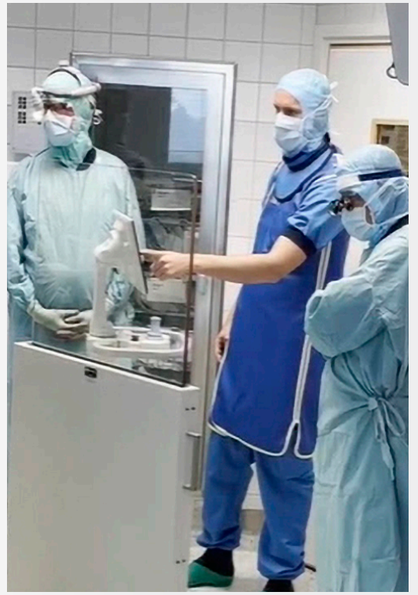
Antero Posterior View

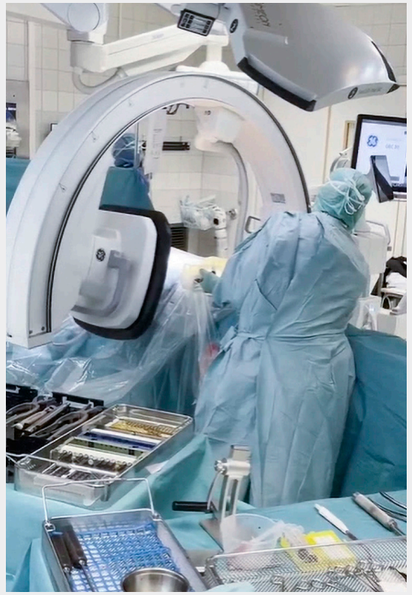
Once all the pedicle screws are placed, surgeons proceed to the 3D acquisition on L4-S1 to control the overall surgery on volumetric images.

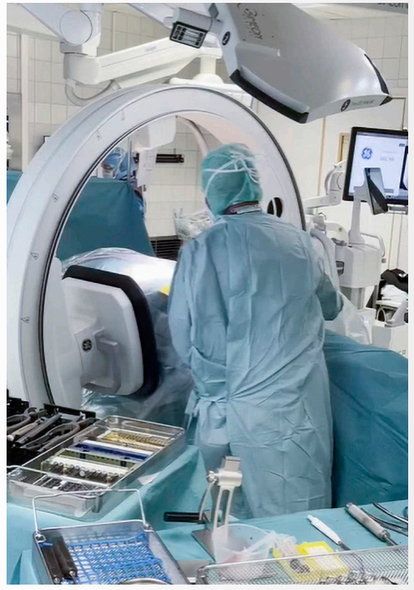


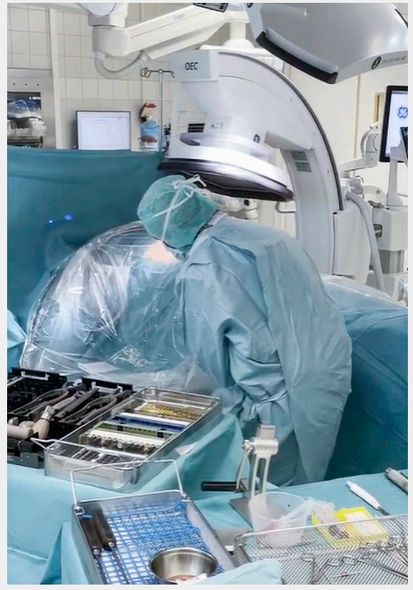
## 3D IMAGING FINAL CONTROL WITH SETUP ASSISTANT

The Setup Assistant guides the user through 4 steps to acquire the 3D scan. After setting the 3D imaging plan and centering the anatomy in the 3D volume, the Setup Assistant allows the user to check that the C-arm rotates freely around the patient.







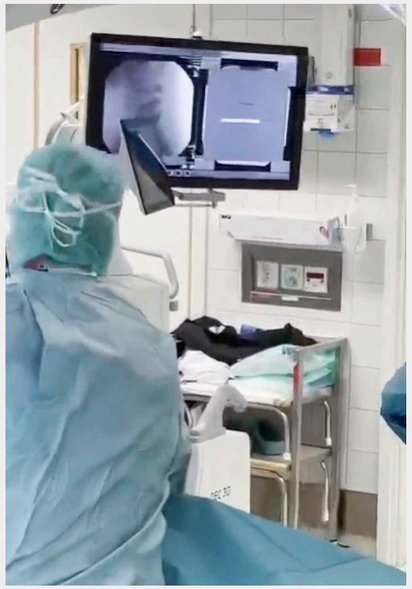


Once the collision check is complete, the system can start the 3D scan. The C-arm rotates 200° during a scan and takes the projections. The scan time is typically 30 seconds.

*“I could make the operation with quick and easy 3D imaging”*

**Dr. John Pak**

3D scan acquisition from wireless pedal footswitch



At the end of the 3D scan, the data set is reconstructed and presented on displays for viewing in the Volume Viewer for precise analysis of 3D perspectives.

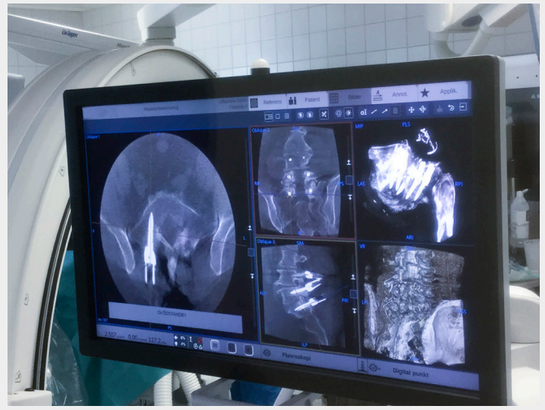
*“I feel more confident to precisely control the position of the screws in the vertebral pedicles before closing the patient. It helps me to assess the quality of my surgical gesture to avoid revision surgery.”*

**Dr. Dan Christensson**



The Volume Viewer presents high resolution 3D images, from the 19 cm x 19 cm x 19 cm volume, in five perspectives.

The volume visualization is based on AW image fabric technology to provide a premium 3D imaging experience. User can analyze images with the Volume Viewer suite of 3D imaging tools including Multi-Oblique Mode, scrolling through all slices, window leveling, zoom, and more.



Each view can be placed on the left side for larger format visualization.

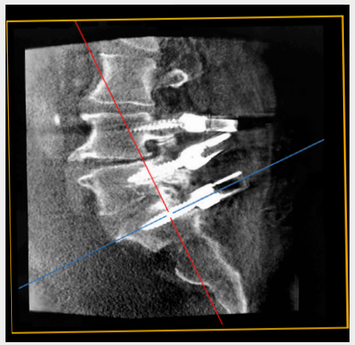
*“With the OEC 3D you can see all the vertebras at the same time, it’s fantastic! It has a wider field of view and more visualization power.”*

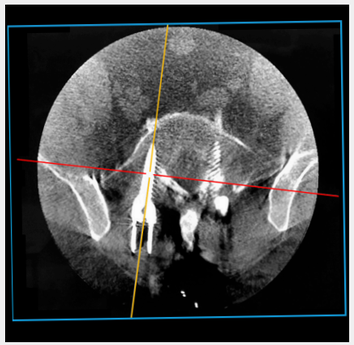
**Dr. Dan Christensson**

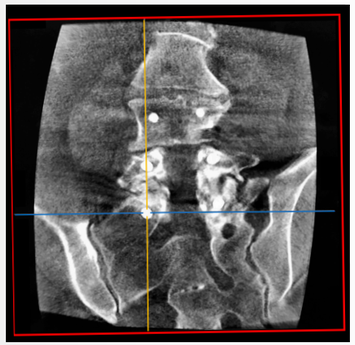
*“The Image Quality of 2D and 3D images is very good even on obese patients. It is important because people are getting more and more obese and we have to deal with more soft tissues, which bleed more and it’s becoming more complex to see.”*

**Dr. John Pak**

OBLIQUE VIEWS OF L5 LEFT PEDICLE SCREW







**CONCLUSION**

The clinical benefit of 2D and 3D imaging with OEC 3D C-arm delivering precise images in a 19 cm x 19 cm x 19 cm volume led the team to select OEC 3D C-arm for their daily practice.

*“The OEC 3D is full of options and has capacity above our needs.*

**Dr. John Pak**

The statements by GE’s customers described here are based on their own opinions and on results that were achieved in the customer’s 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. JB05583XE

# Minimally invasive procedures in a cardiac care center

## with OEC Elite CFD

**Interview with Dr. Jesus Oneto Otero, head of Cardiology department at the Hospital San Rafael in Cadiz, Spain.**

Considering the growing volume of heart diseases linked to lifestyle changes, Cardiology is one of the medical specialties with an increasing demand for both diagnostic and therapeutic medical means. Since cardiovascular diseases affect individuals in their midlife years, prevention strategies are a central focus of development for clinical cardiac care.

The Hospital San Rafael is a private hospital that has been expanding its cardiology department over the past 20 years. It has the capacity to diagnose and treat heart disease in patients from the metropolitan area of Cádiz and the autonomous cities of Ceuta and Melilla.

With the creation of a new cathlab to host the Hemodynamics and Interventional activities of Dr. Oneto, the Hospital San Rafael is reinforcing its cardiology capacity, providing a complete patient care pathway from the initial diagnosis of chest discomfort, to treatment and post operating follow up of the patient.

The Hemodynamics and Interventional Cardiology Unit of the Department of Cardiology lead by Dr. Oneto constitutes a reference center in treatments related to heart diseases.

Facing an increasing number of procedures, the department of Cardiology has equipped a new operating room with the OEC Elite CFD motorized Cardiac C-arm.

Dr. Oneto shares with us his motivation for this choice.

**Can you describe the activity of the Hemodynamics and Interventional Cardiology unit?**

*"The Hemodynamics and Interventional Cardiology unit has developed the capacity to diagnose and treat cardiac arrhythmias from electrophysiological studies to ablation procedures. In coordination with the chest pain unit, after in-depth diagnosis and where appropriate, patients can go through coronary angiography in the early stages of coronary disease.*

*The unit has been implementing minimally invasive approaches for most interventions to allow the patient to go down the ambulatory pathway. In addition, the unit has the capacity to hospitalize patients needing longer monitoring and beds in the Intensive Care area unit for patients going through more complex cardiology procedures.*

*About 95% of the procedures are done through radial access and cover a wide range of treatments for different pathologies. These include simple arrhythmia to more complex cases such as emergencies, complex pacemaker device implantations, atrial septal defect closure, valve repair and coronary interventions.*

*All these procedures require fluoroscopic imaging guidance and control."*

**What motivated the hospital to choose a mobile cathlab with OEC Elite CFD?**

*"As we have an increasing volume of patients, we decided to open a new Operating Room. The hospital budget required us to use the current infrastructure and reallocate some equipment.*

*Therefore, to optimize our working space that already contains an assortment of all necessary patient care hemodynamic equipment, we decided to install a mobile cathlab with the newest generation of flat panel detectors.*

*This new installation includes a cardiovascular table with a floating tabletop, an injector coupled with OEC Elite CFD, a workstation for procedure planning (GE Cardio Vascular Review Workstation), a multichannel hemodynamic recording system, and two ceiling suspended medical video monitors to display fluoroscopic images.*

*After an evaluation of different C-arms, we selected the OEC Elite CFD motorized Cardiac C-arm, mainly due to its high performance in image quality for our longer procedures."*

**Can you tell us how OEC Elite CFD is fulfilling your needs in fluoroscopic imaging?**

*"The procedures that have the most stringent needs in fluoroscopy are those performed on coronary arteries. The anatomy is very small, which means we work inside vessels of less than 2mm in diameter. Image resolution must allow us to clearly see the different types of guides, expandable material, balloons, stents and other devices we bring inside the coronary artery. We need a maximum of image clarification and detail."*

> *"The excellent image quality with OEC Elite CFD allows us to carry out all the different types of cardiac procedures we perform. The user interface improves our procedure workflow."*
>
> **Dr. Jesus Oneto Otero**

*"The Cardiac profile of OEC Elite CFD provide us with the clarity we need during the procedure. We always activate the eNR function which reduces the noise artefacts during guidewires or catheter movement. We see the tip of our guidewires clearly while pushing them.*

*To manage radiation doses for the patient, we manage image quality needs at all steps of the procedure using all the tools available in the C-arm (Live zoom, collimation and fluoroscopy modes, for example).*

*Like all cardiology units we also treat over-weight patients. Our experience with OEC Elite CFD has been very positive, with high quality imaging for these patients allowing us to complete even long procedures.*

*Image Quality has leapt forward with CMOS detector technology compared to our previous equipment. We now see more clearly during coronary procedures regardless of the projection angle or the patient profile.*

*We chose the motorized version of OEC Elite CFD, as we often switch from Anterior Posterior, Right Anterior Oblique (RAO) and Left Anterior Oblique (LAO) views during the procedures. The C-arm can be moved to a precise angle from the remote user interface on the table side by the cardiologist which improves the procedure workflow. The interface is simple and provides quick access to functions. We can also store the most common angulations and retrieve them by simply pushing a button, without staff help.*

*Other functions that I appreciate being able to manage by myself are selection of the low dose mode, setup of the collimation and access to the image directory to retrieve images and use them as reference images. For example, I like to set up the OEC Elite CFD C-arm in low dose mode at the beginning of the procedure, and when I need to see the stent mesh, I remove the low dose mode and use the digital cine pulse for three or four seconds.*

*One projection that is specific to coronary artery surgery is about 45°*

**Dr. Jesus Oneto Otero** is an Interventional Cardiologist, specialized in Hemodynamics, a member of the Spanish and European Societies of Cardiology and a practitioner of interventional Cardiology for 37 years. In this context, Dr. Oneto has contributed to the evolution and the development of hemodynamics and participation in the early stages of coronary angioplasty in Spain.
Dr. Oneto is Head of the Cardiology department at the University Hospital of Jerez and Head of the Cardiology and Hemodynamic department at the Hospital San Rafael in Cadiz.

*Left Anterior Oblique (LAO) with 25° Caudal (CAU). This view permits to visualize the left anterior descending coronary artery. It is difficult to position the C-arm for this view and in this position the X-ray beam goes through thicker amounts of tissues. The deep shape of the OEC Elite CFD C-arm allows us to get this angulation."*

**What are the features of the OEC Elite CFD C-arm that you like and use regularly?**

*"I always try to get the most out of my C- arm, so I spend a lot of time learning about the different functions, and I use them all.*

*But if I must choose, I will highlight two features that I think are very successful in the type of interventions we perform.*

*The first one is the fluoroscopy mode called 'Digital Cine Pulse' (DCP). I can activate this mode directly from the three-pedal footswitch on the far-right X-ray switch. In fact, I use this mode when I need maximal image quality to visualize the coronary arteries at the most critical moments of the procedure. It is a high intensity pulsed mode that automatically records the images in a cine record on the workstation. To manage patient radiation exposure, I run DCP sequences for three or four seconds. Once saved, the sequences are automatically replayed. In this mode I can see dynamic images clearly even with the continuous heartbeat motion, without kinetic artifacts.*

*The second feature I use a lot is the digital Live Zoom. This function is used to zoom in or zoom out on the anatomy under live fluoroscopy. It gives the possibility to magnify the anatomy displayed without increasing the amount of radiation. This is useful for very long procedures."*

Dr. Miguel Alba - Cardiologist, Dr. Jesus Oneto Otero - Interventional Cardiologist , Mrs. Lara Shorbaji Puertas - Operating room Nurse, Mrs. Juana V. Perez Carrasco – Nurse, Mr. Francisco Medina Camacho - Operating room Nurse

**How do you think your activity will evolve in a near future?**

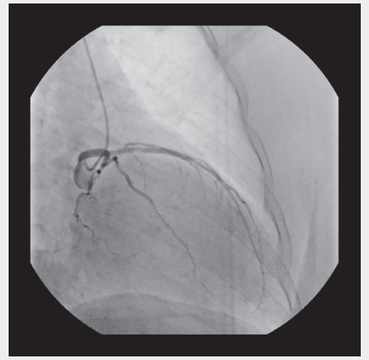
*"Interventional cardiology is constantly evolving and developing. It is hard to predict exactly where this is taking us because there are many branches that are following their own evolution. If we look at the progress in rhythmology and interventional cardiology since I started up until present, great technology improvements occurred in a short period of time, while others have been completely dropped. This is the case, for example, of resorbable stents that we thought would be the solution for many treatments, and which turned out not to be the case.*

*What I believe is that everything is leading us to increasingly treat patients with less invasive procedures. Some time ago, we could not imagine repairing an aortic valve. Today not only is it a quite common procedure, but we are starting to repair mitral or tricuspids valves using a peripheral approach.*

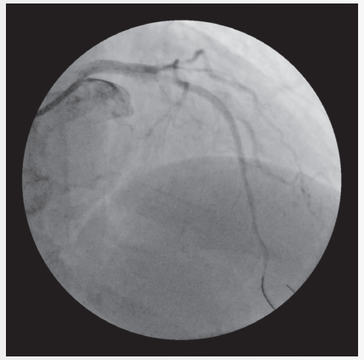
*And since the idea is to perform complex procedures in a less invasive way, fluoroscopic image guidance becomes essential in the evolution of our specialty. I believe that imaging technology and cardiology are somewhat linked to each other."*

## ANGIOPLASTY CASE

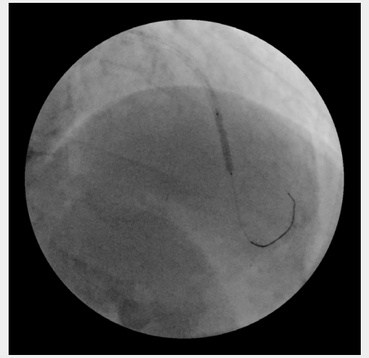
Courtesy of Dr. Oneto, Interventional Cardiologist, Hospital San Rafael in Cadiz, Spain.



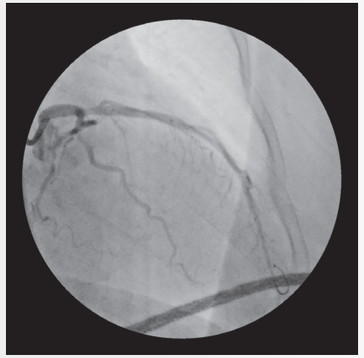
**Initial arteriography: Left and right coronary arteries**
Fov 21 cm
29° Right Anterior Oblique (RAO)
2° Cranial (CRA)



**Arteriography of Left descending artery**
FoV 19cm (MAG1)
0° RAO
31° CRA



**Angioplasty**
FoV 19 cm (MAG1)
0° RAO
31° CRA



**Arteriography of left and right arteries**
FoV 19 cm (MAG1)
36° RAO
4° CRA

A total of 73 series of images were taken with a total exposure time of 14.5 min, and total DAP was 37 Gy.cm².

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's 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. JB16247XX

# Left Heart Catheterization procedures in Ambulatory Surgery Centers

## with OEC Elite CFD

**Interview with Dr. Andre Bouhasin, M.D., Interventional Cardiologist, Medical Director. St. Louis Specialty Surgical Center**

St. Louis Specialty Surgical Center is located in the metropolitan area of St. Louis, Missouri, United States. Composed of eight cardiologists, the Surgical Center recently expanded its capabilities to capture the increasing demand to perform Left Heart Catheterization procedures in Ambulatory Surgery Centers (ASC).

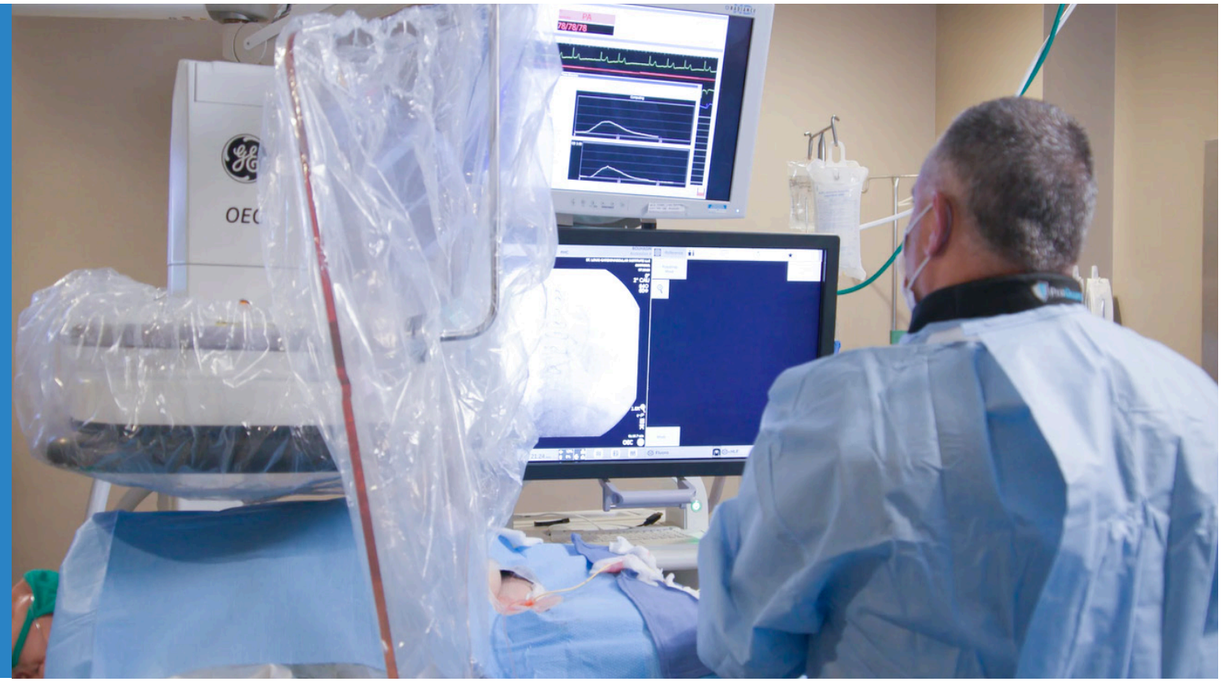
Left heart catheterization procedures address coronary artery disease, valve disease, blood flow issues, and left ventricle dysfunctions for diagnostic or therapeutic purpose. These techniques are commonly used for the measurement of cardiac hemodynamics, diagnosis, and treatment at early stage, to avoid heart damage or risk of further events.

# OEC Elite CFD configured with 31 cm detector, cardiac software, and motorized control

The OEC Elite CFD introduces innovative software features, like Enhanced Noise Reduction (eNR) and Cardiac profile, to enable a superb image quality experience and optimal workflow during cardiac and vascular procedures.

eNR is an advanced software algorithm that automatically reduces noise by more than 30 % during Vascular and Cardiac imaging, presenting an equivalent image to twice the effective power, without increasing radiation dose.  Visualizing medical devices, such as guidewires, stents, or implants, can be challenging during Vascular and Cardiac imaging, due to motion of anatomy and/or devices.
The OEC Elite CFD eNR feature automatically adjusts images for visualization of catheter tips and/or edges in Vascular and Cardiac configuration with equivalent image appearance of 30kW power and no change in dose.

The Cardiac profile available in the OEC Elite CFD, automatically reduces blooming artifacts and enhances visibility of moving features, such as 0.014" guidewires in thoracic region, which needs to be guided precisely to the surgical location in the heart.



**The team of cardiologists of St. Louis Specialty Surgical Center decided to broaden their capabilities to service an increasing patient need, and after testing different equipment, decided that the OEC Elite CFD Mobile C-arm was the best mobile C-arm solution to meet their needs and address the increasing volume in patients. Dr. Andre Bouhasin explains why.**

**Why did you choose a mobile C-arm for the center and what are the type of procedures that you are performing with it?**

*"Once the ASC started to develop the need for Percutaneous Coronary Interventions (PCI) and once Medicare included reimbursement, we realized we needed a capable C-arm.*

*An imaging system is a large investment, when we were talking about adding another fixed unit, trying to retrofit an existing space is a big challenge. There are power and shielding requirements for a fixed unit and our center wasn't designed for that, we didn't anticipate PCIs being performed. So, finding a C-arm that could fit into the existing space was a big factor for us, at an affordable cost.*

*In terms of procedures, we started slow, being conservative doing diagnostic cases, then we added some easy PCIs on thin patients, without advanced lung disease. As we performed more cases, we started to get more and more comfortable with the OEC Elite CFD, pushing the limits of what it is capable of doing. Now we have done some challenging cases that we would never expect that we could do with the C-arm.*

*Procedures such as ostial LAD (Left Anterior Descending) and heavier patients, and we've had fantastic results with OEC Elite CFD."*

**Why the OEC Elite CFD ?**

*"We tried multiple different C-arms and the OEC Elite CFD really made a big difference in clarity on what can be done from a cardiac standpoint. The difference between this C-arm and most of the others is the image quality.*

> *" We have done some challenging cases... such as ostial Left Anterior Descending, and heavier patients, and we've had fantastic results with OEC Elite CFD."*
>
> **Dr. Andre P. Bouhasin**

*The workstation monitor is big enough to get amazing images, and at the same time compact to get the flexibility needed to bring the display over the patient and get close enough to review and manage the images.*

*In addition, having a motorized C-arm with tableside controls, is key in terms of independent control and workflow, instead of having someone moving the C-arm during cardiac procedures and adjusting the settings.*

*The OEC Elite CFD Motorized C-arm is fast and it moves quickly. The detector is large enough to get a nice Field of View for cardiac imaging."*

**You've mentioned the articulating monitor. Can you share what's the value you found in that design?**

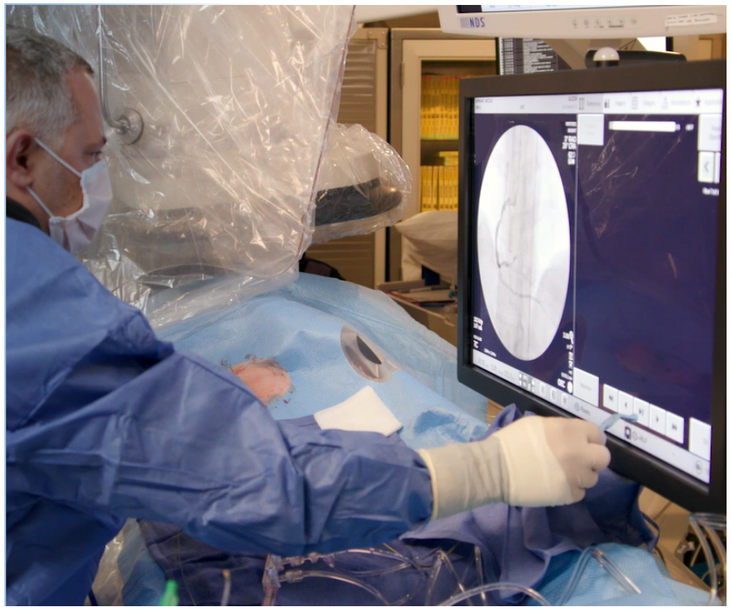
*"A fixed unit cathlab requires an articulating monitor system which can take a lot of space. It can be suspended from the ceiling, from the walls or it can be floor-mounted, usually taking a lot of space from the room.  A surgical C-arm, it's portable, it has its own workstation, and the articulating monitor of the OEC Elite CFD is wonderful and very versatile.*

*The display has a touchscreen interface, making it easy to use a sterile object to playback Cine, review frame by frame, and it provides full system control.*

*The flexibility of the articulating arm really makes a difference. Bringing the monitor right up over the patient's legs to get close and see everything."*

*"The difference between this C-arm and most of the others is the image quality."*

**Dr. Andre P. Bouhasin**



**In terms of flexibility, what advice would you give to other surgeons that are considering a mobile C-arm for their practice?**

*"With a mobile solution, it is possible to perform 90% of the procedures that can be done with a fixed unit once the surgeon gets used to it. In addition to have the portability to remove the C-arm in case there is the need to perform procedures that won't require fluoroscopy.*

*The cost differential is large, a mobile C-arm is more of an affordable solution than a fixed unit, it requires minimal site preparation and lower operating costs, allowing us to take the risk of proceeding and minimize long term investment."*

**Overall, how satisfied are you with the OEC Elite CFD for your Ambulatory Surgery Center?**

*"We've been using it now for approximately eight months, and I've tackled some things I never thought I would have ever tackled, outpatient nonetheless on a C-arm. We've had fantastic results with it.*

*Overall, I'm very satisfied with it. It was a good financial decision for the center. It allows us to deliver quality care for the patients, procedures are done in a more economical and faster pace. It's a huge win for everybody and patient satisfaction has been amazing."*

*"The articulating monitor of the OEC Elite CFD is wonderful."*

**Dr. Andre P. Bouhasin**

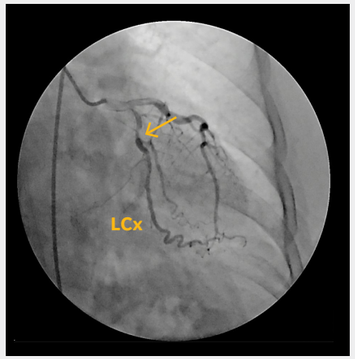


## CORONARY ARTERIES ANGIOGRAMS

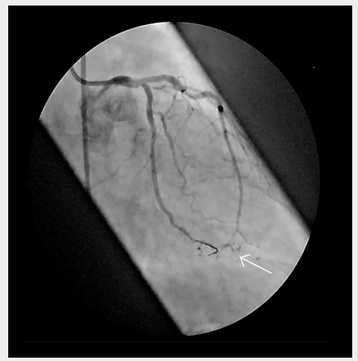
Courtesy of Dr. Bouhasin

The images below are extracted from series of images performed in Digital Cine Pulse 30 pps, with the Cardiac imaging profile and MAG1 mode (21cm) Field of View.

LEFT CORONAL ARTERY (LCA)

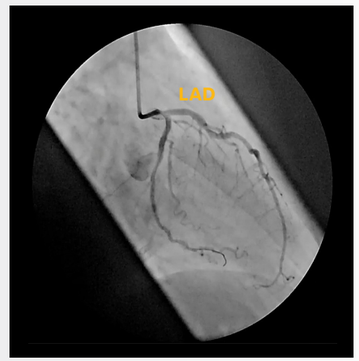



Diagnosis angiogram showing a lesion in the Left Circumflex (LCx) artery.



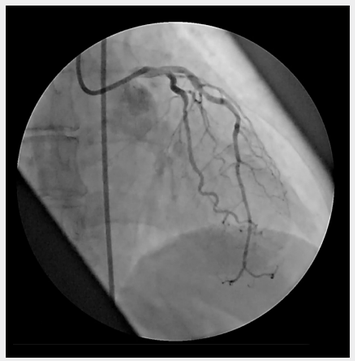
LCx lesion dilated Images. 0.008 inches guidewire in distal LCx. Acquired with collimator leaves in to reduced exposed anatomy.

LEFT ANTERIOR DESCENDING (LAD) ARTERY ANGIOGRAM

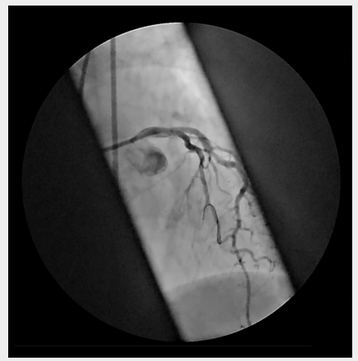



*Yellow marks on images are for reference only. These are not part of product annotations feature.*

LEFT CORONAL ARTERY (LCA)



LCx and LAD Angiogram.



LCx and LAD Angiogram.

RIGHT CORONARY ARTERY (RCA)

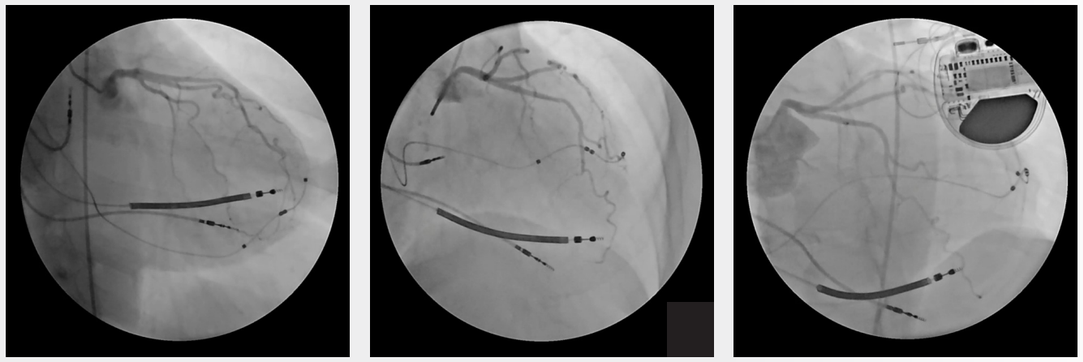
Diagnosis image of distal bifurcation.

## CORONARY ARTERIES ANGIOGRAMS AND VENTRICULOGRAM ON A PATIENT WITH CARDIAC IMPLANT

Courtesy of Dr. Bouhasin

The images below are extracted from series of images performed in Digital Cine Pulse 30 pps, with the Cardiac imaging profile and MAG1 mode (21 cm Field of View, except fpr the left ventriculogram acquired without MAG mode (31 cm Field of View).

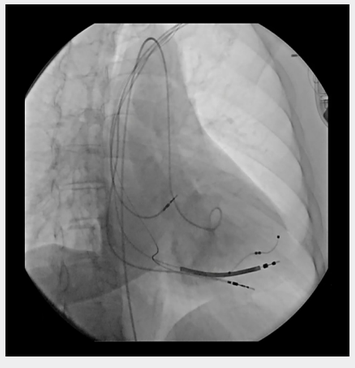
LEFT CORONAL ARTERY (LCA)



LAD and LCx (Left Circumflex Artery) angiograms in different oblique and craniocaudal views to avoid overlap with the 4 leads implant..

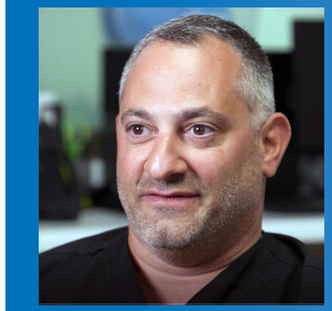
RIGHT CORONARY ARTERY (RCA)

LEFT VENTRICULOGRAM



Diagnosis mid segment.





**Dr. Andre P. Bouhasin M.D.** is an Interventional Cardiologist from St. Louis, MO. and is graduate of St. Louis University School of Medicine in 2001 who completed his fellowship in 2009 at the University of Nebraska Medical Center.

*"Cardiology has always fascinated me. My father was a physician, he used to take me when I was a kid after church on Sundays to rounds at the hospital.*

*The outpatient world of cardiology is very exciting. As you start to learn the business side of medicine and about outpatient labs, it's exciting trying to figure out that you can be a good physician clinically, and then from a business standpoint, learn how to capitalize and perform more procedures out of the hospital, where they can be done faster and more efficiently, which is good for the patients, for the institution and for the payers. It's a win-win"*


Dr. Bouhasin is a paid consultant for GEHC and was compensated for participation in this testimonial, video, article, etc.. The statements described here are based on Dr. Bouhasin 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. JB18359XX

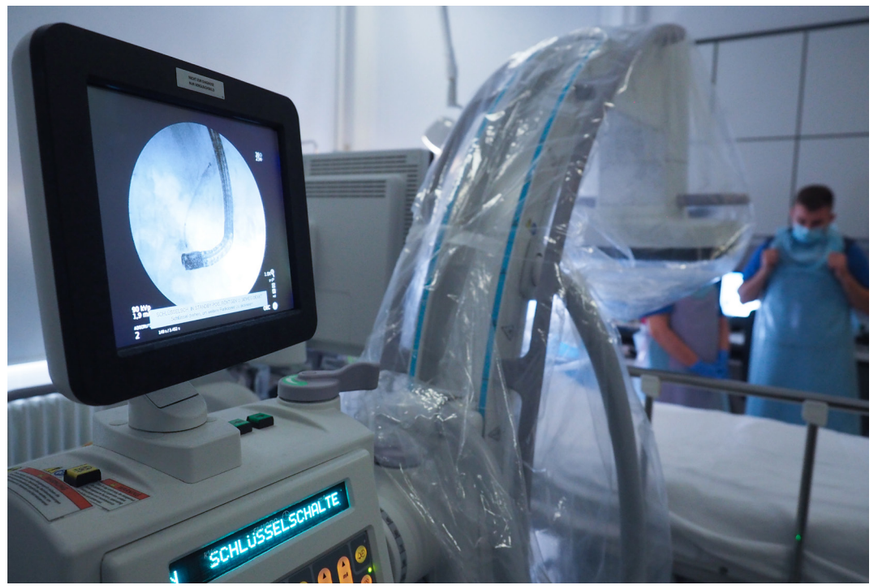
# Advanced Hepato-Biliary-Pancreatic system's procedures: from diagnosis to treatment leveraging ERCP technique

with OEC Elite CFD

**Interview with Peter N. Meier, MD, FASGE, FEBG, head of the Department of Gastroenterology/Interventional Endoscopy/Proctology at the Diakovere Henriettenstift Hospital in Hanover, Germany.**

The Diakovere Henriettenstift Hospital in Hanover has a long experience in patient care excellence, starting some 150 years ago, thanks to a large donation from the Duchess Henrietta of Württemberg. The foundation allowed for the creation of one of the first hospitals in Europe for women, run by deaconesses. The deaconesses were trained and set a standard in skilled nursing which ultimately formed the basis of the state nursing education that was not established until decades later.

Mrs. Gundi Seiger, Dr. Peter N. Meier, Mr. Caner Őzkul




Rehearsal session

**Today, the DIAKOVERE Henriettenstift Hospital cares for about 50,000 patients per year, including 22,000 inpatients. Among its 14 clinics, it hosts the Clinic for Gastroenterology in the Center for Visceral Medicine. This clinic focuses on the treatment of gastrointestinal diseases. It is specialized in endoscopic diagnostics and the treatment of metabolic diseases.**

**Covering a broad range of advanced endoscopic procedures, including in children and adolescents, the clinic acquired the OEC Elite CFD C-arm to update its endoscopy ward.**

**Dr. Peter Meier shares with us his experience with OEC Elite CFD for X-ray guided interventional gastrointestinal procedures and more especially in the hepato-biliary-pancreatic system, such as endoscopic retrograde cholangio-pancreatography (ERCP), stent releasing procedures (non-self- or self-expanding) and in rare but important cases, guided endoscopic maneuvers.**

**Can you describe the activity of your department?**

*"In our hospital, I am responsible for both the gastroenterology department and the interventional endoscopy department. This allows the two specialties to interact and work in close collaboration. For some pathologies, such as Crohn's disease, we must perform an endoscopy to establish the diagnosis and monitor the impact of the clinical treatment. We believe that it is good for the patient to perform both diagnosis and intervention using a minimally invasive approach - that is endoscopy.*

*We currently perform a total of 4,000 procedures per year, of which about 650 are under radiological control, depending on the indication and resources available. Among these we also treat, rarely but regularly, due of our spectrum of care: children, young people and pregnant women.*

*Interventional gastrointestinal procedures can be very complex: we use different endoscopy techniques combined with fluoroscopic imaging and Endoscopic Ultrasound (EUS). During these procedures, we have to combine information from these different imaging procedures to establish our clinical view of the patient's condition. This means new and exciting challenges every day. It is one of the major motivations of my profession.*

*We have a large operating room where we can perform all types of these procedures in a combined way. We are able to do the necessary sedation for the procedure within our own team, because all the nurses and physicians working in my ward graduated with training in this procedure. If we sometimes need the help of a specialized anesthesia team, even in an unsedated situation, it is always possible.*

*This workflow is very effective and patient-oriented, even for those treated on an outpatient basis, which represents approximately 50% of my patient population."*

**Among all your procedures, when do you use fluoroscopic imaging?**

*"We use fluoroscopic imaging whenever necessary, but we are very restrictive to minimize radiation exposure. With the OEC Elite CFD, as already mentioned, we do about 650 gastrointestinal examinations per year.*

*The endoscopic technique has evolved due to the improvement of the endoscopic accessories we use. For example, in the past we did all the dilatations and bougienage of the esophagus under fluoroscopic control. Today, with the new devices available, such as the CRE™ balloon (Boston Scientific), we need fluoroscopic imaging only in rare situations. But especially for interventional endoscopic procedures within the lower gastrointestinal tract, we need to check the procedure under fluoroscopic imaging because of the unpredictable way in which the endoscope can bend.*

*For the treatment of gastric fundal varices, when it may be necessary to inject cyanoacrylate glue (a glue mixed with a radio-opaque dye), it is important to use radiological control for positioning the injection catheter, controlling the flow of the glue and monitoring the way that it holds during injection (for example into the pulmonary veins).*

*Also, when colleagues call me in a situation where there is a need for an assessment by an experienced physician, because the case is quite complex, I need fluoroscopy for positioning the catheters and the endoscope more precisely.*

*ERCP is of course the procedure for which fluoroscopic guidance and control is mandatory. It is a challenging and sometimes a life-threatening procedure. One of the most*

*common complications is acute procedure-related pancreatitis. That is why we need premium radiological control that offers the best image quality, to help us to perform bile or pancreatic duct cannulation, which is a critical step in the procedure. It is hard to define in advance how long the cannulation will take for a given patient. In our procedure, if a trainee does not succeed after 5 minutes, an experienced colleague will have to become involved in order to reduce the risk of complications. Performing complex interventional EUS procedures has become a new and important indication for the use of fluoroscopic imaging. Either because we are working in a critical anatomical situation, such as during drainage of a pancreatic cyst, or because we are dealing with difficult access such as trans-gastric drainage of dilated bile ducts. Whether dealing with transgastric or trans-duodenal access, you need absolute control over the access to the bile duct: you need to make sure that you don't enter a vein, and position the guidewire over a catheter to the targeted cyst or duct. Each step of the procedure has to be performed under fluoroscopic control for precise intervention."*

**What are the imaging challenges you encounter when doing ERCP?**

*"ERCP is a complex and sometimes critical endoscopic procedure. In our hospital, as in most institutions, residents must perform 200 ERCPs to be qualified to perform an examination on their own. Endoscopy is a very different approach to a patient's anatomy, compared to laparotomy and laparoscopy. A few years ago, I performed ERCP procedures with a colleague who was more experienced in laparoscopy and we learned that our way of perceiving the anatomy is completely different. The technology behind endoscopes is also different: for ERCP we use a long flexible endoscope called a duodenoscope; for laparoscopy they use a stiff, shorter endoscope called a laparoscope.*

*A so-called flexible duodenoscope has a side viewing optic and guiding it through the patient's anatomy can be very tricky.*
*In laparoscopy, what you see on the monitor is a large image with a panoramic view of the whole anatomy, but no imaging of the ductular system. In ERCP, you get a reduced image, related to the visualization and distortion of the endoscope, but an excellent image of the ducts.*

*In ERCP, imaging might be sometimes difficult, i.e. reflections that we perceive as artefacts of the image. Endoscopes have algorithms to minimize this effect. We also have different tools that can be used with the help of the endoscope. For example, it is possible to use a tiny video endoscope or baby-endoscope (SpyGlassTM DS System from Boston Scientific) that is about 2.6 mm in diameter, inserted via the working channel of the mother-endoscope. It is possible to use it in the biliary and pancreatic ducts, to check for stones or tumors, and also to take biopsies for further diagnostic evaluation. All these steps of the procedure are done under fluoroscopic imaging guidance."*

**How is OEC Elite CFD helping you in your daily practice?**

*"The problem during a hepato-biliary-pancreato endoscopy is that we have to be aware of imaging the anatomy we want to see. In the hepato-biliary system, fluoroscopic imaging is recommended when there is a tumor in the upper part of the bile duct i.e. a stenosing tumor of a hepatic duct. The patient is lying in the supine position, so we need a high-quality fluoroscopic image to get a view and understanding of which ducts are involved and guide our accessories through the different duct bifurcations. Klatskin tumors are challenging because they develop within the hilum of the liver, where the left and right hepatic ducts join. It is important to get a perfect X-ray image to ensure drainage for both liver lobes and to plan surgical resection. OEC Elite CFD provides such an image to achieve these objectives.*
*In our endoscopic theater, the team is not assisted by a radiology technician or assistants. My staff not only help me control the endoscopic procedure, but also the radiological procedure, therefore we are independent and autonomous.*

*The patient is lying in the supine position and, if we need another projection, we move them to get images from different angles. We perceive the anatomy in 3D through these views and the images from the endoscope. It is a challenging and dynamic way of working to get a kinesthetic perception of the anatomy. So, for fluoroscopic imaging, I follow the 'point and shoot technique' that is easy to do with OEC Elite CFD, because it sets up the image quality quickly and automatically. The image quality is perfect and allows us to take these single quick shots avoiding high X-ray dose exposure.*

*When dealing with tumors of the hilum of the liver, we use the magnification mode to image the biliary duct bifurcations. But in general, we need to know how the endoscope is positioned and how we can optimize it. Therefore, we need an overview image of the landscape of the anatomy.*

*From the fluoroscopic and endoscopic images, and looking at how the patient is lying, I can figure out where I am in the projection of the patient's anatomy.*

*To summarize, with the help of an easy-to-use C-arm with excellent image quality, that is comfortable and ergonomic, radiological procedures and gastroenterology video imaging can be perfectly managed. OEC Elite CFD fulfills these demanding requirements."*

**Dr. Peter N. Meier** passed his German examinations in medicine in 1985, and the ECFMG-Examination (USA) in 1986. He obtained a qualification for Internal Medicine in 1992 and three years later for Gastroenterology and Proctology in Hanover. He also completed training for a diploma in rescue medicine at the Medical University Hospital of Hanover (MHH), where he worked for 15 years. Dr. Meier completed his training in interventional gastrointestinal endoscopy techniques and became head of the Endoscopy Unit at the Faculty of Gastroenterology and Hepatology in 1996 (Director: Prof. Dr. M.P. Manns). He performed up to 800 ERCPs per year in an Institution associated with a liver transplantation program but was also involved in studies of endoscopic therapy of esophageal reflux disease, mainly the Stretta-Procedure. As with many surgical techniques, he learned gastrointestinal endoscopy skills through mentorship, practice, and international relationships (Italy, Spain, France, Netherlands, Belgium, Israel, Egypt, UK, Hong Kong, USA) especially in innovative techniques.

Always going further in the practice of ERCP, Dr. Meier specialized in ERCP for newborns and children which requires tools dedicated to small pediatric anatomies (weighing down to 1.7 kg). He was one of the first gastroenterologists in Europe to acquire a dedicated duodenoscope specially designed for small children.

Dr. Meier belongs to various German societies for emergency, gastroenterology, internal medicine, and imaging in endoscopy. He is also a member of the European Society of Gastrointestinal Endoscopy (ESGE), the American Society for Gastrointestinal Endoscopy (ASGE) where he was and now is again a member of the International Committee, and the American Gastrointestinal Association (AGA).

Dr. Meier has also been a teacher of endoscopic techniques through different programs such as the IRCAD Institute in Strasbourg, a surgical and interventional endoscopy learning center.

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's 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. JB05573XE

# Advanced hepato-pancreato-biliary procedures: Endoscopic Ultrasound (EUS) and Endoscopic Retrograde Cholangio Pancreatography (ERCP)

## with OEC Elite CFD

**Interview with Dr. Carlos Alberto Praticò, Interventional Gastroenterologist, department of Interventional Endoscopy, Private Hospital Armand Brillard (HPAB) in Nogent-sur-Marne, France.**

The Private Hospital Armand Brillard (HPAB) is a multidisciplinary hospital located in the eastern area of Paris, in the city of Nogent-sur-Marne. Since 2009, the hospital has been developing a care policy in which the values of proximity, excellence, quality of care and listening are applied on a daily basis. The establishment, attached to the Ramsay Santé group, counts 155 practitioners. Each year, the care teams welcome more than 50,000 patients. HPAB offers a diversified range of care provided within a medical structure equipped with a high-level technical platform. HPAB has a surgical unit with 8 operating rooms as well as an endoscopy unit with 4 operating rooms.

The department of Interventional Endoscopy, specializing in advanced minimally invasive treatment and diagnostic techniques has equipped itself with a premium OEC Elite CFD C-arm.

Dr Praticò, consultant in interventional gastroenterology, specialist in advanced endoscopic imaging techniques and therapies, explains why he chose the OEC Elite CFD and how it is used within his department.

**Dr Carlos Alberto Praticò** is an Interventional Gastroenterologist, specialized in advanced ERCP endoscopy techniques. After eight years of practice as an Interventional Digestive Endoscopist at Hopital Cochin of Paris, he joined the department of Interventional Endoscopy of the Private Hospital Armand Brillard (HPAB) in Nogent-sur-Marne, to develop advanced endoscopy techniques including ERCP and EUS.

Dr Fonkoua, Dr Praticò, Mrs Gilbert (Nurse), Dr Mami

**Can you describe the types of advanced hepato-pancreato-biliary procedures you perform in your department?**

*"The different hospitals of the group specialize in different fields. At HPAB, the gastroenterology department specializes in the field of digestive cancers. It is in this context that we are developing interventional endoscopy. For the treatment of the digestive tract, we perform Endoscopic Submucosal Dissection (ESD) and Endoscopic Mucosal Resection (EMR) procedures. On the hepato-pancreato-biliary side we establish the diagnosis of cancers and at the same time we have the possibility of carrying out some therapeutic measures, such as for example biliary drainage, radiofrequency treatment of lesions of the pancreas (which is a new technique under endoscopic ultrasound) or radiofrequency treatment of cholangiocarcinoma cancers via the ERCP route.*

*As a gastroenterologist, I quickly specialized in endoscopic techniques and more specifically in interventional endoscopy techniques, in particular ERCP and Endoscopic Ultrasound (EUS) techniques.*

*EUS is a technique in full development: it started as a diagnostic technique, and for the past ten years or so, it has developed into a technique for interventional purposes.*

*Previously, EUS was used to confirm the presence of a stone and then it was followed by an ERCP to remove it. In pancreatic cancer, EUS was used to take biopsies in order to establish a diagnosis and classify tumors in order to provide specific treatments.*

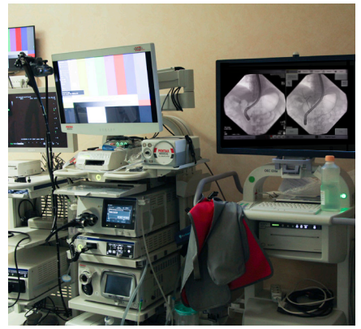
*Today EUS allows for more complex therapeutic procedures than simply performing biopsies for obtaining histology or performing drainage.*

*For example, we use EUS to perform biliary digestive anastomoses during a biliary examination: anastomoses between the stomach and the hepatic bile ducts or anastomoses between the common bile duct and the duodenum. These anastomoses are therefore circuits which have been created but which do not exist naturally in the patient. These procedures are necessary for patients who have undergone anatomical procedures (e.g. bariatric surgery) and who are no longer able to undergo traditional surgical access. In this case, their natural anatomy has been modified, and no longer allows access to the ampulla of Vater by retrograde route. Anastomosis is also necessary for patients with highly developed cancers that alter the anatomy to the point where the bile duct is no longer identifiable. Endoscopic ultrasound allows us to see and identify this modified anatomy, and to create a different and always effective approach.*

*Interventional EUS remains a relatively new technique. Orienting myself towards therapy, little-by-little I specialized in this technique for treatment.*

*Among these advanced interventional EUS techniques, we perform radiofrequency (RF) ablation of pancreatic tumors. Under EUS, we insert needles to destroy small lesions of the pancreas. The endoscope is introduced orally and then lowered intra-gastrically into the duodenum. At its end is an ultrasound probe. Pancreatic lesions are detected through the intestinal wall. A needle is inserted into the core of the tumor, still under EUS control. The needle delivers a current of radio frequencies that will destroy the tumor cells via a thermal effect. Especially for treating small lesions, the duodenal endoscopic route is more usually indicated than the percutaneous route into the pancreas because the presence of the stomach between the abdominal wall and the pancreas makes access more complicated.*

*This is a first treatment to avoid a major cephalic duodeno pancreatectomy (CDP) procedure and has shown results for the patient over a period of 4 years which are similar to conventional surgery."*



Interventional Endoscopy room set up with equipement: OEC Elite CFD C-arm mainfraime, EUS, Endoscopy station and OEC Elite CFD workstation

**Which of these procedures do you need fluoroscopic imaging for?**

*"We use fluoroscopic imaging for ERCP, the placement of stents in the bile ducts and in the pancreas. Treatment of tumors in the bile ducts with RF is also done under fluoroscopic control. In this case, a catheter is inserted into the bile duct. This catheter has radiopaque markers which allow the probe to be positioned relative to the tumor lesion.*

*In interventional EUS, fluoroscopic imaging is used to perform certain anastomoses requiring a cholangiography (with injection of contrast product) such as, for example, when placing a stent during a hepatic or gastric anastomosis.*

*For these complex procedures, there is a major interest in working with a premium C-arm providing high image quality. In classic ERCP, we follow a natural anatomical pathway, we insert the tools into an already existing canal. The risk is a bit lower compared to interventional EUS, where we create pathways that don't exist. When we perform an anastomosis, the procedure requires higher precision. High-quality fluoroscopic imaging is of great interest, as it allows me to visualize clearly the target of the bile ducts and to position the guide precisely during cholangiography and thus reduce the risk of creating false pathways. The OEC Elite CFD C-arm allows me to perform these procedures thanks to its image chain technology.*

*I use fluoroscopic imaging for about 60% of my procedures, the largest volume of which relies on the use of combined EUS and ERCP techniques.*

*In France, we benefit from an strong culture of EUS and "traditional" ERCP: EUS for the establishment of the diagnosis of the disease, followed by therapeutic procedures under ERCP. Previously, these techniques were separated and developed in different*

*centers. The patient journey was longer and could include undergoing an MRI to locate the stones.*

*Now in France, these EUS and ERCP techniques are used in a combined way, at the same time. The patient comes for the diagnosis which is established by EUS followed by the ERCP for the therapeutic procedure.*

*As with many interventional procedures, the treatment is operator-dependent and also instrument-dependent. In these continuous developments of procedural techniques, the equipment must also evolve in order to allow these very specific procedures. We therefore need good endoscopes that provide a high-quality ultrasound image as well as very good fluoroscopic imaging of the same level of quality."*

**How does fluoroscopic imaging compare to endoscopic video and EUS?**

*"The hepato-pancreato-biliary anatomy changes depending on the positioning of the patient. In order to navigate the tools into the anatomical target, it is necessary to be able to view the volume of the anatomy.*

*In almost all of my cases, I position the patient supine. Sometimes, for the sake of anatomical access, I may have to rotate them on to their left side. In this posture, the endoscopic position is more stable, this can provide better access to the ampulla of Vater. However, when working on the bile ducts with the patient on their left side, the endoscopist loses right-left landmarks, and may lose anatomical landmarks in the volume. This is not a problem for simple procedures such as the removal of bile duct stones.*

*In our expert center, where we have to deal with complex cases, such as biliary duct stenosis in the hepatic dome, we need all of the threedimensional information available.*


*Indeed, around the hepatic dome, we need to have a selective view of the vessels and a good anatomical view of the bile ducts. When we are forced to put the patient in lateral decubitus to access the bile duct during cannulation of the ampulla, once in the bile duct, we put the patient in dorsal decubitus to locate the anatomy in the volume. In complicated access cases (e.g. for a patient with deformed bile ducts), we may have to work throughout the procedure with the patient on their left side and, in this case, we may have to tilt the C-arm to have oblique views, of +/- 30 degrees cranio caudal. This way we can retrieve more three-dimensional information on the anatomy.*

*Generally speaking, fluoroscopic imaging is essential after cannulation of the ampulla of Vater. Practitioners must learn to interpret the image in order to navigate the tools into the ducts. Especially in cases of hepatic stenosis, when we have to navigate in several sectors. Since the right liver has a larger volume of liver tissue than the left liver, navigating the right liver requires more experience and practice. Fluoroscopic imaging allows us to identify the intrahepatic bile ducts, and in complex stenoses this identification is possible thanks to the very good fluoroscopic image quality of OEC Elite CFD."*

**What are the tools of OEC Elite CFD that you are using the most?**

*"Live zoom is very useful for very precise drainage procedures in interventional EUS.*

*Recently I performed a drainage and used the digital zoom. It helped us a lot, because we had the possibility to see precisely the point where we made the puncture. With the digital zoom, we can observe peculiarities of the anatomy without increasing the dose of radiation, and that helps us a lot.*

*I really like how easy it is to use the touchscreen interface on the workstation. Recently I had to perform an intrahepatic bile duct drainage with a very tight stenosis. Being able to save an image with the trace of the contrast medium, then display it on the reference screen, allowed me to know which route to take during the procedure. I managed to catheterize the area even though I could no longer see the stenosis in the pictures taken during navigation. The ability to save the reference image is a very useful tool.*

*During a procedure, I often change the fluoroscopy mode with the footswitch: switching between standard fluoroscopy and digital spot to increase the image quality.*

*OEC Elite CFD is easy to use, that's a big advantage. Compared to other C-arms, I find it more compact and easier to handle. During the procedure, I sometimes change the angulation of the C-arm to obtain additional images under other angles to find my way in 3 dimensions. With OEC CFD, this is simple.*

*At the HPAB, we receive a lot of colleagues who come to train in our techniques and this is an activity that I really like. In this training context, I often use the digital pen and the measurement tool.*

*On an initial image before starting the procedure, I trace for the student the bile duct with the bifurcation between the bile duct and the pancreatic duct. The student then uses this blue line to guide their tools in the right direction during the procedure. I also use the measuring tool to define the size of the prostheses. For someone who is just starting out, it is interesting to show them measurements taken from stenoses by calibrating the measurement to the actual size of the endoscope. In routine use, I can use it to measure the size of macro stones, when I don't have anatomical size benchmarks.*

*Another aspect guiding the choice of OEC Elite CFD is its size. When performing interventional endoscopy procedures, the French Society of Digestive Endoscopy (SFED) recommends that we work in rooms with a surface area of 40 $m^2$. However, in the majority of endoscopy centers, our rooms are smaller than this. Therefore, many practitioners prefer to select compact, easy to use and easy to reposition fluoroscopy bars. OEC Elite CFD meets these requirements."*

**What setup of OEC Elite CFD are you using?**

*"The flat detector allows us to optimize the level of radiation for the patient and for ourselves because we use fluoroscopy in about 60% of our procedures. We also chose an adapted patient table to minimize its impact on image quality and radiation dose. After training on the settings of OEC Elite CFD, my colleagues and I defined an imaging protocol suitable for our procedures.*

*We prefer to use the pulsed fluoroscopy mode to manage the X-ray dose. For example, for conventional procedures, such as the placement of*

*an esophageal prosthesis for which the procedures are less precise, exposure times can be relatively long, and the pulsed mode is a good compromise between image quality and dose.*

*For hepato-pancreato-biliary procedures, the examinations are dynamic. We prefer to take a short series of images and repeat a series of images for each procedure. This gives us frequent image changes.*

*In some cases, such as complex drainage in the intrahepatic bile ducts, we remove the pulse mode to set up the C-arm in continuous fluoroscopy mode, which gives us the opportunity to see small passages of contrast medium in hepatic branches.*

*We use dynamic recording of the images to be able to replay the image series and fully understand the anatomy.*

*I really like the articulated arm of the workstation display monitor. Usually, I have access to the screen myself. During the procedure, I can move it to bring it closer to my eyes and better see the small details in the image.*

*As our rooms are full of equipment, the size of the OEC Elite CFD C-arm allows the nurse to have room to position their table with all their ancillaries. For procedures where I am in difficulty, I can ask the nurse to change the fluoroscopy modes for me.*

*The C-arm is very intuitive, and the operating room staff have no problem using it. Another big advantage is that it is tactile and intuitive. This effectively allows us to adapt the different exposure functions and fluoroscopy mode depending on the procedure.*

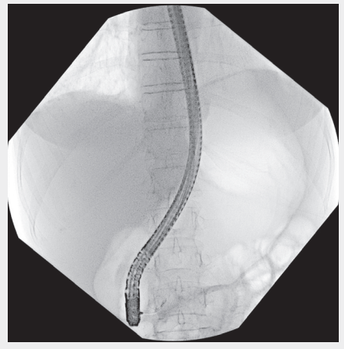
*We are very happy with OEC Elite CFD."*



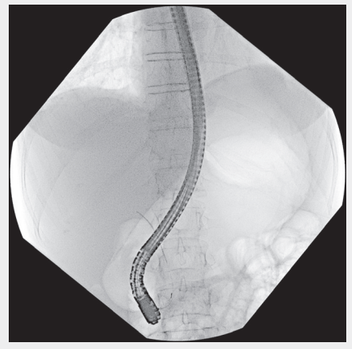

**CLINICAL ILLUSTRATION:**
Endoscopic Retrograde Cholangio Pancreatography (ERCP)

Courtesy of Dr. Carlos Alberto Praticò, Interventional Gastroenterologist, department of Interventional Endoscopy, Private Hospital Armand Brillard (HPAB), Nogent-sur-Marne, France.

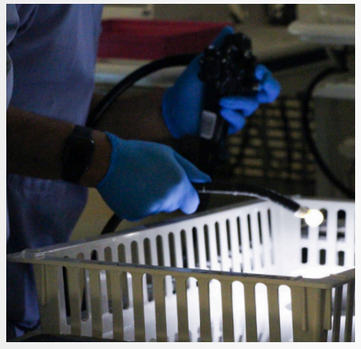
Patient and C-arm set up for ERCP procedure



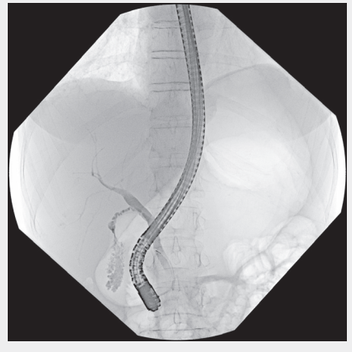
Fluoroscopic imaging control of the cannulation of the ampula of Vater



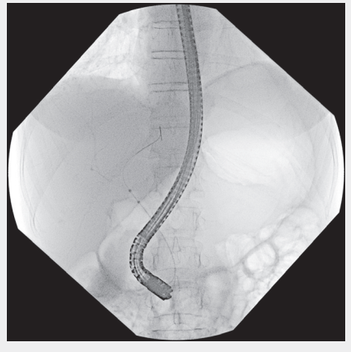
Fluoroscopic imaging guidance of the guide in the bilary canal



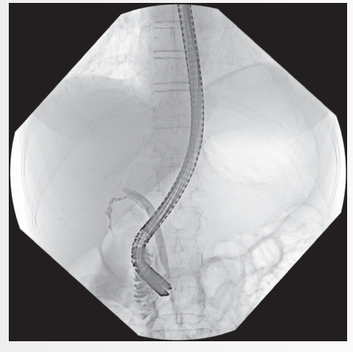
Balloon test before use



Cholangiogram showing the bilary tree, the cystic duct and the gallbladder



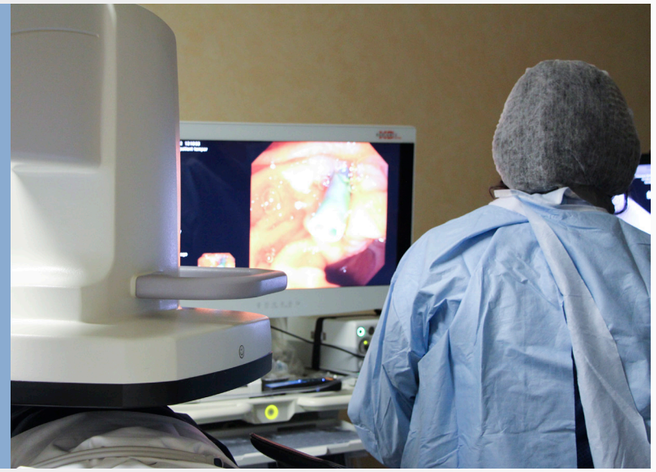
Positionning of the balloon for dilatation of the duct

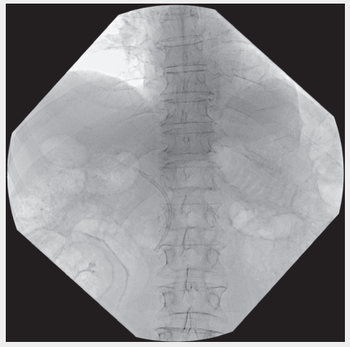


Final control of the cystic duct

## CLINICAL ILLUSTRATION:
Cholangiography and biopsy

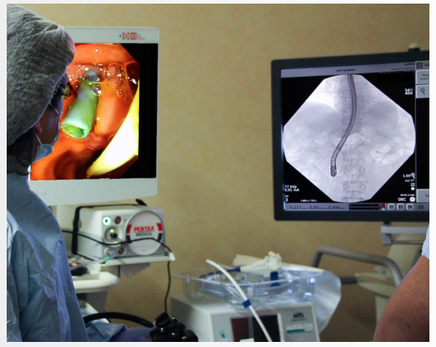
Courtesy of Dr. Carlos Alberto Praticò, Interventional Gastroenterologist, department of Interventional Endoscopy, Private Hospital Armand Brillard (HPAB), Nogent-sur-Marne, France.



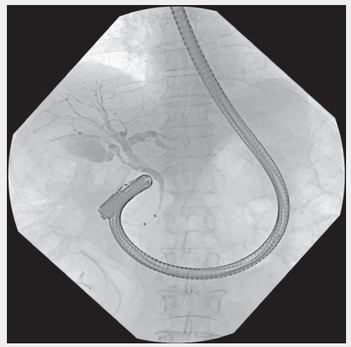


Centering image of the C-arm over region of interest, showing drain in patient's biliary duct.

Endoscope positioning at ampulla of Vater for drain removal



Cholangiogram showing balloon placement in bialry duct

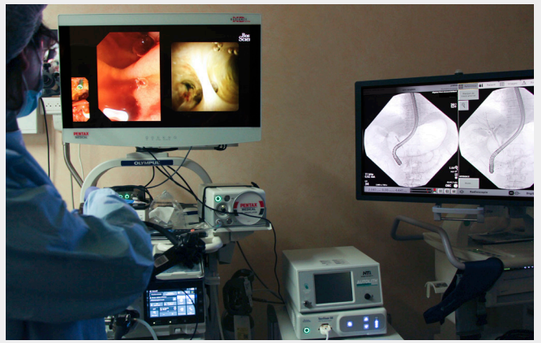


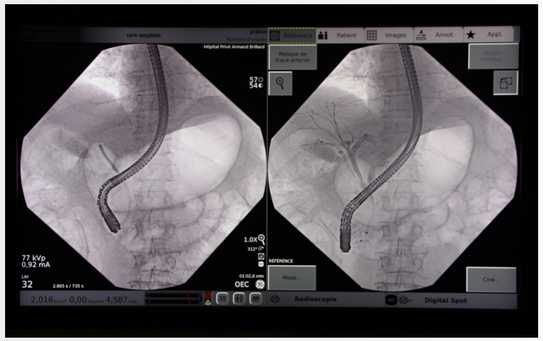
Cholangiogram of control after dilatation

*" The OEC Elite CFD C-arm allows me to perform these procedures thanks to its image chain technology."*

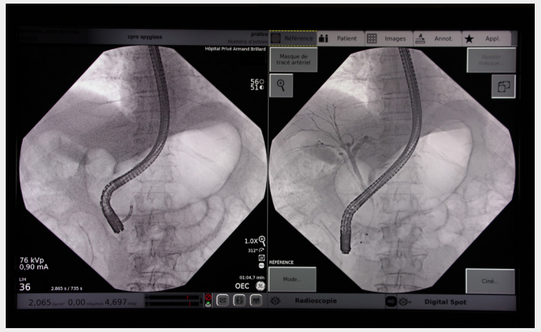
**Dr. Praticò**

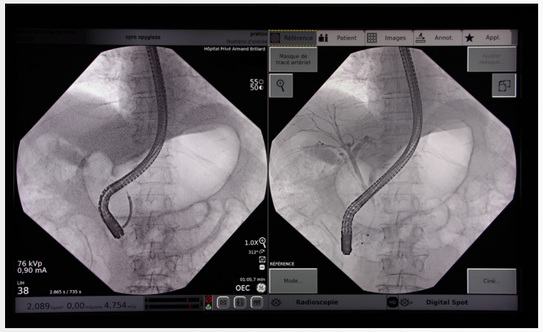


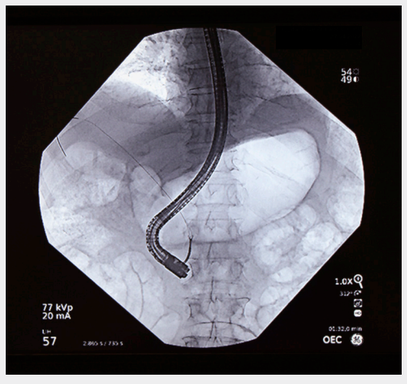




Navigation of SpyGlass™ system (Boston Scientific) under fluoroscopy, using cholangiogram as reference image.







Fluoroscopic image showing SpyGlass™ system over its guidewire, launching the forceps for biopsy

*" OEC Elite CFD is easy to use, that's a big advantage. Compared to other C-arms, I find it more compact and easier to handle."*

**Dr. Praticò**

The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's 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. JB05574XE

# Superselective bariatric embolization in obese patients: a new complex minimally invasive procedure in Interventional Radiology

with OEC Elite CFD

**By Dr. Harvey Manosalva, MD, Specialist in Interventional Radiology, Scientific Director, Ecoimagen Salud, Cúcuta, Colombia.**

According to the World Health Organization[2], worldwide obesity has tripled since 1975, and in 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese.

This population has a high body mass index (BMI)[1], which is associated with an increased risk of cardiovascular diseases, cancers and osteoarticular pathologies. That is why bariatric gastric embolization has been introduced as an excellent alternative for the treatment of obesity.

According to Dr. Manosalva, the bariatric gastric embolization procedure has been successfully introduced in Colombia, and already achieved significant changes in patients' lives. The support provided by the OEC Elite CFD C-arm has been key in overcoming the inherent challenges of gastric vascular anatomy, and features such as Live Zoom and Enhanced Noise Reduction (eNR) enabled the institution to obtain high image quality while performing the procedure.

**Dr. Harvey Manosalva** is a graduate of Buenos Aires University with a specialization in Diagnostic Imaging and a fellowship in Interventional Radiology from the same institution.

Currently based in Cúcuta, Colombia, Dr. Manosalva is the President of the North Santander Radiology Association (Asociación Nortesantandereana de Radiología) and the Medical and Scientific Director at Ecoimagen Salud institution.

*"At Ecoimagen Salud we consider the well-being of all of our patients as the top priority. We rely on our qualified multidisciplinary team as well as on our high quality medical devices. "*


**Why did you select bariatric embolization to treat obese patients?**

*"Obesity is a disease with multiple root cause that can involve different complications when it is not treated in a timely manner. Gastric embolization has therefore become an alternative treatment for overweight patients that has several advantages, as it is minimally invasive compared to other widely used surgical techniques, such as gastric sleeve surgery.*

*At Ecoimagen Salud we began performing this innovative procedure in 2018. In the early stages of the project, it was important to find the right C-arm technology to help us achieve consistent results; that is the reason why we relied on the OEC Elite CFD C-arm."*

**Which patients are candidates for the procedure?**

*"A patient must meet several requirements in order to be a candidate for gastric embolization, which include having a BMI greater than 30; falling within obesity categories I or II; undergoing kidney function, Prothrombin Time (PT) and Partial Thromboplastin Time (PTT) coagulation time testing; a complete blood count and creatinine blood test, all with results within nominal values.*

*Furthermore, abdominal CT angiography must be performed in order to plan the procedure, as well as endoscopic examination of the upper gastrointestinal tract.*

*Patients with prior surgical interventions for managing the same pathology are not suitable candidates."*

**What is gastric embolization?**

*"A minimally invasive treatment with outpatient recovery that is used to control a patient's weight loss.*

*This procedure helps the patient reduce their sense of hunger by blocking the hormone that controls their sense of appetite. This requires the embolization of the artery that supplies blood to the gastric fundus.*

*In general, this procedure is employed when a patient has already tried other solutions, such as dieting or exercise, without success, thus making a surgical solution a valid option."*

**What is the function of ghrelin and why is it important in this procedure?**

*"Ghrelin is also known as the hormone that regulates hunger in the human body. Ghrelin production increases when the stomach is empty, thus increasing the sense of hunger. Therefore, the basis of gastric embolization is to prevent the secretion of this hormone, 99% of which is synthesized in the gastric fundus."*

**What is the process like for a candidate patient, and how does the treatment complement the embolization procedure?**

*"Gastric Embolization and Lifestyles" is a program where candidate patients begin the process with an interdisciplinary group specialized in obesity. Each patient attends an initial consultation to evaluate the possibility of undergoing the procedure, which is done by reviewing the patient's medical history.*

*Following this initial consultation, the above-mentioned additional testing is carried out, which is subsequently evaluated by sports medicine and specialists in nutrition and psychology. Finally, the patient will be monitored during the four months after."*

**What are the origins of this technique worldwide?**

*"It all began around 25 years ago with the boom in Interventional Radiology. At first, gastric embolization was performed to treat cancer-related gastrointestinal bleeding and it was observed that the procedure had a subsequent side effect: patients lost their sense of hunger and lost weight. After much research, it was decided to start using bariatric gastric embolization procedures as an alternative treatment for obesity."*

**What is the greatest clinical challenge during the procedure in the Operating Room?**

*"The anatomy of the gastric artery, without a doubt; it has several origins and sections, making catheterization difficult. In this regard, we can get an idea of the approach using prior computed tomography scan and, of course, it is essential to also have excellent image quality with a C-arm, such as the OEC Elite CFD, which allows me to confidently face these challenges."*

**How have your procedures changed with the introduction of the OEC Elite CFD C-arm?**

*"OEC Elite CFD is a specialized piece of equipment that enables Ecoimagen Salud to prioritize and elevate quality during interventional procedures. Some*

*of its features have optimized my work during procedures, such as Live Zoom, which allows me to view images in detail and zoom the image without increasing the radiation dose, which is a benefit for both, my clinical team and the patient. I am also able to navigate the field of view without changing the detector-patient positioning. Furthermore, the Digital Pen feature allows me to make marks on a vascular structure or structures that should be highlighted during gastric embolization, making these visible on the main monitor, marks remain on the live image for improved referencing.*

*In general, the OEC Elite CFD C-arm managed to solve one of my biggest concerns: being able to constantly handle the schedule of procedures. By acquiring this advanced C-arm, we are able to perform more procedures without worrying about the equipment overheating, patient's size, or compromising the image quality. It is an intuitive platform that is easy to use while performing procedures."*



## PROCEDURE – SURGICAL TECHNIQUE

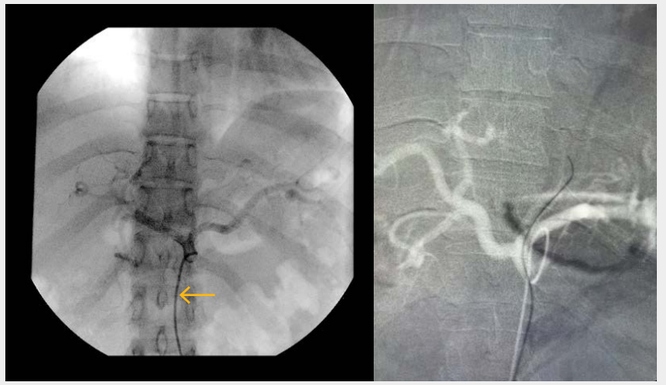


**Fig. 1** A 5 Fr catheter is advanced and selective catheterization of the celiac trunk is performed. Left Image: native image. Right Image: using a roadmap and Live Zoom.

*Yellow arrow mark on image is for reference only. This is not part of product annotations feature.*

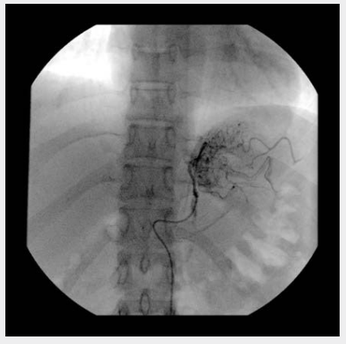


**Fig. 2** A 5 Fr catheter is advanced to the gastric fundus in order to perform superselective embolization. Contrast injection and lavage of the gastric fundus.

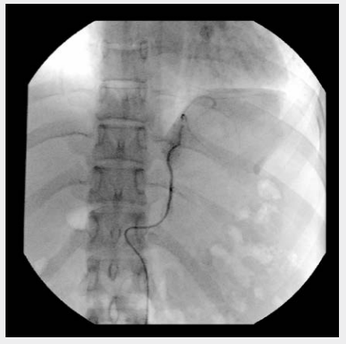


**Fig. 3** Superselective embolization of the left gastric artery with Particles of Polyvinyl Alcoholmeasuring 500–700 microns (PVA-2), achieving total occlusion of the gastric fundus where ghrelin is produced, with the proximal sector of the gastric artery remaining patent.

**Fig. 4** Subsequent monitoring of embolization. Celiac trunk and its branches are patent (image with digital subtraction).

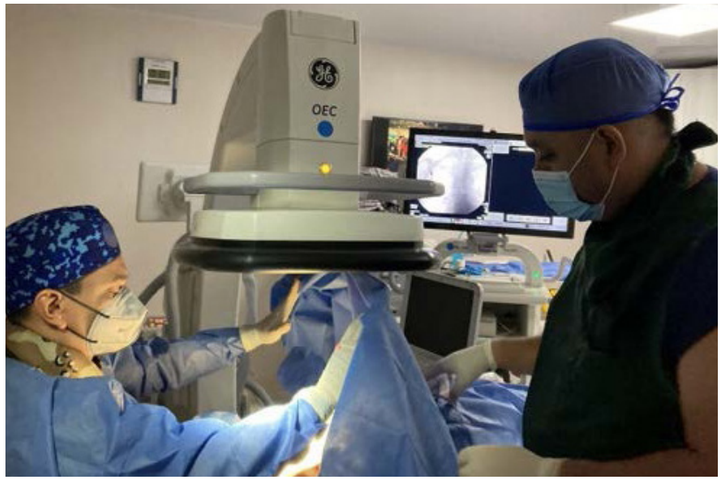
## Dr. Manosalva's Experience with OEC Elite CFD

*"Features such as Live Zoom allow me to evaluate the structures I want to see more quickly and in greater detail without increasing the radiation dose. Digital Pen helps me to plan and guide, which serves as an intuitive learning tool. Roadmap is another vascular feature that I use constantly."*

## Conclusion

*"Bariatric gastric embolization is an innovative procedure that serves as an alternative means of managing Class 1 and Class 2 obesity. The experience of Ecoimagen Salud in Colombia has yielded results, with patients showing an average weight loss between 12 and 20 kg.*

*Successful surgery depends on several important factors, including clinical ability, an expert multidisciplinary clinical team and adequate assistive technology that enables you to view the vascular anatomy of obese patients and to achieve benefits that optimize workflow in the operating room."*




## Key Points:

- *"The OEC Elite CFD C-arm and its features provide high-quality imaging for obese patients, enabling us to precisely identify gastric arteries and their vascular branches to successfully perform bariatric gastric embolization."*
- *"Live Zoom allows for highly detailed viewing, by zooming in on the image without increasing the radiation dose for patient and staff. It also enables focusing on a specific area without moving the device, thus improving workflow."*
- *"Digital Pen is a big help during digital subtraction and/or roadmapping, enabling marks to be made on vascular structures that should be highlighted during gastric embolization, making these visible on the main monitor and remaining on the live image for improved referencing."*

1 BMI: Body Mass Index

2 https://www.who.int/es/news-room/fact-sheets/detail/obesity-and-overweight

3 Sangik Park, MD, Ji Hoon Shin, MD, Dong-Il Gwon, MD, Hyoung Jung Kim, MD, Kyu-Bo Sung, MD, Hyun-Ki Yoon, MD , Transcatheter Arterial Embolization for Gastrointestinal Bleeding Associated with Gastric Carcinoma: Prognostic Factors Predicting Successful Hemostasis and Survival, Revista Cross. Volume 28 • Number 7 • July • 2017

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# Complex endovascular procedures

## With OEC Elite CFD Motorized premium C-arm

**Interview with Dr. Mercedes Guerra, President of CCVE, Spanish Society of Vascular Surgery, Chief of the Department of Angiology, Vascular and Endovascular Surgery, Guadalajara University Hospital, Spain.**

Guadalajara University Hospital is one of the most important hospitals in the region of Castilla – La Mancha, located in the middle of the Iberian Peninsula. It is attached to the University of Medicine of Alcalá, near the city of Guadalajara. In the Spanish health system, this hospital's mission is to support a network of satellite hospitals based on its skills and capacity to treat large volumes of patients. The hospital has 360 beds which increased to 450 during the pandemic. The angiology and vascular surgery service of the hospital serves the population of Guadalajara (approximately 240,000 inhabitants) and Cuenca (120,000 additional inhabitants).

It is in this context that the angiology and vascular surgery service has become a center of excellence for the treatment of pathologies of the aortic artery, both in open and endovascular surgical techniques.

Faced with an increasing demand of the volume of patients to be treated, the department decided to evaluate the performance of a new premium mobile C-arm, the OEC Elite CFD C-arm with motorized gantry movements for its endovascular activity covering from peripheral recanalization to complex aortic repair procedures.

Dr. Guerra shares with us how this new generation C-arm fits her vascular surgery workflows.

**Dr Guerra,** graduated with a Masters in Hospital and Health Services Management, is head of the department of Angiology, Vascular and Endovascular surgery at Guadalajara University Hospital, where she has worked since 2005. She also currently works at the CEMTRO Clinic, a private center in Madrid. Dr. Guerra has been president of the endovascular chapter of the Spanish Society CCVE since 2017.

At the 2019 World Health Day event, Dr. Guerra received the health merit medal from the government of Castilla-La Mancha, rewarding her research studies and teaching activities in endovascular surgery. Dr. Mercedes Guerra has been considered by Forbes magazine (2020 Edition) as one of the top 100 doctors in Spain, in a ranking that brings together the best professionals from all public and private health specialties.

**Can you describe the typical surgical activity of your department?**

*"We are five vascular surgeons, including myself, and usually we have up to three residents.*

*The volume of procedures varies a lot, and this has been especially true during the pandemic. We therefore have three arterial operating theaters per week. In these operating rooms we usually operate on an average of two patients. We do regular afternoon shifts, as well as between 80 and 100 emergency surgeries a year, and this number is growing.*

*Regarding scheduled interventions, we can treat up to 100 aortic cases. For the femoropopliteal sector, the number varies significantly: between 30 to 50 endovascular superficial femoral surgeries, and about 20 open surgeries. In our department we treat the entire vascular system: carotids, upper limbs, lower limbs, visceral, occlusive aneurysms, and we perform open, endovascular and mixed surgery. Therefore, in total, there are usually about 500 surgeries per year.*

*For our angiology activity, we have one theater per week where we treat not only varicose veins, but we also perform thrombectomy in deep vein thrombosis, cava filter placements, insert venous stents and repair hemodialysis accesses.*

*The current volume of surgeries for varicose veins is significant. There are currently 300 to 400 patients on a two-year waiting list whereas before the pandemic we had the capacity to perform 50 procedures per year. Due to the pandemic this type of intervention has experienced delays. Currently we treat about one case per week of venous thrombosis, cava filters and venous stents."*

**What procedures do you use fluoroscopic imaging for?**

*"We need fluoroscopic imaging for 95% of our activity, including when we perform open aortic surgery because in their vascular care pathway patients don't benefit from a preoperative arteriography. We don't use fluoroscopic imaging when we do open abdominal surgery or carotid endarterectomy.*

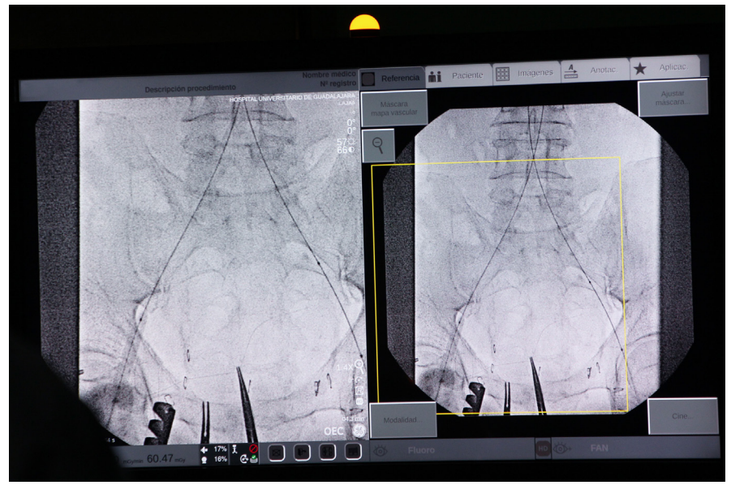
*But for all other procedures, we need fluoroscopic imaging. For example, when patients are referred to us for distal bypass surgery (open surgery of the leg), our vascular laboratory performs the hemodynamic study including claudicometry and Doppler procedure: the patient comes with a fairly complete file but without an arteriography. Also, a diagnostic arteriography is always performed in the operating room, followed by open surgery, and lastly a control arteriography."*

**During the clinical evaluation of OEC Elite CFD, which characteristics were most important for the department?**

*"Firstly, the most important performance of OEC Elite CFD that I demonstrated during my activity is that I am able to perform complex procedures without interruption even with long fluoroscopy times, without overheating the system.*

*Furthermore, I really appreciate the image quality. At first, we thought it would be similar to other mobile flat panel C-arms that we use in our department but gradually we noticed that the image quality with the OEC Elite CFD with CMOS detector is higher. Another great advantage is the Live Zoom, that offers the possibility of zooming the fluoroscopic image during acquisition, without having to use the MAG mode. It is a very good zoom that does not increase the radiation dose and provides a sharp and clear image.*

*We observed that image definition is very good, even when we work in low dose mode. During the procedure we use different fluoroscopic modes to view different elements. When using contrast media with the subtracted mode, the background of the image is less grainy providing a cleaner image. If we use standard fluoroscopy mode, without subtraction, the stent strut, its mesh and its marks, as well as the guidewires are much more visible.*




Live Zoom during iliac dilation with balloon on Workstation's monitors. Zoomed image on left monitor, native image on right monitor. Standard continuous fluoroscopy with low dose mode.

*Regarding the C-arm controls, we prefer to use remote user interfaces rather than the workstation. The Remote User Interface (RUI) is very simple and convenient because it can be placed on the side rails of the patient table, and it is close to the surgeon's hand. The joystick used to move the C-arm is very intuitive, because you move it in the direction you want to move the C-arm.*

*On the OEC Touch Tableside, the controls are accessible on a tablet standing on a cart. These are more numerous than on the RUI, and most of them are directly accessible by pressing one button. This is advantageous during surgery for selecting the mask for roadmap mode, or activating the Live Zoom, for example. We use either one depending on the type of surgery and the operating room setup."*

**Based on your experience, what recommendation would you give for the management of patient flow in endovascular surgery?**

*"We believe that all peripheral endovascular procedures (lower limbs, upper limbs) can now be performed with a premium vascular C-arm.*

*We also performed thoracic and abdominal aortic endovascular*


OEC Touch Tableside placed in the sterile area for direct surgeon access

*surgeries with OEC Elite CFD in an efficient and comfortable manner.*

*Complex endovascular procedures in the abdomen are more demanding. For example, when I have to catheterize a digestive artery, I need a lateral view of the vessel. The patient table and the patient's thickness impact image quality. As in the lateral or even oblique view, the X-ray beam crosses more tissues: the image is more grainy and less sharp than for an anteroposterior view.*

*A fixed room Hybrid OR (HOR) has further advantages. Their image fusion tool, which superimposes on the live fluoroscopic image the preoperative CT scan, has the potential to save radiation dose and contrast media. In the fixed HOR, repositioning of the C-arm relative to the arteries is automated: the C-arm automatically rotates by itself to where you want to position it; you simply move the fusion image on the video monitor. This is done without the necessity of re-acquiring fluoroscopic images or repeating injections of contrast media.*

> *"OEC Elite CFD premium mobile C-arm allows us to perform the most complex procedures, surpassing the limits of traditional vascular C-arms."*
>
> **Dr. Guerra**

*Since the fixed HOR has more power and faster 3D gantry rotation, the fluoro mode technique can be raised to further improve image quality when needed. For these reasons, we believe that for more complex procedures such as branched or fenestrated stent grafts, there are advantages for working with a fixed room HOR.*

*In addition, with the development of new endovascular protheses such as supra-aortic trunks with branches working on a fixed HOR is recommended due to the ability of rotating the C-arm quickly around the patient's head.*

*We believe that by working with a fixed HOR for our complex procedures we can benefit from the built-in image fusion tool. We found that compared to other mobile C-arms, OEC Elite CFD allows us to achieve long fluoroscopic imaging times, with low radiation doses, and with less heating than other premium C-arms.*

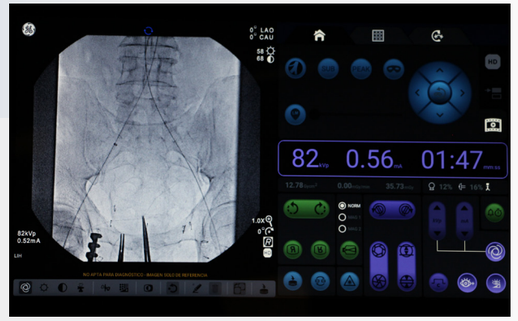
*Thus, with an in-depth knowledge of how to operate the equipment, it is possible to perform complex procedures such as branching or fenestrated stent grafts with OEC Elite CFD."*

## CASE 1

### Hybrid procedure in a patient with total occlusion of left iliac artery (LIA) and right iliac artery (RIA).

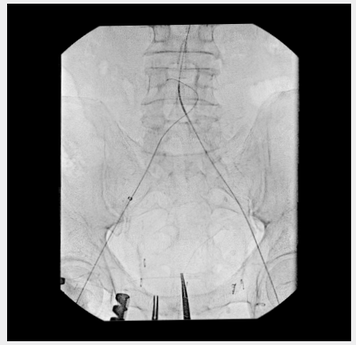
On the right iliac artery, surgeons performed plastic reconstruction with open approach to place the introducer. Percutaneous approach was preferred on the left iliac artery to place introducer because of risk of infection after osteotomy.

Full exam was performed in standard continuous fluoroscopy mode with low dose.
Total fluoroscopy time was about 32 minutes and total DAP was about 43 Gy.cm².

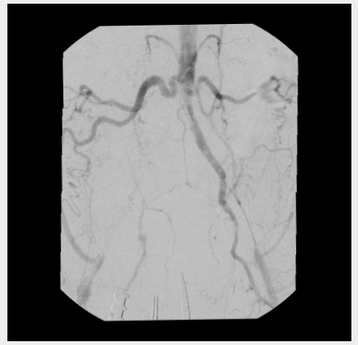



Control tablet used by surgeon from sterile field

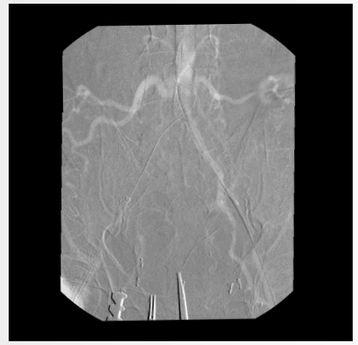
DIAGNOSTIC CONFIRMATION OF LIA AND RIA OCCLUSION



Guides introduced on both sides

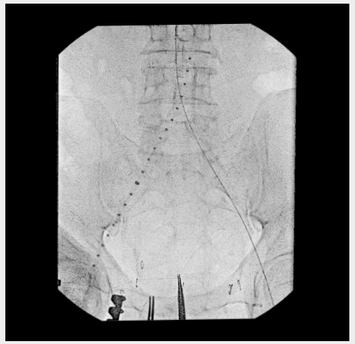


Iodine angiogram showing both occlusions



CO2 angiogram on same anatomy

## RECANALIZATION OF THE ILIAC ARTERIES UNDER FLUOROSCOPIC IMAGING GUIDANCE

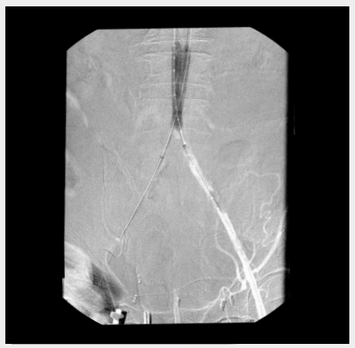


Introduction of catheter with centimetrique marking on RIA

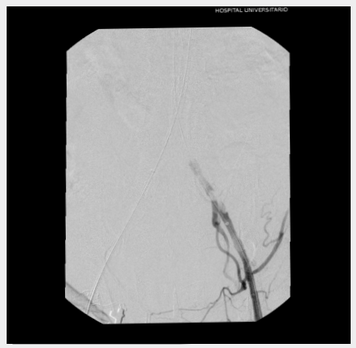
Recanalization of the iliac bifurcation (kissing balloon technique)

Recanalization of RIA and LIA

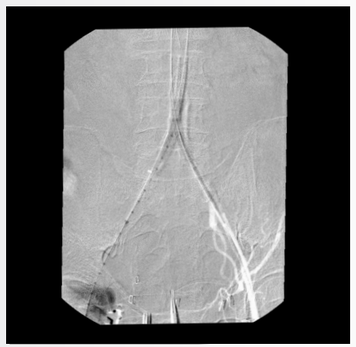
## STENTS PLACEMENT AND DEPLOYEMENT UNDER FLUOROSCOPIC IMAGING GUIDANCE



Stent placement in iliac bifurcation and opening under roadmap mode



Angiogram of LIA and collaterals

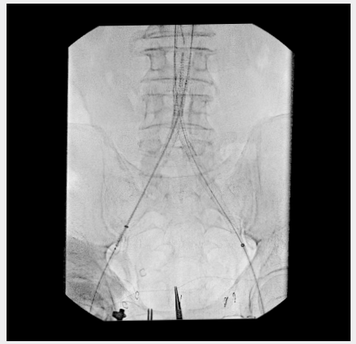


Stent placement in RIA and opening under roadmap mode

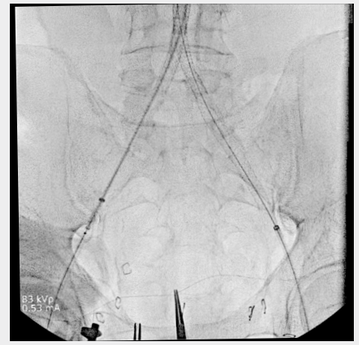
LIA stent placement under roadmap mode

LIA stent placement under roadmap mode

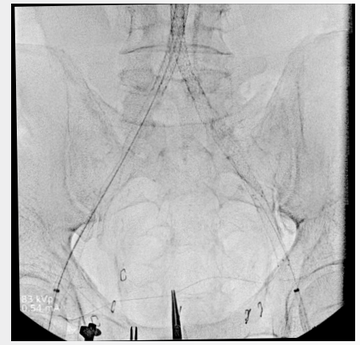
## STENT PLACEMENT AND DEPLOYMENT IN ILIAC ARTERIES USING LIVE ZOOM



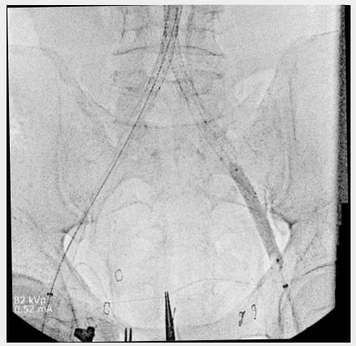
Fluoroscopic image without Live Zoom



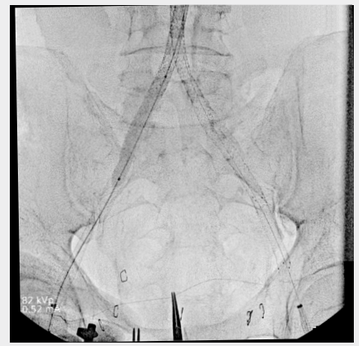
Fluoroscopic image with Live Zoom



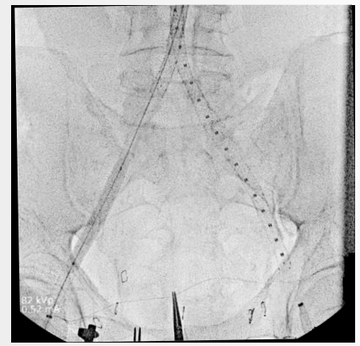
Fluoroscopic image with Live Zoom



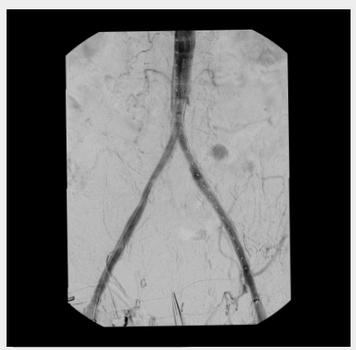
Fluoroscopic image with Live Zoom



Fluoroscopic image with Live Zoom



Fluoroscopic image with Live Zoom



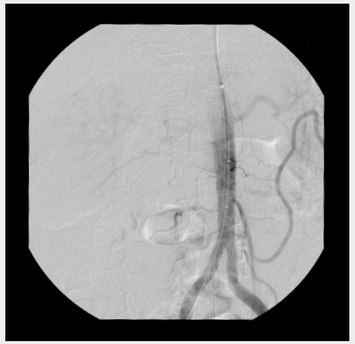
Final control iodine angiogram (image without Live Zoom)

## CASE 2

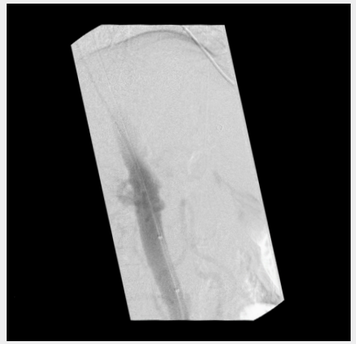
### Recanalization of the Superior Mesenteric Artery (SMA)

Full exam was performed in standard continuous fluoroscopy mode with low dose.
C-arm was placed in Lateral position for the catheterisation of the SMA.
Total fluoroscopy time was about 38 minutes and total DAP was about 217 Gy.cm$^2$.

INITIAL ANGIOGRAM SHOWING SMA OCCLUSION

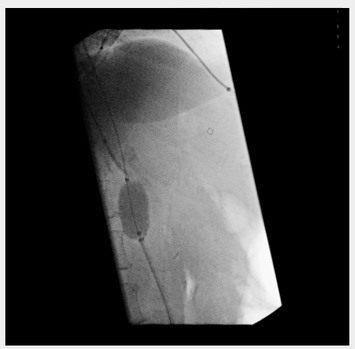


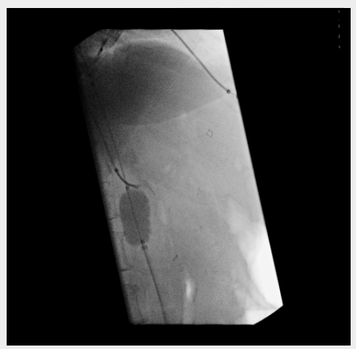
Antero Lateral view

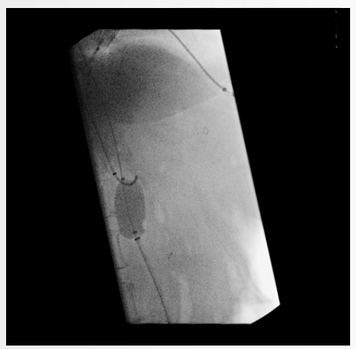


Lateral view

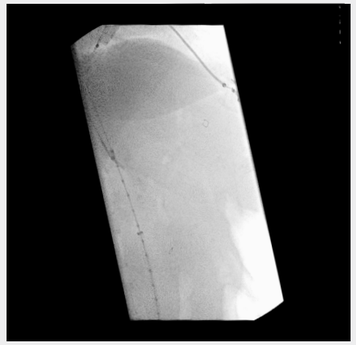
CATHETERISATION OF THE SMA USING A BALLOON FOR PUSH IN LATERAL VIEW





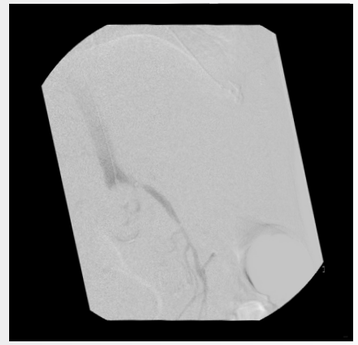


Collimator blades adjusted to considered anatomy

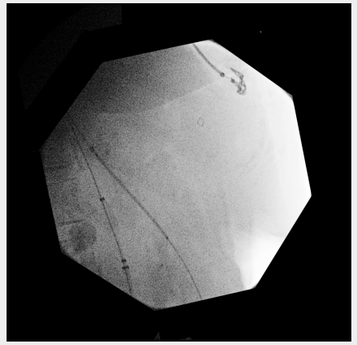


Catheterization of the SMA

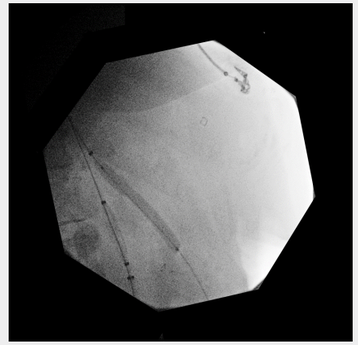
Catheterization of the SMA



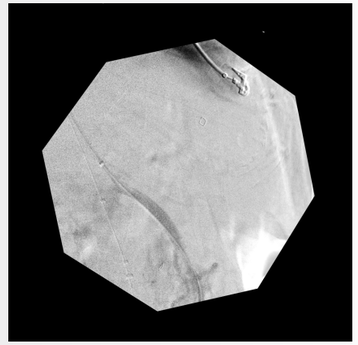
Selective angiogram showing SMA stenosis



Placement of the balloon through the stenosis



Balloon inflation in the stenosis



Final control angiogram of the SMA in lateral view

Dr. Guerra is a paid consultant for GEHC. The statements by Dr. Guerra described here are based on her own opinions and on results that were achieved in her 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. JB19573XX


# *Percutaneous nephrolithotomy (PCNL) and complex urology procedures*

## with OEC Elite CFD

**Interview with Colonel Dr Marius Dinu, Head of urology department at the Central Military Emergency University Hospital ”Dr. Carol Davila”, Bucharest, Romania.**

The Central Military Emergency University Hospital “Dr. Carol Davila” in Bucharest has as its main mission to provide specialized medical assistance, both in peacetime and in wartime, to the military and civilians. For many years, the hospital’s mission has been to offer minimally invasive surgery (MIS) to its patients. In the various departments, endoscopic and robotic equipment is provided for operations in addition to conventional surgical techniques.

In 2017, after several research programs, the hospital introduced a robotic system in the surgical department which allows practitioners to perform treatment procedures in urological oncology using robotic laparoscopic surgery.

In the same spirit of excellence, the department of urology has equipped one of its four operating theaters with the new detector technology C-arm, OEC Elite CFD, to support complex and advanced procedures involving the urinary tract.

The department of urology has earned a reputation for excellence and treats patients from all over Romania.

**Colonel Dr Marius Dinu** has 35 years of experience as a urologist. After training in surgery at the Central Military Hospital, he trained in urology at the Fundeni Clinical Institute of Bucharest. He then returned to the Central Military Hospital in the urology department where he became head of the urology department in 2013.

Focusing on Minimally Invasive Surgery techniques and urological oncology. He is a member of the Romanian Society of Urology, the Romanian Association of Endourology, and the Romanian Society of Lasers in Medicine and Biology for more than 20 years. He also belongs to European Society of Urology and to the European Association of Lasers in Medicine.

**Dr Dinu, head of the urology department, a urologist specialized in ultrasound, nephroscopy and robotic surgery explains to us why they chose OEC Elite CFD Super C, with a 31 x 31 cm field of view (FOV) detector.**

**Why is fluoroscopic imaging needed in the urology operating room?**

*"Among all the procedures we perform in urology, we only need fluoroscopic imaging for 20 to 30% of our work. It can be used for diagnostic procedures such as cystoscopy, cystourethroscopy and ureteroscopy. In these procedures, we inject contrast media to highlight stenosis or the presence of stones in the urinary tract. We also use fluoroscopy for treatment procedures such as internal lithotripsy, ureteral stent placement and PCNL. In this case, it is a question of guiding the tools to access the cavity or anatomy in question.*

*In our department, every day we perform about 2 to 3 stent placements and 2 ureteroscopy procedures. We also perform 2 or 3 Percutaneous Nephrolithonomy (PCNL) procedures per week.*

*The OEC Elite CFD C-arm is not used all the time. However, it is very important that it is in the room and ready to be used for these procedures and in case of complications. We are trained to work effectively at managing radiation exposure for the staff. So whenever possible, we work with ultrasound imaging, but it has its limitations. Fluoroscopic imaging is essential to our activity."*

**Why did you choose OEC Elite CFD?**

*"In complex procedures, accessing the anatomy or the kidney cavity can be very difficult. The image quality of OEC Elite CFD is very good. The 31 x 31 cm field of view is wide and allows us to visualize in a single exposure the entire urinary tract from the kidneys to the bladder. The detector head is small. It can be moved closer to the patient, helping to achieve an anatomical coverage that is approximatively the size of the detector. The procedure workflow time is improved because it is not necessary to change the height of the C-arm during the procedure.*

*The size of the Super C is appropriate, because we also need the space to work with the nephroscope."*

**Can you tell us how are you using the C-arm during the procedure?**

*"During the procedure, I usually work with two or three people in the room: another doctor who helps me, the anesthesiologist and the nurse. The nurse helps me maneuver the C-arm. Often, we have to change the placement of the C-arm or its angulation to change the view from antero posterior, to obliques or lateral views. The C-arm is easy to maneuver.*

*I rarely change the FOV because I prefer using the 31 x 31 cm anatomical coverage. The images are very good: they are very clear. I really don't need to magnify them.*

*I can see a lot of things such as the urological cavities (with contrast media), some abnormalities, the drains, the stones and the tools I use to enter the cavity such as the needles. I combine this information with that from the images from the nephroscope video system that gives me direct visualization of other tools such as the forceps or the basket during lithotripsy.*

*During the procedure we use the two monitors of the C-arm: the reference monitor that is on the C-arm mainframe and the large video monitor on the workstation. When I inject contrast media, I like to record the images. We control that from the touch screen video monitor.*

*We keep the radiation exposure for each patient very low. We use fluoroscopic imaging very carefully. As I want to have total control over the continuous fluoroscopy mode. I often use the low dose mode to decrease the dose radiation.*

*We also control the exposure time by avoiding unnecessary images.*

*The optimized shape of the 31 x 31cm field of view and the image quality of OEC Elite CFD are the main drivers for our choice.*

*The C-arm is easy to manipulate, I have no problem with that. I have trained my staff, and they are doing well."*

**What operating room set up would you recommend for complex urology procedures?**

*"With our OEC Elite CFD C-arm, we are using a very good patient table that I can move in all directions. I can put the patient in any position I want. This way I can do relatively complicated double ureteral and percutaneous access operations at the same time, with two teams, for example for internal lithotripsy with flexible instruments.*

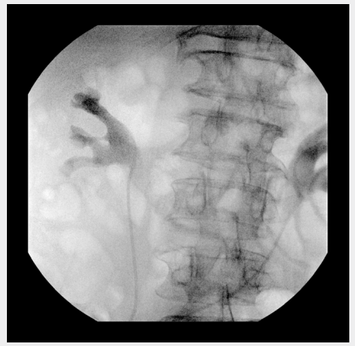
*OEC Elite CFD does the job very well. I like the image quality with its wide 31 x 31 cm field of view, while reducing the radiation dose. I can record the images, change the C-arm angle and the image orientation. The C-arm is very good and I am very pleased with it."*


The statements by GE's customers described here are based on their own opinions and on results that were achieved in the customer's 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. JB19624XX

## CASE 1

Antegrade pyelogram showing right kidney cavity. Patient in supine position:
Antero Posterior View, Low dose mode, General surgery imaging profile.

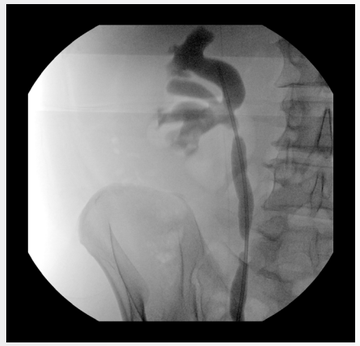
## CASE 2



Final control pyelogram image showing right and left kidney's cavities.

Patient in supine position: Antero Posterior View, Low dose mode, General surgery imaging profile.

## CASE 3

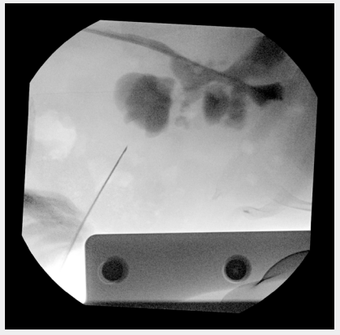


Antegrade pyelogram image showing ureter tract obstructions during drain placement.

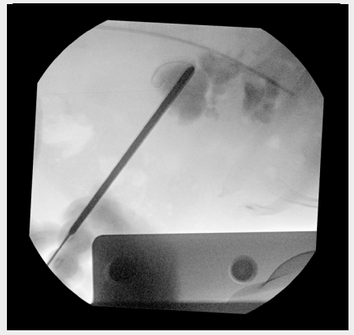
## CASE 4

Percutaneous nephrolithotomy (PCNL)

Patient in prone position – Lateral View, Low dose mode, General surgery imaging profile.



Pyelogram showing cavity target for percutaneous needle puncture.



Introduction of the nephroscope in the kidney cavity for intra coporeal lithothripsy.

# OEC C-arms

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