

# Spine procedures with OEC Elite CFD: efficient and reliable fluoroscopic imaging guidance

**Experience of Dr. Giovanni Alessi, Neurology department, AZ Sint-Lucas, Ghent (Belgium)**

Fifteen years ago, AZ Sint-Lucas was created through the merger of three separate hospitals in Ghent. Located in the city center, the hospital continues to grow with the renovation and construction of new buildings. Half of the patients at AZ Sint-Lucas are from Ghent, but its service area also covers the northwest of the province of East Flanders, extending north to the border with the Netherlands, and west to the province border with West Flanders.

The neurology department has five neurosurgeons, performing over 1000 procedures per year. Dr. Alessi was involved in the selection of the OEC Elite CFD C-arm Ergo C for the department. He explains why the image quality, maneuverability and intuitiveness of OEC Elite CFD is so important for neurosurgery.

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### Can you tell us which neurology procedures require fluoroscopic guidance and control?

We are using fluoroscopic imaging guidance and control in all our spine procedures: spinal arthrodesis (or spinal fusion), intervertebral prosthetic disc replacement, and spine fracture reduction (including kyphoplasty and vertebroplasty). For intracranial procedures, we no longer use fluoroscopy, but rather a navigation system.

Among all the spine surgery procedures, the highest volume is represented by the arthrodesis procedure at thoraco-lumbar and cervical levels. I myself perform about 400 arthrodesis procedures a year, and I would say about 50% of these are thoraco-lumbar and 50% are cervical.

When we do Minimally Invasive Surgery (MIS) or percutaneous arthrodesis, we need fluoroscopic images to define the entry point and the direction of the tools. At each step

of the procedure, we need to know where the instrument is. To do so, we perform dual fluoroscopy with two C-arms: one acquires the Antero Posterior (AP) view and the other one the Lateral view and one Lateral view of the vertebral pedicle, to see the direction of the tool and its depth, and also how to progress the screw in the pedicle bone.

Even during minimally invasive surgery of a herniated intervertebral disc for which I work with the

microscope, I take some fluoroscopic images at the beginning of the procedure to define the level of the disc where I need to perform the incision. To do this, I place a needle under fluoroscopic imaging and confirm its position with one AP and one Lateral projection, which I display simultaneously on the video monitors. From these two views I can mentally rebuild the volume of the anatomy. Then I remove the C-arm and complete the procedure with the microscope. In fact, there are no spinal surgery procedures for which I do not use fluoroscopy for at least a few seconds. I know that some centers don't use fluoroscopic imaging, but at AZ Sint-Lucas we use this protocol all the time as part of our quality charter to ensure a better surgery outcome for the patient.

### What are your main motivations choosing the OEC Elite CFD C-arm Ergo C for your neurology procedures?

The most important criteria for me is the image quality. For a surgeon, the more we see, the higher the quality of the procedure outcome. A surgeon performs better when he sees better. In spinal surgery, there are many instruments that we know will not improve the surgery, even if enhanced. What does improve the quality of the surgery is a good microscope and a good fluoroscopy imaging system. While doing percutaneous arthrodesis, I have no visual control, and I rely on fluoroscopic imaging to see the volume of the vertebrae. I am looking for the delimitation of the bone contour. The most difficult vertebrae to visualize is S1 because of its inclination. To see the cortical bone of the pedicle, we need to apply a craniocaudal angulation to get a true AP view of the vertebra,

compensating for the lordosis. Sometimes, even with a craniocaudal angulation, the pedicles are not clear. If the image is of inferior quality, we feel less comfortable performing the intervention.

My criterion for image quality definition is the ability of a C-arm to provide a good image of S1. Image quality is my first requirement when choosing fluoroscopic imaging equipment.

I love the General HD profile, which gives me an image that is crisp and crystal clear. It really is a great image. In addition, when using the Live Zoom, I can enhance small anatomies and get more details. I better see the contour of the pedicles.

### How should C-arms evolve to better support the evolution of the surgical procedures in neurology?

For me the ideal C-arm of the future is a system with less X-ray radiation, combined with navigation. I would like to take one image at the beginning of the procedure and then navigate on this image for the rest of the procedure. Of course, I need very high accuracy in the position of the surgical tools, this is the sine qua non for using navigation.

If we consider the different tools to better visualize the volume of the anatomy, the 3D feature allows, at each moment of the procedure, to see where we stand on the 3 coronal, sagittal, and axial planes. While there are imaging systems available that provide 3D multi-planar views, the technology is currently too, and I am not convinced that it improves the outcome compared to what I am doing today.

It would reassure me about the location of the screws inside the

pedicles as a final control, but I have been doing percutaneous arthrodesis for 15 years and I haven't misplaced a screw in a pedicle.

I am more interested in features that improve my surgical outcomes. Image quality is essential to me, I can operate better when I see better.

The ease with which images can be acquired is also important and this helps increase the speed or the rate at which I can take images. When we work with a percutaneous approach, we turn the C-arm AP to Lateral multiple times, and we create our 3D representation of the spine mentally from these two projections. If I can speed up the workflow using a motorized C-arm like the one used by vascular surgeons for angiographies, it could contribute improving my surgery outcomes. In this spirit, I tested the motorized version of OEC Elite CFD and I believe that it brings a real added value for spine surgery. I can see the angle value and have it memorized by the system, I can recall the angulations myself from the table rails and have the C-arm move fast from AP to lateral. Without motorization we lose time trying to recall the angulation and find the right angle when coming back to AP from Lateral. This is why, when I work without motorization, I use two C-arms: one to capture the AP view, the other one to get the Lateral view of the vertebra, so I can keep the C-arm at the same angle to avoid the stress of remembering what craniocaudal and orbital angles I used. It is a good compromise using the tools I have available to do my surgery. I believe I could better manage the radiation dose with a motorized C-arm.

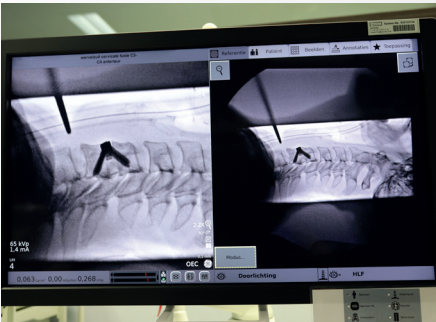


# Anterior Cervical Discectomy and Fusion (ACDF) on C6-C7

Courtesy of Dr. Giovanni Alessi, Neurosurgeon, AZ Sint-Lucas in Ghent (Belgium)



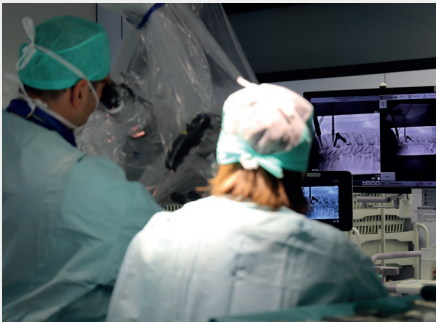
On a 62-year-old female patient with a history of degenerative disc disease and previous C5-C6 ACDF. The C-arm is placed perpendicularly to the patient table to get a lateral view of the neck. The angulation is maintained during the full procedure. Anatomical profile is set to Spine. The live zoom is set to 2.2. Fluoroscopy mode is standard continuous.



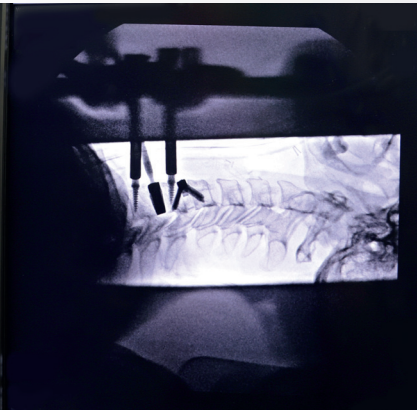
Definition of the incision level with a lateral view



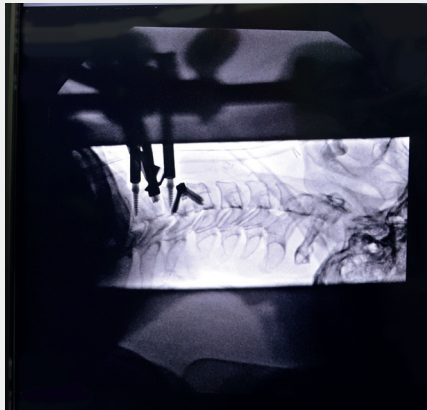
The C-arm is parked to proceed to incision



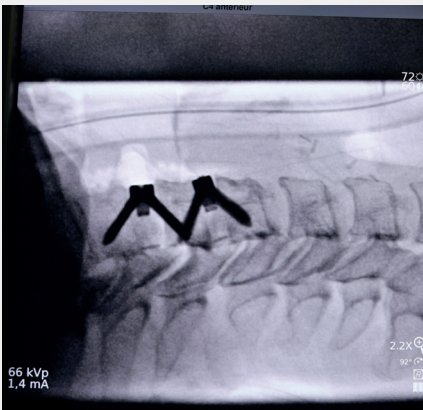
The C-arm is brought back to the sterile field. Discectomy is performed under microscope and fluoroscopy control.



Cage gauge control to define the size



Introduction of the definitive cage



Final control of cage and screw placement

A total of 33 series of images have been taken, the total exposure time was 1 minute and 2 seconds, and the total DAP was 0.7 Gy.cm².

# L5-S1 fusion by Retroperitoneal (Anterolateral) Approach,

Courtesy of Dr. Giovanni Alessi, Neurosurgeon, AZ Sint-Lucas in Ghent (Belgium)

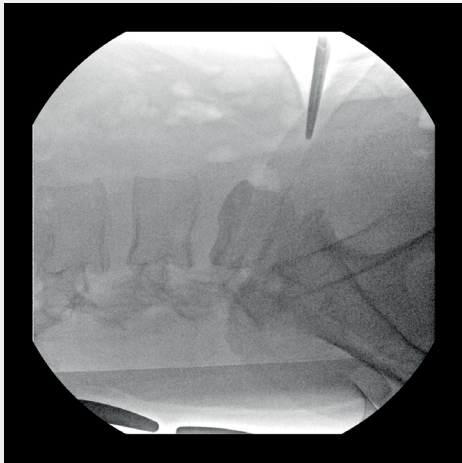


On a 40-year-old male patient. The patient is placed in a supine position. The Retroperitoneal approach requires retraction from the peritoneal cavity medially, and mobilization of the aorta on the contralateral side in order to reach the disc to be treated.

The C-arm is positioned at S1 level, switching angulation from 0° (AP view) to 90° (lateral view) at different steps of the procedure. The anatomical profile is set to Spine. Fluoroscopy mode is standard continuous.



Extraction of bone sample from patient's iliac crest. Bone sample will be placed inside the cage as osteogenic material.

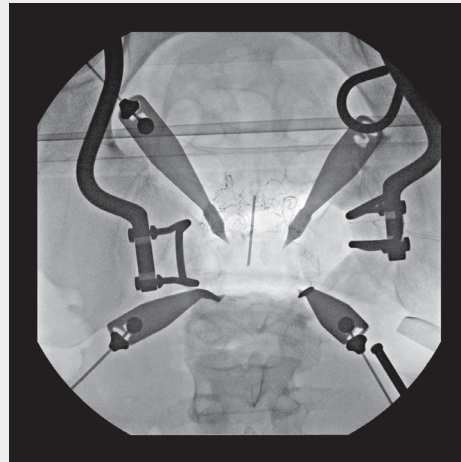


Lateral view of ilium incision





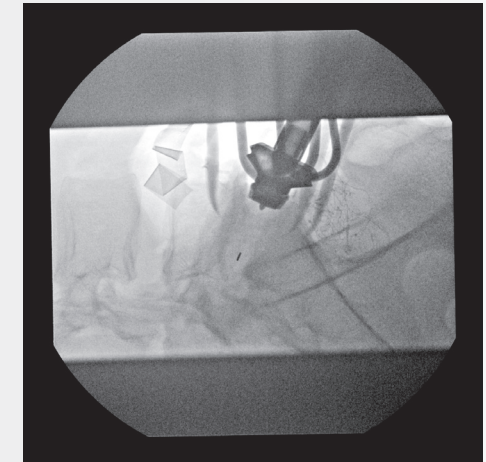
After stabilization of the peritoneal approach, a needle is placed at the center of the vertebral body to materialize the median line to help position the implant in the center of the intervertebral disc space.



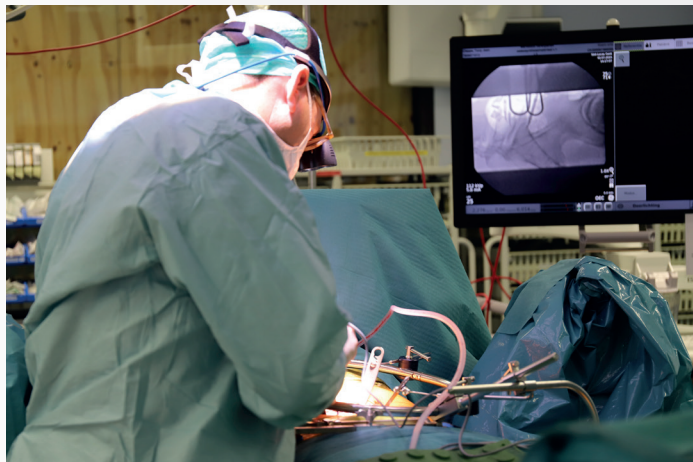
AP view of L5 with needle materializing vertebra median line (between the two pedicles)



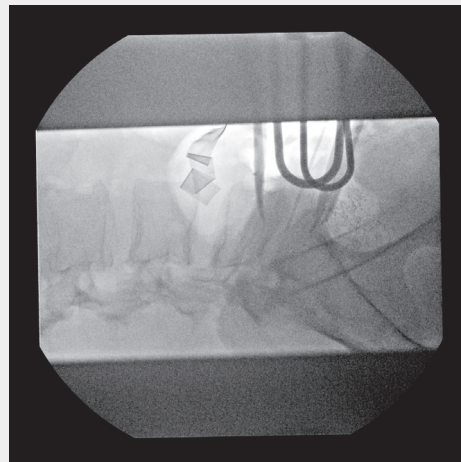
The cage is filled with patient's bone sample



Lateral view of the cage placed in L5-S1 intervertebral space



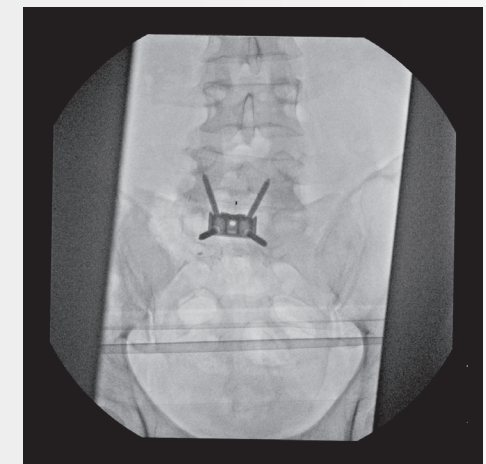
S1-L5 discectomy under fluoroscopy guidance



Lateral view of discectomy

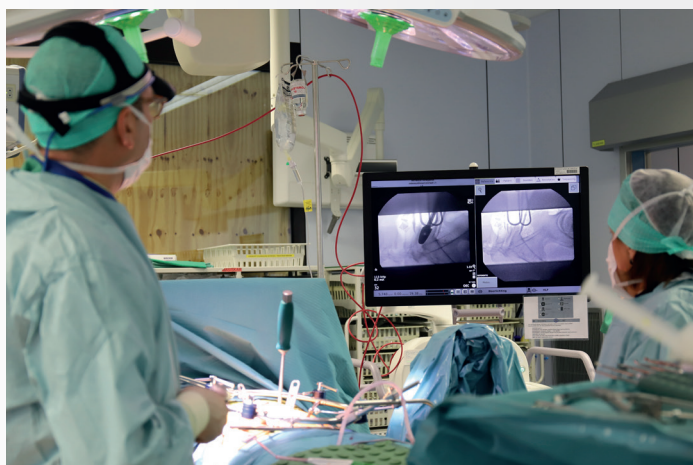


Placement of cage's screws and closure

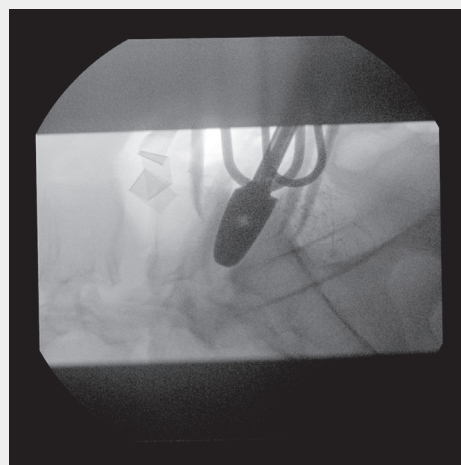


Final control of cage L5-S1 placement. AP view

A total of 38 series of images were taken with a total exposure time of 1 minute, and the total DAP was 7 Gy.cm<sup>2</sup>.



Evaluation of the cage size with the gauge



Lateral view of the gauge in L5-S1 intervertebral space



**Dr. Giovanni Alessi** is a neurosurgeon and has worked for 17 years at AZ Sint Elizabeth, Zottegem and AZ Sint-Lucas, Ghent. He specializes in complex in complex spine surgery, endoscopic pituitary surgery and posterior fossa surgery. He has a specific interest in anterior spine surgery and the minimally-invasive (percutaneous) spine approach.



# Anterior Cervical Discectomy and Fusion (ACDF) on C5-C6 and C6-C7

Courtesy of Dr. Kristel Vanchaze, Neurosurgeon, AZ Sint-Lucas in Ghent (Belgium)



The patient is a 48-year-old male. He is placed in a supine position. The C-arm is placed perpendicularly to the patient table to get a lateral view of the neck, excluding the shoulders. The angulation is maintained during the entire procedure. The anatomical profile is set to Spine. Fluoroscopy mode is standard continuous. C5-C6 discectomy and fusion.



Lateral view of C5-C6 and C6-C7 disc compression      C5-C6 cage in place, first screw insertion      Final control of C5-C6 cage in place, with its two screws in position



C6-C7 discectomy is performed using a microscope



C6-C7 cage placement      C6-C7 cage fixation with first screw      C6-C7 cage fixation with second screw



A total of 43 series of images were taken with a total exposure time of 1 minute and 5 seconds and the total DAP was 2 Gy.cm².



**Dr. Kristel Vanchaze** is a neurosurgeon working at AZ Sint-Lucas in Ghent and AZ Alma in Eeklo since 2016. She acts as head of department at AZ Alma in Eeklo. She focuses specifically on basic skull surgery, vascular neurosurgery, minimally-invasive spinal surgery, and peripheral nerve surgery.



# Posterior percutaneous arthrodesis L5-S1

Courtesy of Dr. David Colle, Neurosurgeon, AZ Sint-Lucas in Ghent (Belgium)



The patient is a 48-year-old female patient with a history of degenerative disc disease and previous L5-S1 retroperitoneal fusion.

The patient is placed in a prone position. The L5-S1 disc has been removed and replaced by a cage in a previous intervention.

For this procedure, two C-arms are used to capture the AP and Lateral views of the vertebra.

The OEC 9900 Elite C-arm is placed in the rainbow position to obtain the Lateral view, and the OEC Elite CFD Ergo C C-arm is placed vertically to obtain the AP view.

Each C-arm angulation is maintained during the procedure, avoiding many manipulations from AP to Lateral and Lateral to AP views.

The anatomical profile is set to Spine, and Fluoroscopy mode is standard continuous.

Once the C-arms are angulated to obtain the correct projections, they are used to define the incision levels for the percutaneous approach on the patient's skin. Th C-arms are covered with sterile drapes and positioned for the full procedure.

At each stage of the procedure the AP view gives an indication of the entry point of the tools, while the Lateral view gives information on the direction and the depth of the tools.

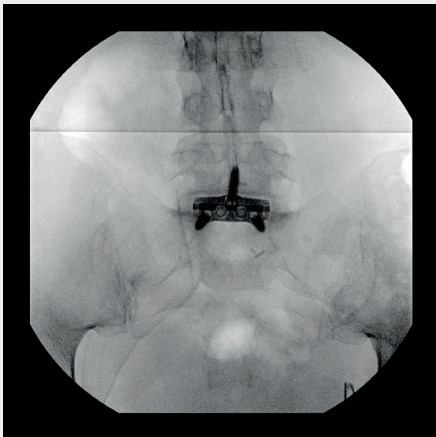
Looking at the two workstations, the practitioner can access to both views and mentally reconstruct the 3D volume of the vertebrae.



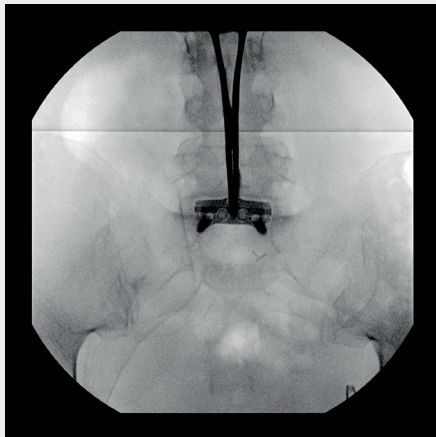
C-arms and video monitors configuration for the percutaneous approach



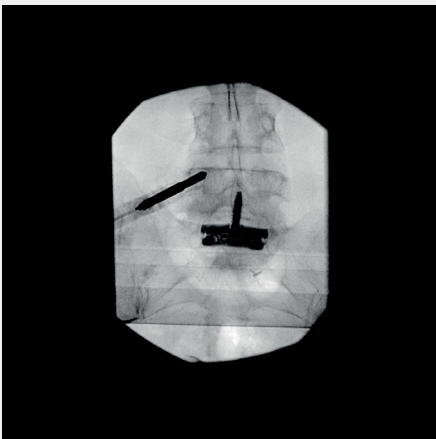
Screw insertion with the percutaneous screw guiding tools



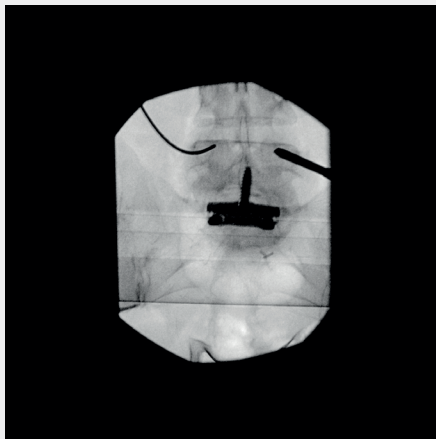
True AP view of L5-S1 disc



Definition of the median line to define incisions for entry points of the 4 screws

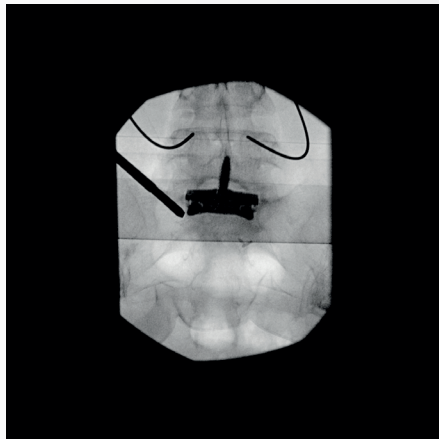


First K-wire placement on L5 pedicle

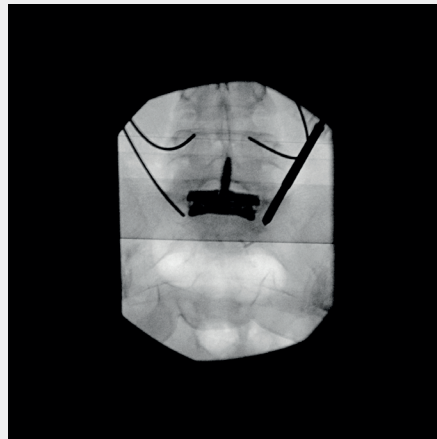


Second K-wire placement on L5 pedicle

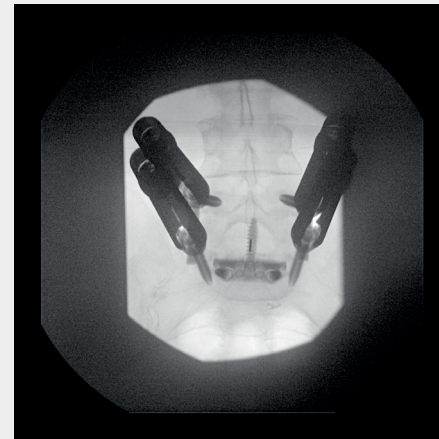




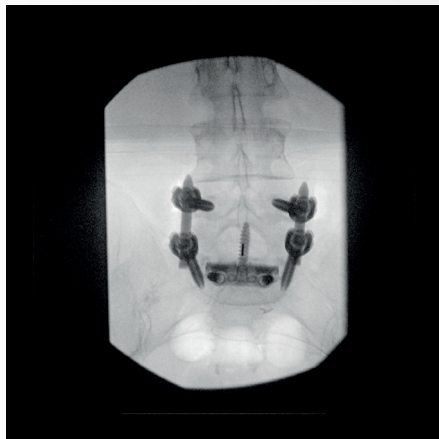
First K-wire placement on S1 pedicle



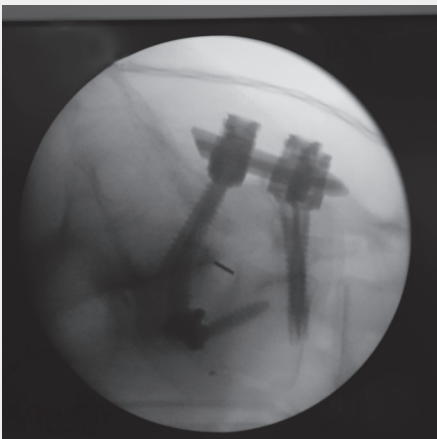
Second K-wire placement on S1 pedicle



Placement of the screws with percutaneous rods



Final AP view control of the pedicle screws and rods



Fluoroscopic image from OEC 9900 Elite



**Dr. David Colle** is a neurosurgeon and has been working at AZ Sint-Lucas in Ghent since 2011. He specializes in spinal instrumentation, brain tumor surgery, and functional surgery. He has specific skills in DBS (Deep Brain Stimulation). He works at AZ Sint-Lucas in Ghent and AZ St-Elisabeth in Zottegem. He is also working in the outpatient clinic in Zelzate.

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.



# OEC Elite Touch control panel

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**Designed for intuitive operator workflow**



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