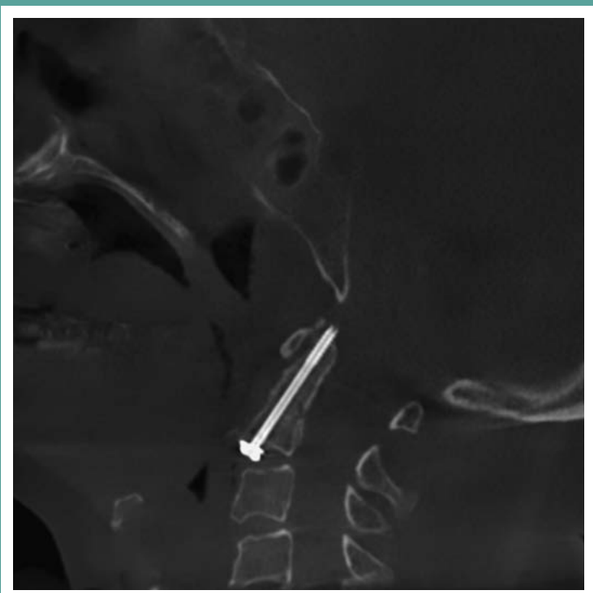
Content

IMAGING



#2
An annual publication presented by
ziehm imaging

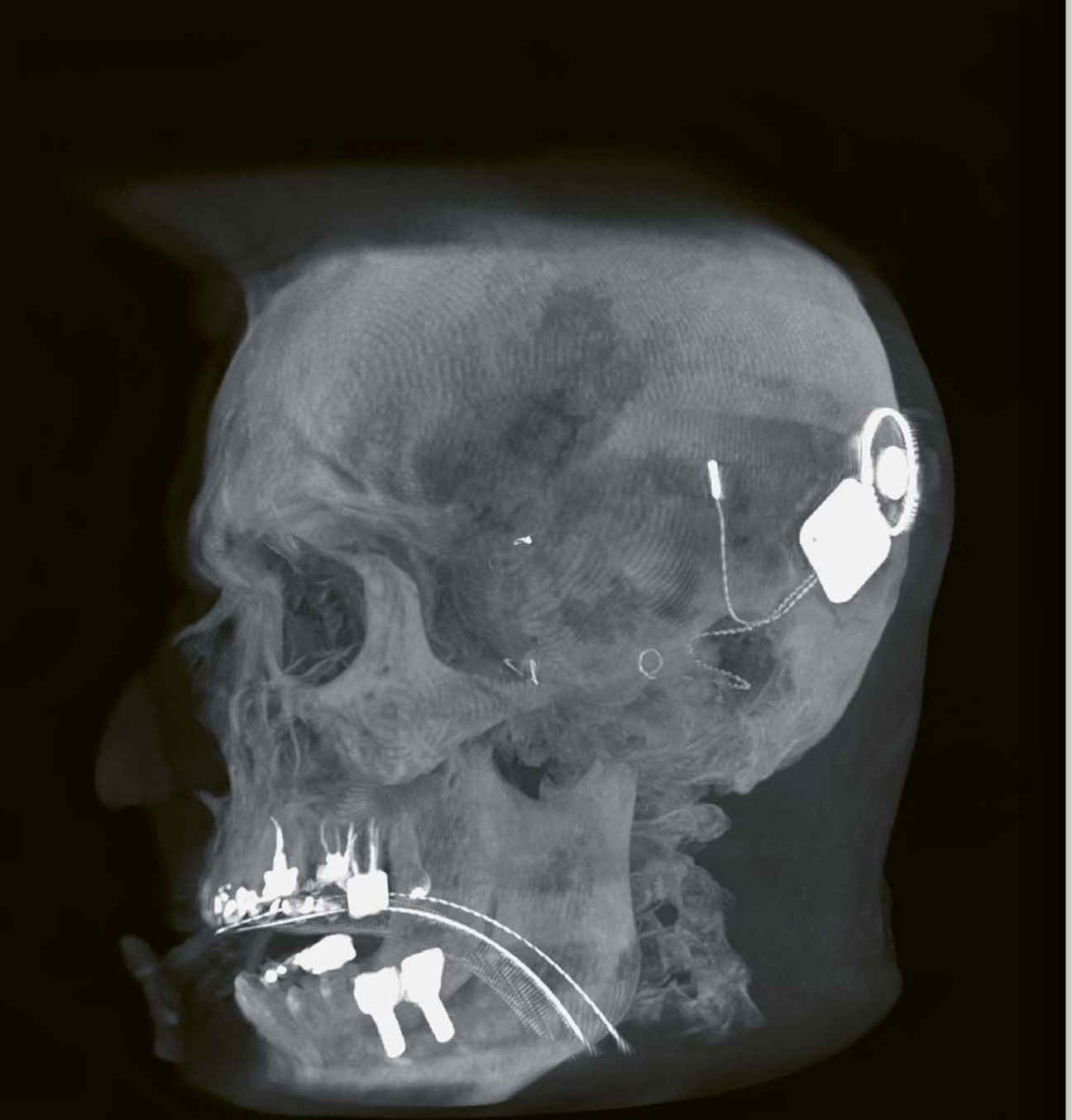
x, y, z

Three-dimensional imaging is revolutionizing industry and the medical field. Consequently, the Z-axis was added to the X and Y-axes in the OR as well. We are adding depth to the plane – pixels are now voxels. As a manufacturer of medical technology, we are moving this innovation forward. We have been experts in the field of intraoperative 3D imaging for more than twelve years. For this reason, this issue of the magazine focuses on the new standard: ‘3D’. In addition to information about our C-arms, the issue provides a detailed look at the everyday working lives of medical professionals all over the world because the specialists who use the technology are also crucial to the success of a procedure. In this issue, you will get to know the impressive physician and entrepreneur Dr. Chopra in Chicago and gain insight into our C-arm technology. And there is a close-up look at the work of Baher Sibai, one of our many terrific colleagues at Ziehm Global Service who make our customers happy every day.

Martin Törnvik, Vice President Global Sales and Marketing

Three values

In three-dimensional space, three values are required to determine the position of an element. Within three coordinate axes, we can create a reconstruction of the space inside the human body. And in recent years, such 3D images have revolutionized operating rooms. Highly valued by surgeons, these images contain more than axial, coronal and sagittal views of the body. Clinical images from the physicians‘ everyday practice show us the benefits of this technology.



Cochlear implant

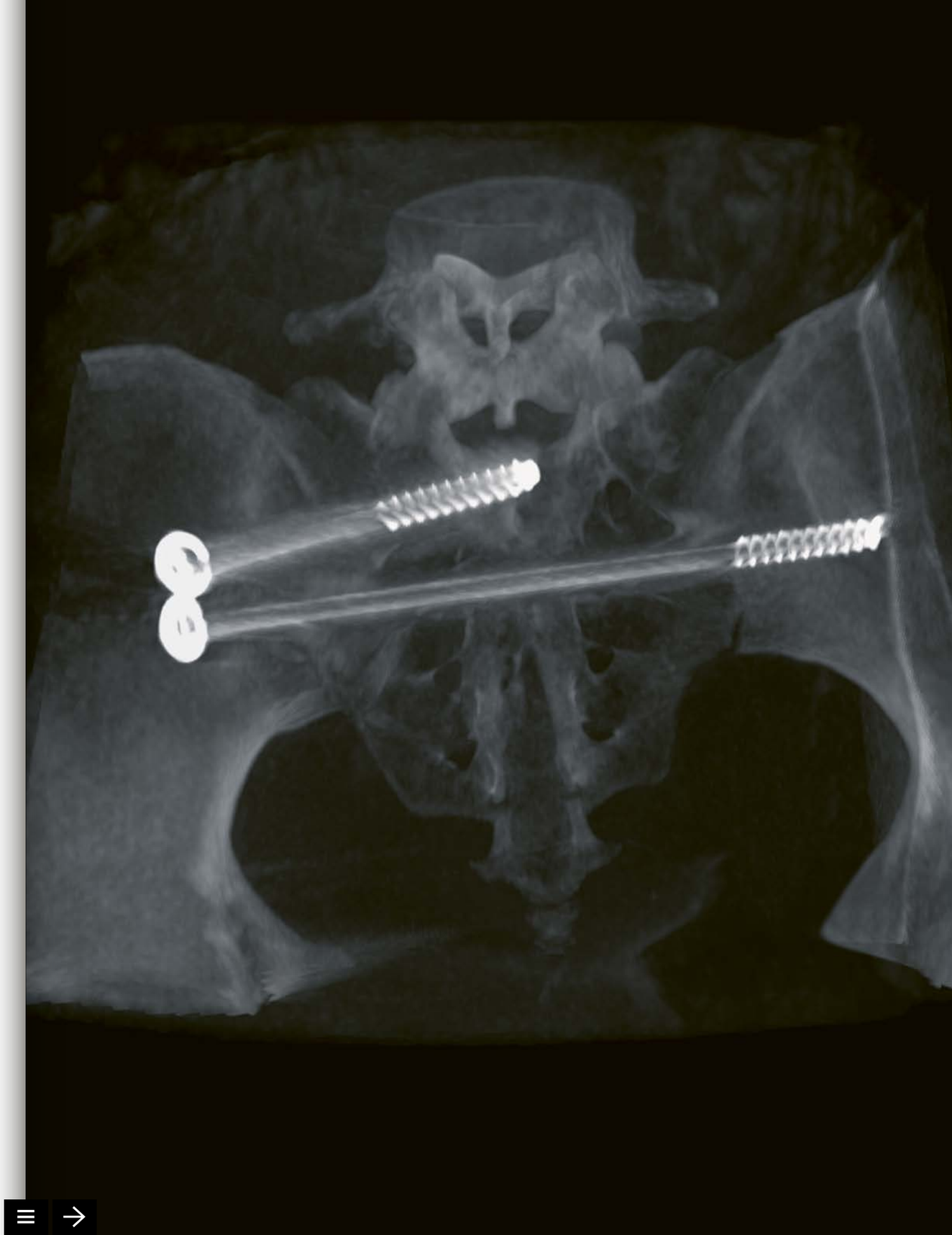
Professor Dr. Diana Arweiler-Harbeck
Department of Otorhinolaryngology
University Hospital Essen, Germany
Ziehm Vision RFD 3D CMOSline[1]

“The cochlear implant is an inner ear prosthesis that rehabilitates severe to profound sensorineural hearing loss in patients who haven’t benefitted from conventional sound amplification. 3D imaging plays a vital role for us in planning, implementation, control and, therefore, the successful placement of a cochlear implant. Especially the new, higher resolution of 512 voxels significantly improves the visualization of details, with razor-sharp images of even the smallest anatomical structures in the middle and inner ear as well as the tiny electrode contacts within the cochlea. The result is a highly successful hearing outcome, providing our patients with great improvements in their everyday lives.“

Pelvis surgery

Dr. Milton Routt
Orthopedic Trauma Division
University of Texas Health Science Center, Houston, USA
Ziehm Vision RFD 3D

“The Orthopedic Trauma Division at the University of Texas Health Science Center provides treatment for the full spectrum of orthopedic trauma. 3D imaging has been a ‘game changer’ for me and my colleagues. It has improved not only our technical capacities and judgment, but also our teaching of medical students and residents and our care of patients here in Houston. Misplaced screws can be corrected, suboptimal reductions can be adjusted – all without the dreaded delays in diagnosis, the need for revision surgeries, or other related problems. With intraoperative 3D imaging, treatments are more precise and patient safety increases.”



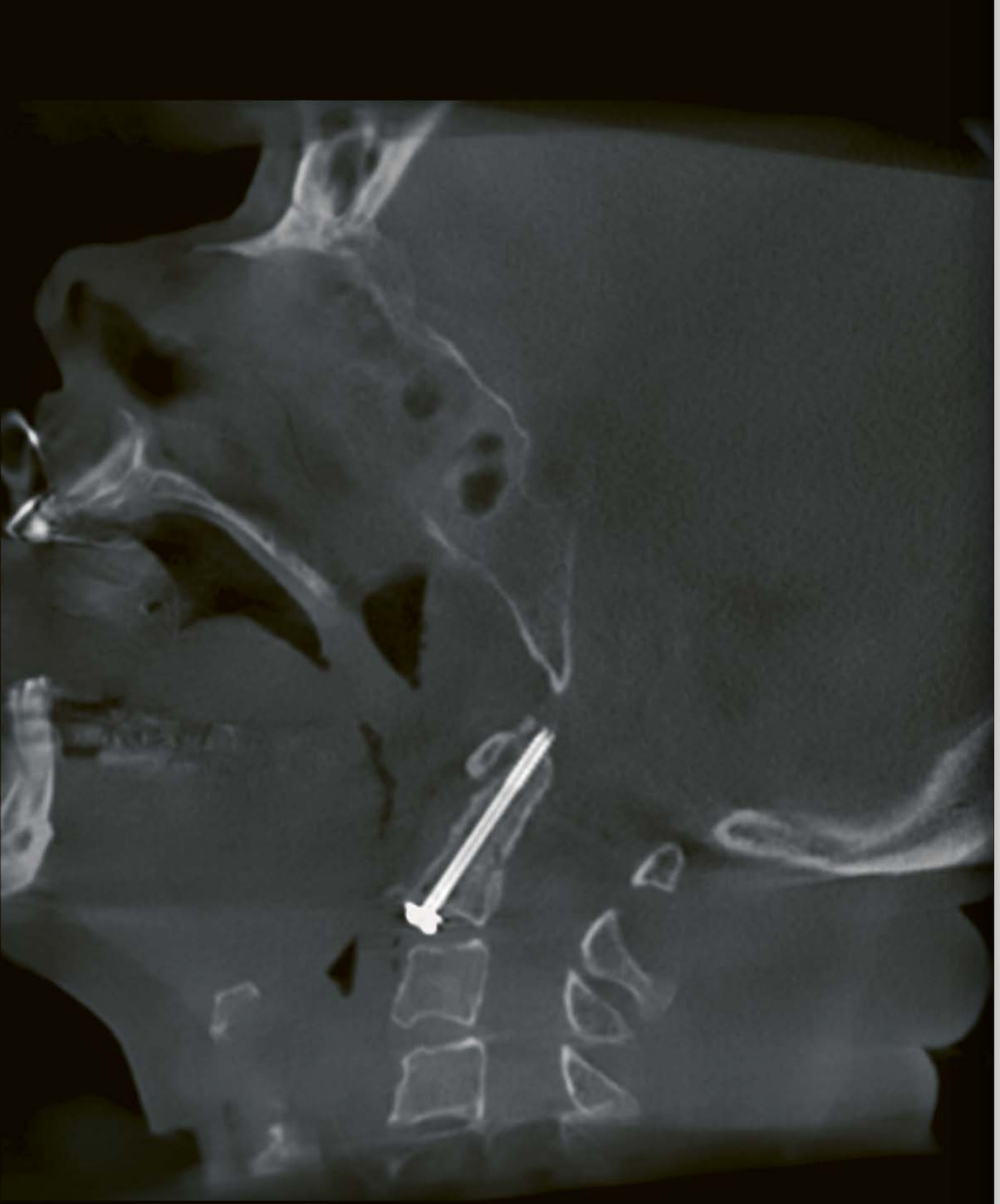
Hand surgery

Professor Wolfgang Böcker
Department for General, Trauma and Reconstructive Surgery
University Hospital Munich, Germany
Ziehm Vision RFD 3D

“Intraoperative 3D imaging is recognized as the most advanced mobile device imaging technology for achieving complete CT-like image information in just one scan procedure. For us, the ability to switch seamlessly among intraoperative navigation, CT-like 3D imaging, and 2D fluoroscopy provides an ideal combination for daily spine and trauma cases such as this particular distal radius fracture.”

Spine surgery

Professor Wolfgang Böcker
Department for General, Trauma and Reconstructive Surgery
University Hospital Munich, Germany
Ziehm Vision RFD 3D



Spine surgery

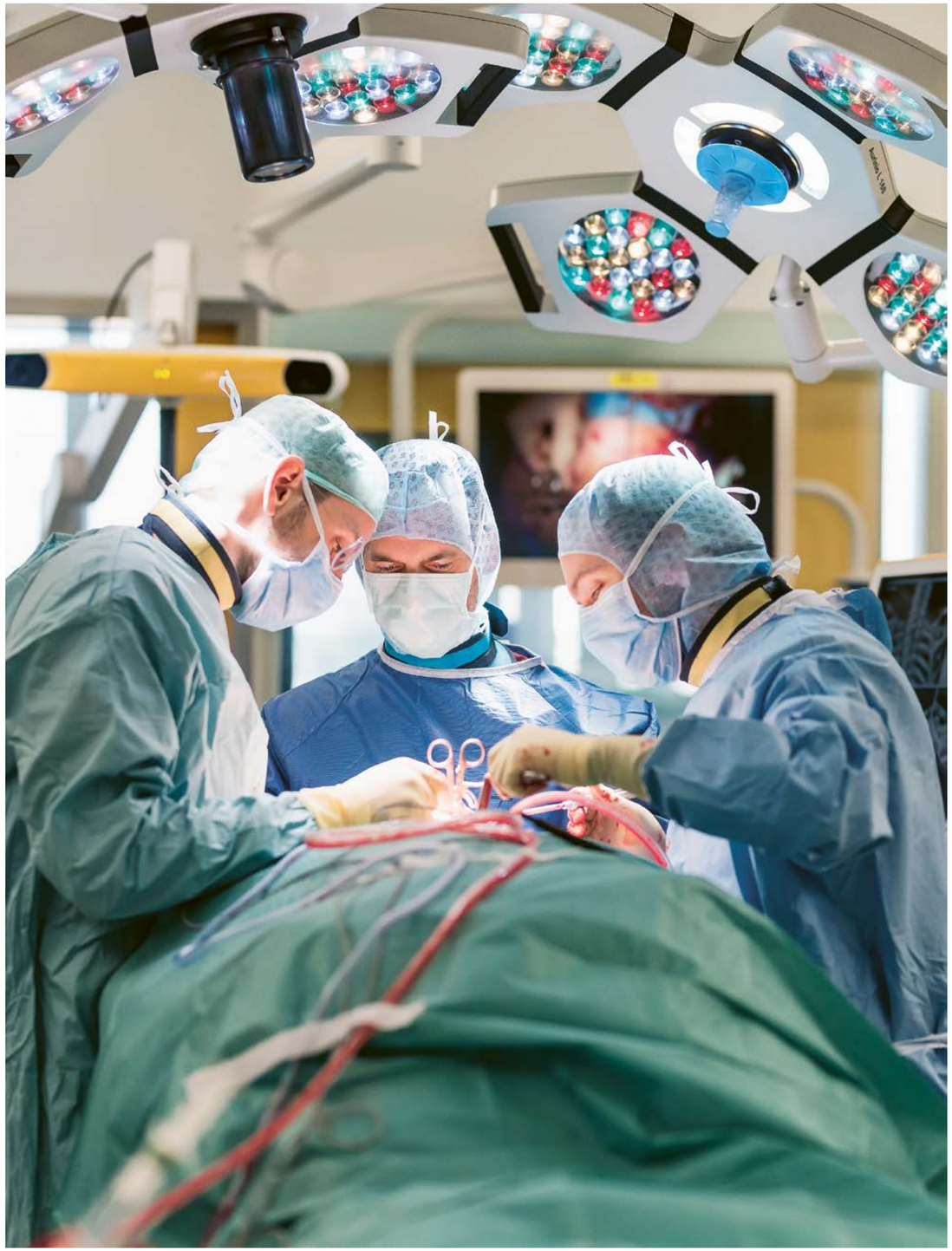
Prof. Christoph Josten
Department of Traumatology, Plastic- and Reconstructive Surgery
University Hospital Leipzig, Germany
Ziehm Vision RFD 3D CMOSline

“3D Imaging allows us to achieve high precision in complex surgical procedures. Moreover, with the ability to perform intraoperative control scans, we can considerably reduce the need for postoperative CT scans. With this 3D scan of a cervical spine there are significant dose savings compared to a CT examination. For me, dealing responsibly with radiation is one of the most important parameters when it comes to patient safety. For this reason, my team and I value the Low Dose Mode that helps us achieve exceptional clinical images with minimized radiation.”

With over thirty operating rooms, the Operating Center in Munich at the Großhadern campus is one of the largest in Europe. The Department for General, Trauma and Reconstructive Surgery under the direction of Prof. Dr. Böcker is located on the fourth floor. Here physicians use new methods and the most advanced medical technology to provide acute treatment for many injured patients.

The highest level of care

Photos
Juli Sing



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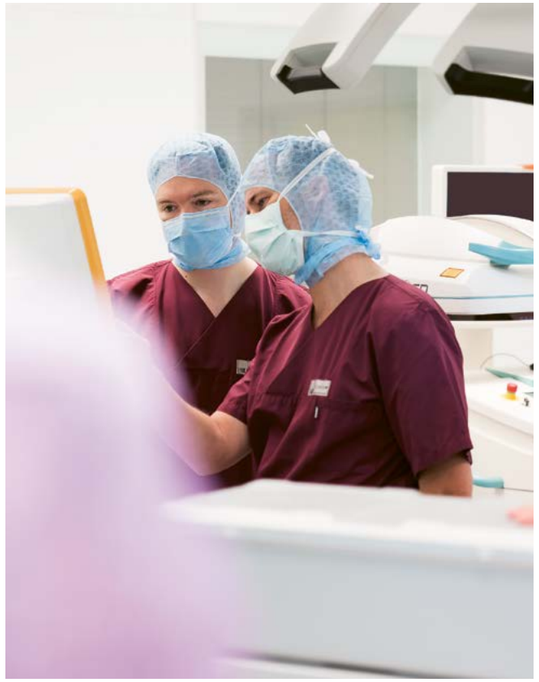
As evening approaches, activity slows down in the halls that lead to the entrances to the operating rooms.

A team of three physicians works for several hours to achieve the best results for the patient.

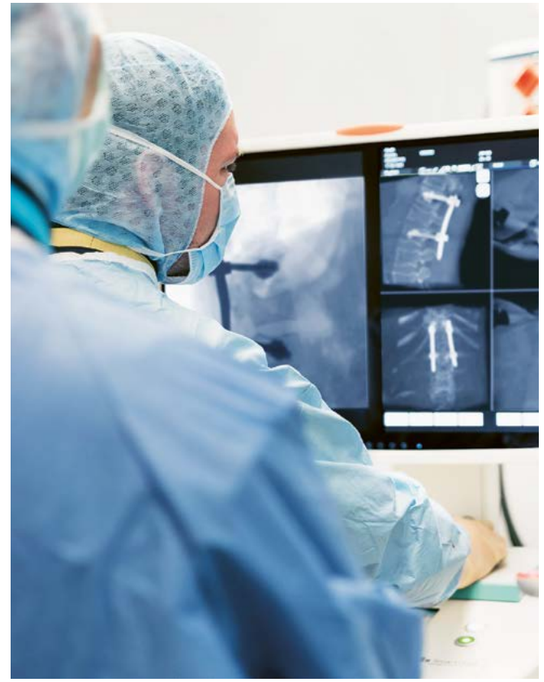
The long halls of the Operating Center in Großhadern provide a sense of the size of this large building. More than 40,000 operations are performed each year here since the center opened in 2014. The Operating Center, part of the clinic at Ludwig-Maximilians-University (LMU), is considered a successful model in professional circles. The influence of the LMU is clear: advanced, minimally invasive procedures, operating in hybrid rooms, and using a sliding gantry, i.e. computed tomography equipment that can be moved back and forth between two operating rooms demonstrate the close connection to research. But the standard technology is highly advanced as well. From patient entrance areas and procedures to the central sterile material supplies department and on to intraoperative imaging, medical advances are a great priority everywhere in the Operation Center. For this reason, in the spinal and pelvic surgery section of the Department for General, Trauma and Reconstructive Surgery, senior physician Dr. Zeckey and specialist Dr. Weidert are planning today's procedures with the assistance of the newest imaging systems. Both doctors work on the team of Dr. Kammerlander, the head physician. He and Prof. Dr. Böcker, the clinic director, are known internationally as experts in their field. That's why, again and again, patients from all over Europe are flown to Großhadern to undergo a second procedure performed by professionals. Prof. Dr. Böcker's team includes nearly fifty doctors, more than twenty of whom are head physicians or specialists. The clinic, a verified mass casualty trauma center, offers treatment for a wide range of situations: from broken bones and tissue damage to athletic injuries and severely injured patients.



Senior physician Dr. Zeckey and specialist Dr. Weidert discuss the final details of the dorsal stabilization of the cervical spine and the transition from the cervical spine to the thoracic spine.

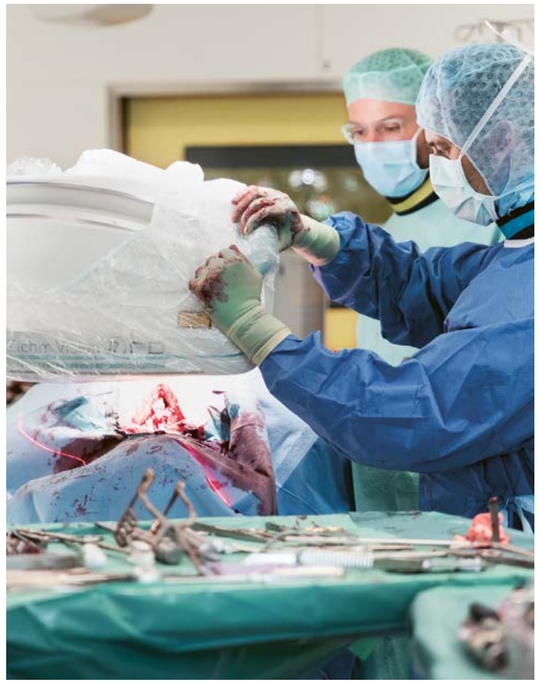
Nadja Baitis, a Ziehm Imaging application specialist, acquires an initial overview image with the mobile C-arm. The vertebral bodies are located precisely based on this clinical image.

Today Dr. Zeckey and Dr. Weidert are performing two spinal procedures. The first operation on the cervical spine is especially challenging: At the patient's request, the surgeons are using an alternative method of treatment. Dr. Zeckey and Dr. Weidert discuss the procedure in detail: because each action must be correct, advanced medical technology is used even in the planning phase. For today's procedure, the physicians are using a new 3D C-arm by Ziehm Imaging: the Ziehm Vision RFD 3D with premium CMOSline equipment, which will be introduced to the market in just a few months. As a reference partner, the trauma surgery department receives the system as a loan unit much earlier in order to test the technical innovations in clinical use. A new detector, settings that reduce radiation exposure, and expanded user functions have improved the image quality of the 3D C-arm. Today the new system has to demonstrate its capabilities. Operating on the cervicothoracic area, the junction between the cervical spine and the thoracic spine, is difficult enough, and this, together with the anatomical condition of the patient, makes a precise lateral 2D aquisition of the transition to the thoracic spine nearly impossible. But the high contrast image of the bony structures is an important requirement for the success of the operation. If the vertebral bodies cannot be represented precisely with intraoperative imaging, the spinal cord could be damaged, for example, due to the improper placement of screws. That's why Dr. Zeckey and Dr. Weidert have decided to perform the operation using image-guided navigation and to scan the spine with the mobile 3D C-arm. The C-arm moves 180° around the patient in both linear and rotational



Using intraoperative 3D imaging, the operating physicians check the exact positioning of various screws.

motion. The 3D data set aquired in this way displays even the smallest anatomical details of the vertebral bodies. The physicians use this as a starting point for image-guided navigation during the operation. First, based on this 3D data set, they plan the exact placement of the screws on the monitor, and then later, during the operation, they display the progress made in setting the screws. Application Specialist Nadja Baitis operates the C-arm. She is a trained medical-technical radiology assistant and is part of 3D product management at Ziehm Imaging. In particular, Ms. Baitis works with new C-arm systems during the test phase to ensure that all of the technical innovations also function in practical use. She trains the OR personnel with regard to using the system and passes on her valuable experience. Ms. Baitis has been in Großhadern for more than two weeks already and is testing the new system in clinical applications. For difficult procedures like the one today, she controls the C-arm herself. The operation on the cervical spine takes more than four hours and the Ziehm Vision RFD 3D CMOSline is consulted for clinical guidance again and again. Finally, the team carries out a 3D scan. Because the implant can be positioned precisely and this intraoperative control scan can be performed, the patient does not have to wait for the results of a post-operative CT scan and perhaps undergo another operation. The final 3D image confirms it: The screws are correctly positioned in the bone at the specified anatomical distance from the arteries and spinal cord. The operation was successful. The Ziehm Vision RFD 3D CMOSline is also used in the next operation, a dorsal instrumentation procedure in the lumbar spine.



A final control image shows that the screw implantation is in the right place. The surgical site can be closed.

A break between two operations: Nadja Baitis and Dr. Zeckey discuss the image quality of the 3D C-arm.

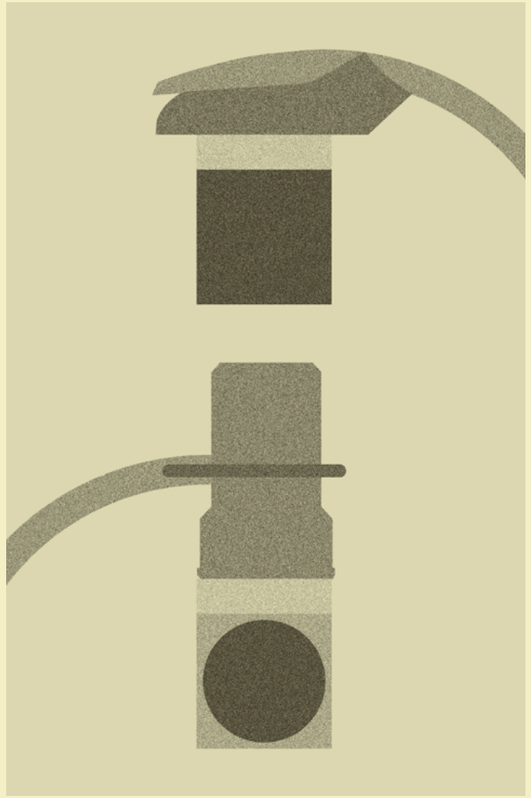
Watch video of the spondylodesis of lumbar spine on YouTube.

Following training by application specialist Ms. Baitis, Dr. Weidert operates the 3D C-arm himself from the sterile area. Once again, the intraoperative 3D imaging provides assurance that the implants are placed exactly where they should be to prevent pain and alleviate the need for further treatment. Following the procedure, Ms. Baitis consults with the physicians. How does the team rate the device's performance? Senior physician Dr. Zeckey is impressed by the quality of the Ziehm Vision RFD 3D CMOSline. And head physician and deputy clinic director Dr. Kammerlander is also satisfied. He uses intraoperative navigation regularly in his standard operation practice. The high-resolution imaging together with the navigation provides assistance, particularly in anatomical areas that are difficult to see into, such as the cervicothoracic transition. The image-guided navigation function allows him to achieve the best possible results in spinal and pelvic procedures. The director of the Department for General, Trauma and Reconstructive Surgery, Prof. Dr. Böcker, is also very pleased with the larger volume size of the 3D C-arm. This new option provides a larger scanning area, which allows more anatomy to be displayed in multiplanar reconstruction. For a large anatomical region such as the pelvis, a single 3D scan now provides adequate coverage of the complete operating area. Ms. Baitis values the close cooperation with the trauma surgeons. She trusts the expertise of the physicians in Großhadern and is glad that the CMOSline version of the Ziehm Vision RFD 3D passed the first practical test. She will be here at the Operating Center in Großhadern again tomorrow for the C-arm's next application.

The C-arm’s identity

Since the first C-arm was introduced in 1955, its application range has expanded tremendously. Today it is impossible to imagine everyday clinical practice without mobile imaging systems. They consist of many different individual components, none of which is as essential to establishing the C-arm’s identity as the image receiver. Rounded or rectangular is not simply a design issue, but is primarily based on the technology the C-arm contains.

1



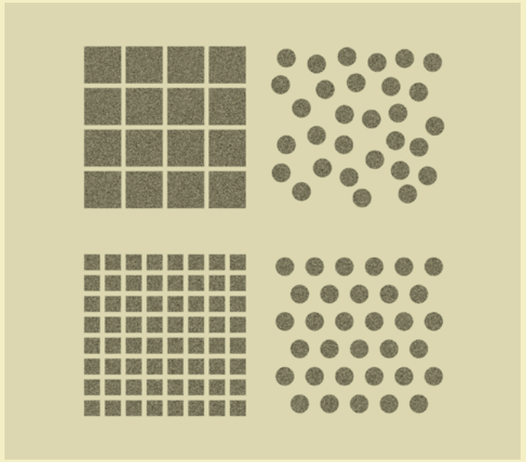
The image intensifier compared with the flat-panel detector

Medical professionals of all specializations use the C-arm for intraoperative imaging. The detector system is the heart of every C-arm. The technology of this system has a critical impact on the quality of the clinical image. While the conventional mobile C-arm was most often equipped with a round image intensifier, today flat-panel detectors are increasingly dominating the market. Up to now, flat-panel detectors (FD) have been based on amorphous silicon (a-Si). Using these detectors has numerous advantages in comparison with conventional image intensifiers. For example, the digital flat-panel detector enables a more direct signal conversion than the image intensifier in which the image is generated traditionally by image intensifier tubes and a connected lens system. The digital signal of the flat-panel detector allows enhanced image processing. It reduces the image noise caused by the analogue electronic components usually installed in the image intensifier. Moreover, flat-panel detector technology allows the generation of clinical images without geometric distortion but with evenly distributed shades of gray in the image. In addition, the flat-panel detector generates rectangular images, which means that the field of view it provides is significantly larger. The increase of nearly 50% in size is ideal for greater patient coverage. For example, both hip joints can be displayed in one image. Furthermore, the linear and greater dynamic resolution with up to 16 times more shades of gray allows soft tissues and bones to be displayed with optimum contrast.

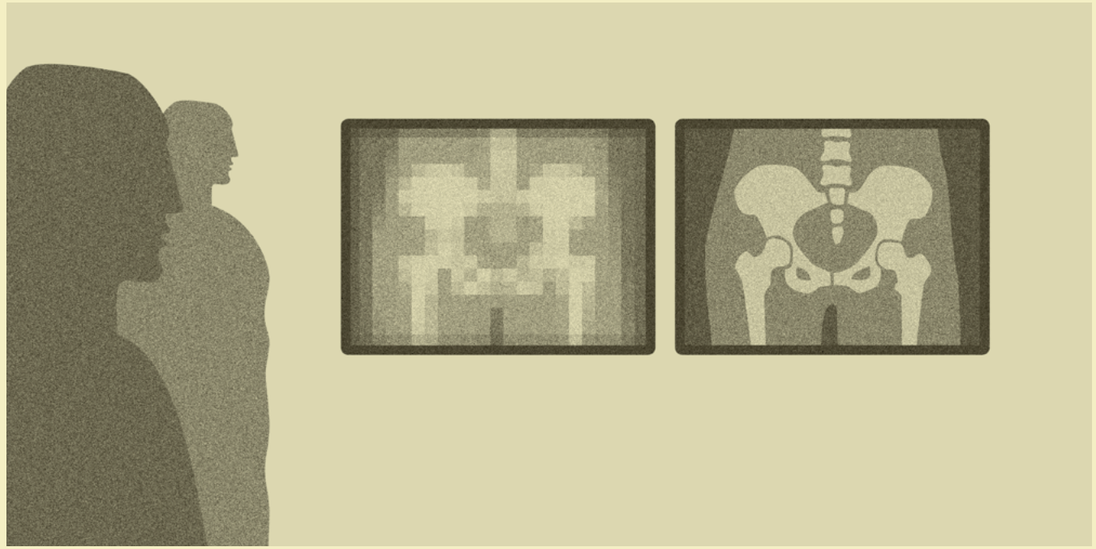
2

The next generation of flat-panel detectors

Because demand is increasing all over the world for high-quality, cost-effective solutions for intraoperative imaging, which is becoming more and more complex, pressure on industry to research new detector technologies continues to grow. CMOS (Complementary Metal Oxide Semiconductor) originally became known as the sensor technology used in digital photography. At first, the medical uses were limited to application areas in smaller anatomy, such as in the dental area or for extremities, and later in mammography as well. In contrast to technology based on amorphous silicon, the new generation of flat-panel detectors relies on semiconductor



technology. With a pixel size of 100 µm, the CMOS wafers used by Ziehm Imaging provide three to four times as many image points as the conventional a-Si technology, depending on the supplier. Even just the lower dark noise level due to physical characteristics allows the CMOS flat-panel detector to achieve greater spatial resolution and sensitivity. This way, even the smallest anatomical details can be displayed with extremely high definition in clinical images. With pixel binning, a process in which multiple individual pixels are combined into one single pixel, noise can be reduced, which improves the signal to noise ratio. This generates an image with less noise in which the image structures are crystal clear. The unified structure of the CMOS wafer contributes to this clarity as well. With a spatial resolution of more than four line pairs per millimeter, the most outstanding advantages of CMOS are best demonstrated in the magnification modes[2]. A native resolution with no interpolation (true resolution) of up to 30 images per second allows the finest structures to be displayed, especially for objects in motion. The differences between bones and soft tissues are even easier to see and more consistent when compared with a flat-panel detector without CMOS technology. The overall result is impressive: With the same dose, the CMOS detector provides greater resolution and, therefore, improved image quality. This also means that the same resolution can be achieved with a lower dose. For this reason, the clinical advantage of the new generation of detectors is not only the greater dynamic or spatial resolution: While the physician is able to work with a better clinical image, patients also benefit from the application of a lower dose.



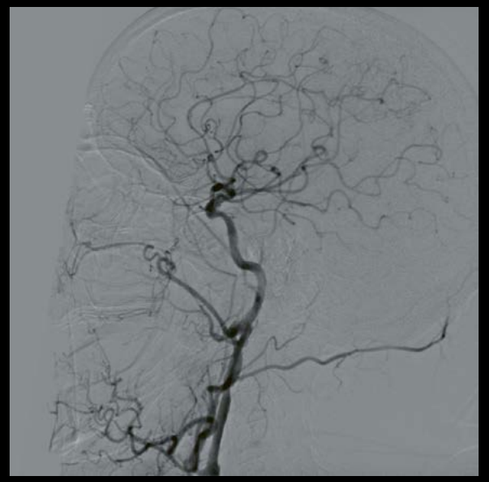
3

The future of detector technologies

While the image intensifier, in terms of its image quality and ergonomic characteristics, cannot compete with modern flat-panel detector systems, it will continue to play a vital role in the future, primarily in price sensitive markets. In every other market, however, the flat-panel detector is making great strides. a-Si and CMOS will both continue to be offered in the coming years; those who want to invest in future technology are already buying CMOS now. Ziehm Imaging was a trailblazer with the introduction of the CMOS detector in mobile C-arms in 2015. Today's CMOSline ranges from a compact 2.4 kW system to a high-end 3D C-arm that can be used in multiple applications. Premium versions of each of the company's FD devices offer this pioneering technology.

Image of the year

1



2

3

1
Native image

2
Digital subtraction angiography (DSA)

3
Roadmapping subtraction angiography (RSA)

Image courtesy of the Medical University of Lublin in Poland, acquired with a Ziehm Vision RFD Hybrid Edition[3] CMOSline

Day in and day out, our C-arms allow the smallest anatomical details in the hidden regions of the human body to be displayed. These images create interest in particular with its precise representation of the extremely fine vascular structures in the brain. Due to patient movement during the digital subtraction angiography (DSA), the so-called single frame roadmapping method was used in which a single image is selected from an entire DSA sequence. The selected image serves as the basis for roadmapping, creating a type of ‘map’ that doesn’t require contrast media to provide the orientation that physicians need within the vascular structures. The CMOSline system's outstanding quality makes it easier for physicians to assess images correctly and plan the next steps.

For more than ten years there has been a clear trend toward outpatient treatment facilities in the United States. New methods for anesthetizing patients and the increase in minimally invasive interventions create support for operations in which the patient can go home within just a few hours or days. Dr. Paramjit Chopra is pushing the boundaries and is at the forefront of this trend.

A salmon swimming upstream

Photos
Christoph Grau

Previous page
While studying medicine in Mumbai, India, Dr. Paramjit Chopra realized his dream to travel to the USA. In the medical education 'Mecca' of Boston, he worked and conducted in research at the Brigham and Women's Hosptial, Harvard Medical School. In 2004 he established the Midwest Institute for Minimally Invasive Therapies (MIMIT) in Chicago (IL) which has grown continuously since, adding three local treatment facilities in 2015 alone.

You have lived and worked in the USA for nearly 30 years. Looking back at the beginning of your career, what are your thoughts?

As a medical student from India, I came to a country in which education and the power of innovation were the top priority and the possibilities seemed unlimited. This fascinated me right from the start. Even though my early years as an unpaid research fellow were difficult, I always kept my eyes on the American Dream. I struggled every day to achieve success and I felt like a salmon swimming upstream.

Being a native of India, in what ways has your former home influenced the development of your career?

It was only after I came to America that I understood how much Indian culture and religion had influenced me. For me, there is no difference between Christians, Muslims, Hindus or other religious groups. The people are what count, no matter if they are black, white, yellow or blue. Now, in my profession, I combine the spiritual thinking of India with my medical knowledge from the West. This means that, in the end, treating the person as a whole is important to me, keeping their feelings and fears in mind, and not viewing them just as a patient.

Has starting your own business allowed you to better meet your patients' needs?

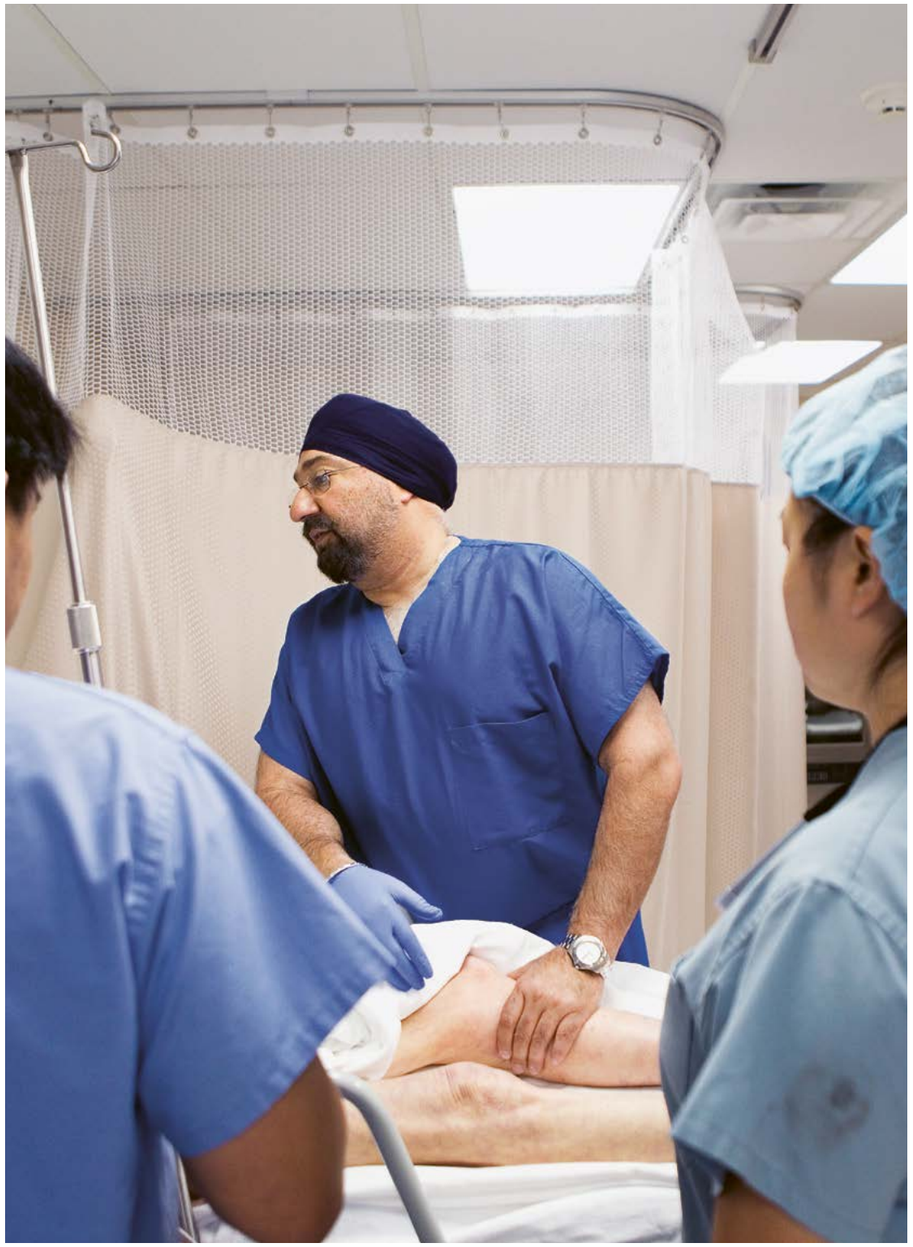
That was the deciding factor for me. In a hospital, you have less autonomy as to the method and manner in which you treat your patients. For me, the focus was always on patient satisfaction and working in a straightforward, intuitive manner, without much bureaucracy.

When people are sick, they need another human being or a group of human beings to help them, not a building or a structure.

We try to be that for our customers. I wanted to establish something of my own to make just that happen. Not only that, but the entrepreneurial spirit is in my blood and I enjoy working with business issues as well.

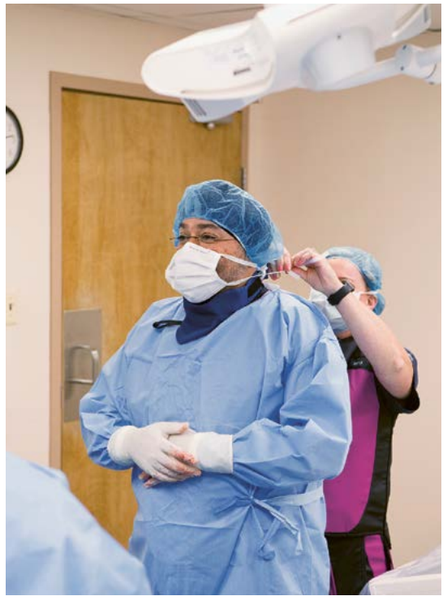
In 2004, you opened the Midwest Institute for Minimally Invasive Therapies (MIMIT). What have you accomplished there that was not possible before?

The MIMIT is an organization where like-minded physicians, such as interventional radiologists, cardiologists, vascular surgeons and other specialists have come together. Our doctors and the medical specialists work in various facilities in and around Chicago. We are specialized in image-guided, minimally invasive procedures. Our focus here is always on the patient and we do our best to keep the risks, pain and rehabilitation time as low as possible for each one. We differ



For Dr. Chopra, the focus is on the patient as a person. He examines a leg not just as an anonymous piece of anatomy, but instead he wants to understand the whole person.

Dr. Chopra and his team complete over 1,000 vascular procedures per year in the various OBLs.



from traditional hospitals in that we take not only a patient's body into account, but also his or her spirit and soul.

How do you implement this philosophy?

Our success is based on six pillars. The first is outstanding clinical results for our patients. Another important point that we have incorporated is patient satisfaction. But this is only possible if the team of doctors, nurses, etc. functions well. This is why we strive to provide all of our employees with a trusting, comfortable working environment. The fourth critical point is that the business remains profitable. The fifth element is our passion for continuous innovation and improvement. Last, but not least, we have established systems to support these pillars. This support extends to the advanced operating methods required, along with perfect interaction between the medical technology and the team. If these pillars do not come together to form a consistent base, success is not possible.

Where do you treat your patients?

My team and I work at both outpatient locations and hospitals: the six MIMIT offices and three other Chicago clinics, including facilities in the Loyola and Rush University systems. To be even closer to patients, in the last two years I have established three additional outpatient treatment facilities, or office-based labs (OBLs), which operate based on the MIMIT philosophy.

What exactly is involved in this form of patient care?

OBLs are small, outpatient units that provide space for four to six patients per day. You can envision it as a small hospital or operation center that is economically independent. Currently, I work with my team in OBLs at three different sites, which are located all over the city. The idea here is to make it easy for patients to access our services. Families look for care within a radius of fifteen to twenty miles or a half-an-hour drive at most. If we are located within this zone, families say, "that's nearby – that's where we'll go."

Which procedures can you offer at your facilities?

All three OBLs are specialized in minimally invasive interventions on an outpatient basis. The range of procedures includes treatments for peripheral arterial disease (PAD), superficial and deep venous disease, and uterine fibroids, for which we provide uterine fibroid embolization (UFE). In addition, we treat spinal disorders with vertebral augmentation and ablation of spinal metastases, and we have recently added prostate artery embolization (PAE) for benign prostatic hyperplasia (BPH) to our services. We use the most advanced image-guided systems, such as the Ziehm Vision RFD Hybrid Edition, and the most up-to-date operating techniques in order to execute these procedures as efficiently and as comfortably for the patient as possible.

What were the challenges when you opened the doors at MIMIT?

First of all I had to realize that as a doctor I was suddenly confronted with issues such as marketing, cash flow and investment rates. An OBL is a business and in order to run it, you not only have to be a doctor, but also an entrepreneur. That means thinking not only in terms of cost-effectiveness, but also wanting to take on a certain amount of risk. To keep the risk as low as possible, it was essential to formulate a business strategy for my OBLs right from the start. Probably the experience I gained while establishing the MIMIT made this much easier for me. Nevertheless, giving the business a chance to develop into a healthy pattern of growth was difficult. Above all, we had to give it time. And we also needed a few friends to support this endeavor.

Who went with you down this path?

I believe that it's best to work with people who you trust, but also who you like.

My team has been with me for years, and even the partners and suppliers with whom I work closely have also become friends.

Ziehm Imaging has been a part of this group for a long time. Right now I'm working with three Ziehm Vision RFD Hybrid Editions and we are considering the purchase of a fourth system. For me, the technical equipment is an important component of the team, and I must be able to depend on it exactly as I depend on my employees.

How long did it take before the idea of your own OBL developed into a functioning operation?

After an intensive, six-month planning phase, in December 2015 I operated for the first time in my outpatient treatment center. After two years, I can say that we are working together even more effectively now and everything has fallen into place. We are always analyzing our processes. All of our administrative departments have access to all of the information, so they can develop new requirements. This helps us make more systematic investments in the future and to expand as well.

What do you think are the greatest advantages for OBLs?

The team and I quickly learned that in smaller facilities, you can do things more easily, more efficiently and more intuitively than in large hospitals.

We can use the time that we do not invest in unnecessary processes to ensure better patient care and greater satisfaction.

With alternative financing options, such as by renting our space or leasing our equipment, we can greatly reduce our costs and contain our risk.

One office-based lab has now turned into three. How do you organize the various locations and ensure consistent communication and quality?

The key words are digitalization and standardization. By using innovative, cloud-based platforms, we have access to all of the information at any time and any place. In turn, this keeps the costs as low as possible. Standardization, especially in the daily routines of the clinic, ensures a consistently high level of quality across the entire supply chain of all of our complex procedures.

Are current developments in the USA regarding compensation for health services advantageous in terms of your business model?

In general, you need to understand that in comparison with other economic sectors, health care systems are years behind. While quality-oriented compensation structures have been the norm in other areas for quite a while already, the health care industry is still just at the beginning. Since the 'MACRA' legislation (Medicare Access and CHIP Reauthorization Act) was introduced in 2015, new structures have been established, such as taking patient satisfaction into consid-

eration as a criterion for remuneration. Now it's more about the quality of care and no longer just about the number of patients treated. This benefits businesses like ours because we are banking on precisely this development. It will certainly be more difficult for larger institutions in the coming years because they will have to completely rethink their strategy.

What is the advantage of this new development for patients?

Patients will no longer just been seen as sick people, but instead as customers entitled to good service. For this reason, hospitals must no longer simply strive to provide medical care, but they must engage in conventional customer management. Suddenly it will be important if patients feel comfortable in the waiting room or if they have to wait for hours among other sick people in a room with a great risk of infection.

Do these new criteria also affect your OBLs?

Of course. My outpatient treatment centers are smaller and less complex in their structures than large hospital complexes. That is why it is possible for us to focus more specifically on patient needs and create more added value for customers. Because we can implement new requirements faster, our work is quickly more cost-effective. The remuneration rates in the OBLs have also changed dramatically in recent years, to our advantage, and today the compensation for procedures is better than a few years ago.

Looking back over the years, would you call the OBL concept successful?

At my three locations that is certainly the case. However, you must also understand, of course, that the daily work involved is completely different. The medical doctor must also be a business and communications professional and attract patients. For example, we use social media such as Facebook and YouTube to communicate our requirements for quality to the general public. Moreover, we hold general informational events in communities and associations in the area.

Will this type of medical care be at the forefront in the future?

I think the number of outpatient treatment facilities will increase sharply in the coming years. On one hand, this is certainly due to the fact that medical advances have made it possible to do many operations even in facilities that aren't as specialized. On the other hand, many doctors will be attracted to this area because it is lucrative, but they may not exactly understand how much work is required. In the end, there will still be large, highly specialized hospitals. Here the trend will be toward forming large purchasing groups and chains of hospitals. But due to their focus on patients, the outpatient facilities will represent an important part of the overall solution.

You stated that the American Dream was something that appealed to you. Has it come true for you?

I am happy to have more control over my life now, to do my work and to enjoy what I do every day. My three office-based labs are leaders in the area of minimally invasive procedures in the greater Chicago area. However, we have to continue to demonstrate our philosophy and quality every day from scratch. That's why I will probably never stop being that salmon that swims with all of its might against the current.

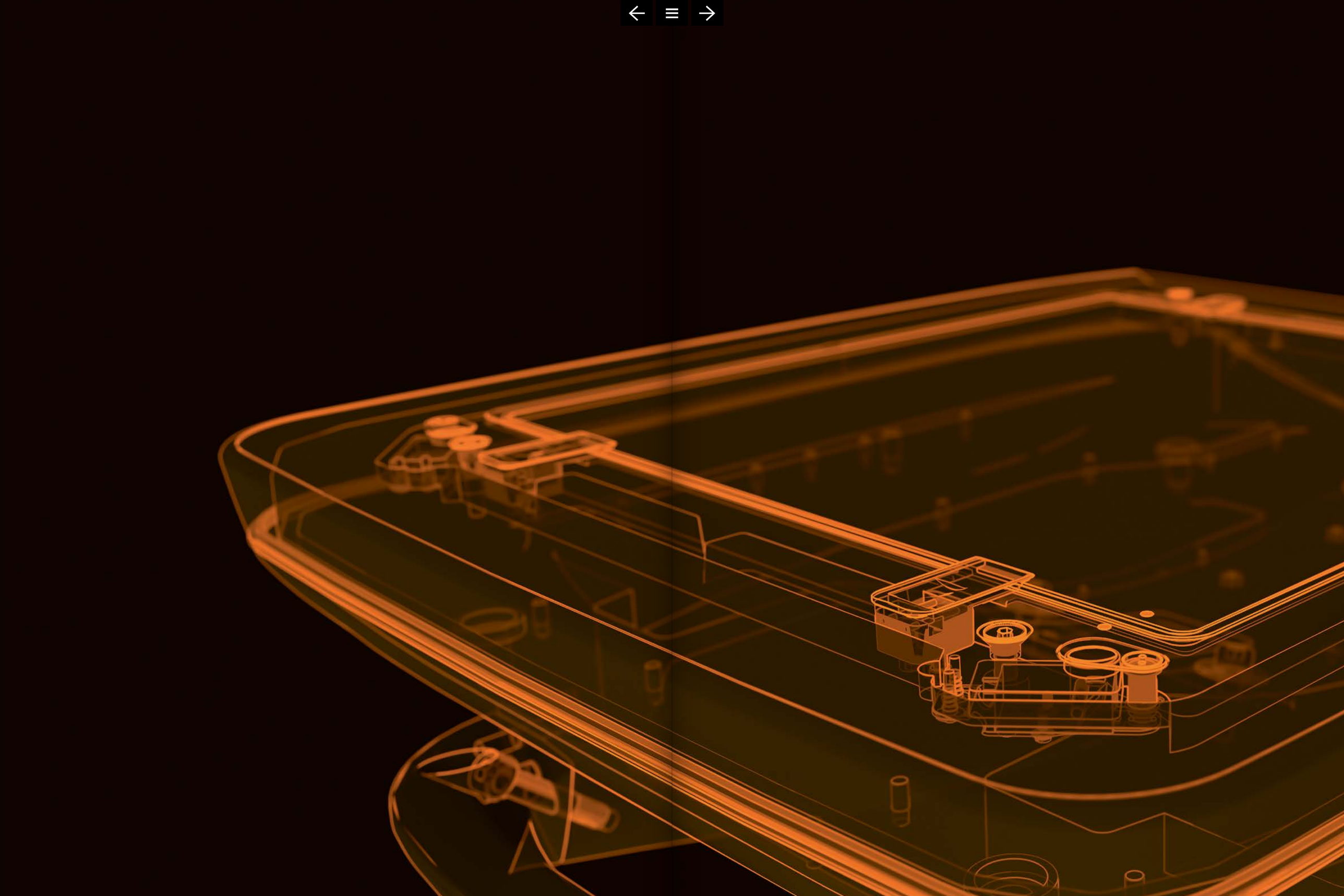
Office-based labs – More and more physicians are interested in a delivery care model that is patient centered and can therefore improve patient outcomes and provide greater autonomy for doctors and staff. For this reason, office-based labs (OBL) and ambulatory surgery centers (ASCs) are expected to increase 18% by 2019. The number of office-based labs in the USA is now estimated at 600.[4]

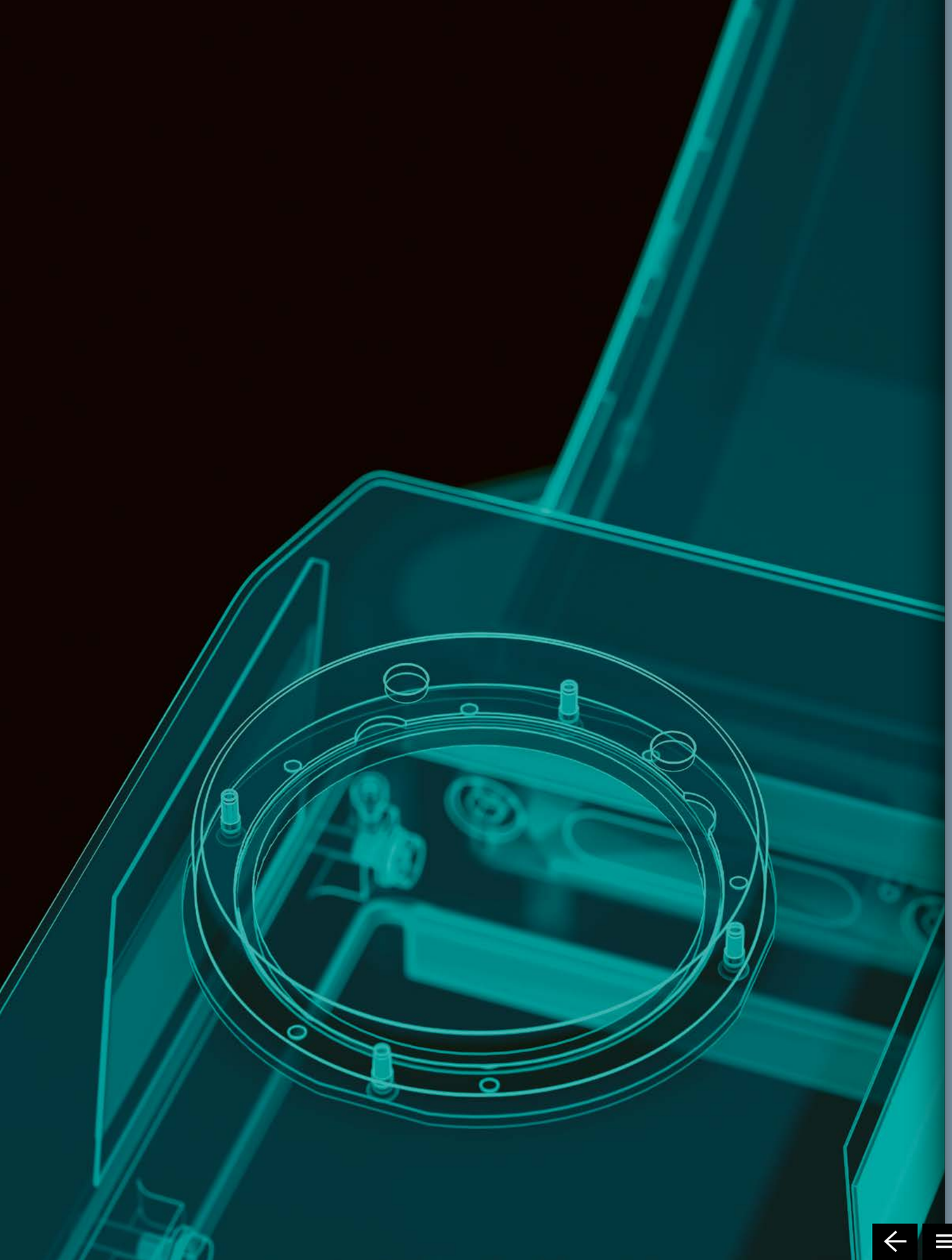
Trust, openness and common goals – these form the basis of the outstanding team structure in Dr. Chopra's OBLs.

Images
Sebastian Mildenberger

Dimen-sions

Medical product design has its own set of rules. It’s about more than aesthetically pleasing shapes or haptics. Healthcare technology must meet high requirements for safety and hygiene, reflect state-of-the-art research, and feature handling that is clearly understandable and intuitive. A look at the design information for the Ziehm Vision RFD 3D demonstrates the wide variety of dimensions involved in planning all of the details.





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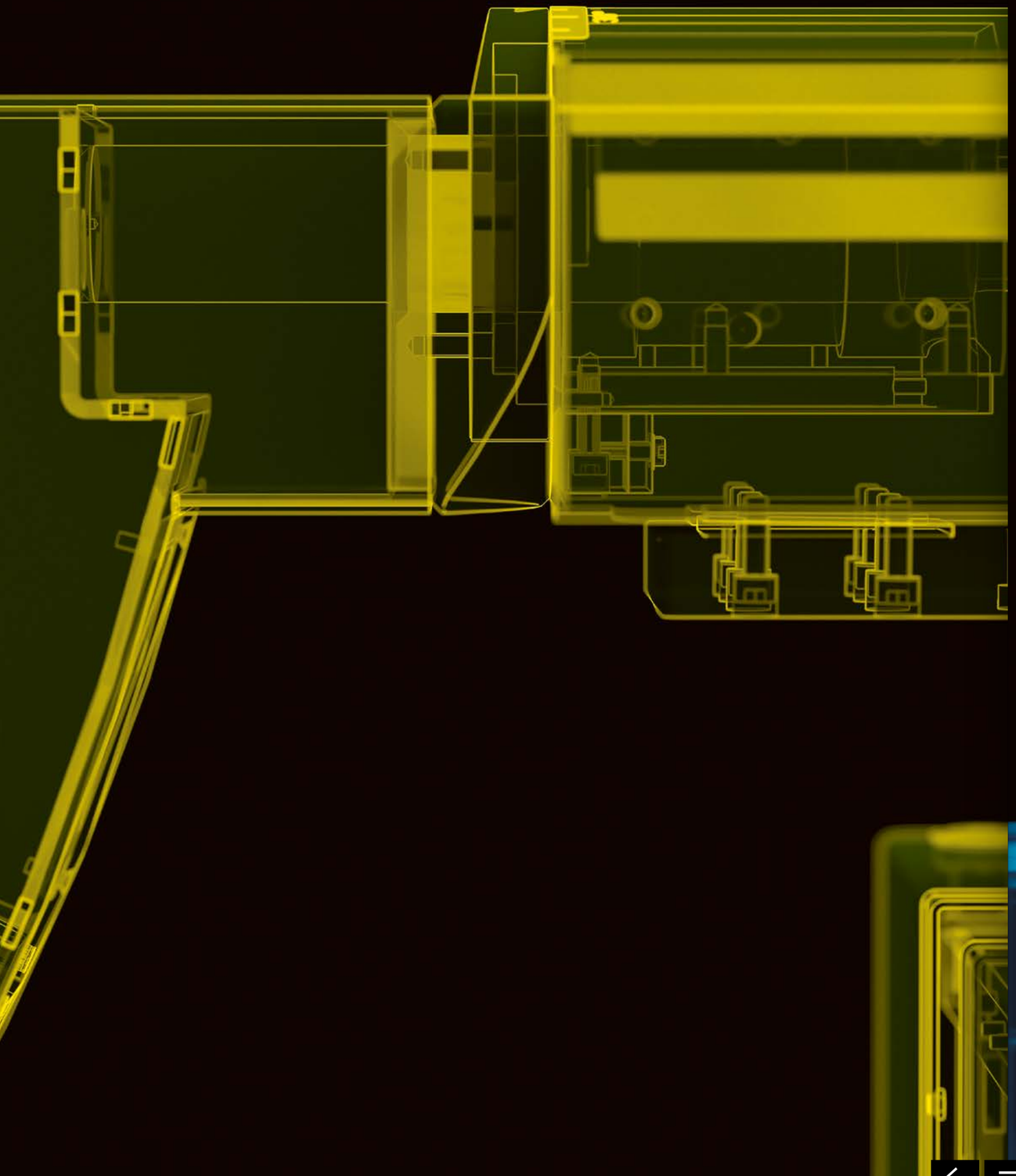
Like a fine filter, the anti-scatter grid extends across the space below the detector. Easy to remove, it allows significant dose savings.

On the left

Two small lasers on the generator have an important function: Together with the lasers on the detector and on the C-arm, they allow the device to be positioned exactly on the patient.

Next page

What looks like a bridge is actually the angulation axis. It supports the 160 kilogram C-arm and simultaneously enables it to move along all of the axes.



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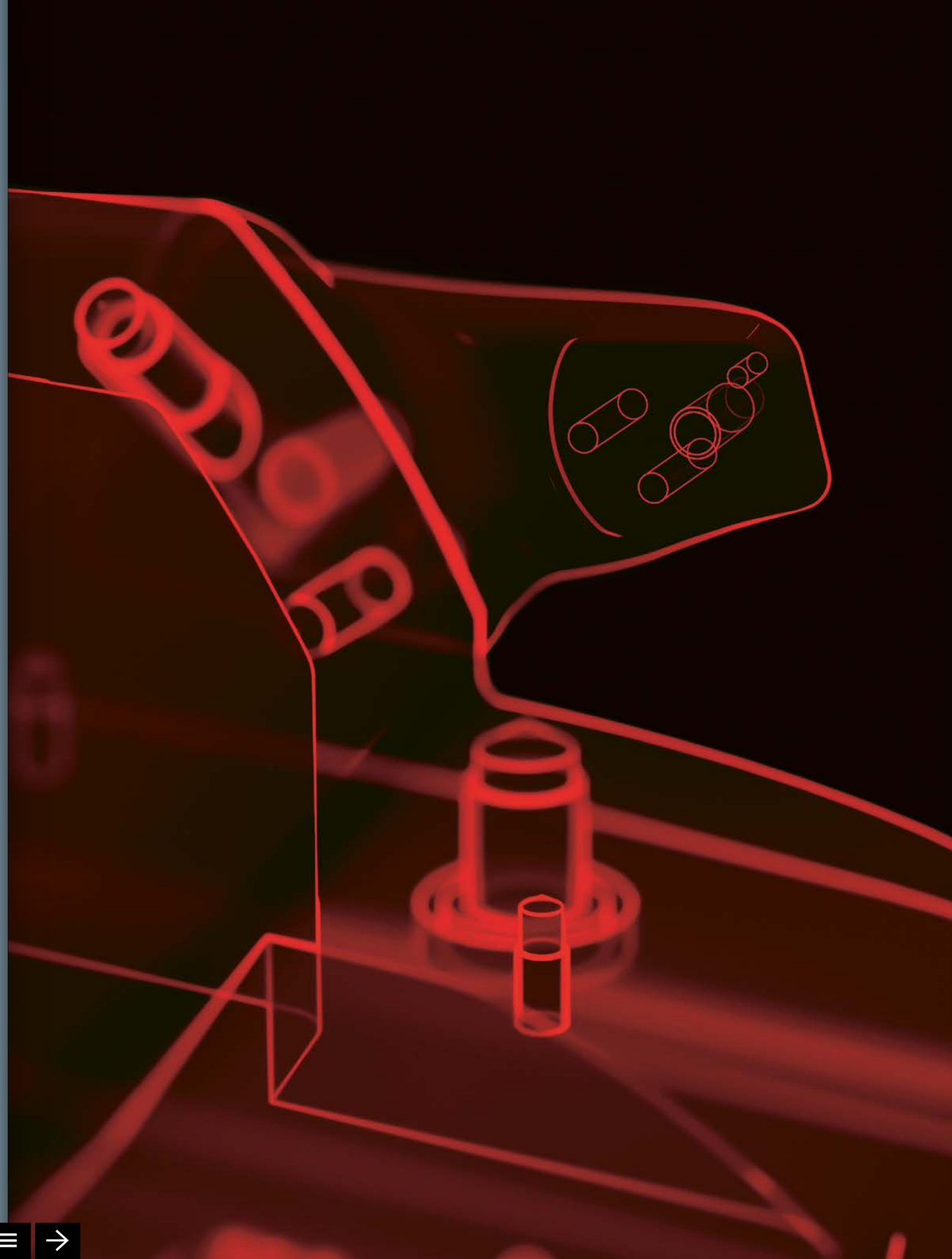
The two joysticks extend upward from the Position Control Center like monoliths. They are used to control the four motorized axes of the mobile C-arm from the sterile area.

On the right

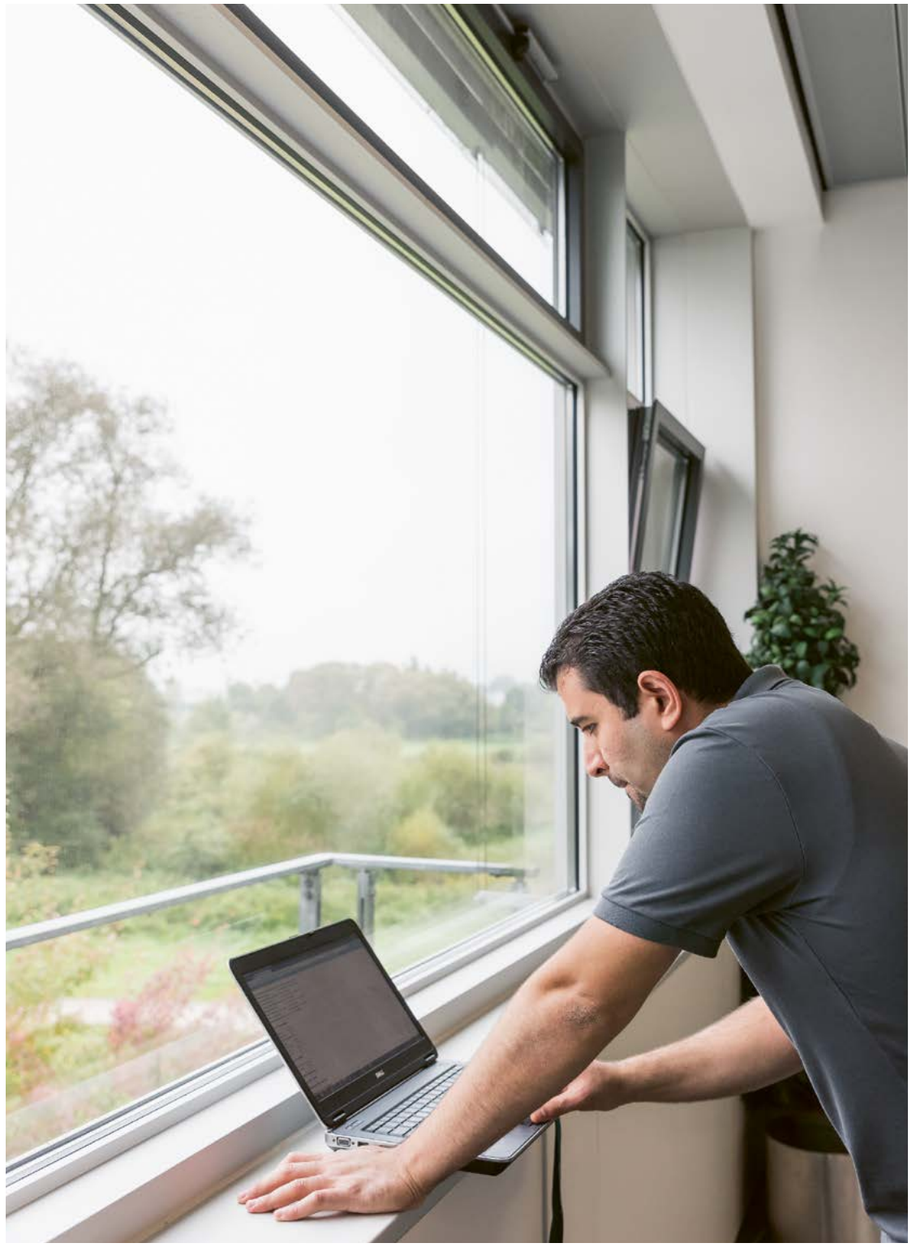
On the extension of the detector handle, the NaviPort interface is expecting its partner from the navigation manufacturer: Together they make it possible for the navigation device to locate the 3D C-arm exactly.



Baher Sibai works all over the world for Ziehm Global Service. A trained electrical engineer, he is one of many service technicians on the hotline and in hospitals every day who make sure that the mobile C-arms by Ziehm Imaging function without a hitch.

On call

Photos
Juli Sing



The service team at the headquarters in Nuremberg can always provide Baher with support, either online or by telephone.

Baher always takes the tool case with him on customer visits to make sure he has what he needs to open the C-arm and replace parts.

Senior physician Dr. Baier tells Baher how the C-arm is most often used. A trauma surgery specialist, he especially likes how the C-arm can be positioned very close to the patient.

Today Baher is on his way to the clinic in Forchheim, which is just half an hour by car from the office in Nuremberg. This is one of the shortest maintenance and repair trips that Baher has to make. He also visits hospitals in Munich, Berlin, Cairo and Paris. Baher speaks English, French and German very well, but because his native language is Arabic, he supervises mainly the service technicians in the Middle East and North Africa. He explains how much easier it is for the experts to talk with a colleague who knows their native language perfectly. This way, language obstacles disappear more quickly and it is easier to build trust. Baher has already been on service calls to Morocco, Algeria, Tunisia, and Egypt. He has met many colleagues who are also technicians, not only during the maintenance work itself, but above all in the targeted training sessions that Ziehm Imaging offers to service technicians in the region. In these training sessions, Baher informs his foreign colleagues about technical innovations or software updates. In addition, he deals with the problems that confront the service technicians on a daily basis. The people in North Africa, where Baher knows nearly every technician personally and by name, trust him

Baher employs not only his technical knowledge, but also his senses and experience. He actuates the sensor by hand to test the distance control function.

He uses his ears and eyes to ensure that the C-arm moves faultlessly in every axis direction.

and call him more often if they have questions. Baher now holds a weekly teleconference with colleagues in Saudi Arabia, during which technical questions and error messages are analyzed and resolved together. Baher studied electrical engineering at the Ruhr University in Bochum. Before he carried out service calls for customers like this one in Forchheim, he had already completed extensive training. For six months, Baher participated in special training sessions at the Ziehm Academy and training for the hotline to prepare for his first service call. For weeks he went with a expert field service representative on customer visits to gain the experience required to maintain and repair Ziehm Imaging C-arms. Baher can still contact his mentor, an experienced service team colleague, about complex issues. In addition to his technical knowledge, Baher also relies on his feeling for the technology. Before he analyzes the error register of the Ziehm Vision RFD 3D, he assesses the interface to note possible deviations. Both what he sees and hears are important here. Baher rotates the C-arm in every axis direction, paying attention to the sounds generated by the movement. His trained ear quickly notices if the C-arm is moving faultlessly.

The image chain is checked and adjusted so that the monitor can also display the clinical images with the same perfect quality delivered by the device.

Then he completes a thorough check of the motorization, software, monitor cart, and screen resolution. Finally, he checks the C-arm's coolant and fan to make sure the device does not overheat during demanding, protracted procedures. On his service calls, Baher concentrates not only on the acute problems, but he also evaluates case-related wear on the individual components in order to point out potential repairs to prevent problems. If Baher encounters an error message that he isn't familiar with, he consults the Ziehm Service Wiki. In the Wiki, service technicians worldwide share field reports in a knowledge base that provides mutual support. Particularly difficult cases are resolved on the service hotline with colleagues in Nuremberg. The experienced service technicians analyze the situation together with Baher and, if necessary, reconstruct the problem on their test devices to find a solution. When Baher is not on national or international service calls, he is on the hotline himself, consulting with colleagues in the field. Not only are maintaining and repairing the Ziehm Imaging C-arms important to Baher, but also contact with customers. Baher takes time for C-arm users, no matter if they are OR nurses, lead physicians, or medical techni-

The service technician talks with Jana, an OR nurse, to learn about the C-arm's performance.

When he returns to the office in Nuremberg, Baher clarifies an urgent customer request with his colleague Vanessa.

cians. He wants to know how satisfied customers are with the system and if there are suggestions for improvement. First of all, the Ziehm Vision RFD 3D C-arm has earned high praise at the clinic in Forchheim. Senior physician Dr. Baier and the OR nurses who primarily use the C-arm are enthusiastic about the system's image quality. Baher gives them a few more tips for optimum device handling and listens to the customers' specific requests. Dr. Baier and his team are satisfied and Baher is too. Knowing that he has made a customer happy, he can now make his way back to the headquarters in Nuremberg.

Ziehm Global Service – With over 70 partners, the global customer service of Ziehm Imaging ensures that more than 12,000 C-arms worldwide function properly every day. Service employees learn about the sophisticated technology of the C-arm in eLearning modules and on-site sessions at the Ziehm Academy as well as on the Ziehm Service Wiki. Based on their experience and expertise, Ziehm service employees do their best to fulfill customer requests quickly and competently.

1 / page 5
CMOSline represents a system configuration that is based on a Ziehm Imaging CMOS flat-panel detector.

2 / page 27
The visualization of more than four line pairs per millimeter is possible with the 20.5 cm x 20.5 cm flat-panel.

3 / page 28
Ziehm Vision RFD Hybrid Edition represents a group of optional hardware and software that creates an option package on the device named Ziehm Vision RFD.

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cf. Cross, Gonzalez, Wright, 2017: Endovascular Today, March 2017; Office-Based Lab Models: Getting Started

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Ziehm Imaging is specialized in the development and manufacture of mobile C-arms. For more than 45 years, we have produced technologies that enhance imaging and streamline clinical workflows. The mobile X-ray devices' exceptional image quality and flexibility in the operating room serve as an important basis for treatment success.