



Customer Perspective

Essential accuracy and efficiency for functional neurosurgery

Contributor: Witold Polanski, MD, Senior Consultant Neurosurgeon and Head of Functional Neurosurgery, Department of Neurosurgery, University Hospital Carl Gustav Carus, Dresden



Leksell® Vantage System provides submillimeter accuracy for stereotactic surgical procedures

University Hospital Carl Gustav Carus, Dresden

The University Hospital Carl Gustav Carus in Dresden is a large teaching hospital, offering the entire spectrum of modern medical services. With 1,410 beds and 201 day-care treatment places, it is one of the largest hospitals in the Saxony region of Germany.

The Department of Neurosurgery provides a full range of diagnostics and surgical treatments for diseases of the brain, spinal cord and peripheral nervous system, including pediatric neurosurgery in cooperation with the hospital's Department of Pediatric Neurology. The Department of Neurosurgery is fully equipped with cutting-edge diagnostics and surgical equipment and has four high-tech operating rooms, in which more than 2,400 surgical interventions are performed annually.



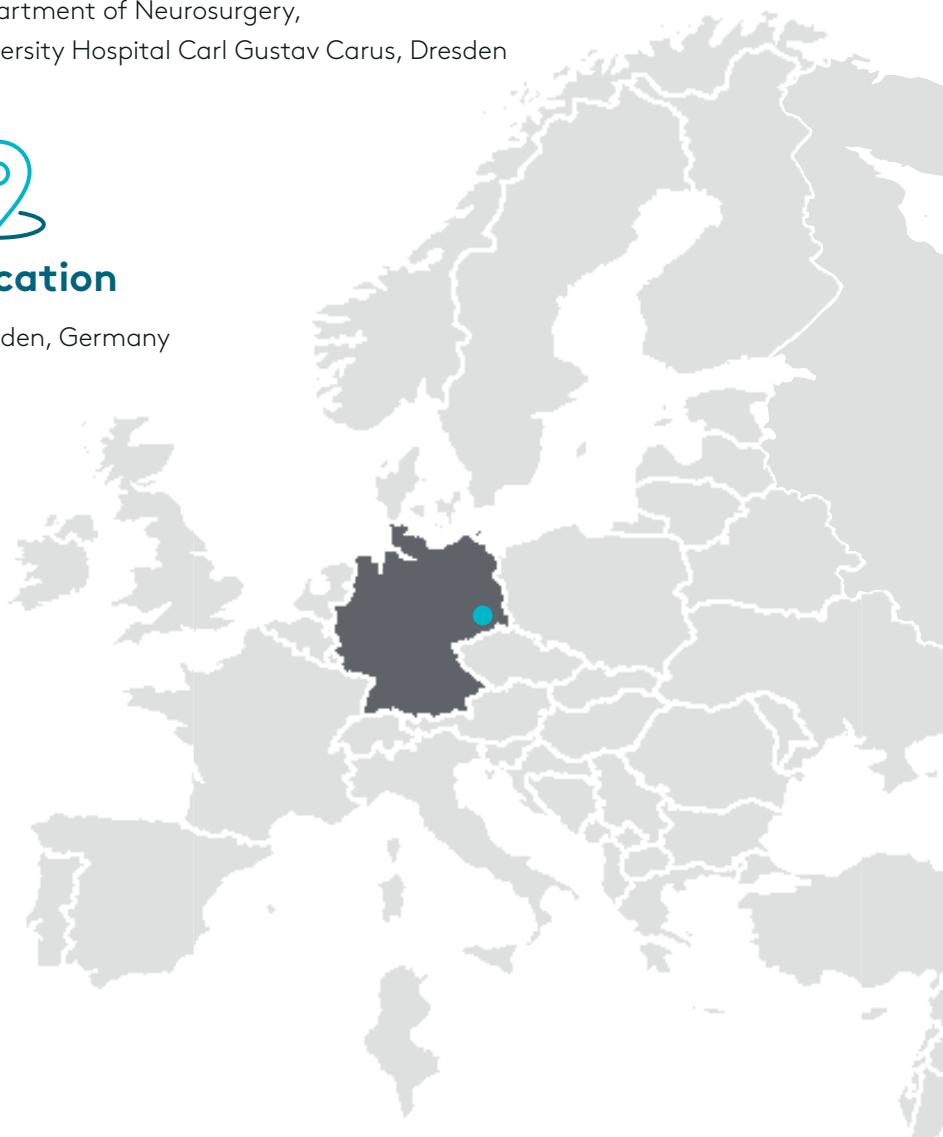
Witold Polanski, MD

Senior Consultant Neurosurgeon and
Head of Functional Neurosurgery,
Department of Neurosurgery,
University Hospital Carl Gustav Carus, Dresden



Location

Dresden, Germany



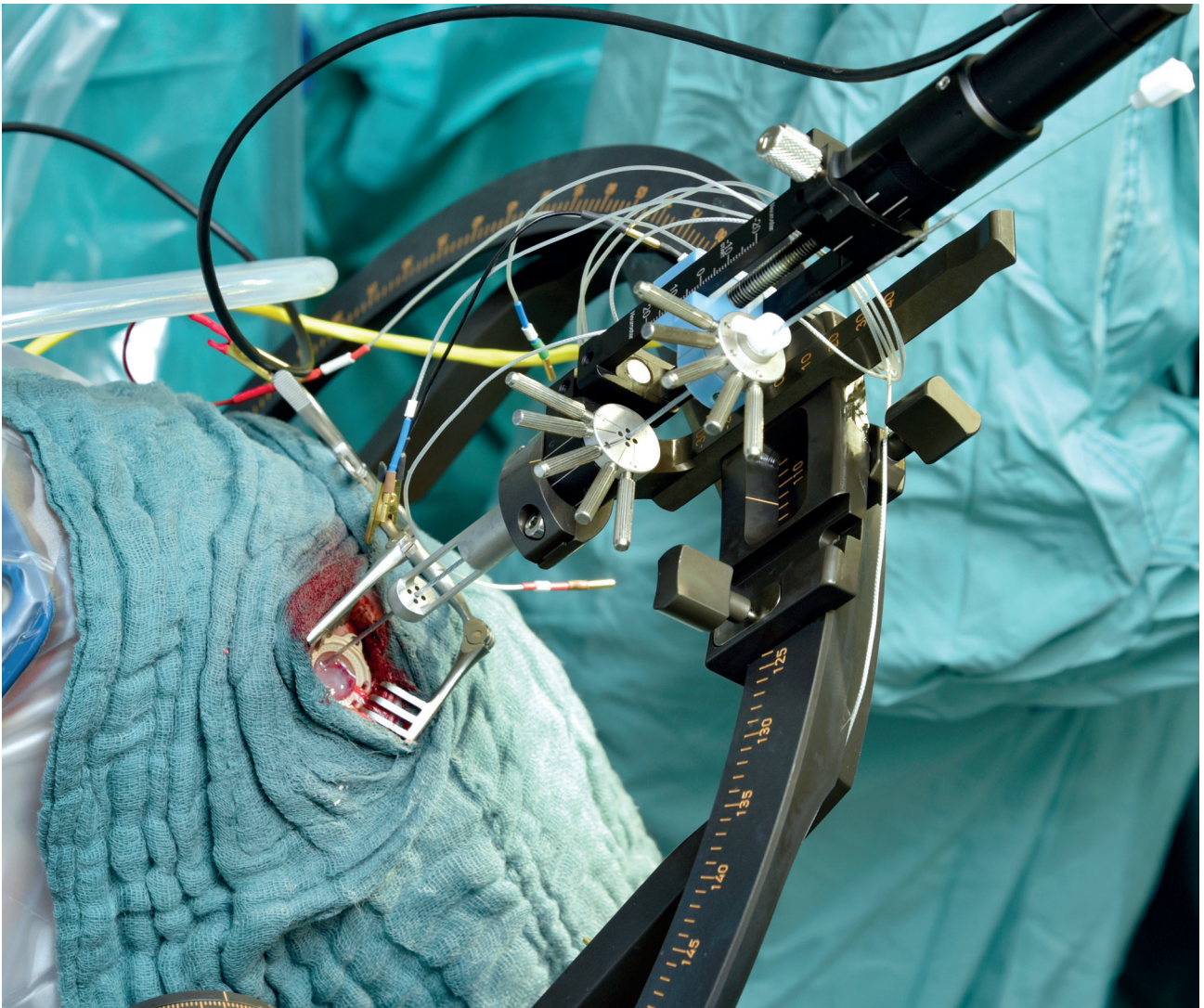


Figure 1. Micro-electrode recording (MER) prior to DBS electrode placement using the Vantage system.

Designed for extreme precision

Head of Functional Neurosurgery, Dr Witold Polanski, and his team perform a wide range of stereotactic surgical procedures, including deep brain stimulation (DBS), stereoelectroencephalography (sEEG) and stereotactic brain biopsies (figure 1). Achieving the highest possible accuracy for these procedures is extremely important to the surgical team. Not satisfied with the deviations they observed using their previous stereotactic system, they began to look for another stereotactic frame system that would suit their purposes and achieve higher levels of accuracy.

This search drew them to the extremely robust design of the Leksell® Vantage Stereotactic System (figure 2). Based on proven Leksell stereotactic

principles, Leksell Vantage provides submillimeter mechanical accuracy for extremely precise neurosurgical procedures.

“The frame is MRI-compatible, which gives us the flexibility to perform localizations using MRI.”

“The single-arm construction of our previous stereotactic system meant that it was not as stable as we would have liked,” Dr Polanski comments. “With the Vantage System, the stability of the arc is much better because it is mounted on both sides of the frame.”

“We also liked that the frame is MRI-compatible, which gives us the flexibility to perform localizations using MRI and we are not dependent on CT alone.”

he adds. “This is a particular advantage for setting up pediatric patients, since we would want to avoid the radiation exposure of CT imaging in children.”



Figure 2. The Leksell Vantage Stereotactic System is based on proven center-of-arc and Cartesian coordinate principles.

Submillimeter accuracy for DBS

The department acquired the Leksell Vantage System in 2018 and quickly set about evaluating the system and getting comfortable with the workflow. “The handling of the Vantage System is very easy,” Dr Polanski continues. “In the first week, I practiced assembling and mounting the Vantage system every day so that I was comfortable to use it fluently during surgical procedures, almost without thinking.

Then, before we started using the system clinically, we conducted some tests to determine the best MRI sequences to use with the frame—to ensure minimal artifacts, minimal distortions, and as short as possible image acquisition times—and to check the accuracy of the system. To do this we mounted the frame on watermelons and phantoms to acquire images with different MRI sequences (figure 3).”

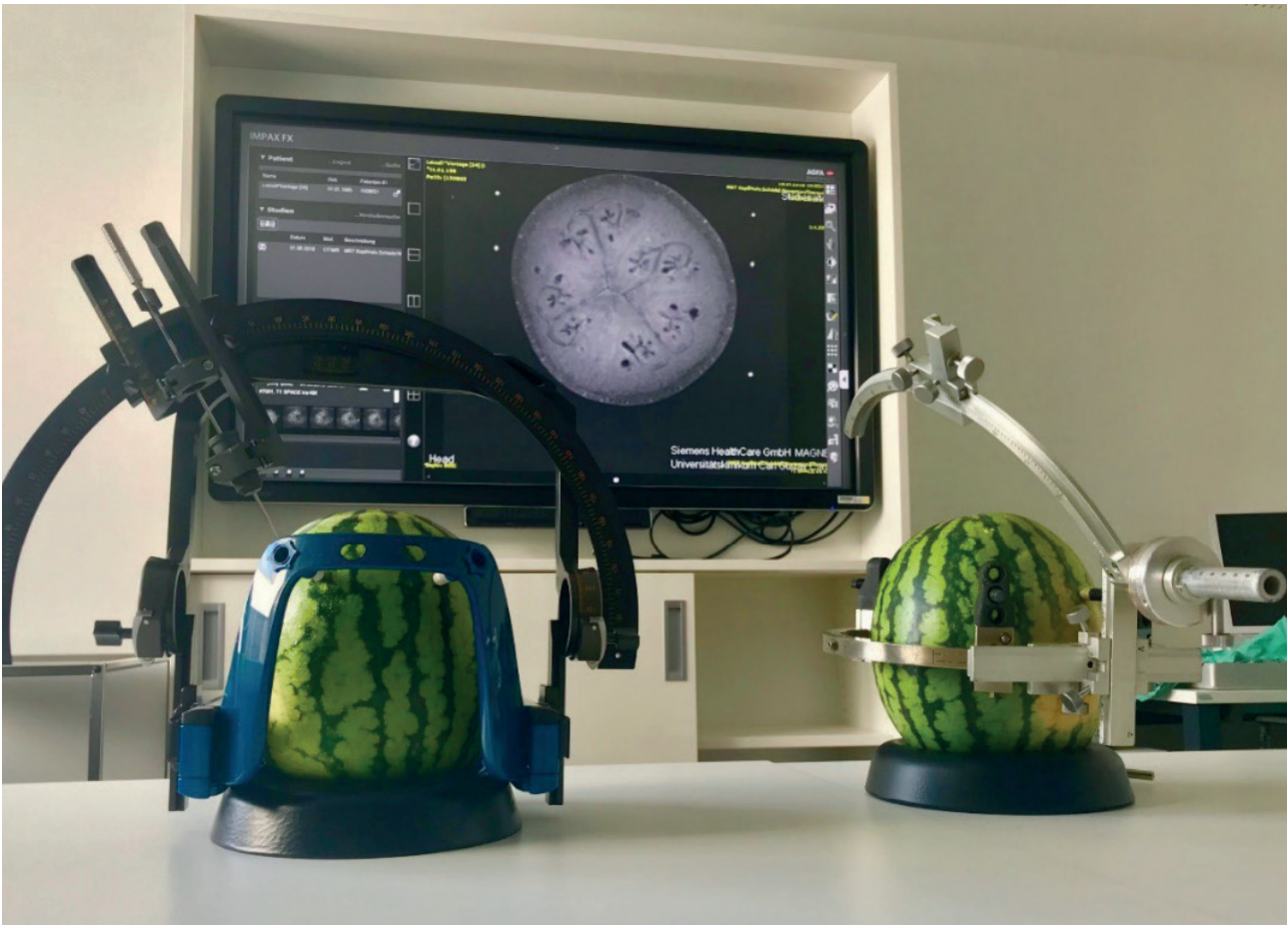


Figure 3. Evaluating the accuracy of the Leksell Vantage System (left) using watermelons.

Satisfied with the high accuracy he could achieve with the Vantage System, Dr Polanski was confident to begin using the frame for all their stereotactic surgeries, such as DBS, sEEG and biopsies. They also use it to perform stereotactic interstitial photodynamic therapy (iPDT) for recurrent glioblastoma, as part of the NOA-11 clinical trial.¹

Routinely, they evaluate every surgery to monitor ongoing accuracy and the time required for each step.

“The deviations we observe for DBS leads are submillimeter.”

“The accuracy of the Vantage System is much higher than we were experiencing previously,” Dr Polanski says. “The deviations we observe for DBS leads are submillimeter (around 0.7 mm)—almost half of what we achieved with the older system (figure 4). When we perform DBS for movement disorders, such as essential tremor or Parkinson’s disease, we depend on very high accuracy due to the very small target or close proximity to critical structures. The higher the accuracy, the better the results and fewer side effects for the patients. We monitor outcome parameters for every patient and, since the implementation of the Vantage System, patient outcomes have been even better than before.”

Deviation of electrodes for DBS

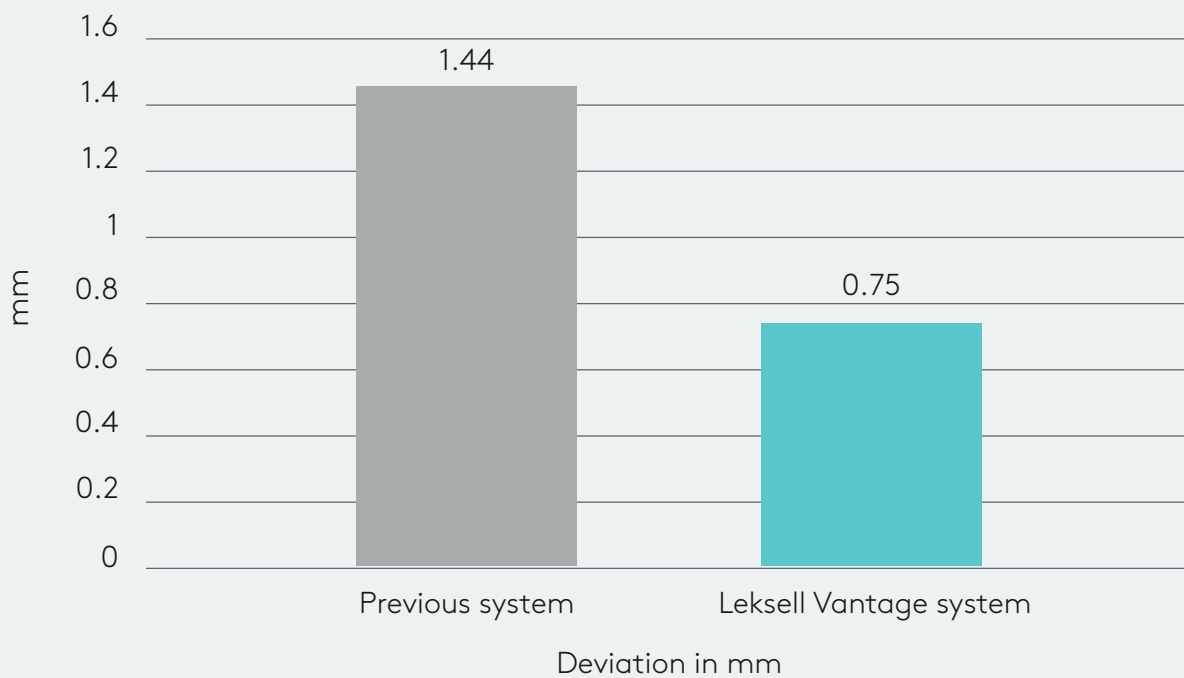


Figure 4.
Electrode deviations for deep brain stimulation.

Greater accuracy and efficiency for sEEG

Similarly, Dr Polanski has experienced greater accuracy, efficiency and safety using the Leksell Vantage System for sEEG implantation. "Unlike our previous system, the Vantage System is very stable and accurate for drilling sEEG burr holes—again, demonstrating submillimeter deviations," he explains. "With such accuracy, we are able to perform more of these procedures and even faster than before. With our old system, it took 7 or 8 hours to implant 16 electrodes. With the Vantage System, we now require only 17 minutes per lead. It takes half the time. Not only can we treat more patients but, due to shorter anesthesia, there is also less risk of complications. So, it's also better for patient safety reasons."

The Leksell Vantage System is manufactured from lightweight materials making it very easy to handle. The arc is attached using an elegant yet robust click-on mechanism, and X, Y and Z coordinates are set quickly and easily, with all scales accessible in the sterile field.

"The Vantage System is very easy to use," he adds. "Everything is quicker than before. The scale display of the Vantage System (figure 5) is much better than our old frame. So, setting the coordinates is faster because it's easier to read and set up."

"Due to shorter anesthesia, there is also less risk of complications."



Figure 5. Vernier scales on the Leksell Vantage System ensure sub-millimeter accuracy.

A more comfortable patient experience

The lightweight, open-face design of the Leksell Vantage frame enhances patient comfort. With nothing obscuring their eyes, nose and mouth, it is easier to communicate with them, read their expressions, and gain access to their airways, if required.

“With our previous frame, part of the frame crossed in front of the patient’s eyes,” Dr Polanski comments. “This would cause problems with awake surgery because patients couldn’t see us and if we wanted to do a neurological examination, such as eye movement, it was really difficult to see everything. With the Vantage frame’s open-face design, examinations are much easier, communication with the patient is easier, their vision isn’t obstructed and they are less stressed during the surgery.”

“With the Vantage frame’s open-face design, patients are less stressed during the surgery.”

“The design of the frame also allows us to perform biopsies in the posterior fossa²,” he adds. “This was something we weren’t able to do with our previous system.”

“Overall, we have found the Leksell Vantage System to have extremely high accuracy and to be very robust and stable for daily use,” Dr Polanski concludes. “The handling of the system is very easy, allowing us to perform stereotactic surgeries in an even faster manner than before and to offer new procedures, such as sEEG and posterior fossa biopsies, with the accuracy we require.”

References

1. <https://neuroonkologische-arbeitsgemeinschaft.de/en/blog/studies/2782/>
2. Posterior Fossa Approaches Using the Leksell Vantage Frame with a Virtual Planning Approach in a Series of 10 Patients—Feasibility, Accuracy, and Pitfalls. *Brain Sci.* 2022 Dec; 12(12):1608. Krüger MT, Terrapon APR, Hoyningen A, et al. doi: 10.3390/brainsci12121608.



We don't just build technology,
we build hope

Elekta AB

Box 7593
SE-103 93
Stockholm, Sweden
T +46 8 587 254 00

Latin America, South America

T +55 11 5054 4550

Asia Pacific

T +65 6221 2322

Turkey, India, Middle East, Africa

T +90 216 4743500

Japan

T +81 3 6722 3808

North America

T +1 770 300 9725

China

T +86 10 5669 2800

For further information please contact your local Elekta office.

Details can be found at [elekta.com/offices](https://www.elekta.com/offices)

[🏠 elekta.com](https://www.elekta.com) [f /elekta](https://www.facebook.com/elekta)

[X @elekta](https://www.x.com/elekta) [in /company/elekta](https://www.linkedin.com/company/elekta)

elekta.com