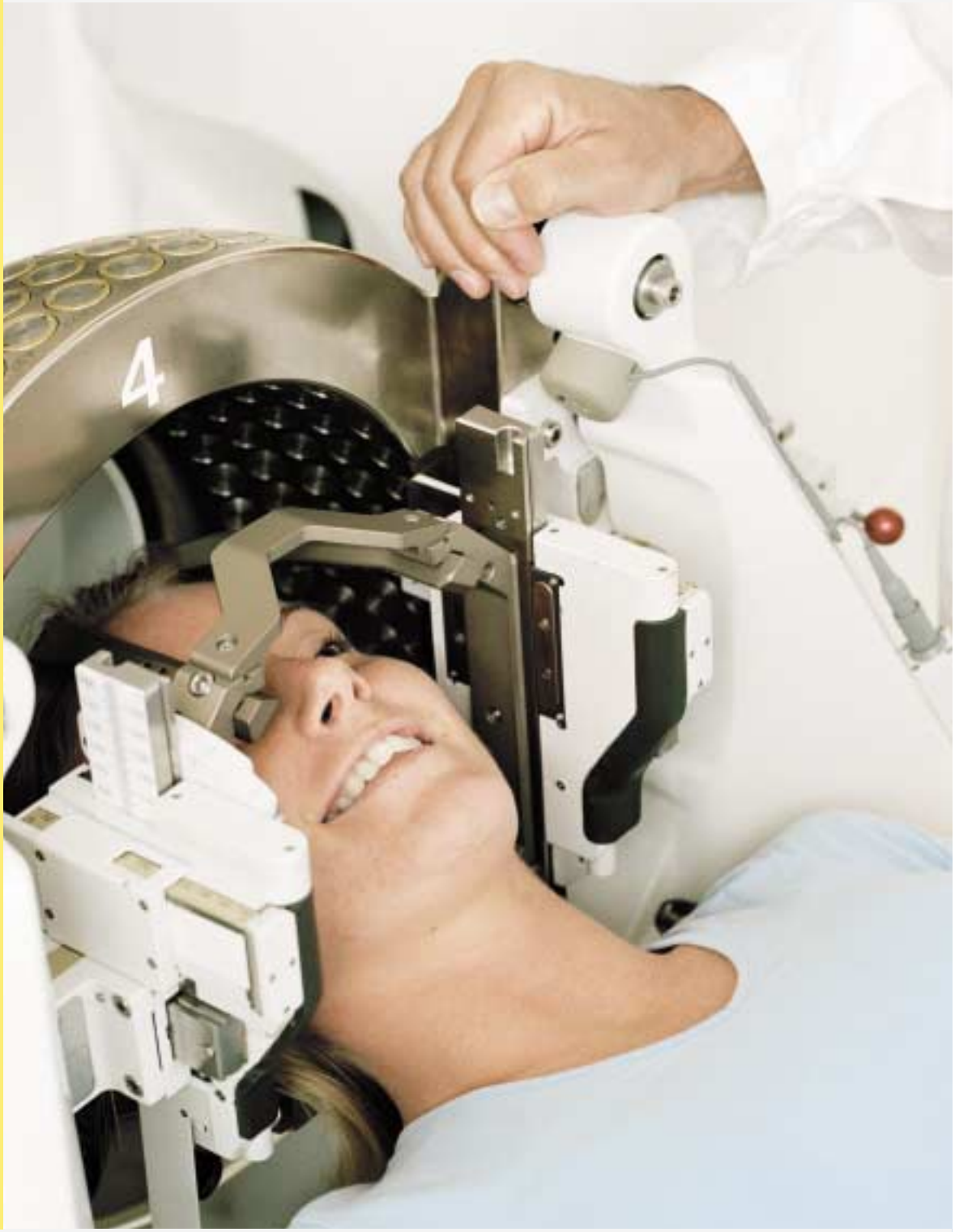
GAMMA KNIFE® SURGERY

Leksell Gamma Knife® 4C



Refining the Art of Radiosurgery

ELEKTA®

"As an active user of both Leksell Gamma Knife and linear accelerator stereotactic radiosurgery, my experience has been that Leksell Gamma Knife allows me to achieve unsurpassed treatment accuracy and conformality. Combined with the most user-friendly treatment planning system available, Leksell Gamma Knife is rightfully referred to as the »gold standard« of radiosurgery."

VOLKER STIEBER M.D.
WAKE FOREST UNIVERSITY BAPTIST MEDICAL CENTER, NORTH CAROLINA, USA

"I first evaluated the role of the Gamma knife in Sweden in 1979, 4 years after the installation of the second prototype unit. While it took almost 8 years after that to introduce the first 201 source Gamma Knife in Pittsburgh in 1987, we have experience now in more than 6,200 patients. We perform about 7500 neurosurgical procedures a year, of which about 10% are Gamma Knife. The technology has steadily advanced, merging dramatic gains in imaging, robotics, and computer planning. Leksell Gamma Knife is the platinum standard for intracranial radiosurgery, providing precision, minimizing risk, and maximizing the therapeutic response. We have outcome studies now extending to 17 years out our center- no existing or emerging technology merits comparable consideration for its well defined role in a broad spectrum of vascular, tumor, and functional cases. For that reason we have now installed a third Gamma Knife at our academic teaching hospital. Gamma Knife represents the prime example of minimal access, minimally invasive brain surgery."

DADE LUNDSFORD , M.D.
UNIVERSITY OF PITTSBURGH MEDICAL CENTER
CENTER FOR IMAGE GUIDED RADIOSURGERY, PENNSYLVANIA, USA

Leksell Gamma Knife® 4C

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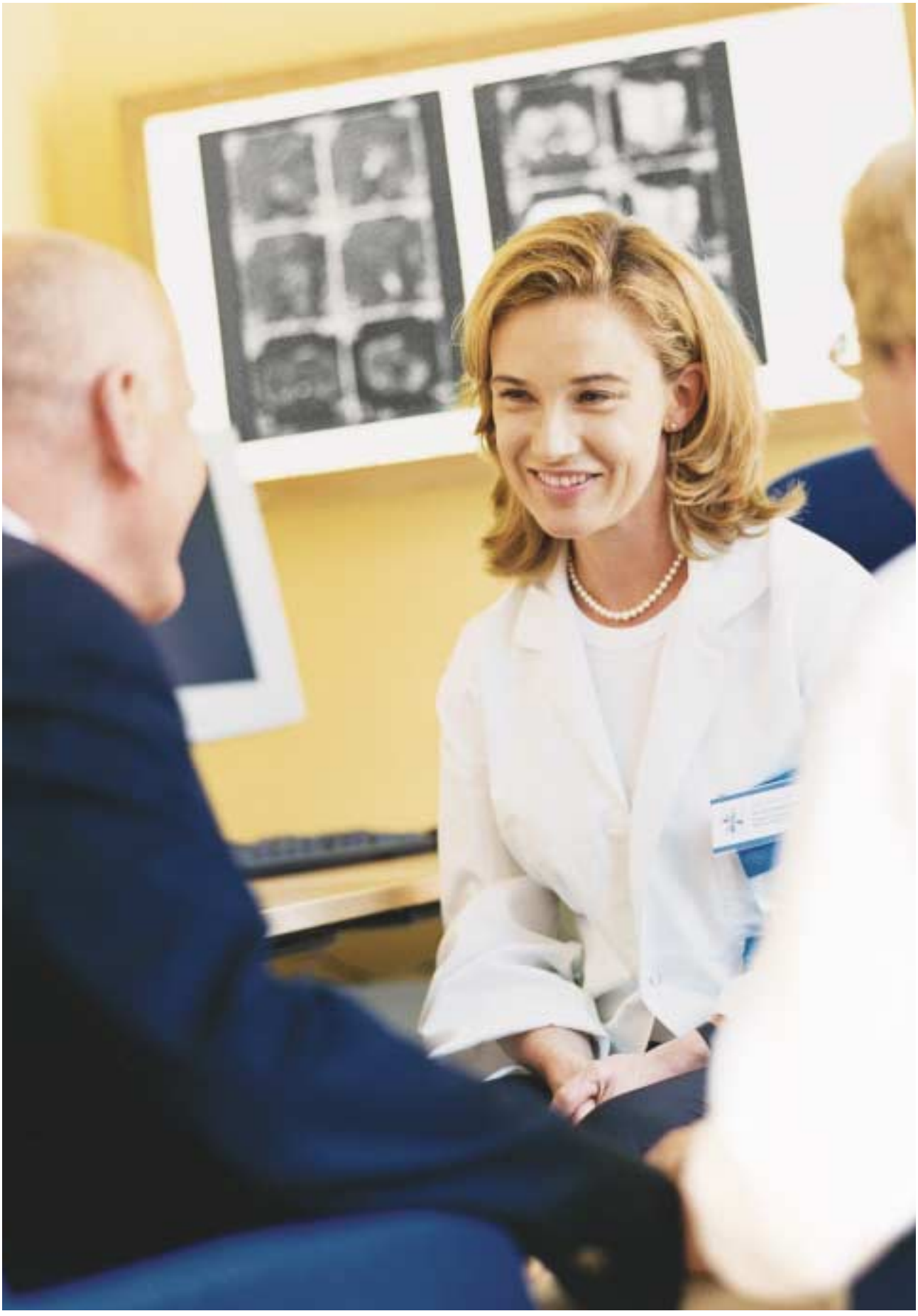


The neurosurgical revolution

”the tools used by the surgeon must be adapted to the task – and where the human brain is concerned they cannot be too refined.” So said Lars Leksell, developer of radiosurgery, the principle behind the concept of Gamma Knife® surgery. In radiosurgery the scalpel is replaced by highly-focused radiation beams which produces the desired biological effect at the precisely predetermined target in the brain. Since its introduction, Gamma Knife® surgery has revolutionized the treatment of intracranial pathology.

UNIQUE TECHNOLOGY

Today, the technique is performed in hundreds of leading hospitals and clinics around the world. Around 40,000 patients undergo Gamma Knife® surgery every year, and this unique procedure has earned an outstanding scientific track record with thousands of peer-reviewed articles.

In fact, no other alternative treatment in this field has gained greater clinical acceptance.

MINIMALLY INVASIVE MAXIMUM EFFICIENCY

The minimally-invasive technique of Gamma Knife® surgery offers important benefits for medical practitioners and patients alike. It means fewer complications and faster recovery times when compared with conventional methods of surgery. In turn, this results in shorter hospital stays and more cost-effective outcomes. Not surprisingly, Gamma Knife® surgery has become the treatment of choice and a complementary procedure to micro surgery for small to medium sized intracranial targets.

HOW DOES GAMMA KNIFE TREATMENT WORK?

Ionizing radiation is delivered from a total of 201 cobalt-60 sources arranged in a hemi-spherical pattern. The beams of gamma radiation always coincide at a fixed focal point within the radiation unit. Each beam will only contribute with a small dose and have a minimum impact on the tissue on its way to the target, but in the focal point were all beams meet the resulting dose will give the desired therapeutic effect. The dose in the sharp focal point is very precisely defined, which makes it possible to treat targets very close to sensitive structures. By combining focal points called isocenters even the most complex shaped target can be covered with minimum impact on surrounding tissue.

The built in robotic movements of Automatic Positioning System™ automatically sets the coordinates directly from the treatment plan – giving improved performance and speed.

A complete system. A seamless treatment flow

leksell gamma knife® 4c is a complete system which comprises a dedicated treatment planning software – Leksell GammaPlan®4C – and advanced treatment technology including the robotic Automatic Positioning System™. This system digitally integrates diagnostic images, treatment planning and dose delivery into a single, seamless information flow.

REDEFINING THE NOTION OF ACCURACY

Leksell® Stereotactic System plays a key role in the success of Gamma Knife® surgery. The Stereotactic technique makes it possible to accurately map the brain in three dimensions, then to precisely locate the target structures deep within the organ. Since it was first introduced by Professor Lars Leksell in 1949, this technique has been setting the standards for precise localization and treatment of targets within the skull.

FULLY COMPATIBLE WITH ALL IMAGING MODALITIES

Leksell® Coordinate Frame is easily secured to the patient's head and gives the reference for the stereotactic coordinate system. It ensures that the head is securely supported throughout the whole procedure. A selection of exchangeable components provides maximum flexibility when attaching the frame. Leksell Stereotactic System® is compatible with all types of imaging modalities such as CT, MR, X-ray.

Treatment Planning with Leksell GammaPlan®

Treatment preparations

Watching and controlling the treatment

Leksell® Coordinate Frame – Compatible with all types of imaging modalities. The accuracy of Leksell Stereotactic System plays a key role in the treatment's success.

Planning for excellence

leksell gammaplan® is the dedicated planning system for Gamma Knife® surgery. This is the most advanced and accurate system of its type available today. It incorporates over 30 years of clinical experience and over 350,000 patient treatments. Utilizing the planning system with Leksell Gamma Knife® enables efficient planning and irradiation of targets with high conformity and selectivity, while ensuring minimum effect on surrounding healthy tissue.

DESIGNED FOR NEUROSURGEONS – BY NEUROSURGEONS

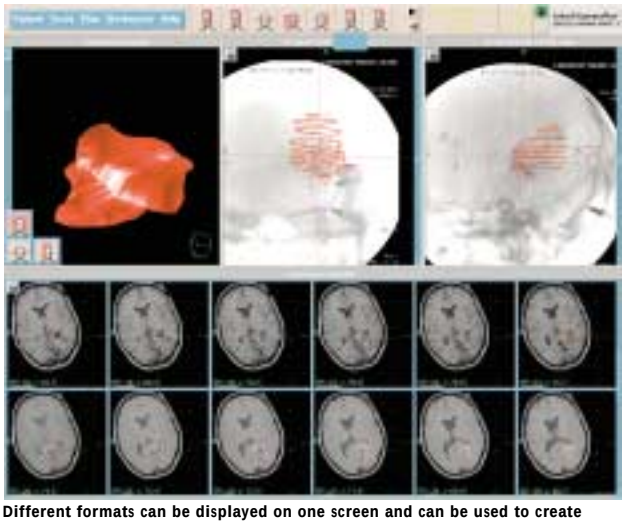
Designed in collaboration with the very people who spend time using the system – neurosurgeons and physicists – this comprehensive and powerful tool also manages to combine speed and accuracy with true user-friendliness. This results in a versatile system that can be handled intuitively, offering the user a clinically recognizable environment.

VIEW ALL THE AVAILABLE OPTIONS

Leksell GammaPlan® 4C – the latest generation of the software includes a Multiview function. This gives the ability to process all forms of imagery. The user can visualize and analyze a wide range of surgical approaches; all in 3-D and real time. Leksell GammaPlan® 4C provides displaying of physiological images, PET, 3D brain atlas structures, AC-PC targeting, image fusion and MEG data import. And based on the advanced ImageMerge™ co-registration algorithm, any frameless image study can be matched with any other image study scanned with Leksell® Coordinate Frame. Leksell GammaPlan® 4C enhances flexibility and cost efficiency in planning since it allows image studies to be scanned at any remote imaging center, for example a PET center.

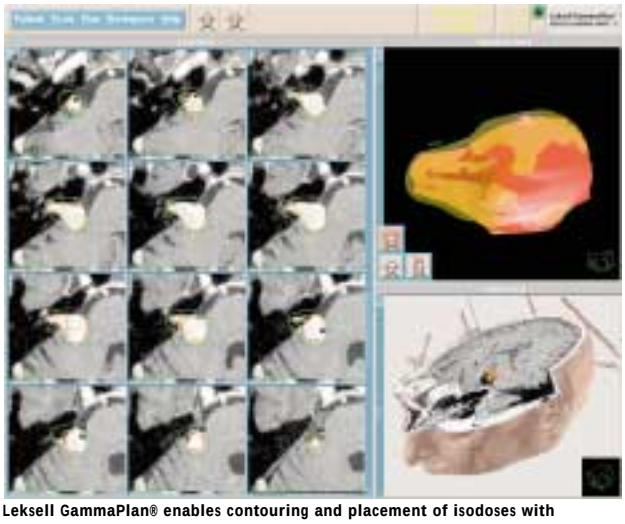
SAVE VALUABLE TIME

The system allows the user to rapidly plan as many isocenters as may be clinically optimal – in seconds. The final dose plan is then transferred to the Operator Console of Leksell Gamma Knife®, thus streamlining and optimizing treatment planning. The software also includes a Wizard™ for inverse, automatic treatment planning, back-up and use in educational programs.

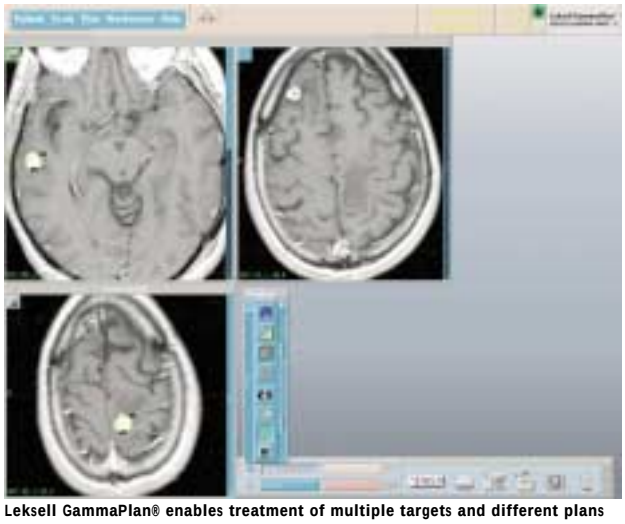


Different formats can be displayed on one screen and can be used to create volumetric 3-D views. With Leksell GammaPlan® 4C any frameless/non-stereotactic image can be matched with a Leksell® Coordinate Frame scanned image.

A graph on the screen helps to keep track on volume and dose.



Leksell GammaPlan® enables contouring and placement of isodoses with extremly high conformity and selectivity thus keeping damage to surrounding tissue to an absolute minimum.



Leksell GammaPlan® enables treatment of multiple targets and different plans for the same target.

Even the most complex shaped target can be covered with minimum impact on surrounding tissue.

Accuracy of treatment

once the frame has been secured to the patient, and the treatment imaging and planning devised, the patient is ready to receive treatment. The patient is placed on the couch with the frame attached to the treatment unit. All actions are controlled from the Operator Console. A tv monitor and intercom provide audio-visual contact between the patient and the operator.

The accuracy for Leksell Gamma Knife® 4C is guaranteed to better than 0.5mm. The treatment plan produces a number of isocenters based on the coordinates defined by the stereotactic coordinate system. These isocenters are then irradiated, ensuring that the target is covered precisely. By using Automatic Positioning System™, even the most complex plans can be easily administered.

INCREASED COMFORT, REDUCED TREATMENT TIME

Automatic Positioning System™ adds to the elegance and efficiency of Gamma Knife® surgery. This robotic system automatically positions the head frame coordinates, repositioning the patient for each isocenter. The system works quietly and smoothly, ensuring the patient's comfort during treatment, and helps to reduce the average length of treatment time.

Educating for confidence in clinical practice

elekta is committed to making its customers confident in the use of their equipment, and to helping them gain the maximum clinical advantage from their systems. This commitment is supported through Elekta's Lifecycle Services staff competence, which offers a wide range of training and education courses covering all phases of Gamma Knife® surgery. These high quality courses have been created for physicians and technicians with levels from beginner to advanced.

CLINICAL TRAINING

All training courses are organized by selected Leksell Gamma Knife® centers, headed by experts in Gamma Knife® surgery. The courses include didactic lectures, observations of patient treatment, and practical hands-on training. Training programs include introductions to Leksell Stereotactic System®; physics and radiobiology; treatment planning; technical- and clinical training. Additionally, all new Leksell Gamma Knife® installations are accompanied by on-site start-up training with guidance of an experienced neurosurgeon and a physicist.

Over the last 10 years, more than 1,500 physicians and physicists have participated in training courses provided by Elekta. Regular updates on improvements in Gamma Knife® surgery and technology are offered through advanced training courses and complimentary membership of Leksell Gamma Knife® Society.

length – 4,640 mm

height – 1,935 mm

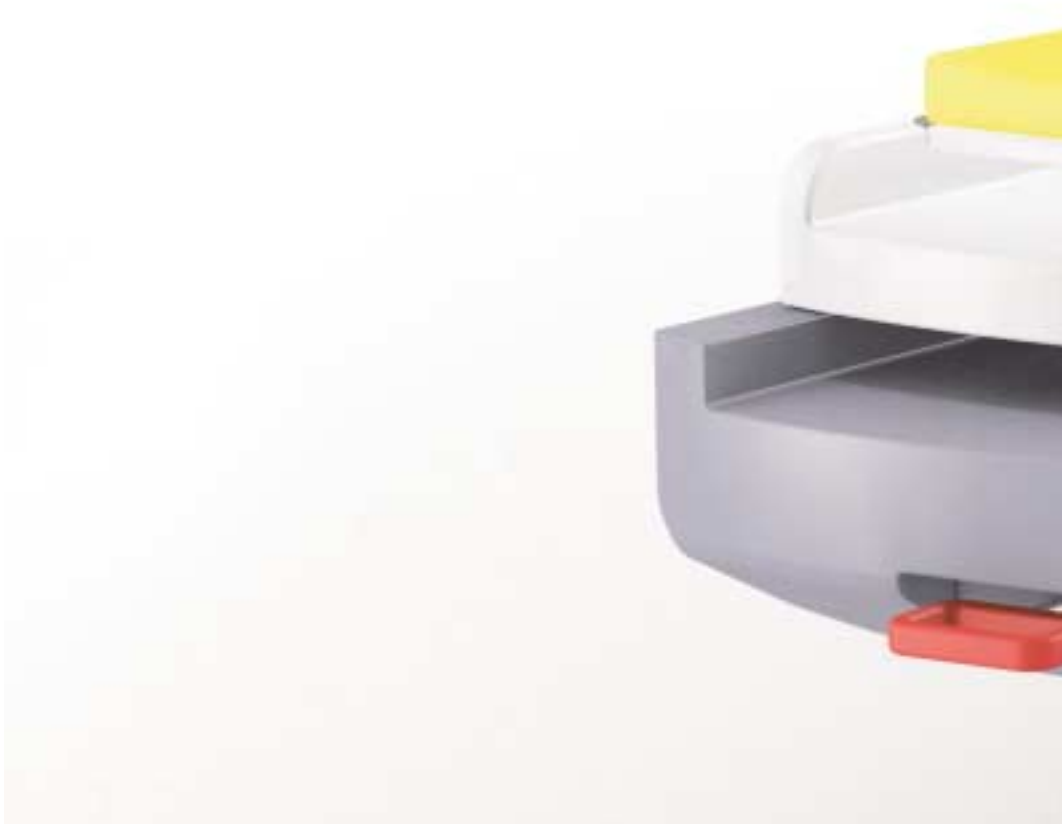
total weight – 20,000 kg

number of radiation sources – 201

total accuracy – 0.5 mm

mechanical accuracy – 0.2 mm

cobalt weight – 25 grams




LEKSELL GAMMA KNIFE®

A lifetime commitment to continuous improvement

elekta lifecycle services is more than just an after-sales service and support program. It is a commitment to optimizing the entire continuum of care, from improving clinical effectiveness, through ensuring staff competence to smoothing patient flow. And, of course, it is about maximizing the investment in Leksell Gamma Knife® 4C.

ENSURING STAFF COMPETENCE

Elekta's Lifecycle Services incorporate a wide range of education and training courses developed by experienced teachers at leading institutions, and which cater for all levels of physician and technician from beginner to advanced level. Supervised hands- on experience in Elekta training courses provides care-givers with specialized knowledge they can apply with confidence to their daily tasks. On-site refresher courses and supplementary training provide staff with added competence.

IMPROVING CLINICAL EFFECTIVENESS

Keeping the clinic's Leksell Gamma Knife® 4C and ancillary equipment up to state-of-the-art condition can add value in many ways. It can help improve patient outcomes, as well as reduce a patient's length of stay. Elekta Lifecycle Services can add to these benefits through a range of upgrades, system enhancements, accessories and new imaging and monitoring capabilities.

SMOOTHING THE FLOW OF PATIENTS

Elekta Lifecycle Services are designed to deliver equipment performance that meets or exceeds original specifications for the life of the equipment. The goal is to

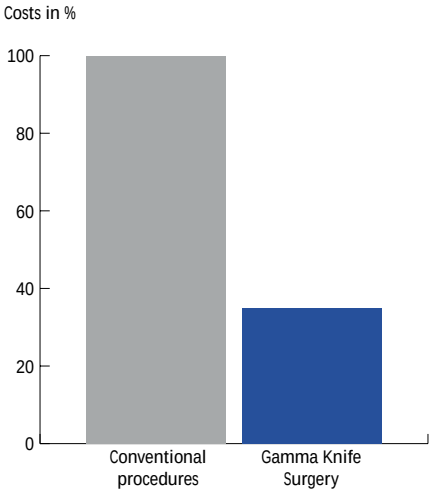
reduce the number of unplanned stops; eliminate clinical disturbances; deliver consistent treatment quality and enable more treatments per day. A wide range of Customer Support and Service Programs can be tailored to meet individual requirements in all respects.

PROTECTING THE INVESTMENT

Elekta Lifecycle Services exists to help clinics achieve full potential from their investment in the years to come. The more patients served, the lower the costs. We offer help and advice with marketing programs to help attract more patients, and expert site planning programs for help in designing facilities to serve more patients.

Elekta Lifecycle Services provide continuous improvements to help optimize every facet of clinical performance.
One improvement inspires the next to extend the lifetime of the Leksell Gamma Knife® system and improve overall patient satisfaction.

Gamma Knife® surgery – an investment in standards of care



van Roijen L, Nijs HG, Avezaat CJ, Karlsson G, Linquist C, Pauw KH, Rutten FF. Costs and effects of open surgery versus SRS in treating vestibular schwannoma. Acta Neurochir (Wien), 1997; 139(10): 942-948

Rutigliano MJ, Lunsford LD, Kondziolka D, Strauss MJ, Khanna V, Green M. The cost effectiveness of SRS versus surgical resection in the treatment of solitary metastatic brain tumours. Open Surgery, 1995;37(3): 445-453

gamma knife® surgery revolutionized the treatment of cranial pathology when it was introduced over thirty years ago – today, the potential for its use and the benefits that it brings are bigger than ever.

Compared with alternative treatments, this non-invasive therapy has achieved greater clinical acceptance with fewer complications; cost effective outcomes; faster patient recovery; shorter hospital stays, and better quality of life for patients. Typically, Gamma Knife® surgery is 30 – 70% less costly than conventional procedures. Convalesence and time to return to normal life is significantly reduced.

THE TREATMENT OF CHOICE

For these reasons, Gamma Knife® surgery has emerged as the treatment of choice for small-to-medium sized neurosurgical indications such as intracranial lesions, vascular malformations and certain functional disorders. Gamma Knife® surgery is also used as a complementary procedure to microsurgery, treating residual or recurrent tumours. And new applications and indications are being explored constantly. Soon, half a million people will have been treated with Leksell Gamma Knife®.

Scientific collaboration

each gamma knife® user receives automatic membership of Leksell Gamma Knife® Society, a scientific global resource for sharing clinical experience and education. The Society has over 2,000 active members, and the proceedings from the bi-annual meetings are being published in The Journal of Neurosurgery. Over 2,000 peer-reviewed articles about Gamma Knife® surgery have been published to date, reflecting the original vision of Professor Lars Leksell: "… to provide the tools that neuro-surgeons need to perfect their art".

Leksell Gamma Knife Society meeting in Vienna, 2004

What users say about Leksell Gamma Knife®

Edward Shaw, M.D.

Roman Liscák M.D.

Stephen B. Tatter, M.D., Ph.D

The use of Leksell Gamma Knife® has won acclaim from both patients and physicians alike around the world. The following are just some of the many reasons why physicians and care-givers prefer Gamma Knife® surgery over other treatment technologies.

GOLD STANDARD OF RADIOSURGERY

"There is no doubt in mind that Gamma Knife surgery is the gold standard of radiosurgery for the neurosurgery community. To grow the program further, we needed the gold standard."

I believe, for example, many acoustic neuroma patients who have surgery and the associated risk of deafness and facial paralysis may be much better served with Gamma Knife surgery.

It is much simpler to plan and deliver multiple isocenter treatments with Leksell Gamma Knife. Consequently, treatments are much more conformal. This results in a greater degree dose inhomogeneity, allowing us to give more dose to the central areas of the tumor, which is the most radioresistant."

EDWARD SHAW, M.D. RADIATION ONCOLOGIST, WAKE FORETS UNIVERSITY, BAPTIST MEDICAL CENTER, WINSTON-SALEM, NC.

PARKINSON'S DISEASE

"Any patients with tremor from Parkinson's disease, essential tremor, multiple sclerosis, etc, may be good candidates for Gamma Knife surgery."

STEPHEN B. TATTER, M.D., PH.D.
DEPARTMENT OF NEUROSURGERY
WAKE FOREST UNIVERSITY SCHOOL OF MEDICINE
WINSTON-SALEM, NORTH CAROLINA

THE TREATMENT BECOMES EFFICIENT AND FAST

"Metestases represents the largest increase, from 150 to 200 cases last year.

With the robotic Automatic Positioning System, adjusting the coordinates for each isocenter, the treatment becomes efficient and fast and it is also convenient for the patient"

DR. ROMAN LISCÁK.
NA HOMOLCE HOSPITAL, PRAGUE, CZECH REPUBLIC.
GAMMA KNIFE CENTER
(TREATING AROUND 900 PATIENTS EACH YEAR)

Na Homolce Hospital, Prague Czech Republic

"Gamma Knife radiosurgery constitutes a versatile and user-friendly treatment platform ultimately to help our patients. Its accuracy gives our team the confidence to both treat difficult cases and carry out experimental research in new indications."

ROBERT D. TIMMERMAN, M.D.
DEPARTMENT OF RADIATION ONCOLOGY
INDIANA UNIVERSITY SCHOOL OF MEDICINE

"What does Gamma Knife surgery mean for a neurosurgeon or a radiation oncologist? It simply means that you can get your patients done, and the rest of the day is free to do other things. You can go treat other kinds of patients, do other operations, do research, see patients in your office, you're not there all day. And, the efficiency of this is unparalleled. For that reason, I can think of no better tool to fit into my practice. The reason Gamma Knife surgery has caught on, and it's still growing, is because, simply put, it works.

As we look ahead, the use of radiosurgery, and Gamma Knife surgery in cancer is just beginning.

We believe the gold standard in the brain is Leksell Gamma Knife. Why is this? Tremendous accuracy, efficiency, ease-of-use, in terms of creation of sophisticated conformal dose plans that are unparalleled. And the ability to treat virtually the spectrum of brain disorders that we see fit, with results that justify it for being the best."

DOUGLAS KONDZIOLKA, M.D.
UNIVERSITY OF PITTSBURGH MEDICAL CENTER
CENTER FOR IMAGE GUIDED RADIOSURGERY, PENNSYLVANIA, USA

Fighting serious disease

www.elekta.com

Stereotactic Neurosurgery • Gamma Knife® surgery • Functional Mapping • Precision Radiation Therapy • Image Guided Radiation Therapy • Stereotactic Radiation Therapy

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