

CyberKnife®
ACCURAY®

SYSTEM OVERVIEW



OUR HANDS PUSH THE TECHNOLOGY. YOUR HANDS PUSH THE RESULTS.

The CyberKnife® System is the first and only robotic radiosurgery system to offer highly precise and customizable, non-surgical treatment options for a broad range of tumors anywhere in the body, providing the most flexible treatment options.



The CyberKnife® VSI™ System continues Accuray's tradition of innovation. Building on a foundation of accuracy and precision in radiosurgery, the CyberKnife VSI System extends these benefits to conventionally fractionated, high-precision radiation therapy with Robotic IMRT™ that can be delivered anywhere in the body.

All CyberKnife VSI treatment options are delivered using a seamless, fully-integrated and intuitive workflow. The clinical accuracy, routine non-coplanar delivery, robotic mobility and the precise target tracking are leveraged when delivering any fractionation scheme. The combination of rapid treatment times, support for treatment regimens that span the full spectrum of fractionation and the highest quality treatments ultimately attract a new patient population to the clinic.

The CyberKnife VSI System expands the capabilities of the CyberKnife System in the treatment of cancer. With several hundred peer-reviewed publications and a rapidly increasing number of treated patients, the growing community of CyberKnife users is discovering an expanded number of applications leveraging the flexibility of the CyberKnife System.

The CyberKnife® VSI™ System creates precise, purposeful and powerful solutions for clinicians to provide better patient outcomes. With a compact, X-band 1000MU/min linac at its core, treatments with the CyberKnife VSI System are delivered quickly and efficiently. A full spectrum of fractionation schemes can be delivered with a logical workflow designed to provide clinicians with customized and highly accurate treatments for every patient.

RESPIRATORY SOLUTIONS

When treating tumors that move with respiration, detecting tumor motion is only part of what is needed for accurate treatments. The Synchrony® Respiratory Tracking feature of the CyberKnife VSI System takes advantage of robotic mobility to dynamically detect and correct for tumor motion during beam delivery, automatically adapting to changes in the patient's breathing pattern throughout each treatment fraction and

allowing the patient to relax and breathe normally.

The Xsight® Lung Tracking System¹ and the Lung Optimized Treatment feature offer clinicians a range of fiducial-free lung tracking options. These tracking options provide non-invasive treatment solutions for all lung tumors, regardless of tumor location. The Simulation Application provides a workflow for determining which non-invasive tracking method is best for each patient.

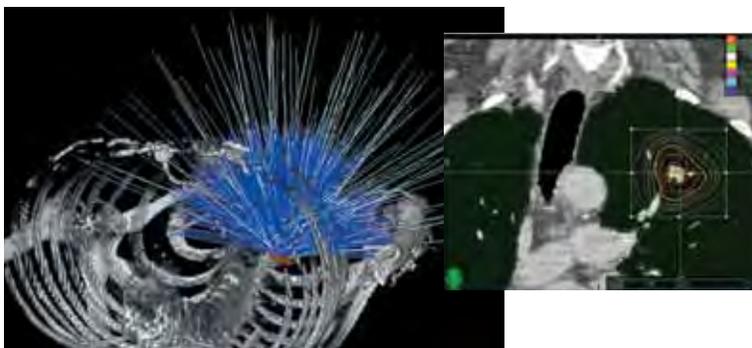


Image courtesy of Georgetown University Hospital

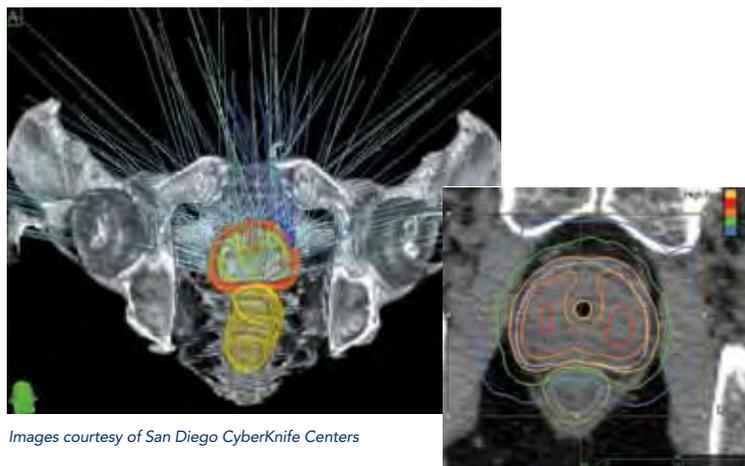
Sequential Optimization, a clinically intuitive planning method for tumors that move with respiration, allows the creation of expert level treatment plans in a logical, straightforward and reproducible manner. Because the Synchrony System has a demonstrated delivery accuracy of better than 1.5 mm, treatment plans can be created with dramatically reduced treatment margins. In addition, the Monte Carlo Dose Calculation feature provides highly accurate treatment plans for challenging cases, including lung tumors.

PROSTATE SOLUTIONS

Safely and accurately delivering radiation to the prostate can be challenging knowing that intrafraction prostate motion is random and unpredictable. Unlike other technologies that provide image guidance for pre-treatment setup only, the CyberKnife VSI System combines continual image guidance with robotic mobility to automatically adapt treatment delivery for target motion in real time.

The CyberKnife VSI System supports a full spectrum of fractionation schemes. From radiosurgery to conventionally

fractionated Robotic IMRT™, full flexibility is provided to the user in determining the optimal course of treatment for each patient. Robotic IMRT is a practical option in routine daily practice when delivered using the Iris™ Variable Aperture Collimator, which provides an array of variably sized beams to efficiently deliver a highly conformal treatment plan.



Images courtesy of San Diego CyberKnife Centers

An intuitive workflow and efficient patient throughput are possible with the use of the included treatment planning tools:

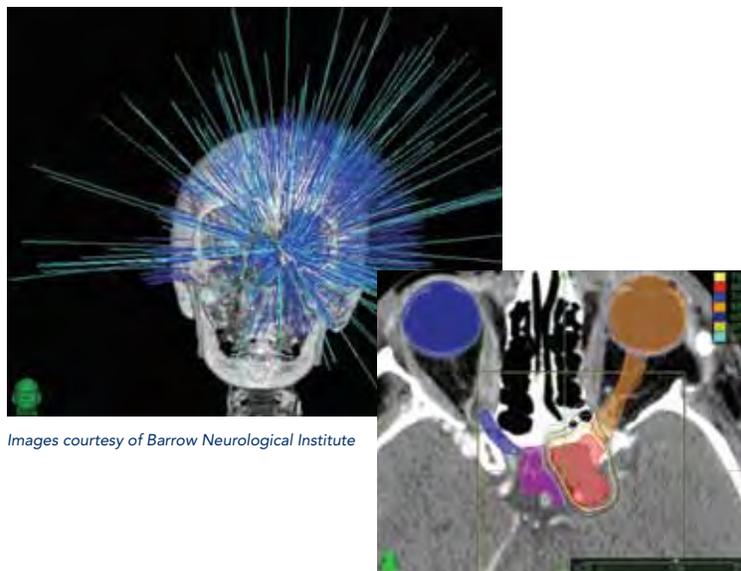
- AutoSegmentation™ provides accurate and automatic delineation of critical structures with minimal user input.
- QuickPlan™ automates several aspects of the treatment planning process.
- Sequential Optimization not only makes achieving the most complex planning objectives easy, but also predicts and optimizes treatment times based on individual patient needs.
- The InTempo™ Adaptive Imaging System adapts imaging frequency according to the amount of prostate motion between images, maintaining high accuracy at all times.

INTRACRANIAL AND SPINE SOLUTIONS

The CyberKnife® System offers all the proven benefits of intracranial radiosurgery, without the need for head frames. Frameless intracranial radiosurgery delivered with the CyberKnife System has been established as a safe and effective technique. Accuracy is ensured throughout a CyberKnife treatment by combining continual image guidance with automatic, real-time corrections for patient and target motion.

Intracranial radiosurgery treatment planning is made more efficient with the AutoSegmentation option for brain and intracranial anatomy. Automatic three-dimensional delineation of complex intracranial structures is accomplished in minutes with this combination atlas-based/model-based segmentation solution.

Incorporating the 6D Skull Tracking System and the revolutionary Xsight® Spine Tracking System, the CyberKnife System has made robotic radiosurgery of the central nervous system painless, more accurate and more convenient. By making invasive head frames obsolete, the CyberKnife VSI™ System allows clinicians to freely design fractionated treatments to best suit the needs of their patients, ensuring the highest level of patient care.

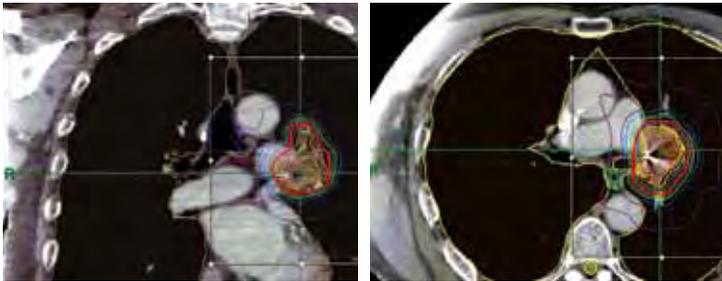


Images courtesy of Barrow Neurological Institute

FLEXIBLE TREATMENT OPTIONS

ROBOTIC RADIOSURGERY

The CyberKnife® VSI™ System provides the most comprehensive set of radiosurgery features available. These features combine to produce the high conformality, steep dose gradient, non-coplanar treatment delivery and fully-adaptive intrafraction motion tracking required for accurate robotic radiosurgery treatments.



Images courtesy of CyberKnife Centers of San Diego

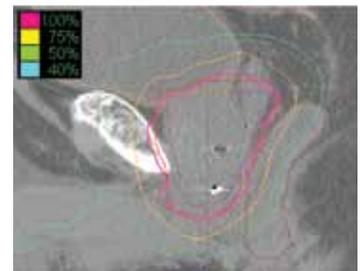
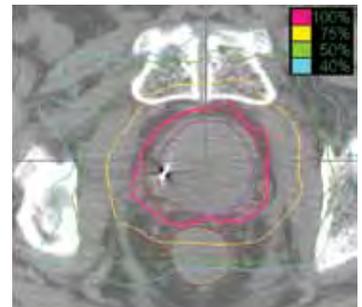
Coronal view (left) and axial view (right) of treatment plans for a central lung lesion. The 73% prescription isodose is indicated by the thick red line.

- The robotic manipulator enables routine use of a large number of non-isocentric, non-coplanar beams that are individually targeted at unique points within the patient—without the need to reposition the patient for each beam.
- The Iris™ Variable Aperture Collimator enables multiple field sizes to be combined within each treatment such that a complex dose distribution can be constructed from a set of independently targeted and sized beams.
- The powerful plan optimization algorithms select optimal beam weights, beam directions and beam sizes.
- The continual image guidance during treatment delivery enables tracking of patient and target motion, and also enables the system to automatically correct beam targeting without interrupting treatment.

ROBOTIC IMRT™

The features that make the CyberKnife VSI System the best solution for radiosurgery treatments are leveraged to deliver high-precision radiation therapy anywhere in the body. By making the use of any fractionation scheme convenient and routine, clinicians are now free to select the treatment type that is optimal for the patient.

- The ability of the clinician to control the treatment time during the plan optimization process results in greater efficiency and increased patient throughput.
- Robotic IMRT™ enables treatment anywhere in the body using conventional fractionation while maintaining accuracy throughout each treatment fraction.



REFERENCES

1. Limited to tumors of size 1.5 cm or greater.
2. Data on file.
3. Xie, Y., Djajaputra, D., King, C. R., Hossain, S., Ma, L., and Xing, L. Intrafractional motion of the prostate during hypofractionated radiotherapy. *Int.J.Radiat.Oncol.Biol.Phys*, 72[1], 236-246. 2008.
4. Gagnon GJ, Nasr NM, Liao JJ, et al. Treatment of spinal tumors using cyberknife fractionated stereotactic radiosurgery: pain and quality-of-life assessment after treatment in 200 patients. *Neurosurgery* 2009;64:297-306.



CYBERKNIFE® VSI™ SYSTEM

HARDWARE



Robotic Manipulator and Linear Accelerator – The compact, 1000 MU/min 6 MV X-band linear accelerator is capable of being positioned in virtually any direction by a high-precision robotic manipulator with repeatable sub-millimeter accuracy.



Imaging System – The low-energy X-ray sources and the flush-mounted detectors create high-resolution anatomical images throughout the treatment. These images are continually compared to previously generated, digitally reconstructed radiographs (DRRs) to determine real-time target location.



Iris™ Variable Aperture Collimator – Rapidly manipulates beam geometry to deliver up to 12 beam diameters from each linac position with characteristics virtually identical to that of fixed circular collimators.



RoboCouch® Patient Positioning System – Robotically aligns patients precisely with six degrees of freedom, enabling faster patient setup. The Seated Load feature enables simple and comfortable loading of mobility-limited patients.



Xchange® Robotic Collimator Changer – Automatically exchanges collimators, allowing for greater treatment efficiency.

CYBERKNIFE® VSI™ SYSTEM

TRACKING



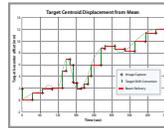
Synchrony® Respiratory Tracking System – Continuously synchronizes beam delivery to the motion of the tumor, allowing clinicians to significantly reduce margins while eliminating the need for gating or breath-holding techniques.



Xsight® Lung Tracking System – Directly tracks the movement of lung tumors without fiducials while maintaining precision, reliability and self-adjusting repeatability.*



Xsight Spine Tracking System – Eliminates the need for surgical implantation of fiducials by using the bony anatomy of the spine to automatically locate and track tumors.



InTempo™ Adaptive Imaging System – Intelligent, adaptive imaging system designed to address the unique challenges of prostate tracking resulting from random and excessive target motion.



Lung Optimized Treatment – Expands fiducial-free treatment options for lung SBRT patients. Simulation and comparison workflows, combined with unique tracking modes, allow the clinician to select from multiple, non-invasive options.

* Limited to specific tumor size and location

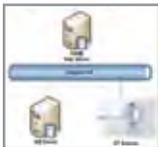
DATA MANAGEMENT



CyberKnife® Data Management System – Provides comprehensive storage and processing of the patient data that is generated during the CyberKnife planning and treatment workflow.



Report Administration – Gives easy access to patient and system utilization data, along with a variety of departmental reports. Remote viewing is also enabled via the Report Administration web application.

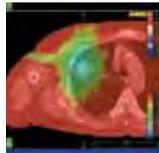


Radiosurgery DICOM Interface – This interface utilizes the industry-standard DICOM protocol to export patient treatment plan and delivery information to an Oncology Information System.



Storage Vault – Hardware for long-term storage of patient records, provides approximately 10 TB of space for up to 5000 patient records. Includes automated storage of patient records based on user specified configurations.

TREATMENT PLANNING



Monte Carlo Dose Calculation – Often considered the gold standard for dose calculation, the CyberKnife System's Monte Carlo Dose Calculation produces highly accurate dose calculations in minutes.



Sequential Optimization – An intuitive and intelligent plan optimization algorithm for rapidly developing customized treatment plans for the unique clinical objectives of each patient.



AutoSegmentation™ – Automatically generate accurate contours for intracranial and male pelvic anatomy using both model-based and atlas-based delineation methods. Results can be generated using both CT and MR image information, requiring minimal user input.



QuickPlan™ – A complete treatment plan is generated and presented to the user for review. The entire planning is automated based on clinical objectives set by the user, including plan parameters, optimization and dose calculation.

For more information on the CyberKnife Robotic Radiosurgery System, please contact Accuray Incorporated.
www accuray.com sales@accuray.com

The CyberKnife System and CyberKnife options may not be available in some countries. Specifications, features and functionality subject to change without prior notification. For a complete list of CyberKnife Systems and options available, please contact Accuray at sales@accuray.com.

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