



TREATING PROSTATE TUMORS WITH SYNCHRONY®

The Challenge

Treating prostate cancer with radiation is challenging. The prostate can move up to twelve to fifteen millimeters¹⁻² in an unpredictable manner often caused by changing volumes in the bladder or rectum. Prostate movement can be rapid, as much as ten millimeters in thirty seconds.³

The Problem with Conventional Systems

Conventional radiation treatment systems require clinicians to make trade-offs to compensate for motion of targets due to prostate movement. Clinical compromises are made with respect to margin size, delivery efficiency, and natural patient behavior. These compromises affect clinical outcomes, treatment delivery cost, patient satisfaction, and ultimately practice viability.

The Accuray Solution – Synchrony®

Synchrony® enables continuous delivery of radiation treatment to tumors while they are in motion by synchronizing the delivery beam position to the tumor location precisely and accurately during the delivery of a treatment fraction. Synchrony frees clinicians from being forced to evaluate and make trade-offs that may be less than optimal for their patients, their practice, or their center.

The Synchrony Principle

The Synchrony principle is easy to understand and the system is intuitive to use. Simply **Track**, **Detect**, and **Correct**.



TRACK

Pick a target that should be monitored for movement.



DETECT

Look for a change in the position of the target at the right frequency.



CORRECT

Move the treatment beam to synchronize it to the detected position of the tracked target.

Synchrony® on the Radixact®



TRACK

Track

The prostate can be difficult for the treatment system to see because of its low contrast. Therefore, the Radixact® System requires at least one fiducial marker to be implanted in the prostate so that the system can track it as a surrogate for the prostate itself.

- The system assists clinicians in selecting the fiducial markers for tracking
- The system automatically monitors fiducial behavior to ensure reliable correlation with the motion of the tumor itself



DETECT

Detect

A kV beam line enables the Radixact System to take images to determine the internal position of the fiducial surrogate and thus the treatment target. The kV beam line is positioned ninety degrees from the linear accelerator on the gantry and rotates around the patient producing sequential monoscopic images.

- Any-angle imaging allows the selection of two to six imaging angles, at least 30 degrees apart, per gantry rotation to ensure that the target is always visible, and motion can be detected
- The system assists clinicians in the selection and customization of optimal imaging angles. The selected angles may be modified during treatment delivery
- The total imaging dose, for all images taken in preparation for and during a Synchrony® treatment, is less than a typical CBCT image taken with conventional systems
- No additional time is required for imaging during delivery; kV images are taken with the beam on, while treatment is delivered



CORRECT

Correct

The dynamic jaws and ultra-fast binary multi-leaf collimator (MLC) allow the Radixact System to automatically synchronize the treatment delivery beam position to the target position in real-time.

- With an MLC response time less than thirty milliseconds and the dynamic jaws capable of moving ten millimeters in a tenth of a second, the system is able to quickly respond to clinical target movement
- Treatment beam synchronization does not require pausing or stopping treatment delivery, therefore treatment is continuously and efficiently delivered
- Treatment beam synchronization is automatic with no manual intervention required. As soon as movement is detected on the kV image, beam synchronization to the detected position occurs

THE Synchrony® ADVANTAGE

Automated, real-time tracking, detection, and beam correction synchronizes the treatment beam delivery with target motion enabling more accurate, more efficient and more comfortable radiation therapy treatments, without compromise.

Allowing patients to behave naturally, without rectal balloons or spacers means the system can provide greater patient comfort and improve the patient experience in comparison to conventional motion compensation.

Providing clinicians with the accuracy and confidence to prescribe tight margins, the system offers the potential for better clinical outcomes with fewer side effects, the ability to retreat if required in the future, and the freedom to hypofractionate treatment delivery to a larger extent than conventional systems.

Automatically and continuously delivering treatment, without the inefficiency of stopping and manually moving the patient when motion is detected, the system is not resource intensive or workflow disruptive. It can provide more efficient treatments at a lower cost which can increase profitability compared to conventional motion compensation methods⁴.

The Radixact System with Synchrony enables clinicians to expand patient-first treatment like no other system in the world by providing the flexibility to quickly, easily and confidently treat any tumor, even those that move, using the approach and fractionation schedule that best addresses the individual clinical needs of patients.

REFERENCES

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2. A Price, E Chao, S Chang, J Matney, A Wang, J Lian, Intrafractional Motion Effect Can Be Minimized in Tomotherapy Stereotactic Body Radiotherapy (SBRT), *Medical Physics*. Volume 43, Issue 6 Part 31 June 2016
3. Kupelian P, et al. Multi-Institutional Clinical Experience with the Calypso System in Localization and Continuous, Real-Time Monitoring of the Prostate Gland During External Radiotherapy. *Int J Radiat Oncol Biol Phys*. 2007; 67(4):1088–1098.
4. Hypofractionation in the Age of Value-Based Care. Accuray MKT-CYRA-1218-0015

Important Safety Information

Most side effects of radiotherapy, including radiotherapy delivered with Accuray systems, are mild and temporary, often involving fatigue, nausea, and skin irritation. Side effects can be severe, however, leading to pain, alterations in normal body functions (for example, urinary or salivary function), deterioration of quality of life, permanent injury, and even death. Side effects can occur during or shortly after radiation treatment or in the months and years following radiation. The nature and severity of side effects depend on many factors, including the size and location of the treated tumor, the treatment technique (for example, the radiation dose), and the patient's general medical condition, to name a few. For more details about the side effects of your radiation therapy, and to see if treatment with an Accuray product is right for you, ask your doctor.

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Radixact®