

REAL-TIME MOTION MANAGEMENT FOR A SMALL TARGET IN THE RIGHT LOWER LOBE WITH LARGE TUMOR MOTION USING RADIXACT® SYNCHRONY®: A CASE REPORT

Authors:

Guang-Pei Chen, An Tai, Lindsay Puckett, Eric Paulson (Radiation Oncology, Medical College of Wisconsin, Milwaukee, WI USA)

Challenge:

The lesion in the right lower lobe (RLL) was only 6 mm in size but exhibited 18 mm of motion in the superior-inferior direction. Traditional motion management techniques (e.g., abdominal compression, breath hold) are often uncomfortable or inefficient.

Solution:

Synchrony® real-time adaptive motion management with markerless tracking was used on the Radixact® System.



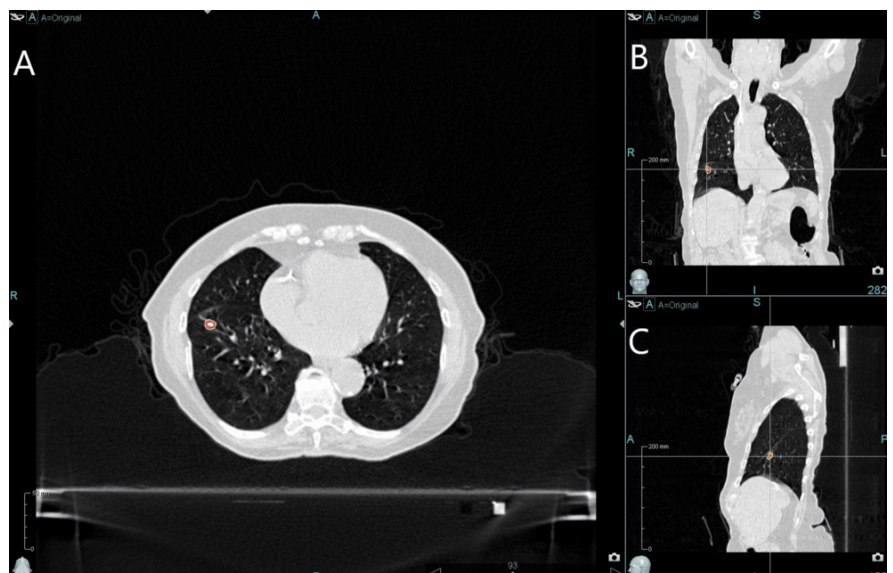
Case Information:

Patient	73-year-old woman with a history of metastatic rectal cancer with oligoprogressive disease to the liver and lung.
History	Received previous SBRT treatment to a right lung lesion 1.5 years earlier.
Current Presentation	New lesion in the right lower lobe (Figure 1).

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Figure1: Patient's planning CT image with target tracking volume (TTV) and GTV indicated by red and orange contours, respectively, in axial (A), coronal (B), and sagittal (C) views. The image window width and level were set to the lung preset.



Treatment:

Margins	PTV was a 5 mm expansion of GTV.
Tracking Technique	Synchrony® fiducial-free tracking with 4 radiographic image angles per rotation was used. A simulation session confirmed the feasibility of accurate tracking using external LED markers and radiographic imaging.
Dose	54 Gy in 3 fractions.
Planning Constraints	All organ at risk constraints of the RTOG 0234 protocol were met.
Beam-on-time	10.41 minutes.

Outcomes:

Tracking accuracy was high, with strong model confidence and low prediction error. At 20-month follow-up, the patient showed complete response with no evidence of recurrence or significant side effects.

Key advantages of Synchrony on the Radixact® System :

- Continuous real-time motion tracking without fiducials
- High tracking accuracy despite large motion amplitude
- Minimized treatment margins, reducing normal lung exposure
- Efficient dose delivery with no significant increase in treatment time

Conclusion:

“Small lung lesions with large motion are more prone to being missed during treatment, and treatment with a large margin increases radiation exposure to healthy tissue. This case study demonstrates the clinical feasibility and effectiveness of Radixact® Synchrony in managing significant respiratory-induced tumor motion for a small lesion in the lung. Future studies should explore long-term outcomes and dosimetric refinements for further optimization”

Chen G, Tai A, Puckett L, et al. (June 01, 2025) Real-Time Motion Management for a Small Target in the Right Lower Lobe With Large Tumor Motion Using Radixact Synchrony: A Case Report. Cureus 17(6): e85195. doi:10.7759/cureus.8519

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