

# Data from 4D Lung Imaging of NSCLC Patients (4D-Lung)

# Summary

## Redirection Notice

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This data collection consists of images acquired during chemoradiotherapy of 20 locally-advanced, non-small cell lung cancer patients. The images include four-dimensional (4D) fan beam (4D-FBCT) and 4D cone beam CT (4D-CBCT). All patients underwent concurrent radiochemotherapy to a total dose of 64.8-70 Gy using daily 1.8 or 2 Gy fractions.

4D-FBCT images were acquired on a 16-slice helical CT scanner (Brilliance Big Bore, Philips Medical Systems, Andover, MA) as respiration-correlated CTs with 10 breathing phases (0 to 90%, phase-based binning) and 3 mm slice thickness. 4D-FBCT images were acquired during simulation, prior to therapy, and used for therapy planning. In 14 of the 20 subjects, 4D-FBCTs were also acquired on the same scanner weekly during therapy. 4D-CBCT images were acquired on a commercial CBCT scanner (On-Board Imager™, Varian Medical Systems, Inc.). An external surrogate (Real-time Position Management, Varian Medical Systems, Inc.) was integrated into the CBCT acquisition system to stamp each CBCT projection with the surrogate respiratory signal through in-house software and hardware tools. Approximately 2500 projections were acquired over a period of 8-10 minutes in half-fan mode with half bow-tie filter. The technique was 125 kVp, 20 mA, and 20 ms in a single 360° slow gantry arc. Using the external surrogate, the CBCT projections were sorted into 10 breathing phases (0 to 90%, phase-based binning) and reconstructed with an in-house FDK reconstruction algorithm.

Audio-visual biofeedback was performed for all 4D-FBCT and 4D-CBCT acquisitions in all subjects. A single Radiation Oncologist delineated targets and organs at risk in all 4D-FBCT and a limited number of 4D-CBCT images, on all 10 phases per scan. Seven of the subjects had gold coils implanted as fiducial markers in or near the tumor.

The dataset is most fully described in detail in Balik et al.<sup>1</sup> Seven of the subjects had gold coils implanted as fiducial markers in or near the tumor. The implantation procedure and details of marker location are described in detail in Roman et al.<sup>2</sup>

## References

<sup>1</sup> S. Balik et al., “Evaluation of 4-Dimensional Computed Tomography to 4-Dimensional Cone-Beam Computed Tomography Deformable Image Registration for Lung Cancer Adaptive Radiation Therapy.” *Int. J. Radiat. Oncol. Biol. Phys.* **86**, 372–9 (2013) PMID: PMC3647023.

<sup>2</sup> N.O. Roman, W. Shepherd, N. Mukhopadhyay, G.D. Hugo, and E. Weiss, “Interfractional Positional Variability of Fiducial Markers and Primary Tumors in Locally Advanced Non-Small-Cell Lung Cancer during Audiovisual Biofeedback Radiotherapy.” *Int. J. Radiat. Oncol. Biol. Phys.* **83**, 1566–72 (2012).

## Acknowledgements

Data collection and analysis was supported by NIH P01CA116602.

## Data Access

## Data Access

Data Type	Download all or Query/Filter	License
Images and Radiation Therapy Structures (DICOM, 183GB)	<a href="#">Download Search</a> (Download requires <a href="#">NBIA Data Retriever</a> )	CC BY 3.0

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## Additional Resources for this Dataset

The NCI Cancer Research Data Commons (CRDC) provides access to additional data and a cloud-based data science infrastructure that connects data sets with analytics tools to allow users to share, integrate, analyze, and visualize cancer research data.

- [Imaging Data Commons \(IDC\)](#) (Imaging Data)

### Detailed Description

#### Detailed Description

Collection Statistics	
Modalities	CT, RTSTRUCT
Number of Participants	20
Number of Studies	589
Number of Series	6,690
Number of Images	347,330
Image Size (GB)	183

### Citations & Data Usage Policy

#### Citations & Data Usage Policy

Users must abide by the [TCIA Data Usage Policy and Restrictions](#). Attribution should include references to the following citations:



##### Data Citation

Hugo, G. D., Weiss, E., Sleeman, W. C., Balik, S., Keall, P. J., Lu, J., & Williamson, J. F. (2016). **Data from 4D Lung Imaging of NSCLC Patients (Version 2) [Data set]**. The Cancer Imaging Archive. <https://doi.org/10.7937/K9/TCIA.2016.ELN8YGLE>



##### Publication Citation

Hugo, G. D., Weiss, E., Sleeman, W. C., Balik, S., Keall, P. J., Lu, J., & Williamson, J. F. (2017). **A longitudinal four-dimensional computed tomography and cone beam computed tomography dataset for image-guided radiation therapy research in lung cancer**. In Medical Physics (Vol. 44, Issue 2, pp. 762–771). Wiley. <https://doi.org/10.1002/mp.12059>

### Publication Citation

Balik, S., Weiss, E., Jan, N., Roman, N., Sleeman, W. C., Fatyga, M., Christensen, G. E., Zhang, C., Murphy, M. J., Lu, J., Keall, P., Williamson, J. F., & Hugo, G. D. (2013). **Evaluation of 4-dimensional Computed Tomography to 4-dimensional Cone-Beam Computed Tomography Deformable Image Registration for Lung Cancer Adaptive Radiation Therapy**. In International Journal of Radiation Oncology\*Biophysics (Vol. 86, Issue 2, pp. 372–379). Elsevier BV. PMID: [PMC3647023](https://pubmed.ncbi.nlm.nih.gov/24121202/). <https://doi.org/10.1016/j.ijrobp.2012.12.023>

### Publication Citation

Roman, N. O., Shepherd, W., Mukhopadhyay, N., Hugo, G. D., & Weiss, E. (2012). **Interfractional Positional Variability of Fiducial Markers and Primary Tumors in Locally Advanced Non-Small-Cell Lung Cancer During Audiovisual Biofeedback Radiotherapy**. In International Journal of Radiation Oncology\*Biophysics (Vol. 83, Issue 5, pp. 1566–1572). Elsevier BV. <https://doi.org/10.1016/j.ijrobp.2011.10.051>

### TCIA Citation

Clark K, Vendt B, Smith K, Freymann J, Kirby J, Koppel P, Moore S, Phillips S, Maffitt D, Pringle M, Tarbox L, Prior F. **The Cancer Imaging Archive (TCIA): Maintaining and Operating a Public Information Repository**. Journal of Digital Imaging, Volume 26, Number 6, December, 2013, pp 1045-1057. DOI: [10.1007/s10278-013-9622-7](https://doi.org/10.1007/s10278-013-9622-7)

## Other Publications Using This Data

TCIA maintains [a list of publications](#) which leverage our data. If you have a manuscript you'd like to add please [contact TCIA's Helpdesk](#).

### Versions

#### Version 2 (Current): Updated 2016/10/19

Any download of this dataset prior to October 18 2016 contains data that was updated after that date by the investigators. It is recommended that you download a fresh copy before applying your analysis.

Data Type	Download all or Query/Filter
Images (DICOM, 183GB)	<a href="#">Download</a> <a href="#">Search</a> (Download requires the <a href="#">NBIA Data Retriever</a> .)

#### Version 1 : 2015/09/14

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