



2010

# A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group

I. S. Grills

*William Beaumont Hospital*

A. J. Hope

*Princess Margaret Hospital and University of Toronto*

M. Guckenberger

*University of Wuerzburg*

L. L. Kestin

*William Beaumont Hospital*

M. Werner-Wasik

*Thomas Jefferson University and Hospitals*

---

## Recommended Citation

Grills, I. S.; Hope, A. J.; Guckenberger, M.; Kestin, L. L.; Werner-Wasik, M.; Yan, D.; Sonke, J. J.; Bissonnette, J. P.; Xiao, Y.; and Belderbos, J. (2010) "A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group," *Bodine Journal*: Vol. 3: Iss. 1, Article 32.

Available at: <http://jdc.jefferson.edu/bodinejournal/vol3/iss1/32>

This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University's [Center for Teaching and Learning \(CTL\)](#). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in *Bodine Journal* by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: [JeffersonDigitalCommons@jefferson.edu](mailto:JeffersonDigitalCommons@jefferson.edu).

*See next page for additional authors*

Follow this and additional works at: <http://jdc.jefferson.edu/bodinejournal>

 Part of the [Oncology Commons](#)

---

---

A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group

**Authors**

I. S. Grills, A. J. Hope, M. Guckenberger, L. L. Kestin, M. Werner-Wasik, D. Yan, J. J. Sonke, J. P. Bissonnette, Y. Xiao, and J. Belderbos

# A Multi-national Pooled Analysis of 434 Cases of Stage I Non-small Cell Lung Cancer (NSCLC) Treated with Volumetrically Image-guided Stereotactic Lung Radiotherapy: Results from the Elekta Collaborative Lung Research Group

Grills, I.S.,<sup>1</sup> Hope, A.J.,<sup>2</sup> Guckenberger, M.,<sup>3</sup> Kestin, L.L.,<sup>1</sup> **Werner-Wasik, M.,<sup>4</sup>** Yan, D.,<sup>1</sup> Sonke, J.J.,<sup>5</sup> Bissonnette, J.P.,<sup>4</sup> **Xiao, Y.,<sup>4</sup>** Belderbos, J.<sup>5</sup>

<sup>1</sup>William Beaumont Hospital, Royal Oak, MI

<sup>2</sup>Princess Margaret Hospital and University of Toronto, Toronto, ON

<sup>3</sup>University of Wuerzburg, Wuerzburg, Germany

<sup>4</sup>Department of Radiation Oncology, Thomas Jefferson University and Hospitals, Philadelphia, PA

<sup>5</sup>Netherlands Cancer Institute, Amsterdam, Netherlands

## Background

Published lung SBRT outcomes/dose response data for inoperable NSCLC come from small phase I-II studies or larger datasets not requiring image-guided radiotherapy (IGRT) or volumetric prescriptions. This entire cohort of SBRT patients had daily online cone-beam CT.

## Materials/Methods

Four-hundred-thirty-four (434) cases of Stage I (T1-2N0M0) NSCLC were treated with SBRT via VIGRT at 1/5 institutions from 1998-2009. Median age was 74y (42-92); 53% male, 47% female. Median FEV1 was 1.4L (65% predicted); median DLCO was 9.8 ml/min/mmHg (54% predicted). Sixty-two percent (62%) of tumors were biopsy-proven; 84% of cases were staged with CT and PET. Clinical stage was IA in 76%, IB in 22%, locally recurrent in 1%. Median max tumor dimension was 2.4cm (0.9- 8.5cm). Histologies were: 41% adenocarcinoma, 34% squamous, 12% large cell, 13% NSCLC. NOS. 8%, 51%, and 42% were grades 1, 2, 3. Median volumetric prescription dose (PD) was 54Gy (20-64Gy) delivered in median of 3 fractions (fx) (1-15fx) over 8d (1-27d). Median biological equivalent PD (BED<sub>10</sub>) was 132Gy (60-180Gy), equal to 2-Gy fx equivalent (FE) of 110Gy (50-150Gy). Corresponding GTV and PTV mean doses (2-GyFE) were 157Gy and 137Gy. Mean follow-up was 1.3y (0.1-7.3y).

## Results

2-y Kaplan-Meier rates of local recurrence (LR), regional recurrence (RR) and distant metastasis (DM) were 8%, 13%, and 26%. Two year overall survival(OS) and cause-specific survival(CSS) were 58% and 84%. No statistically significant differences in LR, RR, DM, OS or CSS were identified for biopsied vs. non-biopsied tumors. On univariate analysis, stage (IA 5% v IB 16%, p=0.002), GTV max dimension (<2.7cm

4% v ≥2.7cm 12%, p=0.006), and 2-GyFE PD (<88Gy 17% v ≥88Gy 5%, p<0.001) predicted LR. GTV (<115Gy 32% v ≥115Gy 4%, p<0.001) and PTV (<105Gy 24% v ≥105Gy 4%, p<0.001) mean doses also predicted LR. Cox multiple regression confirmed the relationship between PD and LR, independent of GTV size (p=0.01).

## Conclusion

This is the first Lung SBRT dataset of patients treated uniformly with daily online VIGRT and resulted in excellent local control for Stage I NSCLC. A 2-GyFE dose of 88 Gy predicted superior local control.