

# Treatment Team

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Medical Physicist: **Steve Humphries**

Radiation Therapist: **Mark Post**

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## References

- <sup>1</sup> Timmerman, Robert, Paulus, Rebecca, Galvin, James, et al. Stereotactic Body Radiation Therapy for Inoperable Early Stage Lung Cancer. JAMA. 303(11): 1070-1076, 2010.
- <sup>2</sup> van der Voort van Zyp, Noelle, Prevost, Jean-Briac, van der Holt, Bronno, et al. Quality of Life after Stereotactic Radiotherapy for Stage I Non-Small Cell Lung Cancer. Int J Radiat Oncol Biol Phy 77:S31, 2010.



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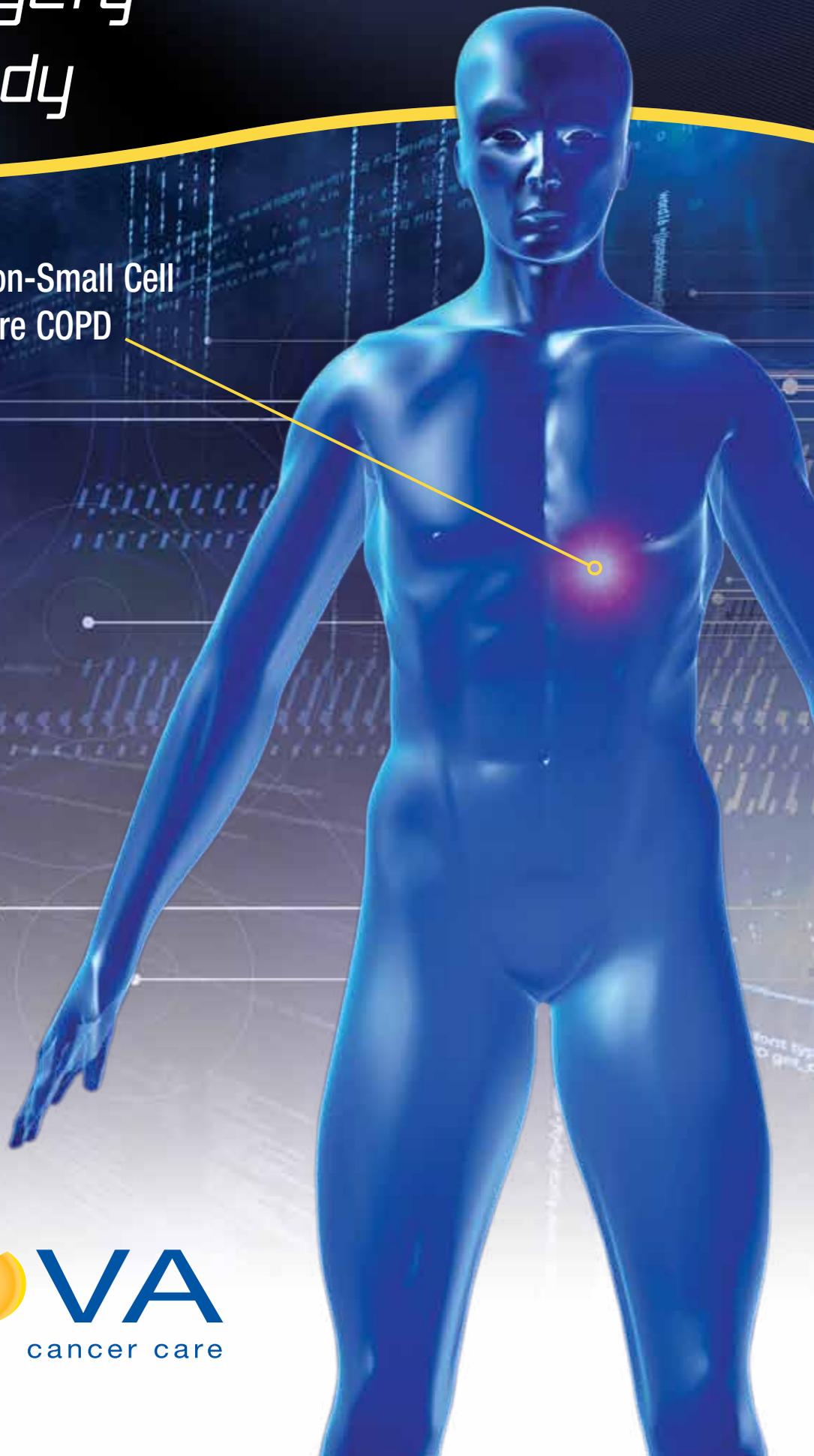
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# *Radiosurgery Case Study*

T2 N0 M0, Stage I, Non-Small Cell  
Carcinoma with Severe COPD

*June 2010*



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# Radiosurgery Case Study

## Case History

An 80 year-old female, former 40-year two pack-per-day smoker, presented to her primary doctor with worsening dyspnea. She had a CT scan of the chest, which showed a 5.5 x 4 cm mass in the left lower lobe (LLL) of her lung abutting her heart. A CT guided transthoracic biopsy was performed and was positive for non-small cell lung carcinoma.

A PET CT indicated there was no evidence of mediastinal involvement or metastatic disease. Her FEV1 was 31% of predicted. She required 2.5-3 L O2 at rest with 4L O2 with exertion. With her severe COPD and the characteristics and size of her tumor, she was not felt to be a surgical candidate.

## CyberKnife Treatment Rationale

When possible, Stage T2aNOMO NSCLC is treated by primary surgical resection. Conventional radiation therapy has been reserved for patients who refuse surgery or are deemed medically inoperable because of associated co-morbidities. In recent years, improved tumor control with relatively few complications has been achieved using CyberKnife high dose, hypo-fractionated, stereotactic body radiation therapy (SBRT) and is a standard treatment option for medically inoperable early stage NSC lung carcinoma.

The CyberKnife System delivers high-dose radiation to the lung tumors while minimizing deleterious effects to normal surrounding tissue by tracking and correcting for tumor movement throughout the respiratory cycle. Recent studies have highlighted the lack of toxicity associated with CyberKnife SBRT compared to gantry based systems such as Novalis, Trilogy, or Synergy.<sup>1,2</sup>

The patient chose CyberKnife SBRT due to her co-morbidities, tumor characteristics, and a desire not to experience serious treatment related side effects.



*Prior to CyberKnife treatment, the patient's tumor volume was 113 cc.*



*Just seven weeks following treatment at Anova Cancer Care, the tumor volume measured only 8 cc.*

## Planning Process and Goals

The patient was referred to interventional radiology for CT guided transthoracic fiducial placement. Three fiducials were placed into the LLL tumor without complications. A high-resolution planning CT scan was obtained eight days later. Fiducials were identified and the lesion and adjacent critical structures were contoured. A multiple collimator treatment plan with 193 unique beams was created to deliver 50 Gy in 5 fractions with minimum cardiac dose.

## Treatment Delivery

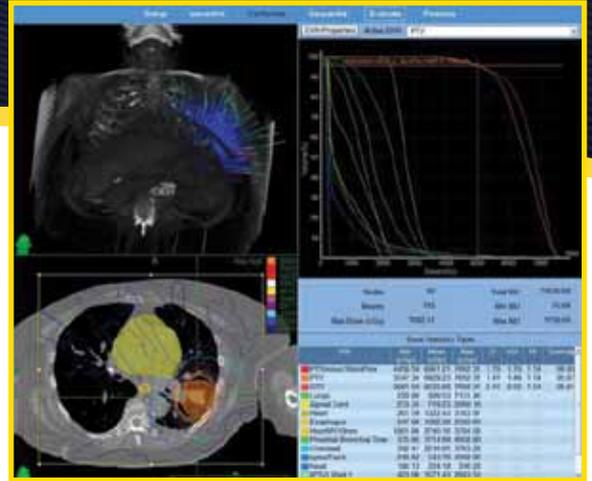
The patient underwent her five fraction course of treatment without any discomfort or acute side effects. She rested comfortably and breathed freely on the treatment table. The average duration of each fraction was 90 minutes.

## Outcome and Follow-Up

Prior to treatment in March 2010, the mass measured 7.0 x 6.0 x 5.0 cm. Seven weeks after CyberKnife treatment completion, CT imaging revealed an interval decrease in the size of the LLL tumor to 2.6 x 2.4 cm x 2.3 cm. Imaging revealed no infiltrates or findings consistent with radiation pneumonitis or radiation damage to surrounding lung. The patient denied any increased dyspnea or need for increased oxygen use. Her dyspnea and endurance had actually improved. During treatment she was using a wheelchair and at the time of her first follow-up she was able to walk without observed dyspnea or fatigue.

## Conclusions & Commentary

CyberKnife SBRT was an excellent treatment option for this patient and she has had an excellent outcome with respect to tumor response and improvement in respiratory and emotional quality of life. She did not experience any side effects from treatment. Recent clinical trials have demonstrated that this patient's experience with CyberKnife SBRT was to be expected and is reproducible with other patients. She was spared the significant toxicity associated with other treatment options due to the CyberKnife's unique ability to track the motion of her tumor in real time and deliver surgically precise treatment which protected her adjacent lung and heart. Happy and satisfied patients are what make performing radiosurgery with CyberKnife SBRT and CyberKnife SRS such a pleasure for the clinical team at Anova Cancer Care and the referring physicians.



*The treatment planning images depict the dose contouring around the tumor, as well as the beam distribution of the treatment delivery.*

***“Before I got the results (of my follow-up CT scan), I was thinking the worst and I was a nervous wreck, but after I heard the news, I was ecstatic and just so happy. I appreciate your whole staff. I am happy and thank you all. I had been discouraged with everyone that I had seen until I got to Anova Cancer Care. You have encouraged me considerably.”***

— Patient quote, at follow-up appointment