

A New Approach For Radiosurgical Marker Placement Using The inReach™ System

Nonsurgical Candidates: Radiotherapy May Be An Option

Stereotactic radiosurgery is a highly precise form of radiation therapy used primarily to treat tumors and is an important alternative to invasive surgery. The treatment involves the delivery of a single high-dose or sometimes smaller, multiple doses of radiation beams that converge on the specific area of the tumor. The ACCP Guidelines recommend to use stereotactic radiosurgery in patients with a malignant Solitary Pulmonary Nodule (SPN) who are not surgical candidates or who refuse surgery¹.

Targeting A Lung Tumor – Not Really A ‘Sitting Duck’

The challenges of external beam radiation delivery originate from the inability to practically see the tumor during treatment. Accurate alignment of stereotactic planning onto the patient, before the procedure, is required for real time tracking of the tumor. Additionally, tumor position in the lung changes as a result of the normal respiratory cycle, unpredictable baseline shifts and variable amplitude of respiratory rates, and change in tumor morphology. Consequently, the delivered dose of radiation may be restricted to avoid toxic effects on the surrounding healthy lung

tissue. On the other hand, an insufficient dose may lead to failure to control tumor growth.

A Great Advancement In Radiotherapy To Overcome Tumor Tracking Challenges

The evolution of radiotherapy has derived from the unmet clinical need to maximize the radiation dose to the tumor while minimizing the damage to the surrounding healthy tissue. This need has led to the creation of the latest image guidance technology – image guided radiation therapy (IGRT) such as the Accuray® or Varian systems. IGRT takes an already precise treatment like intensity modulated radiation therapy (IMRT) and makes it even more accurate. With IGRT, the Radiation Oncologist can really see the tumor in an image and accurately track the tumor location in real time. However, IGRT requires radiosurgical markers (fiducial markers) that act as internal reference points for identification of tumor location. Multiple radiosurgical markers must be placed in or near the tumor for best localization. IMRT also benefits from using radiosurgical markers, as they assist in the planning phase. Transthoracic implantation of radiosurgical markers is currently the most common practice. Unfortunately, this technique can be associated with a very high rate of pneumothorax (30% - 50%)³. For patients with significantly compromised lung function, a pneumothorax can induce a critical response thus reducing their ability to receive the markers^{2,3}.

Achieving New Synergies – Enhancing Communication Between Medical Specialties

To achieve the best results for physicians and their patients through integration of advanced technology, superDimension now offers the opportunity to use its inReach™ System for transbronchial placement of radiosurgical markers. Early data suggests the transbronchial approach is superior to the transthoracic approach due to its excellent safety profile and negligible risk of pneumothorax^{8,9,10}.



Now, Bronchoscopists Place Radiosurgical Markers

The inReach System uses Electromagnetic Navigation Bronchoscopy to provide a minimally invasive pathway to peripheral lung lesions – even for patients with procedure restricting conditions. The inReach System enables physicians to locate, diagnose and plan treatment for lung tumors that are otherwise difficult to access safely or precisely with traditional procedures. The inReach System has revolutionized the way physicians think and manage peripheral lung lesions. Now, bronchoscopists can place radiosurgical markers in and near lung tumors to help radiation oncologists to better plan and treat patients, using IGRT.



Radiosurgical Markers Placement With inReach System

Provide Accurate Treatment in the Least Invasive Means Possible as Safely and Quickly as Possible

Accurate

- 3-D visualization and steerable navigation enables access to target locations within the lung
- Electromagnetic Navigation Bronchoscopy provides precise placement of radiosurgical markers for accurate alignment of planning onto patient
- inReach placement of markers enables physicians to carefully track changes in tumor position during radiation therapy and tumor morphology over time
- Accurate targeting minimizes damage to surrounding tissue

Less Invasive

- Transbronchial procedure dramatically reduces risk of pneumothorax
- May be only option for patients with procedure-restricting conditions

Potential For Better Outcomes

- Preserved healthy lung tissue
- Reduced complications
- Get a treatment solution in a less invasive manner/means
- Potentially lower morbidity, stress, pain
- Shorter hospital length of stay

After the lesion has been located and a diagnosis has been achieved using the inReach System, an angulated guide catheter is advanced through the inReach Guide Catheter (EWC) into the lesion. The radiosurgical marker is loaded into the proximal end of the catheter and a guide wire is placed through the catheter. The radiosurgical marker is deployed under fluoroscopic guidance. Because the guide catheter has a pre-formed tip shape, it can be turned in different directions, allowing marker placement in different planes of the tumor. Once the radiosurgical markers are placed, their position is confirmed fluoroscopically and the guide catheter and bronchoscope are removed.



Optimizing Radiotherapy

Once the radiosurgical markers are placed, a CT scan is done to plan the radiotherapy procedure. At the IGRT procedure, real time accurate tumor tracking can now be achieved. Due to greater accuracy, higher doses can be delivered (up to 120Gy), hypofractionation over a short time of one to five treatments is effective, better local control and less end-organ toxicity are attained^{4,5}.

inReach™ System Expands The Boundaries

The inReach System enables physicians to expand the boundaries of their practice and bridge medical specialties for better outcomes for patients and for advancement of the medical profession. By using the inReach System for transbronchial placement of radiosurgical markers, physicians provide enhanced visual localization of the tumor and guide accurate radiotherapy, thus, offering another treatment alternative for their patients.

Technique at a Glance

Planning Phase

- Target tumor is selected using the inReach System

Localization

- Using the inReach steerable navigation catheter (LG) and guide catheter (EWC) under electromagnetic guidance

Marker Placement

- Angiocatheter with front or back loading

Radiotherapy

- Stereotactic radiotherapy treatment process

References

1. Michael W. Alberts. **Clinical Practice Guidelines (2nd Edition) Executive Summary: ACCP Evidence-Based Diagnosis and Management of Lung Cancer.** DOI 10.1378/chest.07-1860. Chest 2007;132;1-19
2. Willoughy et al. **Evaluation of an infrared camera and X-ray system using implanted fiducials in patients with lung tumors for gated radiation therapy.** Int J Radiat Oncol Biol Phys. 2006 Oct 1;66(2):568-75.
3. Cox et al. **Transthoracic needle aspiration biopsy with variables that affect risk of pneumothorax.** Radiology. 1999;212:165-168
4. Shirato H, et al. **Feasibility of insertion/implantation of 2.0-mm-diameter gold internal fiducial markers for precise setup and real-time tumor tracking in radiotherapy.** Int J Radiat Oncol Biol Phys (2003);56(1): pp. 240–247.
5. Imura et al. **Insertion and fixation of fiducial markers for setup and tracking of lung tumors in radiotherapy.** Int J Radiat Oncol Biol Phys. Vol. 63, No. 5, pp. 1442–1447, 20056.
6. Holger Hof et al. **Stereotactic Single-Dose Radiotherapy (Radiosurgery) of Early Stage Non-small-Cell Lung Cancer (NSCLC).** DOI10.1002 / cncr. 22763. 2007 American Cancer Society
7. P. Kupelian et al. **Implantation and Stability of Metallic Fiducials within Pulmonary Lesions.** Int J Radiat Oncol Biol Phys 2007.
8. D Anantham et al. **Electromagnetic Navigation Bronchoscopy-Guided Fiducial Placement for Robotic Stereotactic Radiosurgery of Lung Tumors; A Feasibility study.** CHEST 2007; 132:930-935.
9. McGuire et al. **Radiotherapy monitoring device implantation into peripheral lung cancers: a therapeutic utility of electromagnetic navigational bronchoscopy.** J Bronchol 2007; 14(3): 189-192.
10. McLemore et al. **Endobronchial ultrasound and/or superDimension bronchoscopic placement of fiducial markers in malignant mediastinal lymph nodes and lung cancers: A novel approach for highly selective external beam radiation therapy.** 14th WCB, June 2006.

United States Corporate Office

Minneapolis, MN
Tel: +1-800-387-9016
Toll Free: +1-888-586-4767
info.us@superdimension.com

Europe Corporate Office

Düsseldorf, Germany
Tel: +49-(0)211-436-156-0
info.de@superdimension.com

superDimension

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RSMWP01; Rev 05/2008