

# Clinical Application Series

## VISICOIL™ Linear Fiducial Marker for Lung IGRT

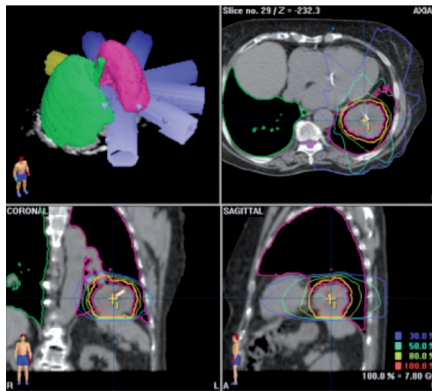


Fig. 1: Lung cancer SBRT plan with 7.8 Gy x 10 fractions; VISICOIL used to define planning isocenter and PTV location

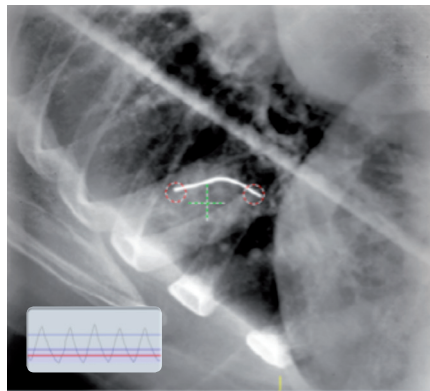


Fig. 2: Real time gated IGRT image. VISICOIL used to precisely set-up patient and to define magnitude of respiratory motion

### Clinical Application of VISICOIL at Klinikum Frankfurt Oder, Germany

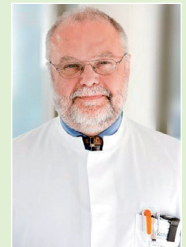
#### Lung SBRT (Stereotactic Body Radiation Therapy)

- SBRT lung cancer treatment protocol: 7.8 Gy x 10 fractions
- One to two 2 cm VISICOIL markers applied using a CT-guided transthoracic procedure. No pneumothorax developed with our patients <sup>1)</sup>
- VISICOIL is clearly visible in the CT providing a distinct tumor reference during imaging, treatment planning, and follow up imaging (Fig.1)
- Excellent local marker stability, no VISICOIL migration experienced <sup>1), 2)</sup>

#### Lung IGRT set-up and treatment delivery

- Precise tumor location via VISICOIL and kV imaging (Fig.2) enables accurate patient set-up prior to treatment
- In-house studies have proven a set-up accuracy of 2.07 mm \*
- The clear and unambiguous VISICOIL marker positions enables therapists to perform faster and more confident patient set-up
- To address respiration induced tumor motion and to provide targeting accuracy throughout the treatment fraction we apply periodic verification x-rays for select gated treatments

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*"We are using VISICOIL linear markers since 2004 primarily for radiation therapy of lung and liver tumors as well as for prostate cancer."*

*Until 2010 we have been applying VISICOIL to more than 150 of our lung cancer patients where we typically apply one to two 2 cm markers per lesion in a CT-guided transthoracic procedure.*

*Using an x-ray based IGRT system the VISICOIL markers are tracked prior to treatment for initial precise patient set-up. For lung and liver cases with tumor motion larger than 10 mm VISICOIL is used to track breathing induced motion during gated treatment delivery. Key benefits are a high tumor targeting accuracy with a lower dose to the patient as compared with other solutions like cone beam CT. VISICOILs also help us to speed up the patient set-up as the clear visibility and unambiguous location of the markers allows our therapists to confidently define the tumor location during IGRT patient set-up.*

*We are pleased with the spiral design of VISICOIL as we could not verify any marker migration from the initial position in or close to the lung tumor<sup>1)</sup>.*"

<sup>1)</sup> Wurm et.al.; Image guided respiratory gated hypofr. SBRT for liver and lung tumors; Acta Oncologica, 2006; 45: 881\_889

<sup>2)</sup> Kupelian et.al.; Implantation and stability of metallic fiducials within pulmonary lesions; IJROBP Vol.69, No.3, pp. 777-785, 2007

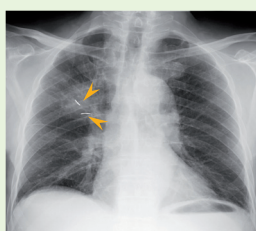
\* 113 verification images, average standard deviation 0.87 mm



## Safety, Efficiency and Clinical Confidence in Tumor Targeting

### Patient Safety

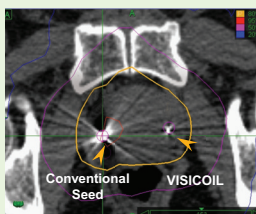
- Non-migrating design
- Visualizing tissue deformation and motion



Lung, kV image

### Treatment Efficiency

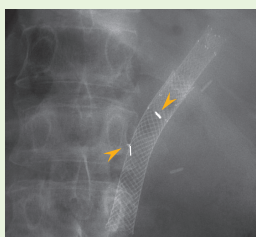
- Faster patient set-up based on unambiguous marker geometry
- One marker – two reference points



Prostate CT (minimized artifacts)

### Clinical Confidence

- Accurate tumor targeting at planning and treatment due to minimized artifacts



Two VISICOIL markers  
0.5 mm x 1 cm

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