

Cased-Based Ablation: Top 10 Clinical and Technical Pearls

Robert Suh, MD

Disclosures

Robert Suh: Consultant – Boston Scientific, NeuWave Medical;
Speakers' Bureau – Boehringer Ingelheim

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Lung Ablation: Top 10 Clinical and Technical Pearls

- Tumor size
- Patient positioning
- Pleural anesthesia and pleural wheal
- Lesion stratification
- Approach to central versus peripheral lesions
- Preserve margin visualization
- Minimize collateral damage
- Ensure end-ablation margins
- Complication avoidance and management
- Patient and imaging follow-up

Tumor Size: Common Factors

Survival: Significant Independent Factors

- Size ≤ 3.0 cm
- Disease-free interval
- Nonsynchronous / slow progression / few in number
- Extrapulmonary involvement
- Complete response to ablation

Local Control: Significant Independent Factors

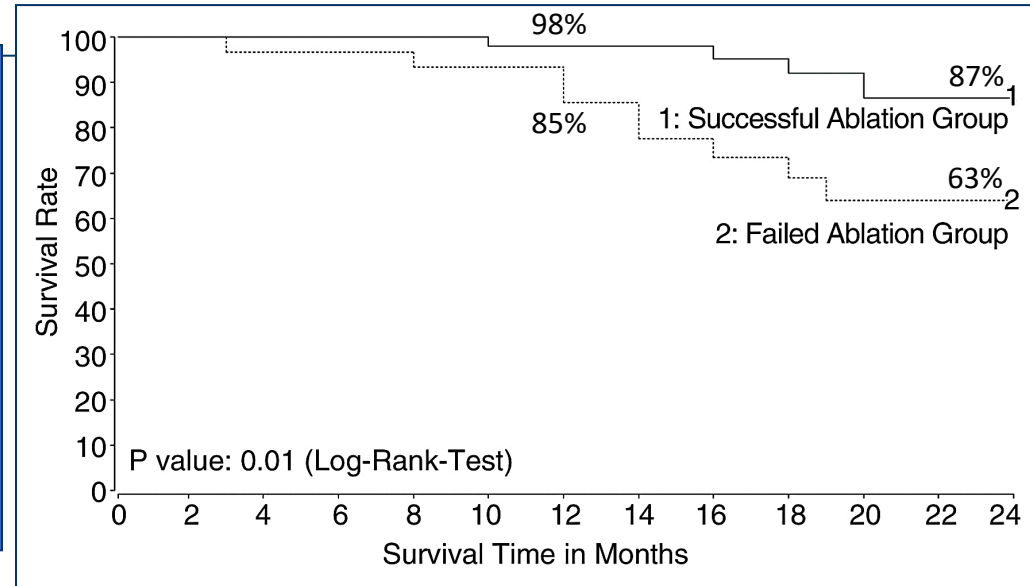
- Size $\leq 1.0-3.5$ cm
- Contact w/ bronchus ≤ 2 mm
- Contact w/ vessels ≤ 3 mm
- Tumor shape
- Energy per volume

SIZE is the main determinant for better prognosis

Tumor Size: Considerations

Independent Predictors RPFS

- ▶ Tumor stage $p < 0.01$
- ▶ Incomplete ablation: 14.2% $p = 0.002$
 - ▶ ≤ 3 cm and 3.1-5 cm $p = 0.024$
 - ▶ 3.1-5 cm and > 5 cm $p = 0.85$
- < 3 cm v. > 3 cm: 11.1 odds $p = 0.0003$
- ▶ 1° technical success: 80%
- ▶ $\pm 7\%$ odds/mm $p = 0.0001/0.0002$



- ▶ 36% 5-year survival for complete resection
- ▶ 13% 5-year survival for incomplete resection

SIZE

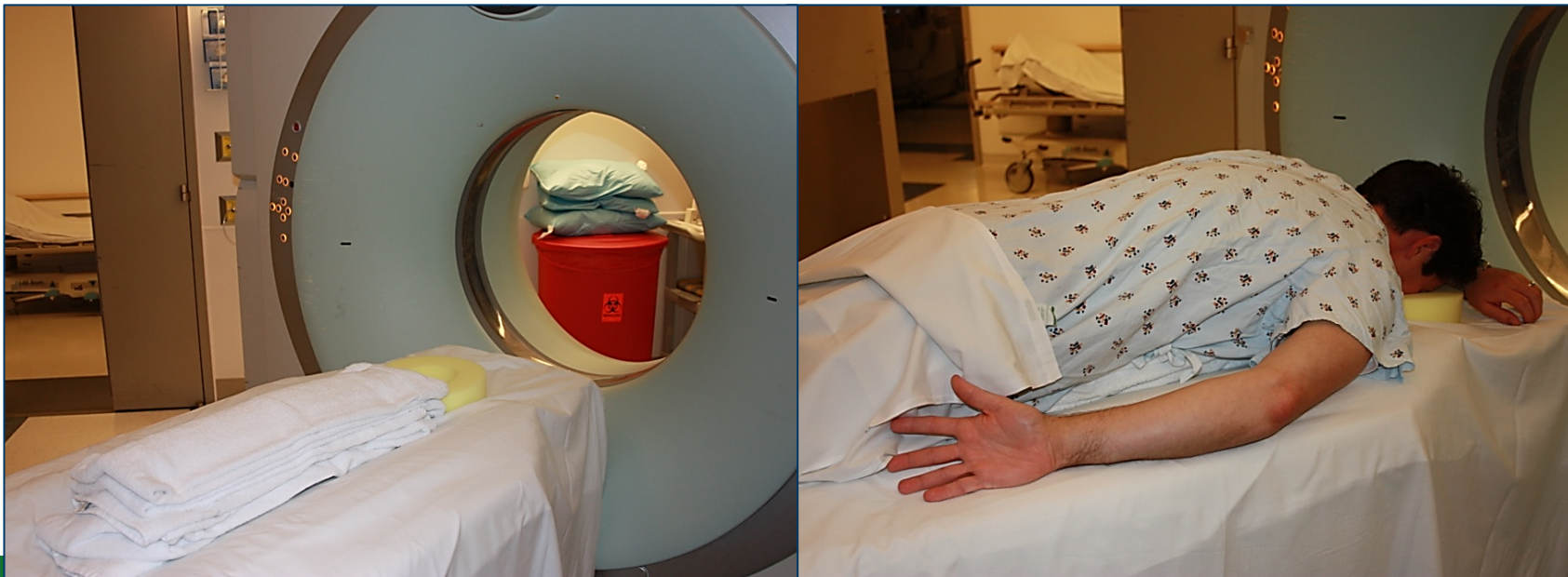
▶ Incomplete ablation

▶ Survival



Patient Positioning

- Scapular displacement for posterolateral lesions:
 - Prone
 - Ipsilateral arm down and externally rotated
 - Longitudinal towel roll to further laterally displace the scapula



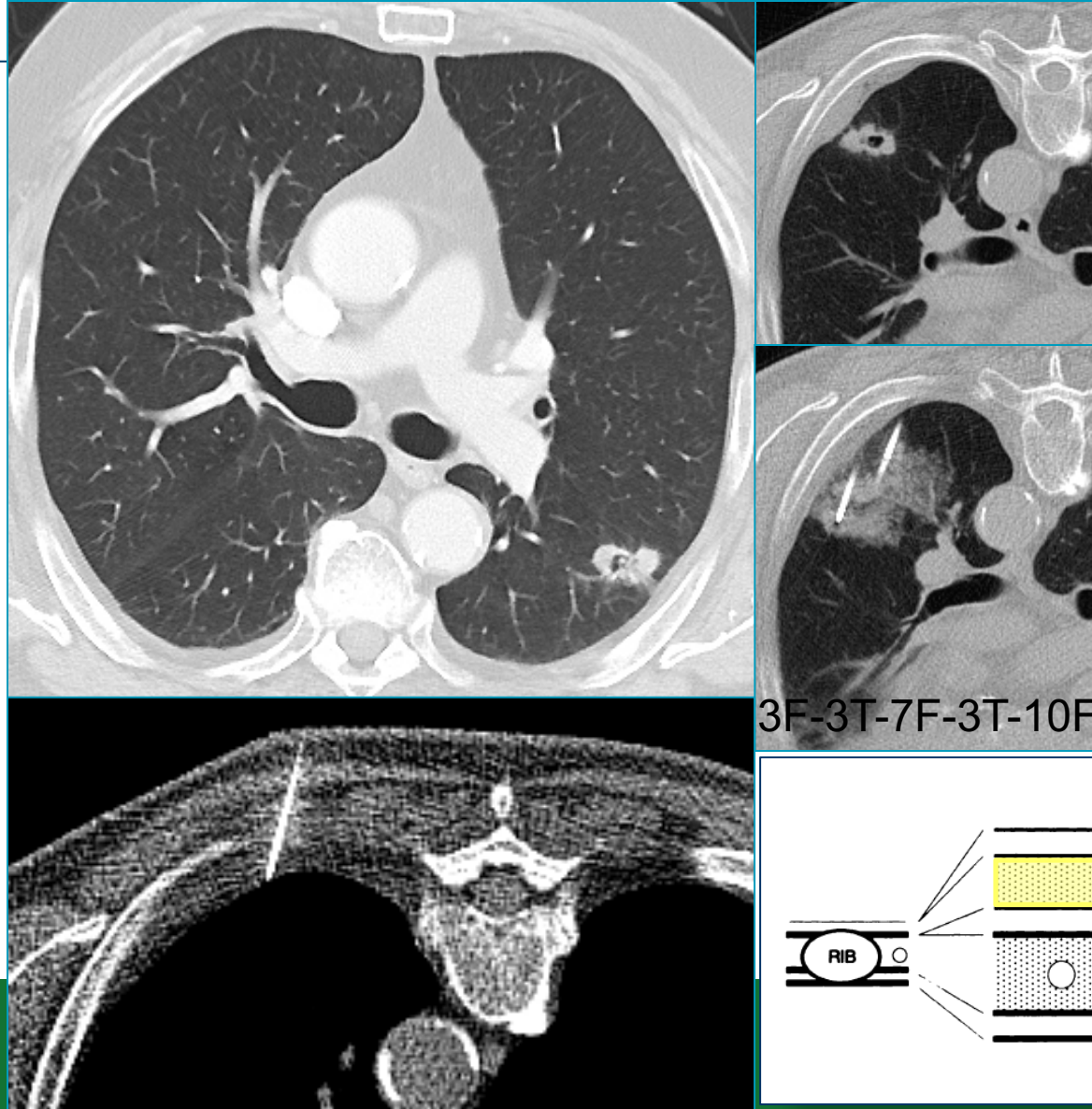
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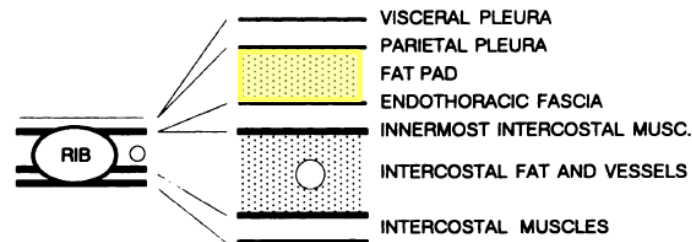


Lee, et al. *RSNA* 2006;p.696.

Pleural Anesthesia



- Prevent any sudden movements or changes in breath-hold when entering the lung
- Careful advancement of the coaxial needle until its tip lies within the **extrapleural fat**
- ~ 5-10 (10-15) cc of 1% lidocaine or 0.5% bupivacaine



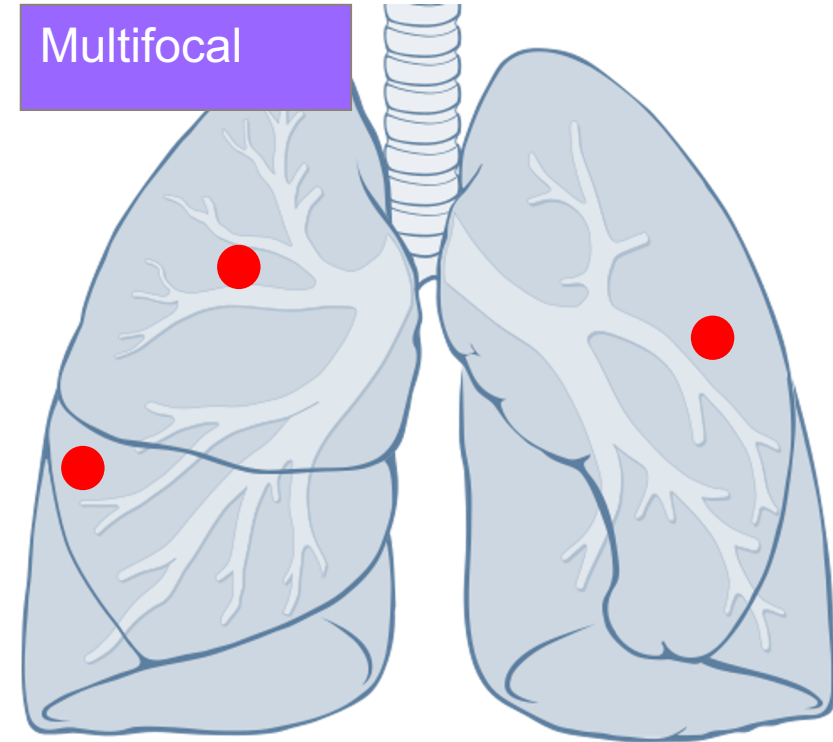
Gutierrez et al.
Hong K, Georgiades CS.
"Percutaneous Tumor Ablation:
Strategies & Techniques" *Thieme
Medical Publishers, Inc.* New York,
NY, 2011.

Lung Ablation: Lesion Stratification

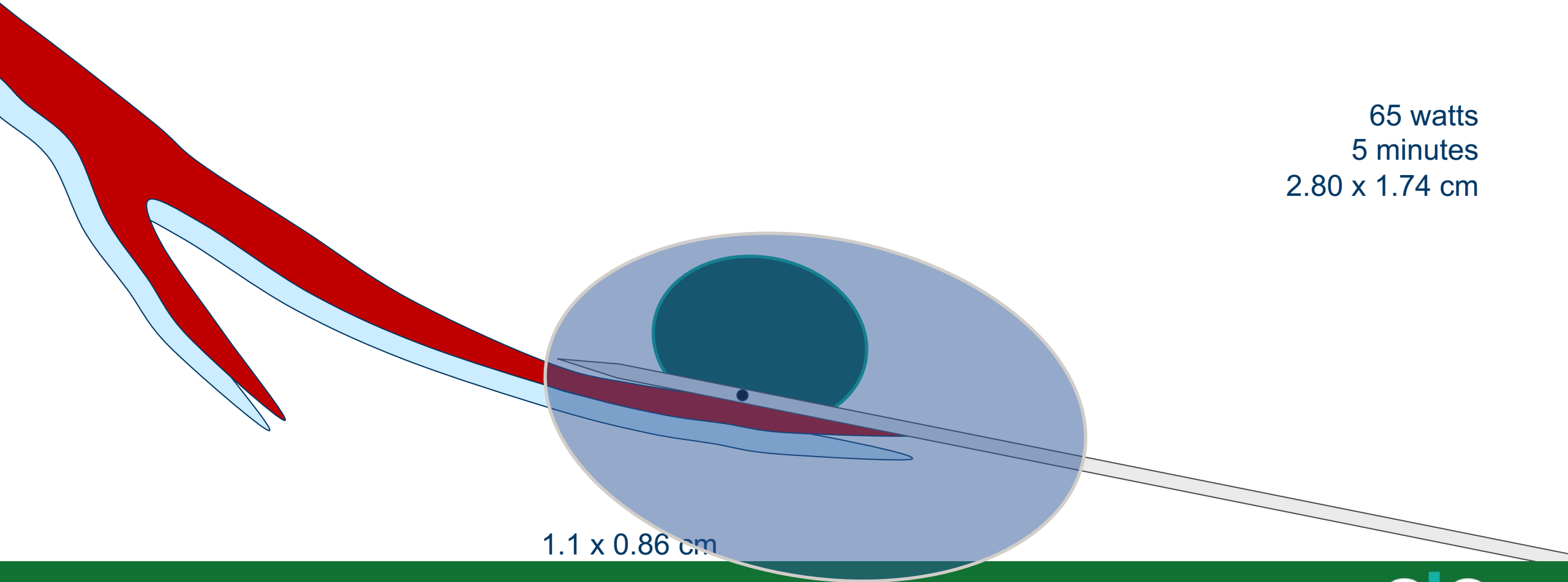


Lung Ablation: Lesion Stratification

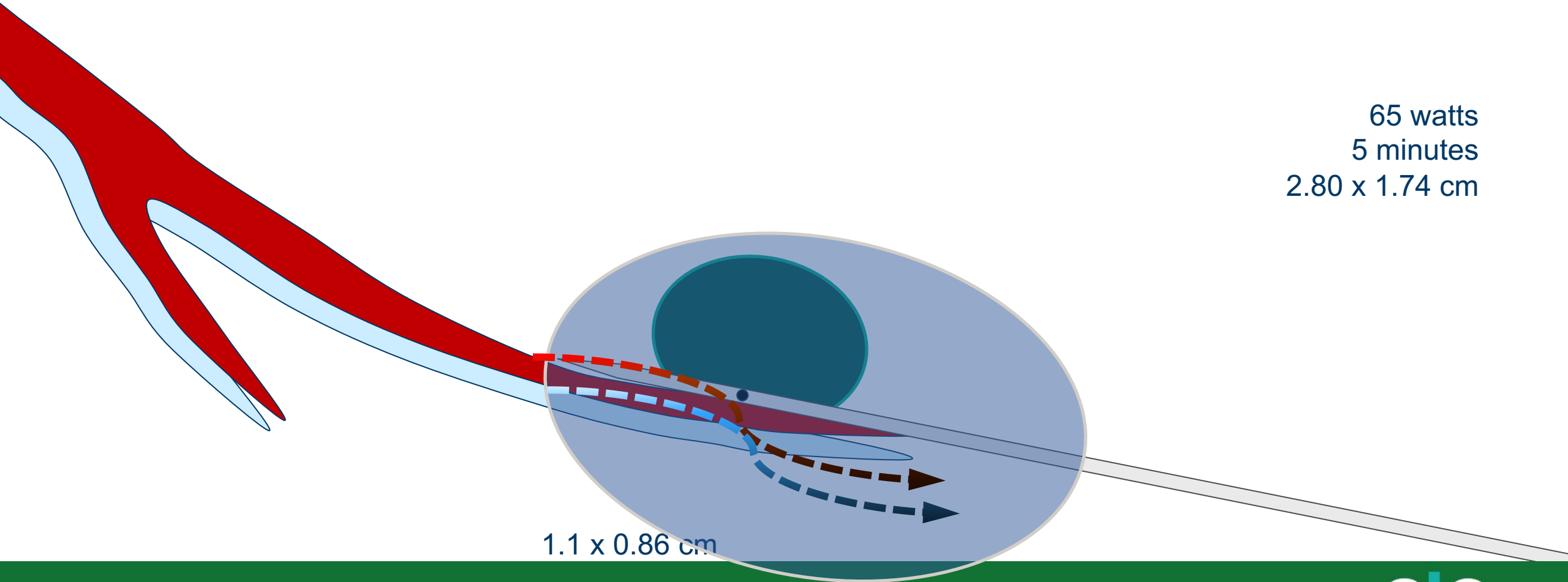
- Location and number
 1. Left upper lobe
 2. Right middle lobe
 3. Right lower lobe
 - Large before small
 - Central, if possible, versus peripheral
 - Problematic ablation (potential heat or cold sink)
 - Problematic future growth
 4. Both right lung metastases



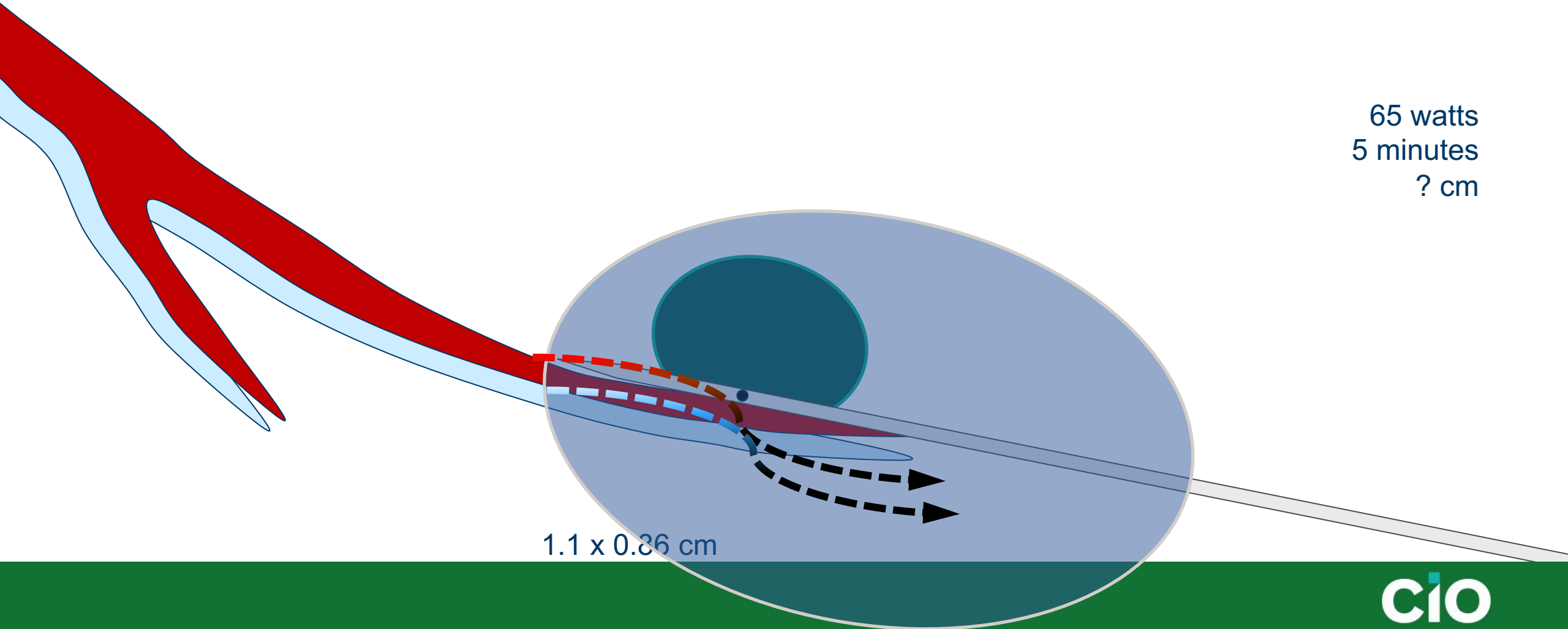
Central Lesions: Microwave Ablation Strategy



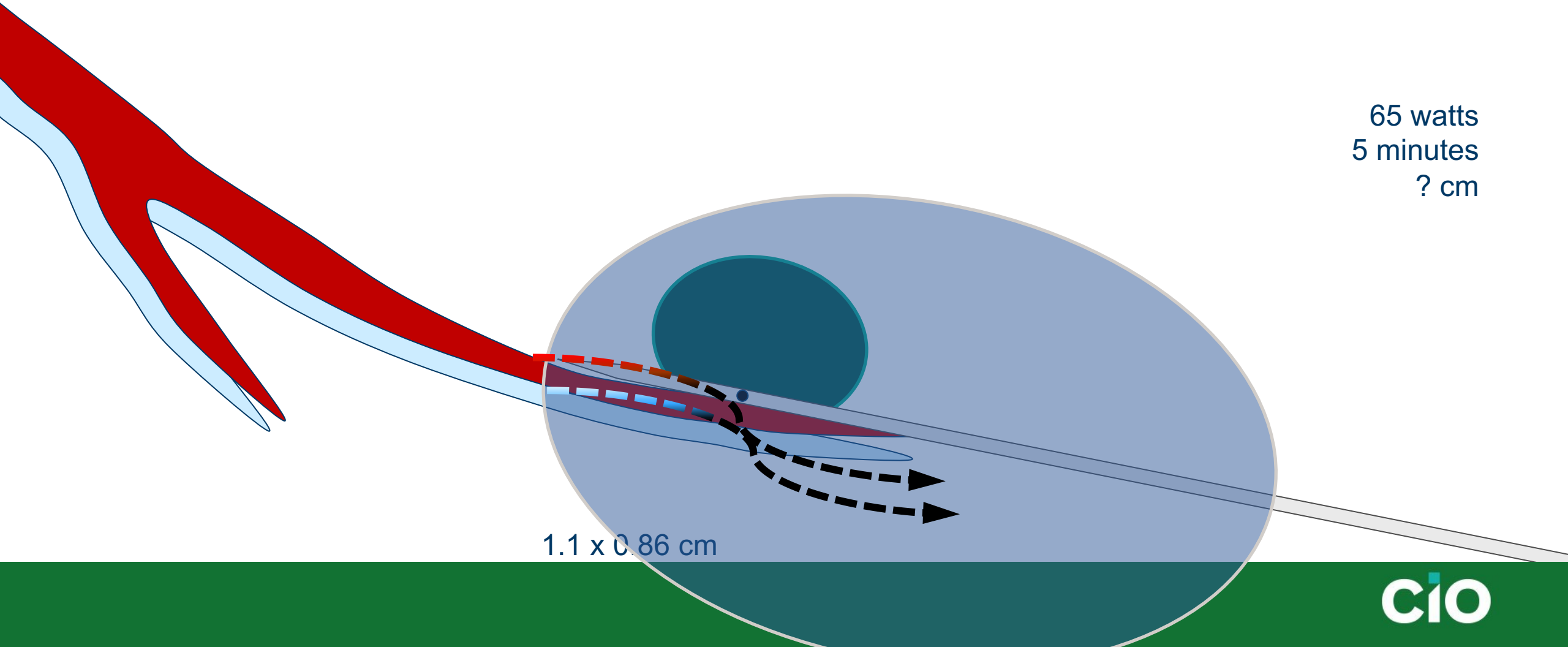
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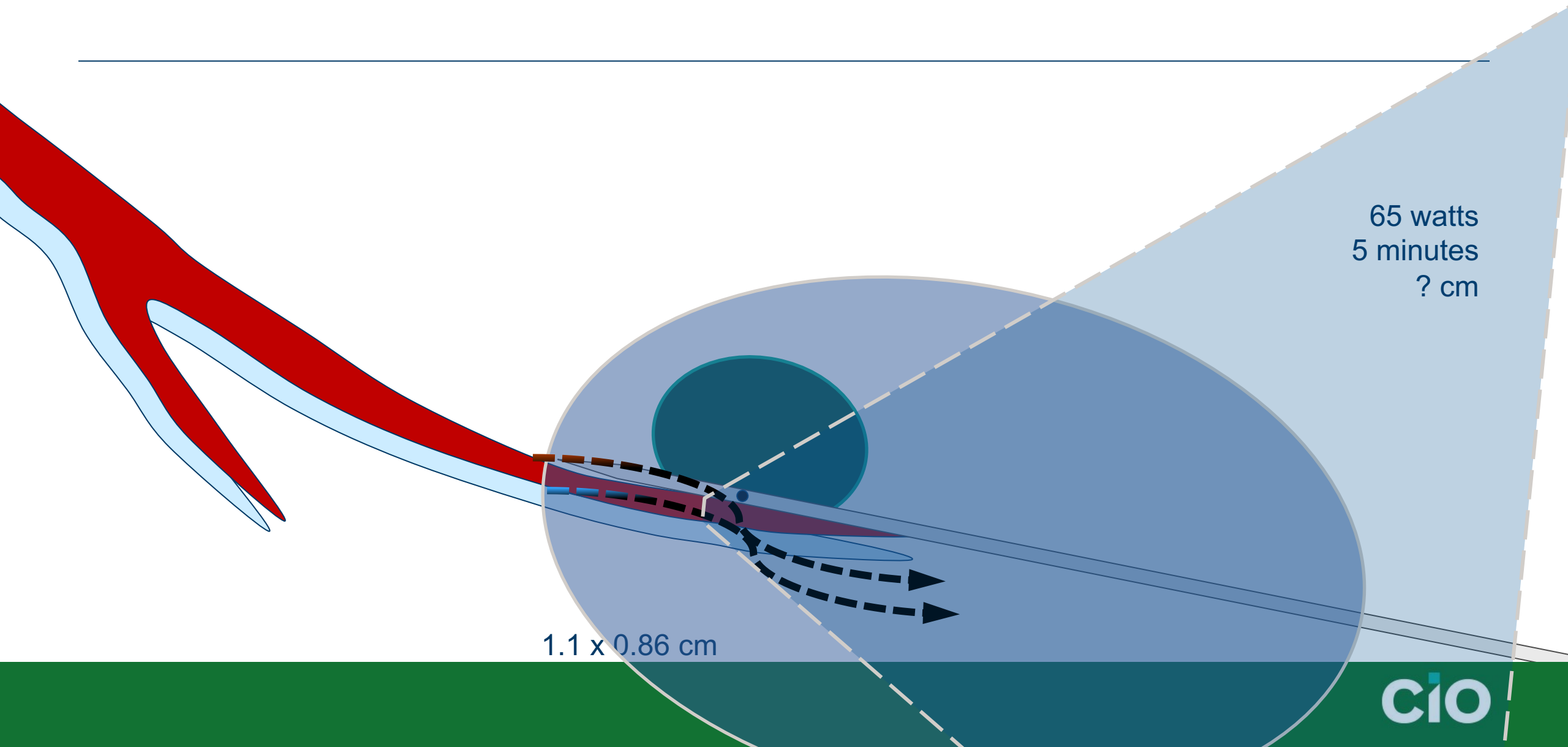
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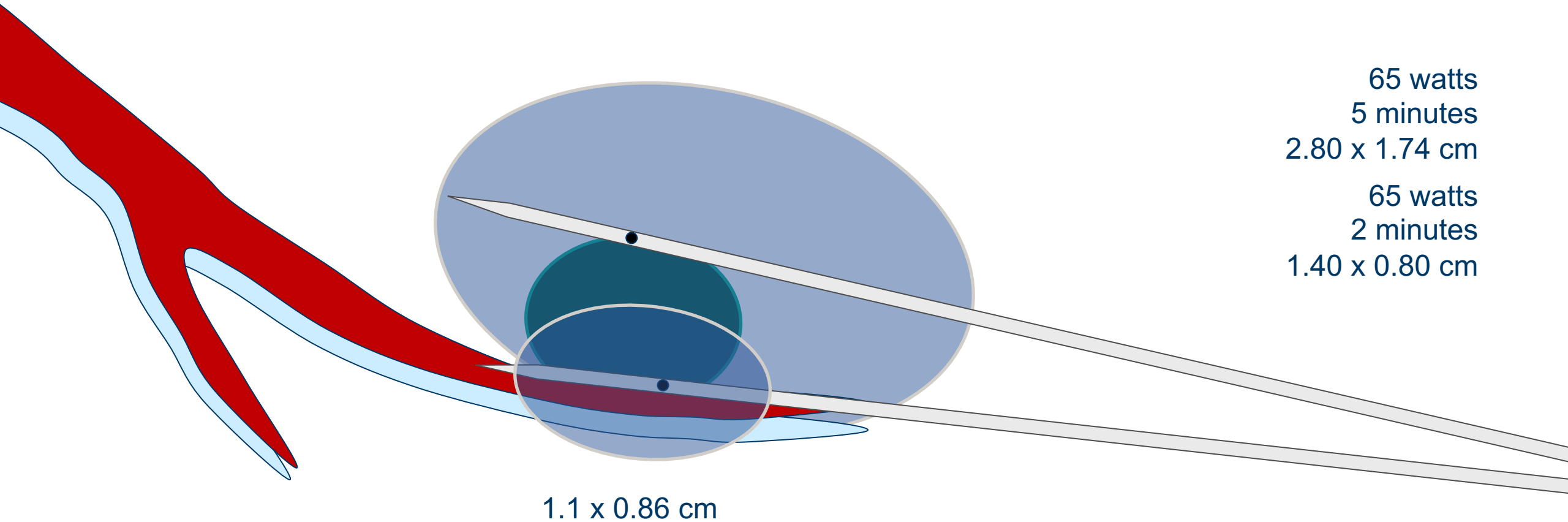
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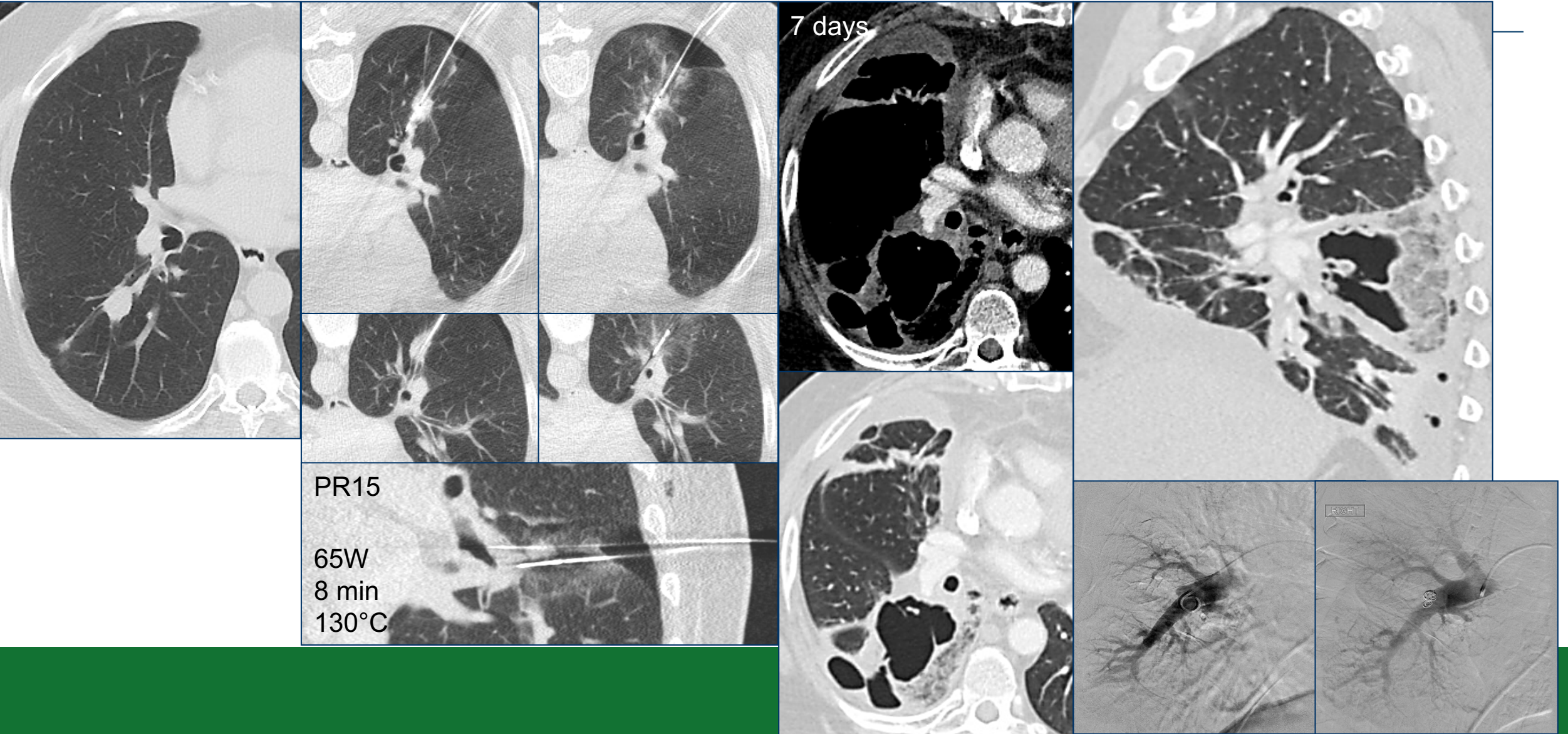
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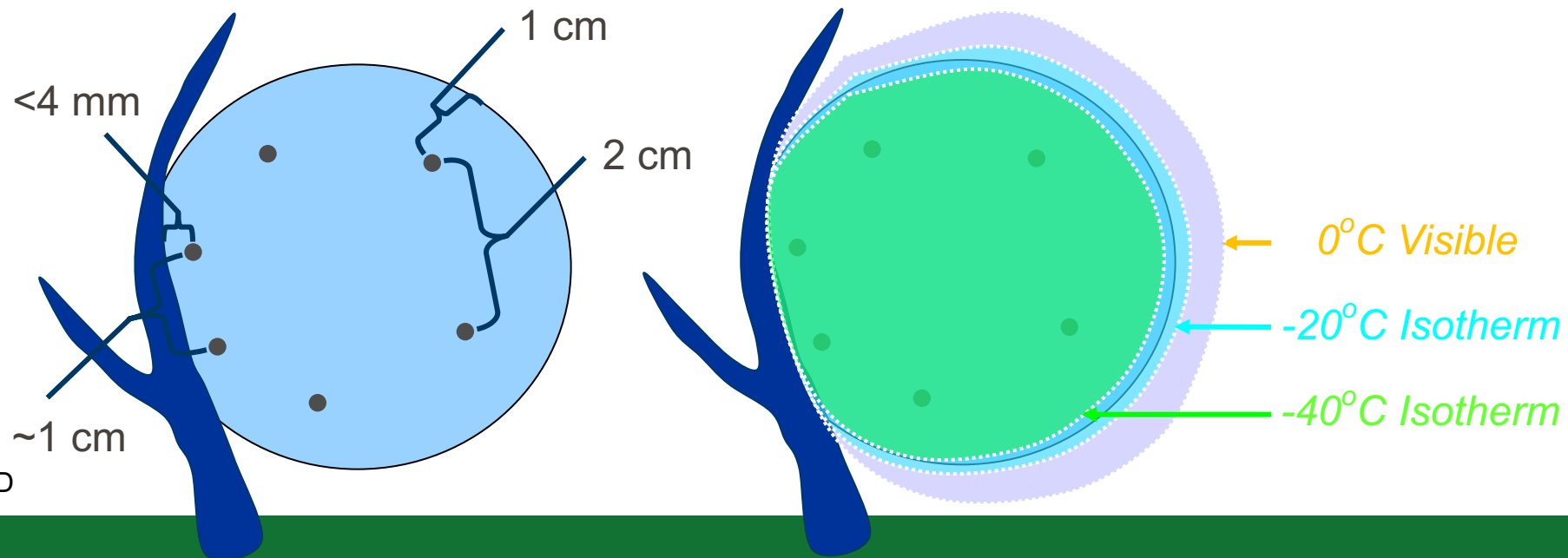


Central Lesions: Infarction and Pseudoaneurysm



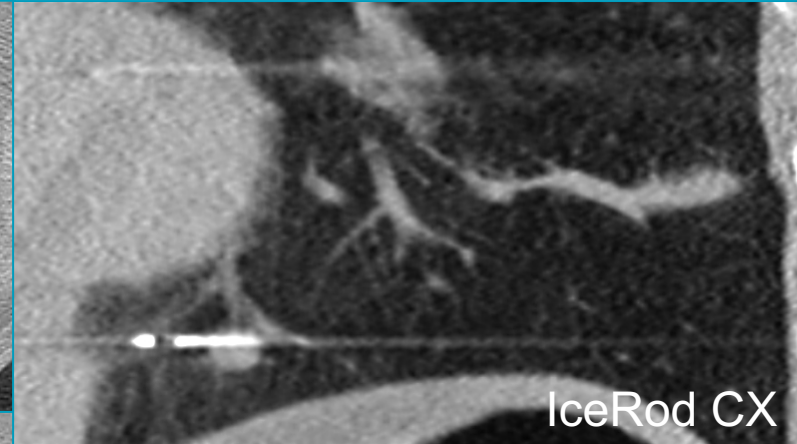
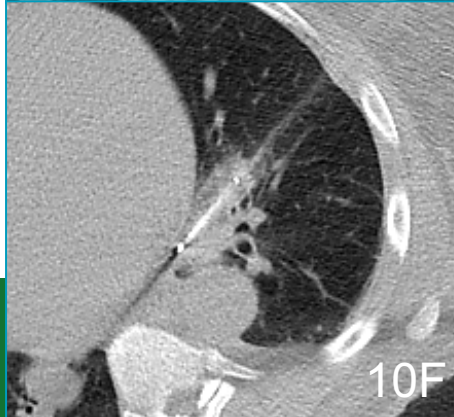
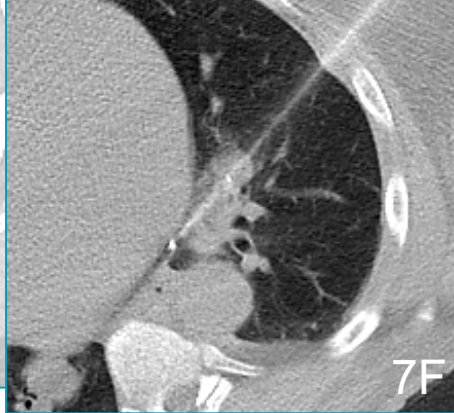
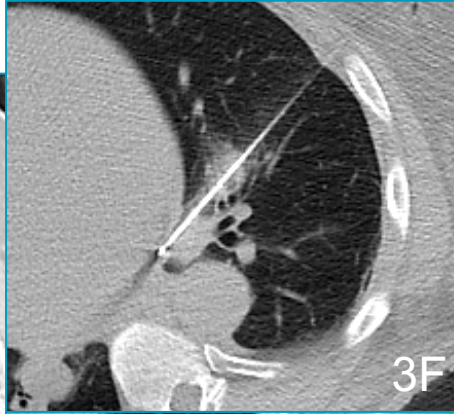
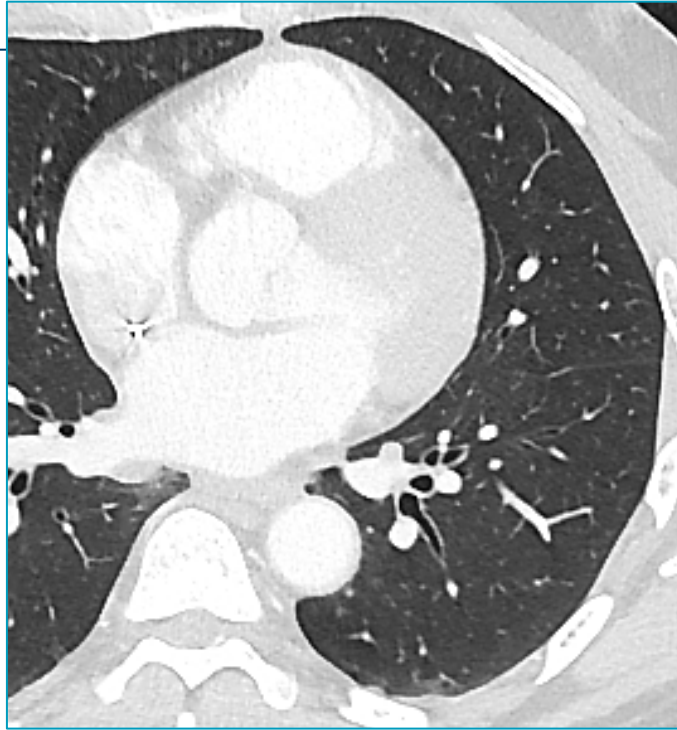
Central Lesions: Cryoablation Strategy

- Overcoming vascular effects
 - Distort the “1-2 rule” toward heat sink of the vessel
 - Lethal isotherms push into the vessel wall without damage
 - Preservation of collagen in vessel wall prevents rupture



Images: Robert Suh, MD

Central Lesions: Large Vasculature and Airways

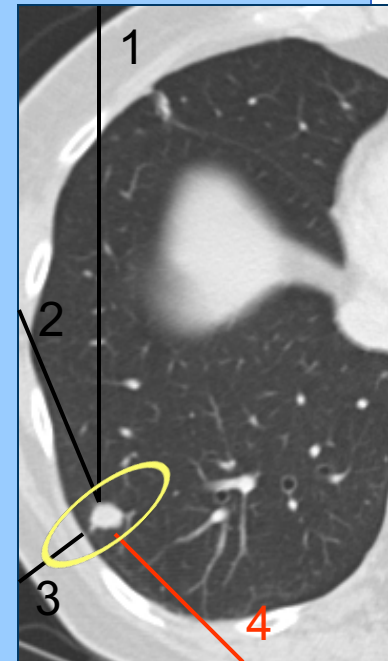
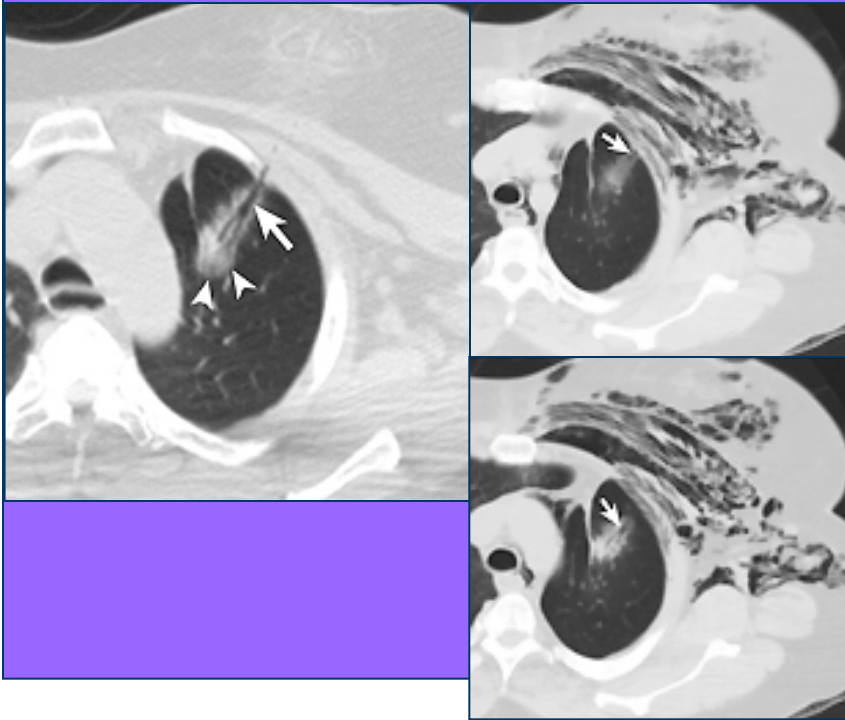


Approach to Peripheral Lesions

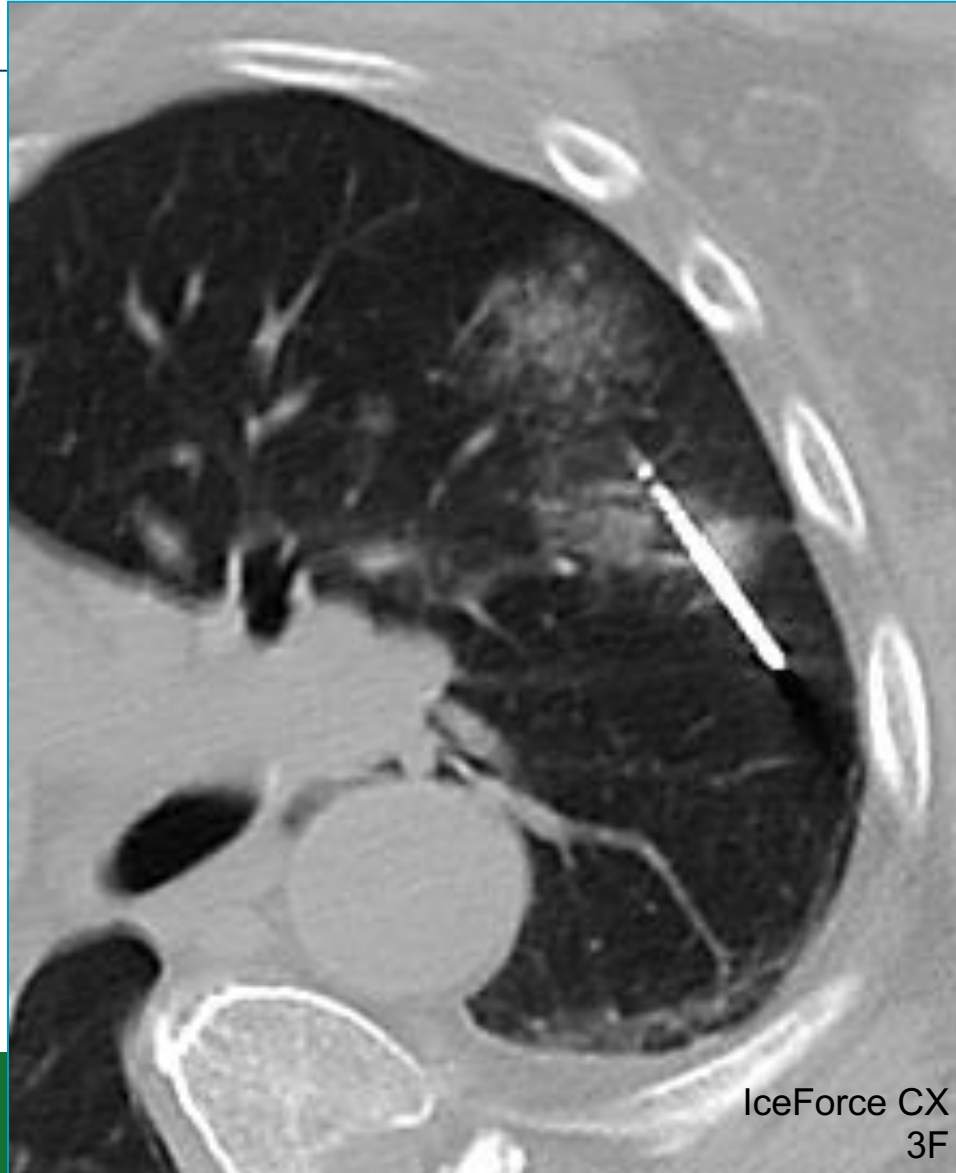
► Bronchocutaneous fistula after MWA

0.04% incidence following RFA

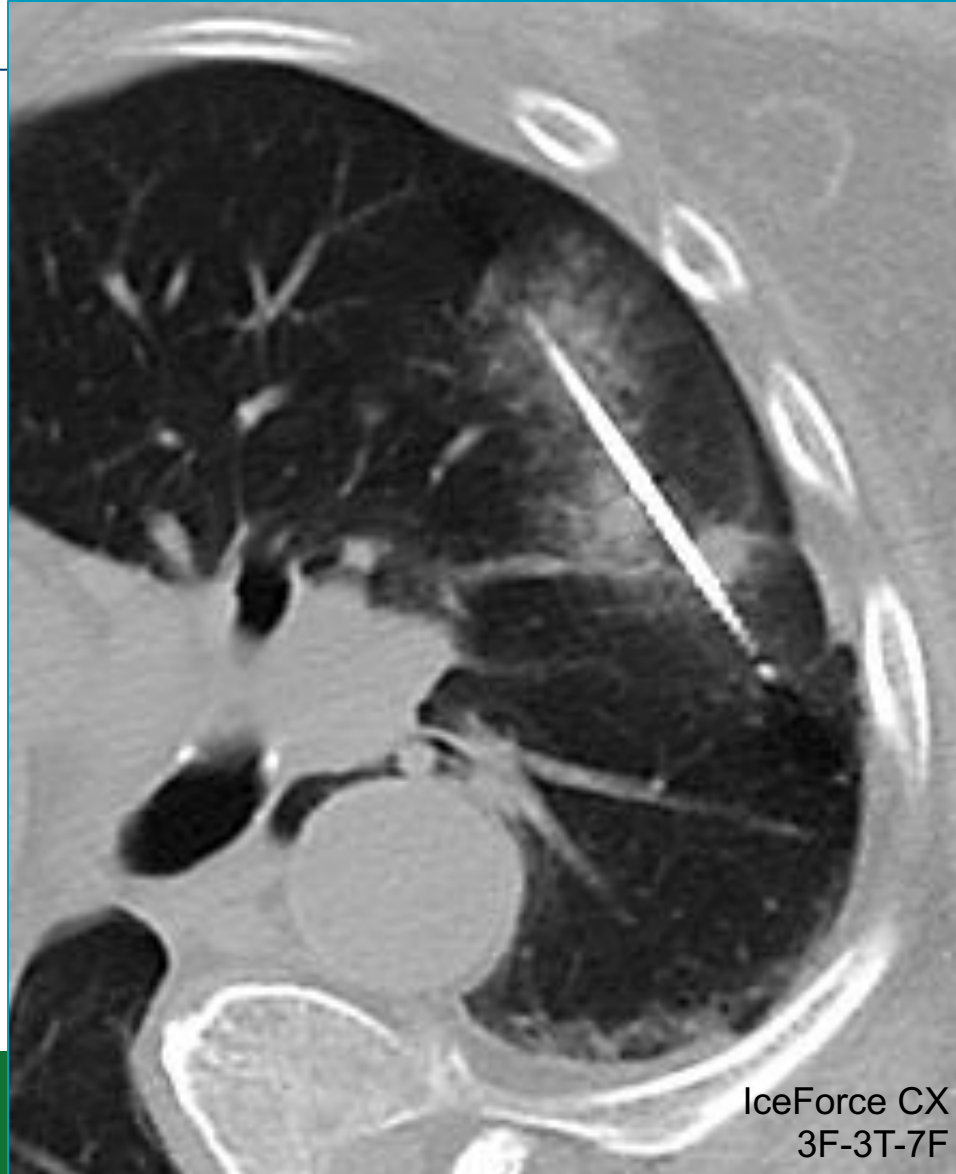
Reported cases: 6 following MWA



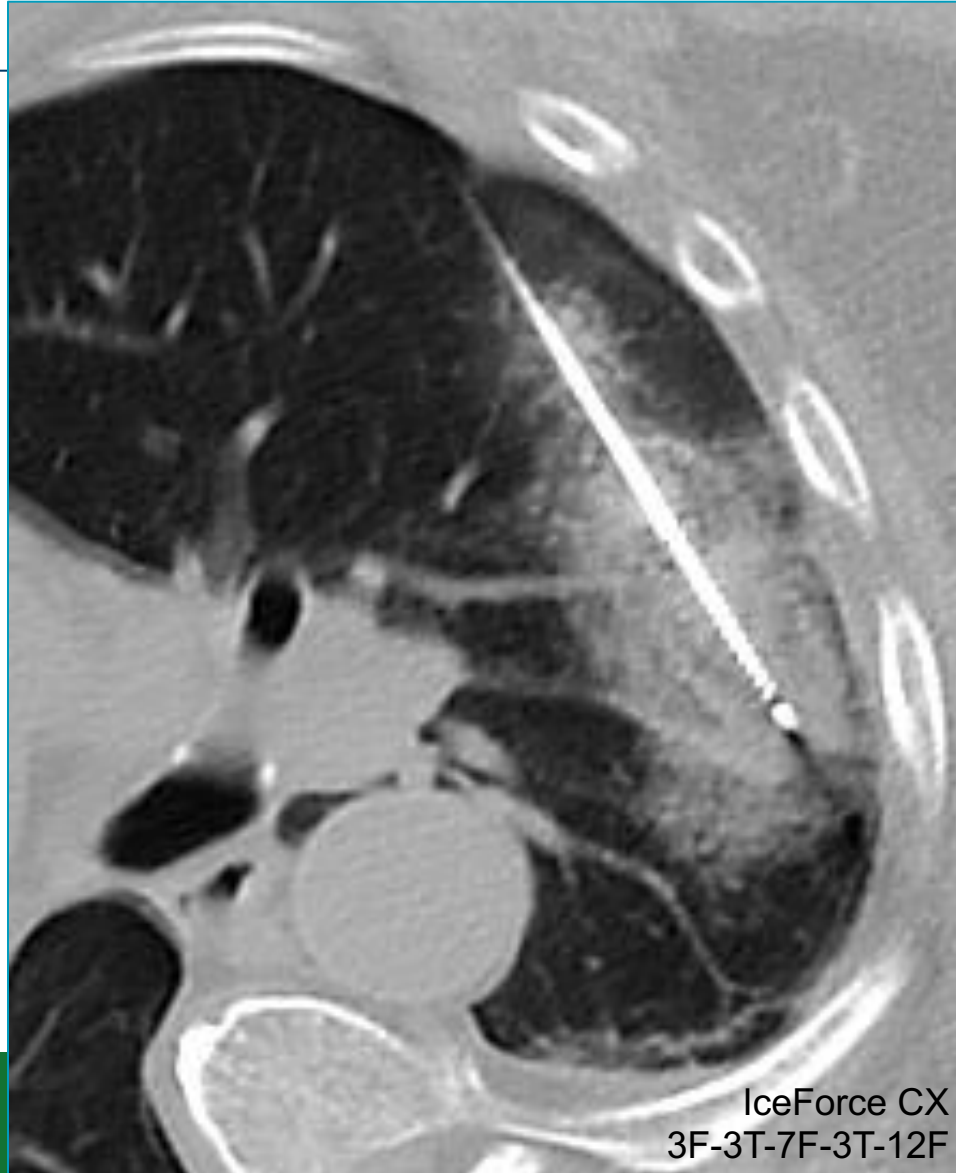
Peripheral Lesions: Leveraged Advantage



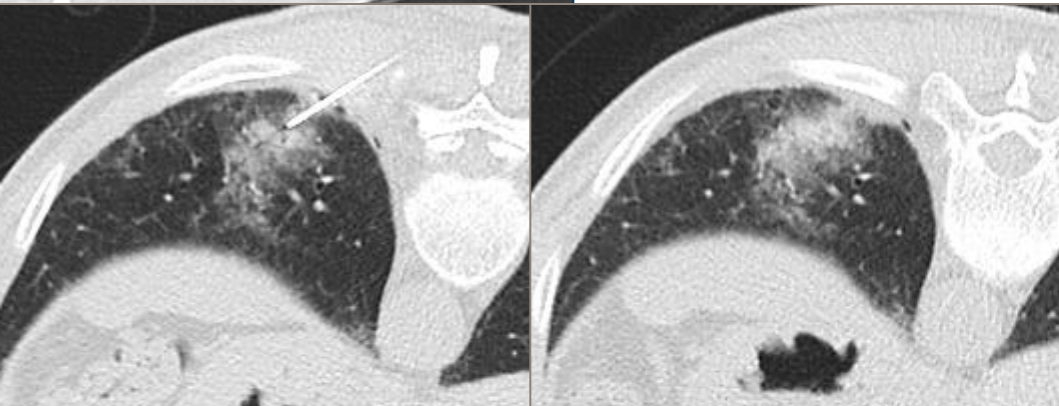
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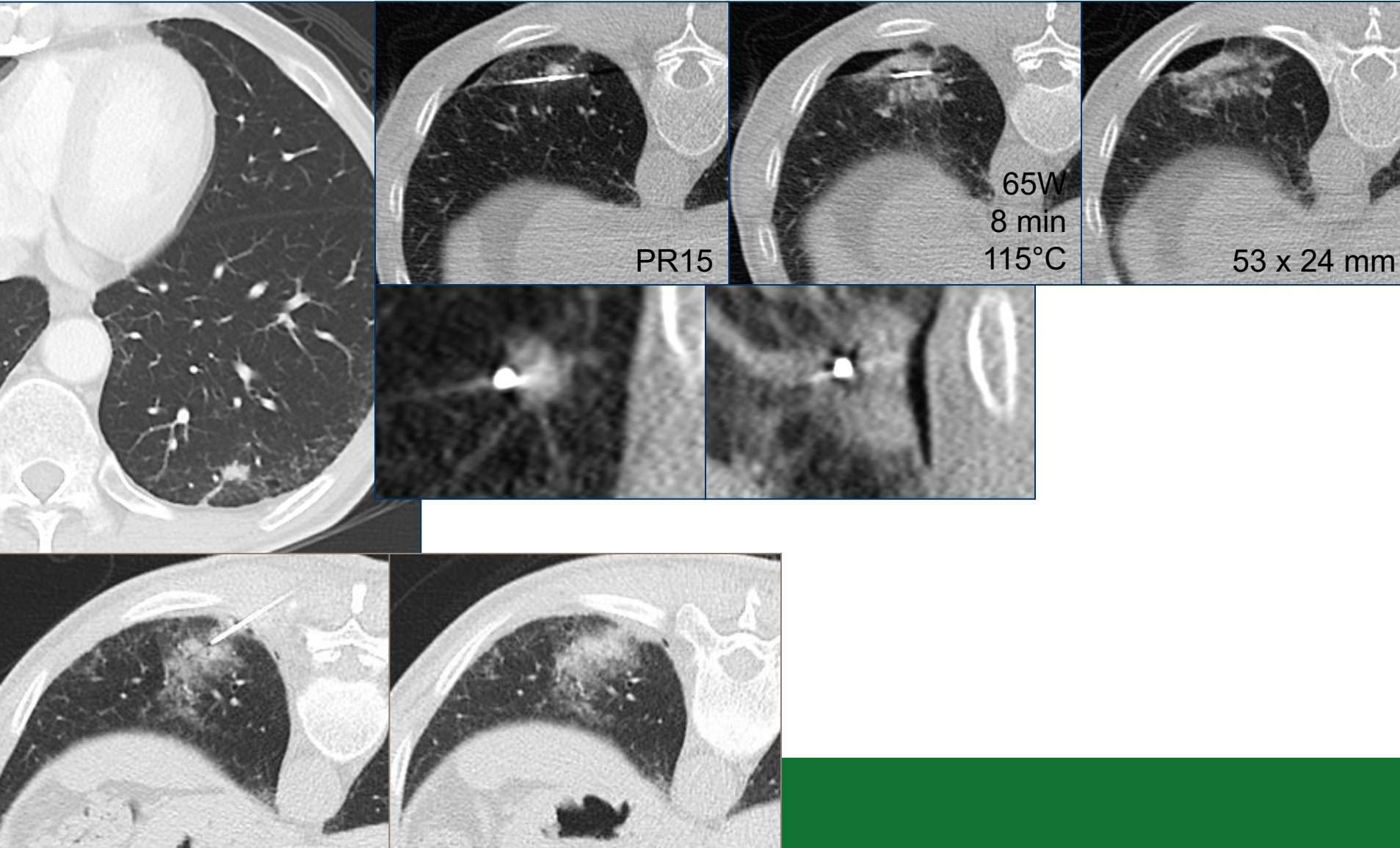
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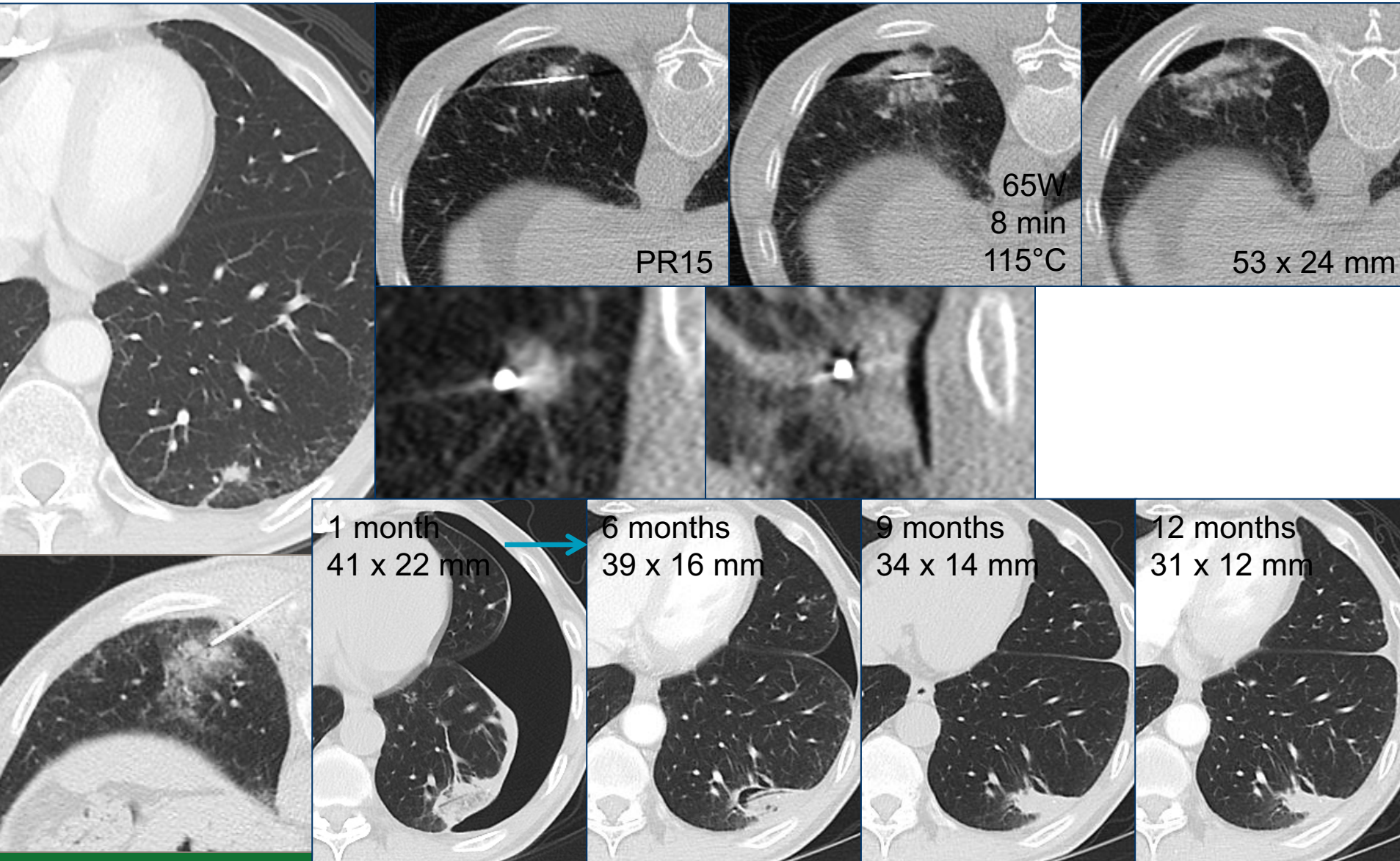
Preserve Margin Visualization: Hemorrhage



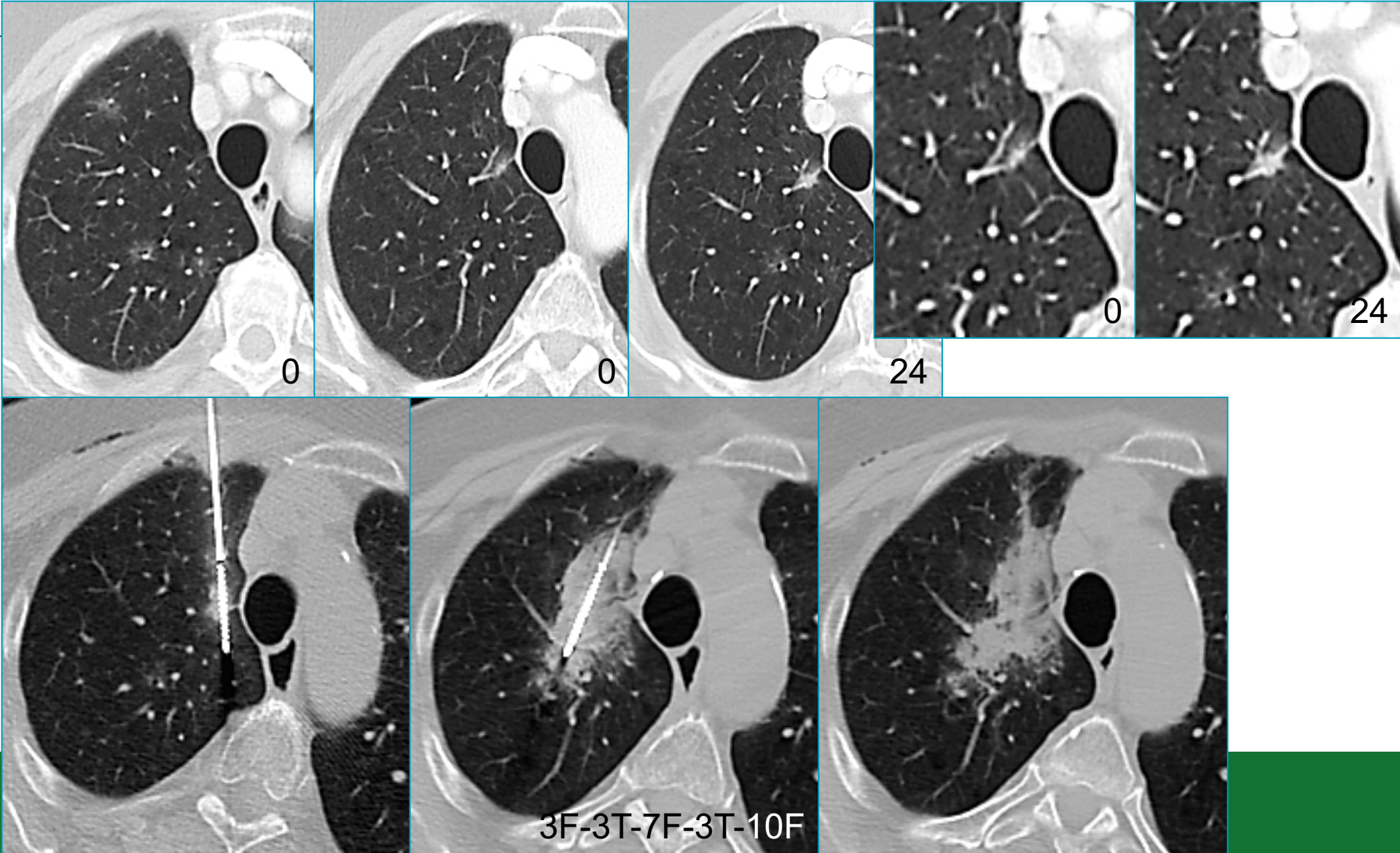
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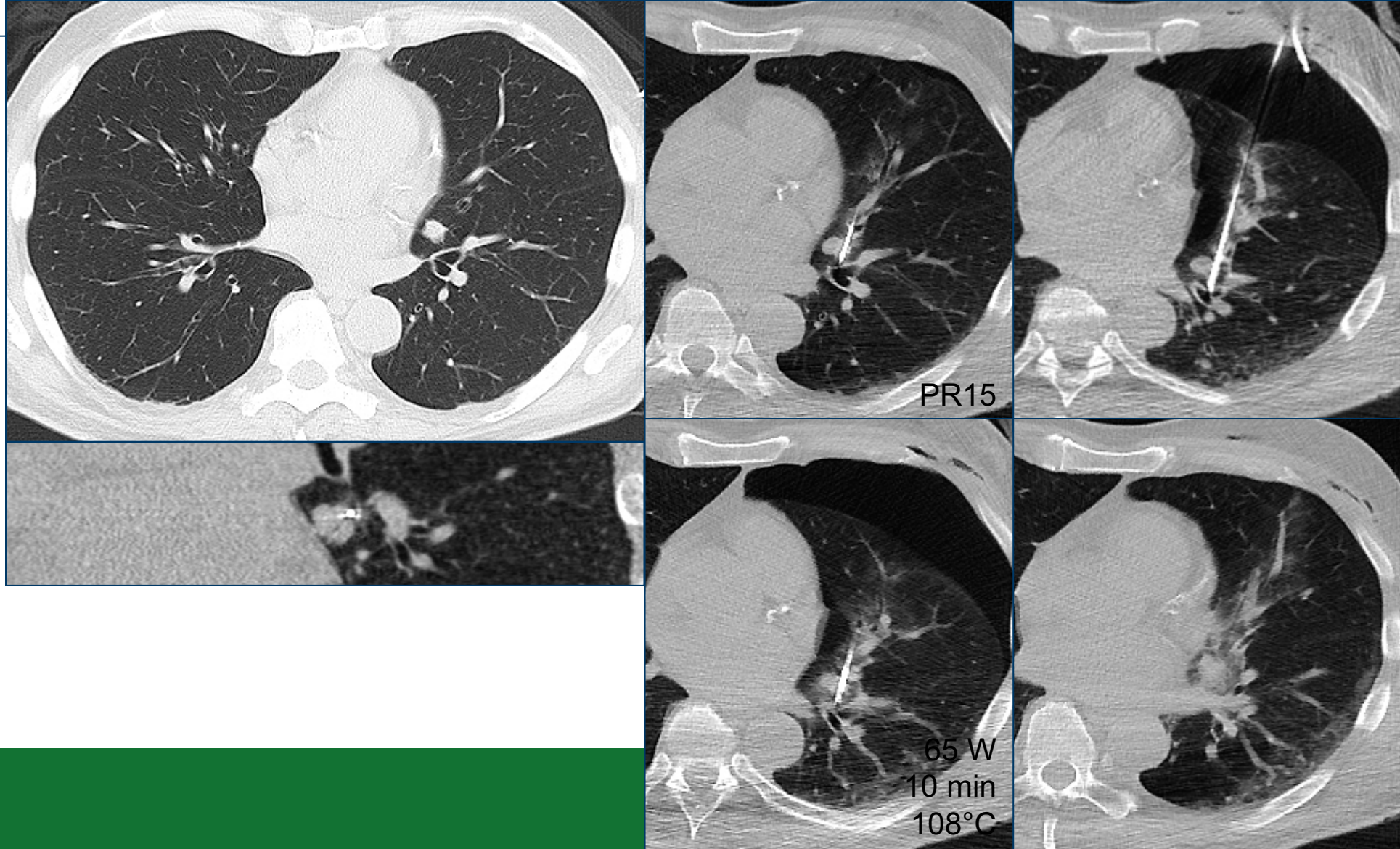
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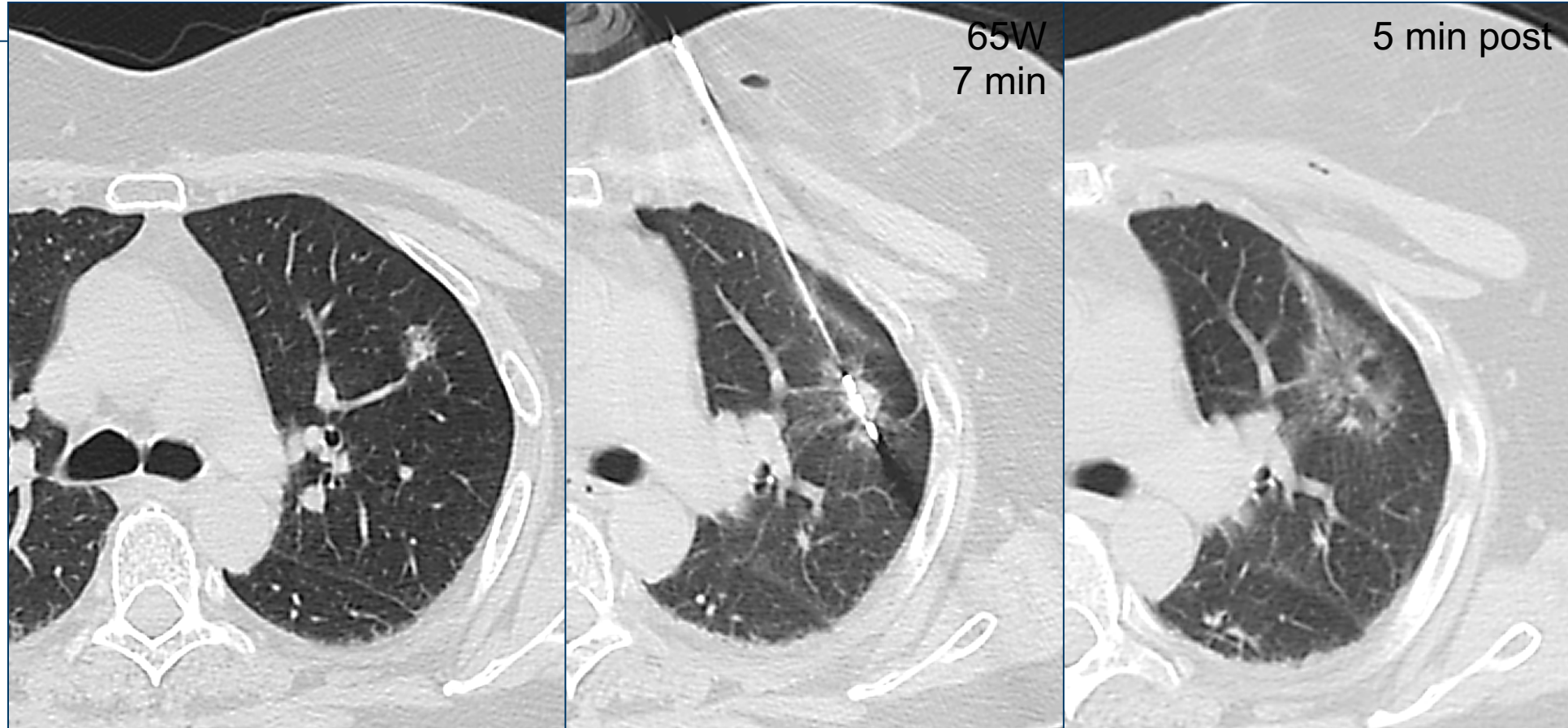
Minimize Collateral Damage: Favorable Relocation



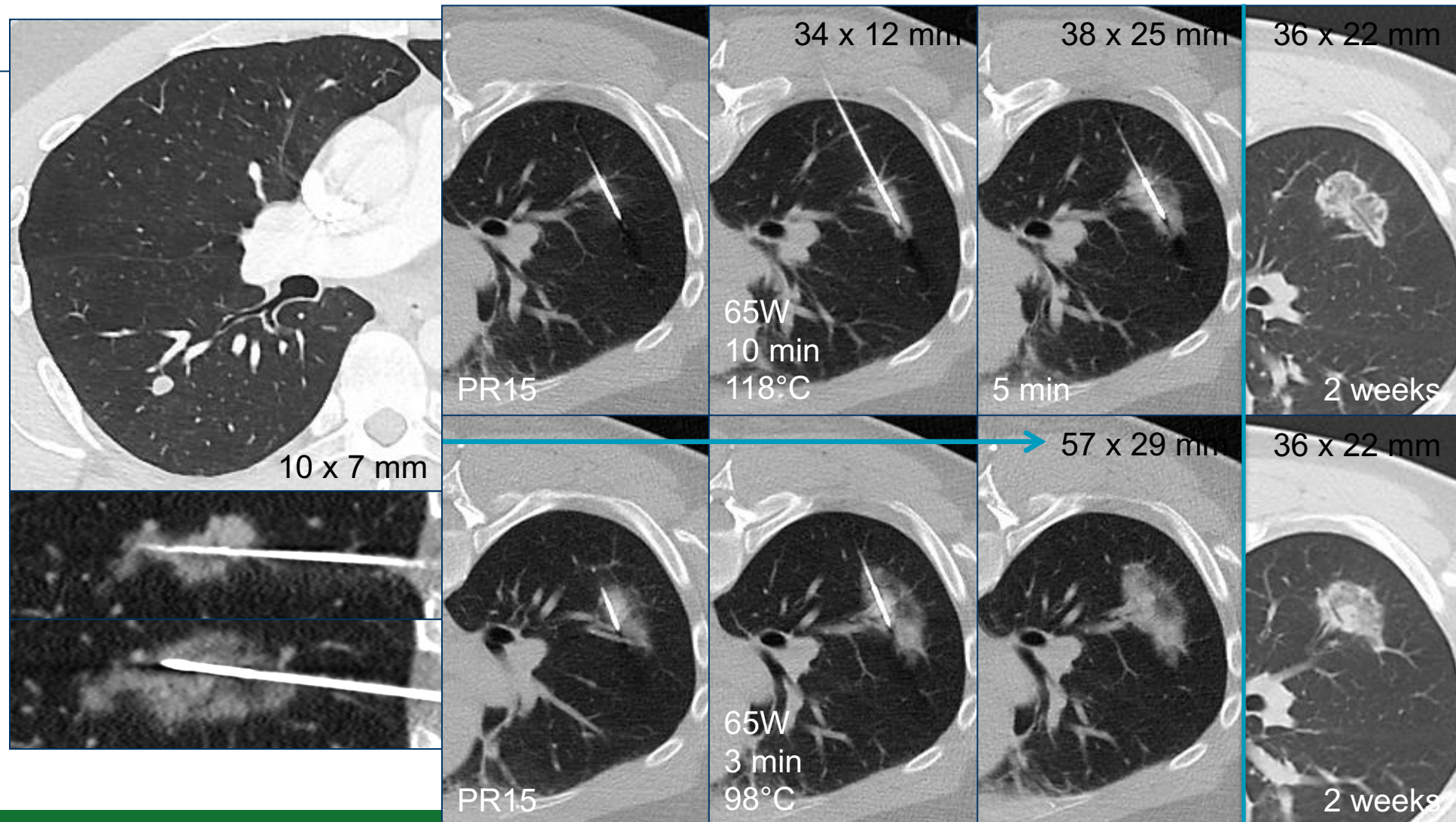
Minimize Collateral Damage: Air Offset



Ensure End-Ablation Margins: Ground Glass Delay



Ensure End-Ablation Margins: Reformatted Images

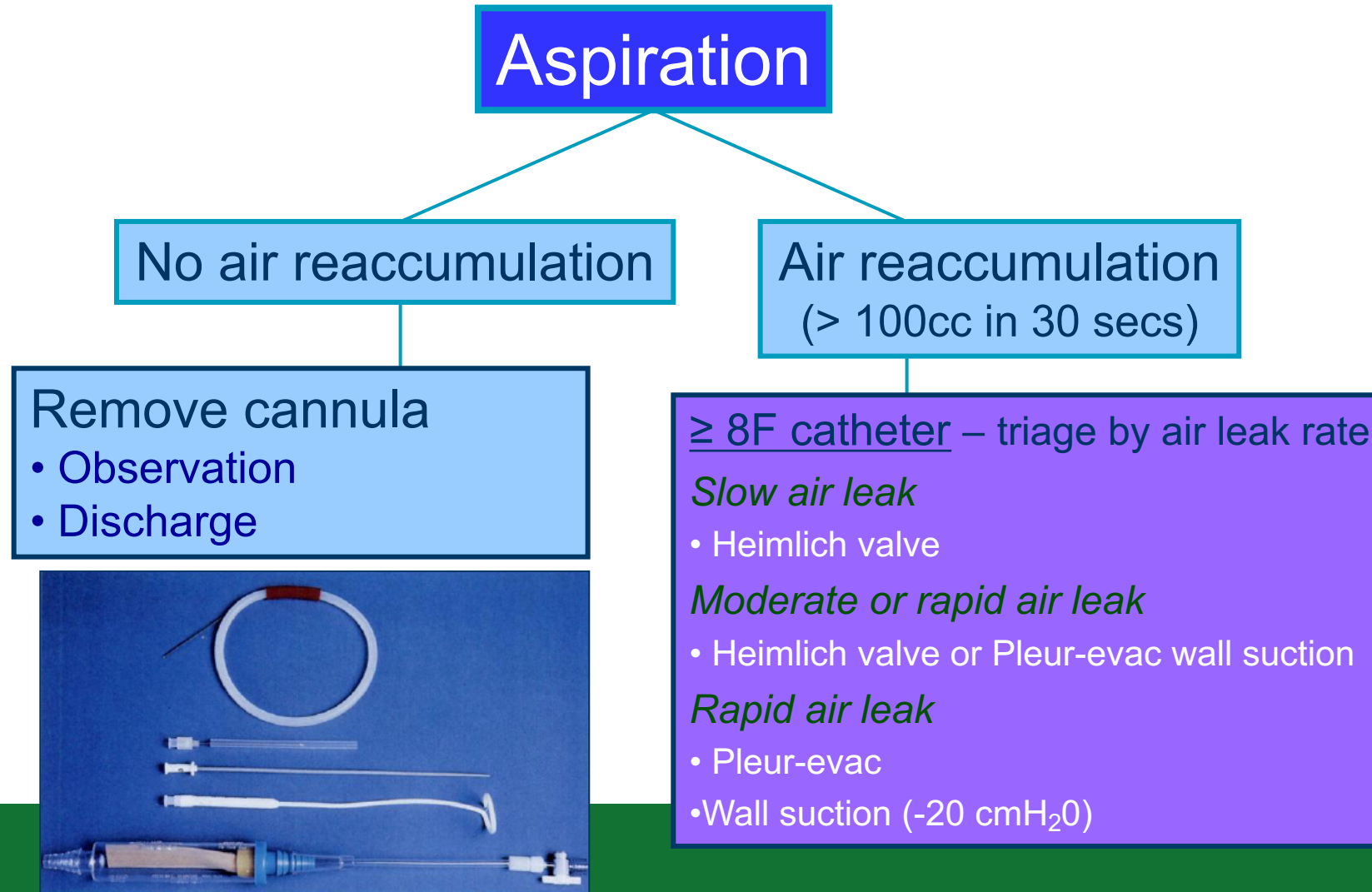


Complication Management: Post-Ablation Care

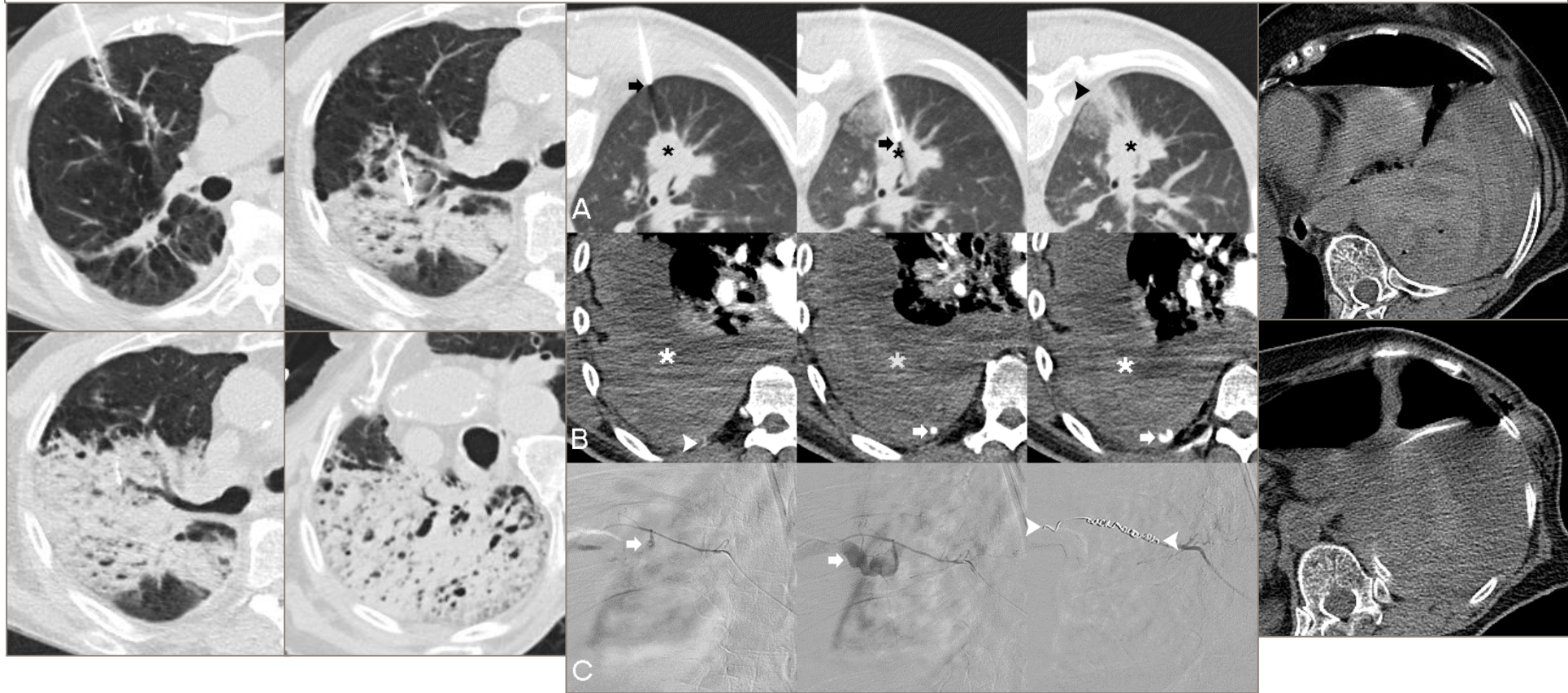
Prolonged Post-Ablation Pain (> 1 week) Management

- Anti-inflammatory agents (NSAIDS): continuous
- Narcotics (oral and/or patch): breakthrough pain
- Pulse corticosteroid therapy
- Anticonvulsant drugs
 - Gabapentin (Neurontin)
 - Pregabalin (Lyrica and Serigaplin)
- Lidocaine patch 5% (Lidoderm 700 mg: 50 mg/g of adhesive)
- Intercostal nerve block (temporary vs. permanent)
- Local comfort measures (hot or cold packs)
- Considerate parietal pleural and intercostal nerve ablation

Complication Management: Pneumothorax



Complication Management: Hemothorax

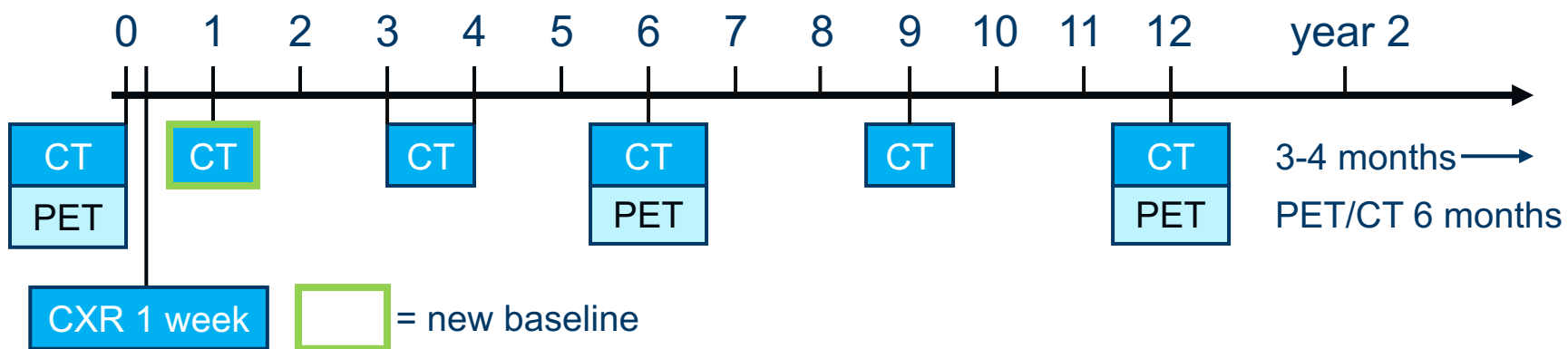
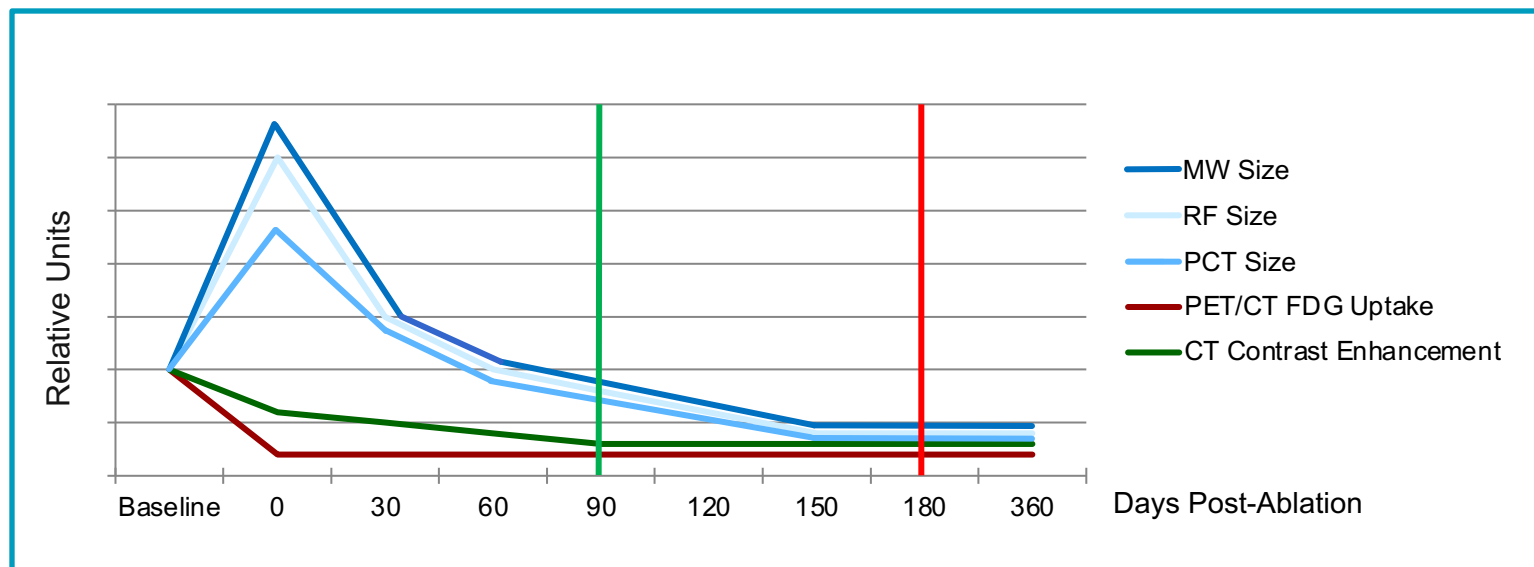


Supportive
Positional
Bronchoscopy

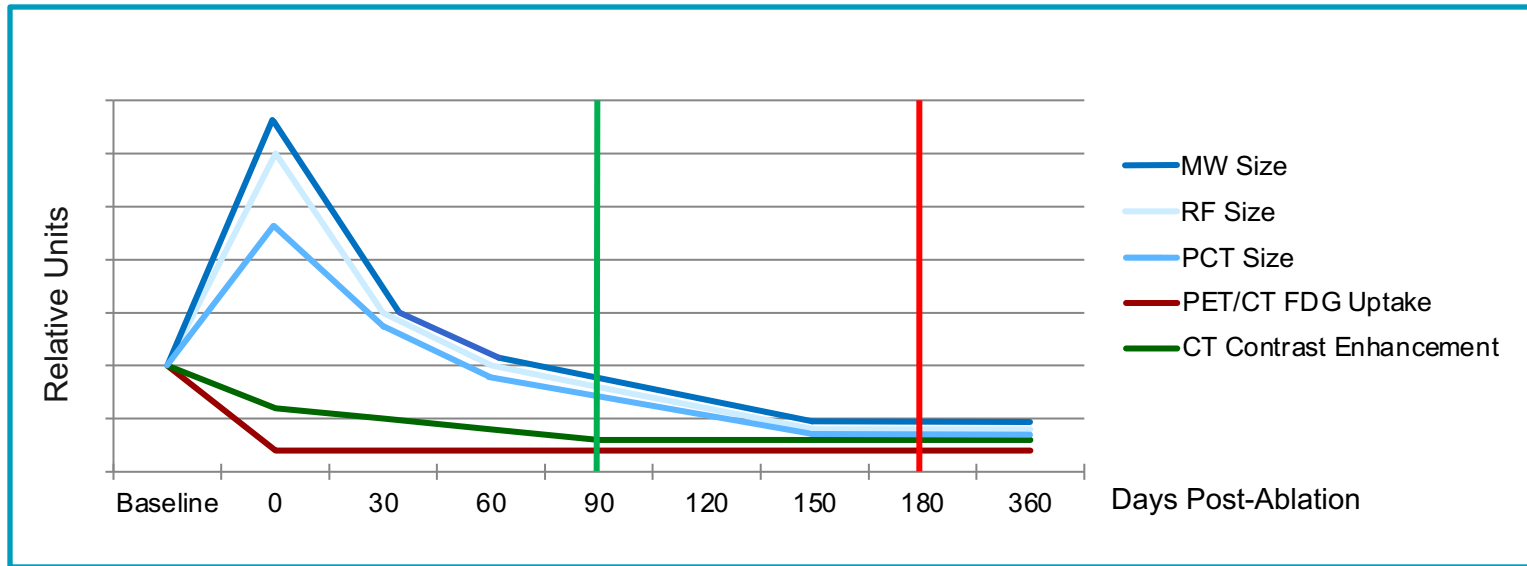
Self-tamponade
Embolization
Evacuation

Apposition
Drainage
Evacuation

Imaging Follow-Up: Thermal Ablation Timeline



Imaging Follow-Up: Post-ablation Tumor Progression



- Growth at ablation site (WHO criteria) after 3(6) months
 - For cryoablation, significant enlargement ≥ 1 month
- $\uparrow$ contrast enhancement (> 15 HU) at ablation site after 3(6) months
 - Nodular and/or central enhancement > 15 mm (10 mm)
- FDG activity at 1(4) months: focal and rim + focal corresponding

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