

Toward Planning As Control and Tissue Sparing Needles

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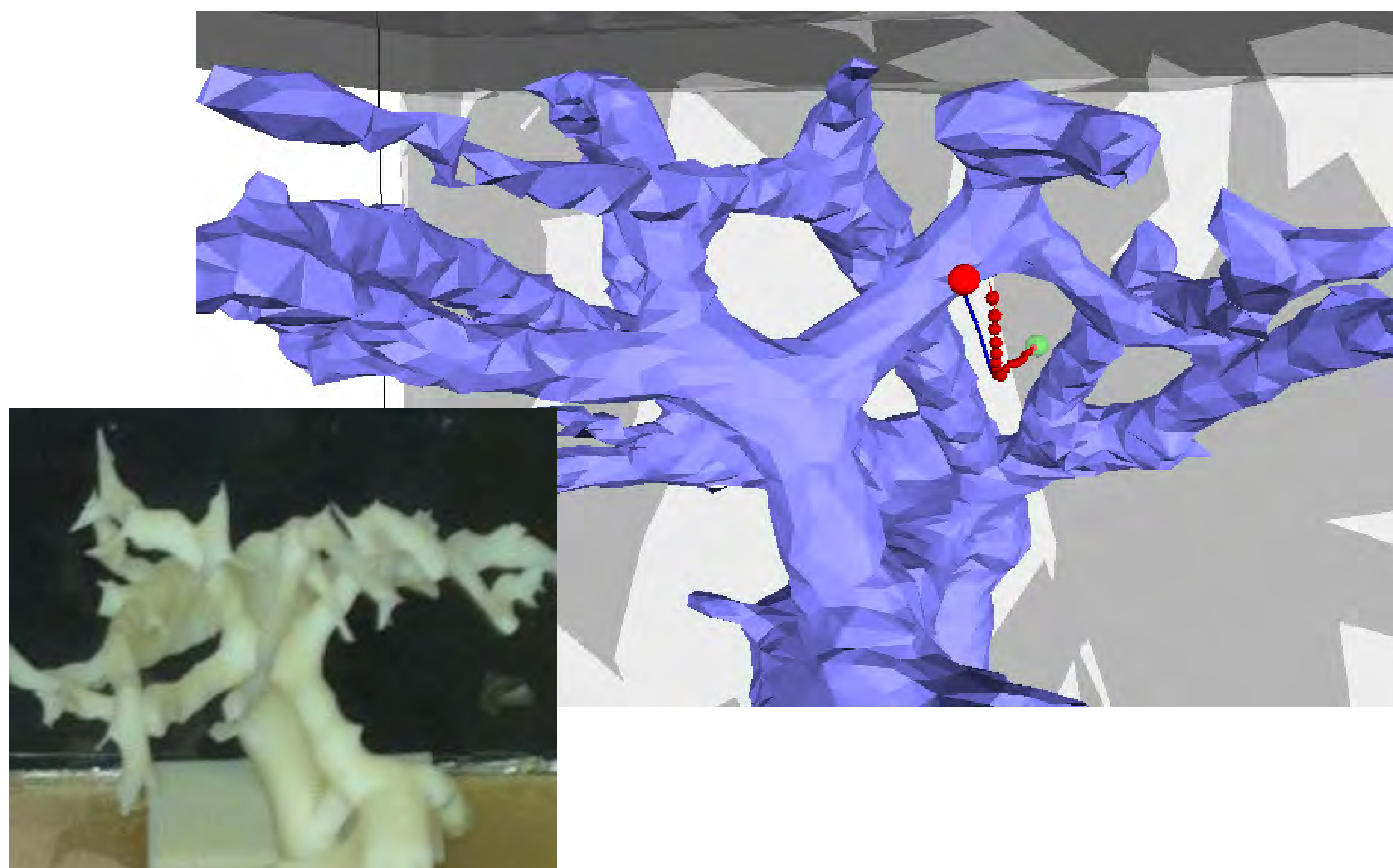
Objectives

- Experimentally investigate the "rapid replanning as control" paradigm for needle steering around obstacles
- Create a needle with the steerability of a kinked tip, but which causes less tissue damage



Application

Liver vasculature and bile ducts are obstacles to be avoided during needle-delivered therapy.



Experiments



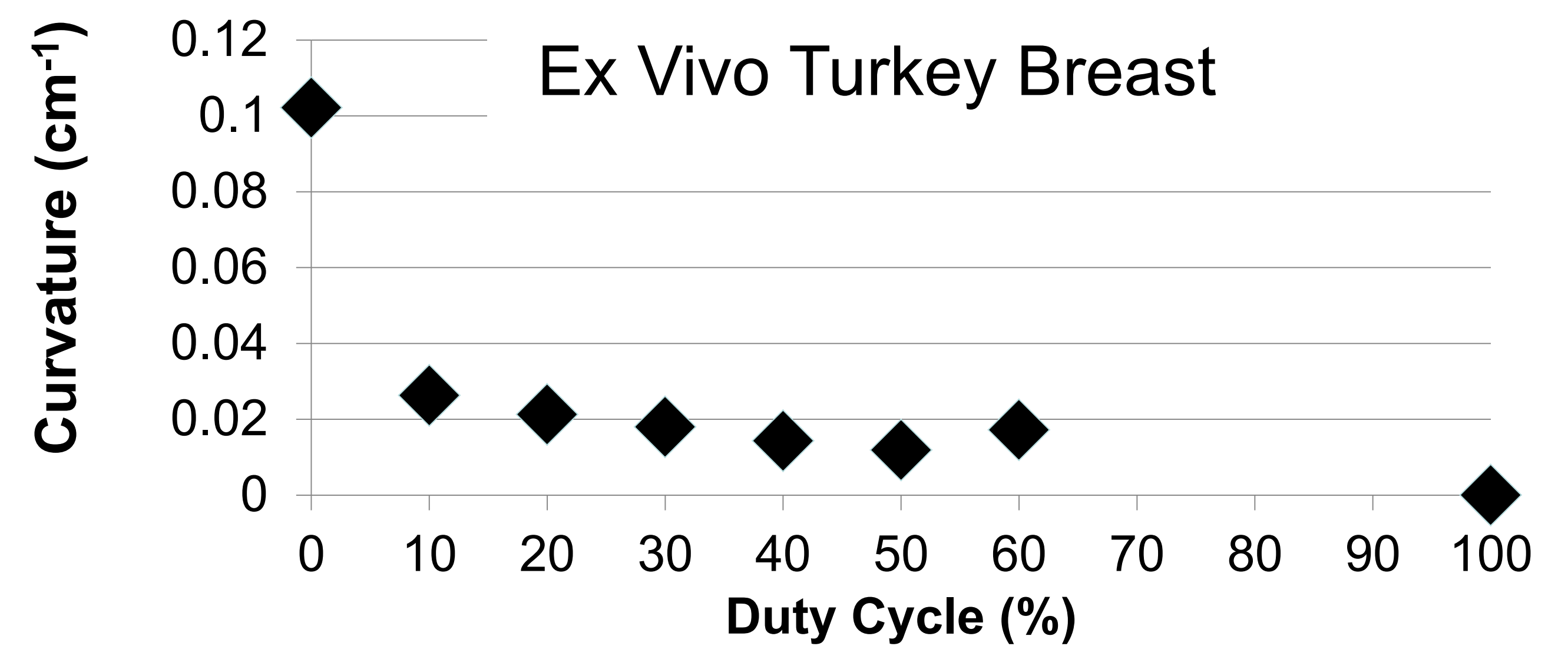
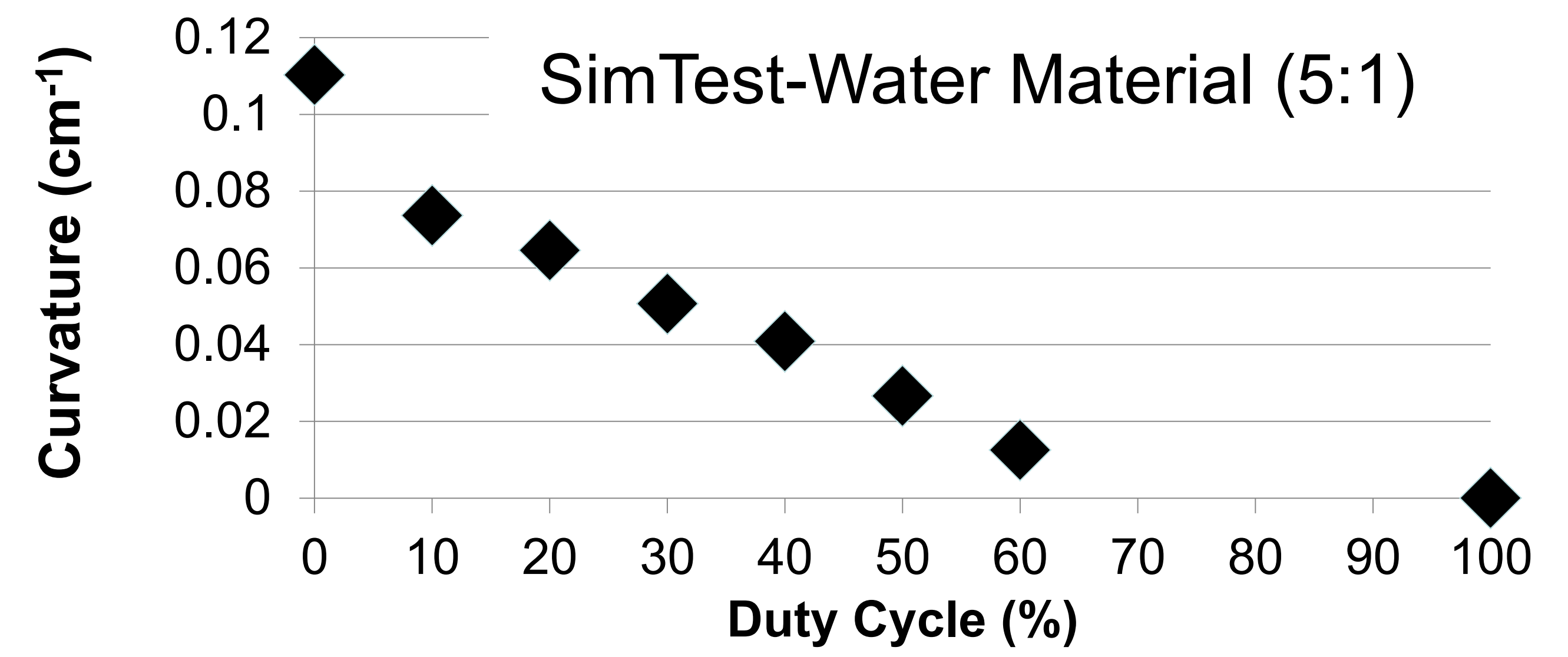
Homogeneous SimTest Material

- 28 Insertions, 9.5 – 12 cm deep
- Tip Error: 3.5 ± 2.6 mm

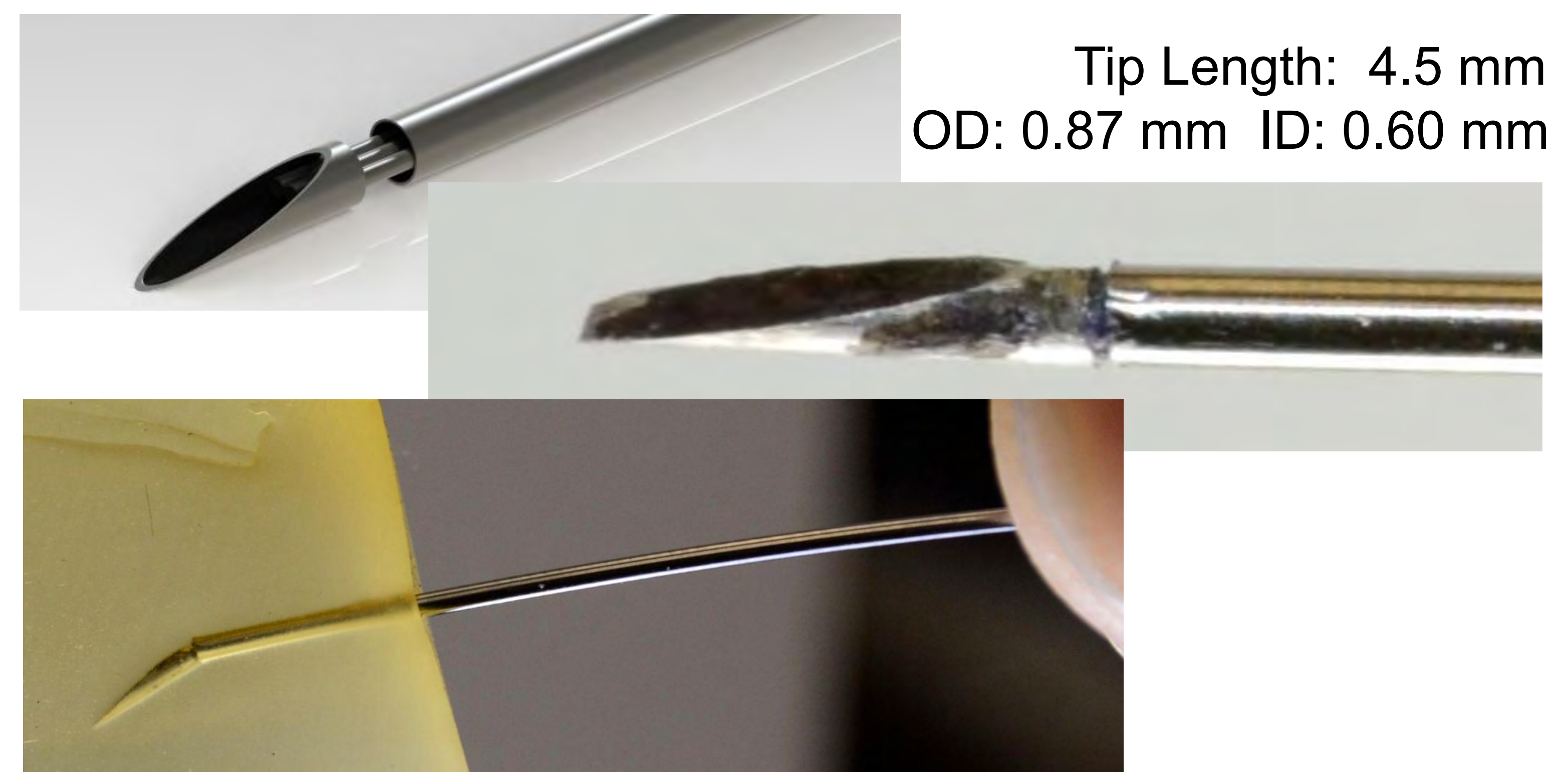
SimTest Material with Liver Vasculature Phantom

- 16 Insertions, 9.5 – 12 cm deep
- Tip Error 5.9 ± 2.6 mm

Duty Cycling Calibration



Tissue-Sparing Flexure Tip



Tissue Damage Comparison

