AbstractID: 13981 Title: Intravascular imaging with storage phosphor detector

Purpose: To develop and test an intravascular positron imaging system based on a storage phosphor (SP) detector for imaging vulnerable plaques of human coronary arteries. **Materials and methods:** The positron-emitting radiotracer F18-FDG accumulates in vulnerable arterial plaques with inflamed overlying cap; thus vulnerable plaques could be imaged by an intravascular positron detector located at the end of a cardiac catheter. An experimental intravascular imaging detector was constructed as a SP tube with 55 mm length, 2 mm diameter, and 0.28 mm wall thickness. A light diffuser with 0.9 mm diameter and 55 mm length is inserted into the SP tube to erase signal accumulated in the SP during fluoroscopic guidance of catheter insertion. The light diffuser was connected to a 0.38 W laser source through a 2 m long optical fiber. A heart phantom with 300 cm^3 volume, and 3.2 mm diameter coronary arteries with plaques was fabricated. 0.5 $\mu Ci/cm^3$ FDG solution filled the heart and coronary arteries, with a range of activities in the plaques. The detector was inserted in a coronary artery and the plaques were imaged for 2 min. The detector was extracted and read out in 2 min using a SP reader. **Results:** The light diffuser erased the fluoroscopic x-ray signal of the SP to background levels. Vulnerable plaques with area activities of 1.2 nCi/mm^2 and higher were visualized. This activity is a factor of 10 lower than that expected in human vulnerable plaques. The detector can image the internal surface of 50 mm long vessels with 0.6 mm FWHM spatial resolution in a single measurement. The detector is flexible, easy to handle, and provides virtually real time imaging. **Conclusion:** The intravascular detector provides sensitivity, spatial resolution, flexibility, and imaging times that are well suited for clinical imaging of vulnerable plaques of human coronary artery.