

AbstractID: 3656 Title: Optical imaging of tumor microvasculature in 3D

Purpose: Great interest exists at present in determining methods to image and understand tumor micro-vasculature structure and how it can be perturbed by a variety of agents, including radiation and anti-angiogenic drug therapies. Present methods including micro MRI and micro CT can yield high spatial resolution, but limited contrast in micro-vasculature makes determining subtle 3D structure problematic. We have developed a non-destructive optical method for imaging tumor micro-vasculature which can yield significantly greater image resolution and micro-vasculature contrast than achievable with existing technique.

Method and Materials: Murine tumor micro-vasculature staining was achieved by in-vivo tail vein injection of dark-dye solution. After several minutes the HTC116 (human colon cancer) tumor was removed, washed in saline solution and set in 1% agarose gel. Tumor tissue was then taken through a clearing process prior to optical imaging. Light from a diffuse white light source was caused to traverse through the tumor tissue and a projection image was acquired using focussing optics and a CCD camera. Quantitative images of microvasculature density were reconstructed from projections acquired at multiple angles.

Results: Good optical transmission was achieved through significant tumor samples (e.g. 1x1x1cm). Excellent contrast was observed between microvasculature and surrounding tumor tissue. Very high resolution (5 micron) isotropic 3D reconstructions were achieved through large whole mount murine tumor sample. The method can provide quantitative maps of micro-vasculature density throughout the tumor sample.

Conclusion: We present a novel technique for imaging 3D micro-vasculature in tumor and normal tissue with unprecedented image resolution and contrast. Quantitative analysis of microvascular density in whole mount (i.e. unsliced or undisturbed) large tumor specimens is possible. The technique has potential as a valuable new tool for the analysis of tumor microvasculature and the effects of vascular perturbing agents (e.g. anti-angiogenic drugs and radiation).

Conflict of Interest (only if applicable):