Fast new method for mapping blood vessels may aid cancer research

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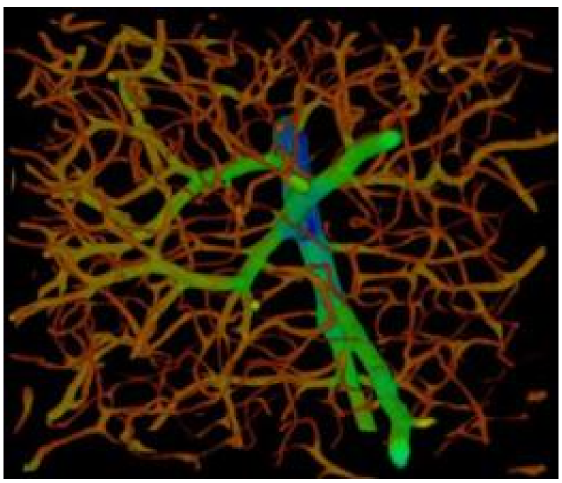
Complex network of blood vessels in the mouse brain imaged by knife-edge scanning microscopy. The image represents an area about 2.9 millimeters across. Credit: *Biomedical Optics Express*

Like normal tissue, tumors thrive on nutrients carried to them by the blood stream. The rapid growth of new blood vessels is a hallmark of cancer, and studies have shown that preventing blood vessel growth can keep tumors from growing, too. To better understand the relationship between cancer and the vascular system, researchers would like to make detailed maps of the complete network of blood vessels in organs. Unfortunately, the current mapping process is time-consuming: using conventional methods, mapping a one-centimeter block of tissue can take months.

In a paper published in the October issue of the Optical Society's open-access journal *Biomedical* Optics Express, computational neuroscientists at Texas A&M University, along with collaborators at the University of Illinois and Kettering University, describe a new system, tested in mouse brain samples, that substantially reduces that time.

The method uses a technique called knife-edge scanning microscopy (KESM). First, blood vessels are filled with ink, and the whole brain sample is embedded in plastic. Next, the plastic block is placed onto an automated vertically moving stage. A diamond knife shaves a very thin slice – one micrometer or less – off the top of the block, imaging the sample line by line at the tip of the knife.



Reconstruction of a small section from the previous image, showing the relative thickness of each blood vessel in the network (color-coded by thickness). The area depicted in the image is about 0.275 millimeters across. Credit: *Biomedical Optics Express*

Each tiny movement of the stage triggers the camera to take a picture. In this way, the researchers can get the full 3-D structure of the mouse brain's vascular network – from arteries and veins down to the smallest capillaries – in less than two days at full production speed. In the future the team plans to augment the process with fluorescence imaging, which will allow researchers to link brain structure to function.

More information: "Fast macro-scale transmission imaging of microvascular networks using KESM," Biomedical Optics Express, Mayerich et al., Vol. 2, Issue 10, pp. 2888-2896 (2011).

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