3D imaging of microvessels as a tool to evaluate angiogenesis in prostate cancer

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Angiogenesis is considered one of the hallmarks of solid tumour initiation and progression. Angiogenesis is described as the sprouting of new capillaries from existing blood vessels [1] and is known to play a critical role in cancer growth and development. It also provides a conduit for circulating tumour cells (CTCs) and plays a significant role in the metastasis of prostate cancer. An altered pattern of the vasculature and progressively increasing number of microvessels are observed with cancer progression, and emerging cancer treatments are based on the suppression of angiogenesis. Imaging the changes in the microvasculature that are caused by angiogenesis may provide an important tool to diagnose and further improve the treatment of prostate cancer. In this study, we demonstrate the new application of array tomography (AT) to generate three-dimensional (3-D) data from resin embedded prostate tissue prepared routinely for electron microscopy. This new imaging technique allows an automatic acquisition of a large field of view with an x/y resolution of up to 1-2 nm which is sufficient to image the sprouting of capillaries from blood vessels giving a comprehensive model of cell proliferation and migration. Furthermore, it clarifies the relationship between tumour growth and the growing vascular supply.

[1] Murray C. Killingsworth and Xiaojuan Wu, Pathobiology 2011.