Phase contrast X-ray tomography for investigation of spine and spinal cord of ex-vivo small animals

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The modern high-resolution 3D imaging techniques such as X-ray Phase Contrast micro-Tomography provide great insight into the internal structure of objects. However, given the complexity of biomedical objects, it is often difficult for researchers to interpret and analyze data in a meaningful and efficient manner without destructive preparation of the samples. We present here Phase Contrast micro-Tomography imaging combined with relevant computational platform to get high-resolution and high-contrast 3D images of the spinal cord without the need of contrast agents, or of destructive sample preparations such as removing the vertebrae in ex-vivo small animal models. In addition, we proposed and tested Simultaneous Iterative Reconstruction method with Total Variation regularization as a tool to reduce X-ray exposure time during the scan and prevent the motion artefacts formation in high-resolution 3D image of the spinal cord. We demonstrated that micro-XPCT with sparse set of tomographic projections preserves the visualization details in spinal cord surrounded by vertebrae.