X-ray phase-contrast imaging shows improved soft-tissue contrast compared to standard absorption-based X-ray imaging. Especially the grating-based method seems to be one promising candidate for clinical implementation due to its extendibility to standard laboratory X-ray sources. Therefore the purpose of our study was to evaluate the potential of grating-based phase-contrast computed tomography (PCCT) in combination with a novel bi-lateral denoising method for imaging of focal liver lesions in an ex vivo feasibility study. Our study shows that grating-based phase-contrast CT (PCCT) significantly increases the soft-tissue contrast in the ex vivo liver specimens. Combining the information of both signals - absorption and phase-contrast - the bi-lateral filtering leads to an improvement of lesion detectability and higher contrast-to-noise ratios. The normal and the pathological tissue can be clearly delineated and even internal structures of the pathological tissue can be visualized, being invisible in the absorption-based CT alone. Histopathology confirmed the presence of the corresponding findings in the analyzed tissue. The results give strong evidence for a sufficiently high contrast for different liver lesions using non-contrast-enhanced PCCT. Thus, ex vivo imaging of liver lesions is
possible with a polychromatic X-ray source and at a spatial resolution of ~100 µm. The post-processing with the novel bi-lateral denoising method improves the image quality by combining the information from the absorption and the phase-contrast images.