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In Vivo X-Ray Digital Subtraction and Computed Tomography
Angiography of the Murine Cerebrovasculature

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In cerebrovascular research, investigation of the anatomy, patency, and function of arterial and venous vessels in small animal models of cerebral ischemia, venous thrombosis, or vasospasm has become indispensable. Due to their extremely small caliber, the in vivo examination of these vessels is extremely difficult. In the underlying work the development of a method for digital subtraction angiography (DSA) of the murine cerebrovasculature using a micro-CT is described. The external carotid artery (ECA) of C57BL/6J-mice (n=5) was catheterized. During intra-arterial injection of iodized contrast agent (33 μ l/1sec), 2D-DSA of the intra- and extra-cranial vessels was performed. DSA provided high-resolution images of the murine cerebrovasculature with the smallest identifiable vessel calibers of <50 μ m, hereby allowing repeated measurements of changes of the vessel caliber. High temporal resolution (30fps) allowed identification of anastomoses between the ICA and the proximally ligated ECA by detection of retrograde flow within the superficial temporal artery (STA). Additionally, intra-arterial injection (220 μ l/20sec) allowed generation of high-resolution, high-contrast 3D-micro-CT angiography datasets within 20 seconds scantime that allowed identification of collaterals between the pterygopalatine and STA. To conclude, DSA of the murine cerebrovasculature is feasible using a micro-CT and allows precise and repeated measurements of the vessel caliber while providing relevant information on blood flow in vivo.