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An in vivo Microcomputed Tomographic 3D reconstruction of vasculature and organs of Rat

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The morphological and volumetric investigation of organs and disease progression in experimental animal models involve many invasive procedures such as the handling and restraint of the animal. These acts cause animal pain, suffering or distress and impact on the animal welfare influencing experimental outcome. Microcomputed tomography (micro-CT) is an ideal technique for in vivo quantifying both acute and chronic diseases in diachronic studies and for understanding the morphological development and regeneration of organs without interfere with animal welfare. The micro-CT detection improve the 3Rs principle for performing more humane animal research reducing the number of animals used during longitudinal in vivo tests as recommended by the Directive 2010/63/EU and Italian D.Lgs 26/2014. This technique clarify the inter-hierarchical relationship between microscopic and organ-level tissue deformation dynamics if associated with the In Vivo Imaging System (IVIS) scanner revealing the molecular and cellular activities of drugs. The information provided by this technique is complementary to histological and anatomopathological evaluation and it is used by researchers to investigate preclinical animal models: oncology, angiogenesis, neurodegenerative disorders, inflammation, cardiovascular, infectious diseases, etc. Therefore, non-invasive micro-CT imaging technique provide reliable images of skeleton, organs, tumours, and responses to exogenous substances can be spatially and temporally monitored is associate with IVIS scanner. Furthermore, it allows serial studies on the same animal, reducing inter-animal variation and the number of samples needed to achieve statistical significance. This study provide an anatomical study by using a Micro-CT scan as compendium about the in vivo anatomy of the rat to show details of the internal organs of the whole body and improve the knowledge on the animal model used in many experimental model. The images performed illustrate the high precision of scanned organ anatomy and monitoring differences in shapes during organogenesis and diseases. This high-resolution imaging study is a highly accurate anatomical atlas performed by a nondestructive method and explores the orientation-independent measures of the organ structure in the animal models virtually moving the sample and exploring it from any perspective to gain a greater understanding of the morphologic characteristics.

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Key words

In Vivo imaging, animal model, vascolature, rat anatomy organs, micro-computed tomography.

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