

High-quality digital 3D reconstruction of the terminal pathway of a heart stab wound

Andrea Porzionato¹ - Diego Guidolin¹ - Veronica Macchi¹ - Cristina Mazzarolo² - Cinzia Tortorella¹ - Gloria Sarasin¹ - Anna Rambaldo¹ - Raffaele De Caro¹

¹ Sede di Anatomia Umana, Università degli Studi di Padova, Padova, Italia - ² ULSS 12, Venezia, Italia

High-quality digital 3D reconstructions of microscopic findings have been involved in anatomical and histopathological research, but their potentialities in forensic pathology may also be of particular interest. We here present the use of such methods to furtherly analyse a heart stab wound in a suicidal case. External examination revealed multiple incised wounds on the wrists, three stab wounds at the neck and a single stab wound on the chest. At autopsy, injuries to the neck and wrists were superficial whereas the thoracic stab wound penetrated the chest wall and pericardium. Heart examination showed an 8-mm-long stab wound on the anterior surface of the left ventricle. Heart sectioning and inspection of the correspondent internal aspect of the left ventricle did not show a macroscopic injury, but the irregularity of the trabeculae carneae did not permit to exclude a microscopic pathway. Thus, the heart wall including the stab wound was paraffin-embedded and subjected to complete sectioning for microscopic analysis along all the wound extension. Every 10th section was stained with haematoxylin-eosin and was acquired by using a Leica DMR microscope and a high resolution digital camera. The three-dimensional aspect of the lesion was reconstructed with a software system for 3D computer graphics. Microscopic examination and 3D reconstruction demonstrated that the lesion extended to the internal surface of the ventricle wall, although for a very limited extension. 3D reconstruction also showed a certain curvilinear pattern of the lesion in the myocardium, consistent with myocardial contraction at the moment of injury and consequent vitality of the lesion. Moreover, 3D reconstruction permitted to obtain the dimensions of the intra-myocardial injury (corrected for shrinkage and evaluated in the context of muscle contraction), also permitting to furtherly confirm the identification of the knife involved. In conclusion, the present case is indicative of how complete microscopic sectioning and 3D reconstruction may add further information about characteristics of injuries of forensic interest.