

Histology in forensic practice

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Histology is an indispensable part of clarifying cause and manner of death. The different stages in the determination of cause and manner of death can be summarized as follows: external examination, autopsy, supplementary investigations such as histology, immunohistochemistry, toxicology, postmortem biochemistry and molecular pathology [1]. The external examination has the lowest evidential value; a much higher evidential value results of course from the autopsy. Histology is a routine part of postmortem examination not only in cases in which the cause of death remains unclear based on macroscopic findings. Even in cases where the causes of death appear clear, routine histology may provide valuable information for solving a case. For example, Bauer et al. [2] reported the case of a homicide (strangulation with subsequent burning) where routine histology of the uterus revealed chorionic villi in the uterus due to a terminated pregnancy. Using laser microdissection and PCR technology it was possible to perform paternity testing, enabling investigators to identify a suspect as father of the child and also as murderer of the woman. Without having performed histology, no one would have identified the chorionic villi, which were essential for resolving the case. Therefore, in most autopsies, and especially in all criminal cases, the forensic pathologist will have to carry out a thorough histological examination, even if only to exclude the possibility of occult natural disease [3].

There are clear national and international customs, guidelines and recommendations for retaining tissues for

histological examinations. According to the recommendation no. R (99) 3 of the Committee of Ministers of the Council of Europe on the harmonization of medico-legal autopsy rules dated 1999, the basic sampling scheme includes specimens from the main organs for histology in all autopsies. If the cause of death cannot be established with the necessary degree of certainty, sampling should include additional specimens and fluids.

If death is related to physical violence, sampling includes the injuries, e. g. in order to determine wound age and identify any foreign materials in the wounds. If strangulation or the application of physical force to the neck is suspected or diagnosed, the entire neck structures, muscles and neurovascular bundles have to be preserved for histology.

Histology represents a necessary prerequisite for a complete investigation of a case, for adequate training and, of course, for collecting material for current and future research. The importance of a systematic training in histology cannot be overemphasized. For example for post-graduate training in forensic medicine in Germany, a minimum of 2,000 histological investigations are mandatory [4]. Histology is necessary for systematic studies on the pathogenesis of diseases, tissue alterations from environmental trauma, to highlight the evidential value of minor tissue changes, for the exclusion of concurrent causes of death, and last but not least, for performing systematic research with new techniques and new approaches [1, 5]. In many European countries forensic medicine is thankfully still university based and therefore the scientific demand is of course higher than just being restricted to determining cause and manner of death on a macro-pathological level. Compared to an autopsy alone, histology is a powerful diagnostic tool which assists in the study of diseases, tissue changes following trauma, and wound

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healing processes etc., on a different and higher morphological level. Progress in pathology and forensic pathology has been achieved by systematic research [6, 7].

In cases where no further results can be expected from histology, e. g. with advanced putrefaction, microscopy may not be necessary. However, this always depends on the case. Altogether nothing is so trivial and small that it cannot become a decisive factor in medico-legal proceedings [7]. Having not retained tissues and performed histology may represent a crucial deficit in some cases.

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