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Commentary

Histopathology Diagnostics of Tumour Tissue by Microscopy

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DESCRIPTION

Tumor pathology is the most common genetic disease. Considering the complexity of the mechanisms causing cancer, recent developments in DNA sequencing have made it possible to identify the molecular genetics factors. Giant Cell Tumours of bone (GCTs) are common tumour types that tend to impact younger generation more frequently. Although these tumours are termed benign neoplasms, they usually experience local recurrences with detrimental functional effects, and occasionally a metastatic process is linked to their development. Tumor tissue is collected by cytology, needle biopsy, or surgical excision and is transferred to the pathology laboratory for both cellular and molecular pathology. The tumour is usually removed, macroscopically evaluated, and fixed in formaldehyde solution. The advantage of formalin fixation followed by paraffin embedding of tumour specimens is that the (intra) cellular histology of the tumour can be permanently preserved while being stored at room temperature for extended periods of time.

Alternative fixation procedures, such as formic acid and flash freezing in liquid nitrogen, are also intended to preserve tissue, cellular, and nuclear structures. To conduct chemical or immunohistochemical staining and histopathology diagnostics of the tumour tissue by microscopy sections of the fixed material are removed. These identical specimens can be utilised by a number of cytogenetic and molecular techniques. Patient materials long - lasting durability have accumulated as a result of the storage of FFPE (Formalin Fixation of Paraffin Embedding) samples. A significant portion of these collection contents are accompanied with patient reports describing the course of their illness and treatment, making them an invaluable resource for retroactive biomarker research. In addition to long-term storage, is the pathologist's ability to label tumour tissue and easily scrape tumour tissue away from normal cells prior to DNA isolation. However, there are disadvantages to using FFPE tumour specimens for genetic research. All proteins are fixed by formalin fixation, which is appropriate for morphology and immunohistochemistry but damages DNA in the process.

When DNA is extracted from FFPE samples, it is damaged by nicks and gaps, modified by the deamination-hydrolysis procedure that converts a cytosine into a uracil, fragmented into small pieces, and cross-linked, which reduces the DNA's accessibility in subsequent analyses. RNA structures are also impacted by the fixation procedure, and as messenger RNA (mRNA) is inherently unstable, its integrity can be severely affected ex vivo prior to formalin fixation. Furthermore, proteomics analysis decreases from formalin fixation. For cytogenomic diagnostics, acquiring the tissue material itself presents a number of difficulties. To obtain tissue material, a conservative resection method is necessary for quality and high areas like the brain. In many cases, only needle samples are required for histopathologic and molecular diagnostic tests. As a result, the tissue material needed for DNA isolations is unpredictable and frequently limited. Downstream NGS data analysis is made more difficult by the fact that the tumour tissue material is typically a heterogeneous mixture of genetically different tumour cells and involves various normal cells. Specific tumour clones may completely disappear from the biopsy due to local sampling. Standardization and automation after tissue sample collection are difficult due to the necessity of pathology activities in response to DNA or RNA isolation.

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