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1. Immunohistochemistry and immunocytochemistry are fast becoming an indispensable diagnostic tool in histopathology laboratories, discuss

Immunohistochemistry and Immunocytochemistry refers to the demonstration of an antigen in tissue sections through the use of a primary antibody that is directed against a speciﬁc part of the antigen (epitope). The primary antibody-antigen reaction is then further detected using a labelled secondary antibody. Immunoperoxidase is a speciﬁc immunohistochemical detection technique employing peroxidase enzyme conjugated to the secondary antibody, which acts on a speciﬁc substrate (chromogen) to produce a brown color change. This technique is the most commonly used IHC detection method in clinical practice and the term has essentially become synonymous with IHC. Another method that can be used is immunofluorescence, with makes use of fluorescent labels and requires the use of florescent microscope for viewing.

Over the years, hematoxylin and eosin (H&E) technique have been considered the gold standard for the identification of pathologies in biological samples. However, quest for more knowledge in the pathogenesis and progression of some emerging diseases have questioned the indiscriminate continual usage of the H&E technique in the field of diagnostic pathology, hence the adaptation to Immunohistochemistry (IHC). Immunohistochemistry, which is a technique that microscopically detects cellular constituents using specific antibodies have been used for the detection and localization of a variety of microorganisms and other tissue proteins.

IHC has played an eminent role in the histopathological classification of diseases. The detection of specific patterns of immunohistochemical expression and its likely association with a given diagnostic label has become a standard component of a pathologist’s diagnostic perspicacity and, in many ways, dictates much of the ground breaking research in diagnostic histopathology. The ultimate aim of introducing IHC to laboratory medicine is to achieve reproducible and consistent demonstration of antigens with the minimum of background staining whilst preserving the integrity of tissue architecture.

IHC is important because it can be used to demonstrate the earliest changes in transformed tissues, identifying cellular changes not normally visible with H&E. Individual markers for proliferation, apoptosis and specific tumor proteins can be used to help distinguish hyperplasia from neoplasia and determines specific tumor origin/type. IHC provides a relatively rapid and simple method to better determine the origin of neoplastic tissue or investigate the behavior or progression of a given neoplasm. The three distinct roles of IHC which include:

(1) diagnostic IHC;

(2) genetic IHC and

(3) therapeutic IHC have their individual impacts on modern diagnostic pathology

In basic research, IHC has become a crucial technique and is widely used in many medical research laboratories. IHC used to understand the distribution and localization of biomarkers and differentially expressed proteins in different parts of human and animal tissues as ovary uterus. IHC is also used in field of mesenchymal stem cells, embryonic stem cell and Telocytes research area. IHC can also be used to determine specific molecular markers in fundamental biological processes such as proliferation, development and apoptosis.

IHC might also act as a Prognostic marker in cancer, prediction of response to therapy and to detect infectious agent in tissues by use of specific antibodies against microbial DNA or RNA, e.g. in Cytomegalo virus, Hepatitis B virus, Hepatitis C virus. IHC used in the Histopathology of the Respiratory System and lung diagnosis, differential diagnosis and classification of soft-tissue tumors, diagnosis of prostate cancer surgical pathology, practice in the Diagnosis of Bioterrorism Agents, in mammary pathology and breast cancer, Diagnosis of Cutaneous Leishmaniasis, and in oral pathology laboratory. In brain trauma, immunohistochemical staining for beta amyloid precursor protein has been used as a method to detect axonal injury within as little as 2–3 h of head injury. This is useful in establishing timing of a traumatic insult in medico-legal settings. In muscle diseases IHC can assist in differentiating vascular dystrophy from non-dystrophic disorders.

Geogenic immunohistochemistry will help in identification of the underlying molecular changes that can be used both for diagnosis and therapy. Using automated computerized image capture and analysis systems will give more accurate results. Development of more specific antibodies from recombinant antibody fragments will give molecules with ultra-high affinity, high stability, and increased potency. The use of tissue microarrays [TMA] as a high-throughput technique enables economical evaluation in terms of sample utilization and reagent costs.

Common uses of IHC in clinical practice include:

1. Determination of histogenesis (cellular origin) of tumors for more accurate and precise diagnosis e.g. keratin (epithelial), HMB45 (melanocytic), GFAP (glial), and certain CD markers in the classiﬁcation of lymphomas;
2. Distinction between benign or in situ lesions from invasive malignancy e.g. use of basal layer markers 34βEl2 and p63 for prostate and breast carcinoma;
3. Theranostics: determination of specific treatment modalities e.g. Her-2 and trastuzumab (Herceptin) for breast cancer, c-Kit and imatinib (Gleevec) for gastrointestinal stromal tumors (GIST), EGFR and gefitinin (Iressa) for small cell lung carcinoma, CD 20 and rituximab (Rituxam) for B-cell lymphomas;
4. Prognostication: estimation of the likely course of disease e.g. Ki-67 in urothelial and endocrine tumors, EGFR in glioblastoma, CD44 for gliomas and ovarian carcinoma;
5. Identiﬁcation of cell types and antigens in non-neoplastic lesions e.g. NSE and bcl-2 identifies ganglion cells and are used to exclude Hirschsprung’s disease and CD markers are used in inﬂammatory lesions. Other examples are amyloid, dystrophin and H. pylori; and
6. Conﬁrmation and typing of viral infection e.g. adenovirus, EBV, HHV8, HIV (p24), HSV and CMV.
7. Embalming and plastination, compare and contrast

Embalming in most modern cultures is the art and science of temporarily preserving human remains to forestall decomposition and make it suitable for display. While Plastination is a scientific procedure or technique of preservation of body or body parts useful in anatomy and forensic medicine departments for medical education. Under this technique, the water and fat of the body are replaced by certain plastic yielding specimens that can be touched, do not smell or decompose, and even retain most properties of the original sample.

In plastination, the water and fat are replaced by certain plastics, yielding specimens that can be touched, do not smell or decay, and even retain most properties of the original sample. Whereas in embalming that is not the case as the fluids are replaced with the embalming fluids.

Embalming involves the use of fixative (embalming fluid is introduced or perfused into the cadavers, through the arterial system to prevent autolysis and putrefaction). The ingredients recommended for making up embalming fluids are: 1) Formalin-phenol. 2)Methylated spirit. 3)Glycerin. 4)Water. While there are four steps in the standard process of plastination: fixation, dehydration, forced impregnation in a vacuum, and hardening.

Plastinated specimens are relatively inflexible and structures cannot be manipulated or easily reflected to reveal underlying anatomical gross structures and features. Dissection after plastination is also limited but with careful tissue preparation before plastination an extremely useful and somewhat superior specimen can be produced. Embalmed samples are still flexible and are easy to dissect as they aren’t as rigid as plastinated samples.

After embalming is carried out on samples, it is left with a pungent smell of formaldehyde, which needs to be applied again every once in a while, while in the case of plastination, after the resin sets, there is no need for reapplication and there is no pungent smell of formaldehyde.

Embalming and plastination are both methods of tissue preservation. They are both highly relevant in medical research and other medical fields, more so for the purpose of education. They involve the use of chemicals to maintain the general structure or outlook of a large or small sample, ranging from a whole body (eg. Birds, human being, etc.) to an organ. Both embalmed and plastinated samples can be put out for display (educational purposed) and can be palpated. The body, from which the sample is collected from must have been dead already as a live body cannot be plastinated or embalmed. Plastination and embalmment are both done to prevent the decay of the specimen and can last for long periods of time. They both make use of formaldehyde.