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COURSE TITLE: CELLULAR PATHOLOGY

ASSIGNMENT TITLE: ASSIGNMENT 1

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QUESTIONS

1. Write explicitly on 5 diagnostic techniques use in pathology, relevant illustrations and examples required
2. Cellular adaptation precedes cell death, discuss. Diagrams essential.

 ANSWERS

1. A. Histopathology

B. Cytopathology

C. Hematopathology

D. Immunohistochemistry

E. Microbological examination

 A. Histopathological techniques

 This examination studies tissues under the microscope. During this study, the pathologist looks for abnormal structures in the tissue. Tissues for histopathological examination are obtained by biopsy.  Biopsy is a tissue sample from a living person to identify the disease.  Biopsy can be either incisional or excisional.  Once the tissue is removed from the patient, it has to be immediately fixed by putting it into adequate amount of 10% Formaldehyde (10% formalin) before sending it to the pathologist.

The purpose of fixation includes:

> To prevent autolysis and bacterial decomposition and putrefaction

>To coagulate the tissue to prevent loss of easily diffusible substances

>To fortify the tissue against the deleterious effects of the various stages in the preparation of sections and tissue processing.

> To leave the tissues in a condition which facilitate differential staining with dyes and other reagents.

  Once the tissue arrives at the pathology department, the pathologists will exam it macroscopically (i.e. naked-eye examination of tissues).Then the tissue is processed to make it ready for microscopic examination. The whole purpose of the tissue processing is to prepare a very thin tissue (i.e. five to seven μm or one cell thick tissue) which can be clearly seen under the microscope. The tissue is processed by putting it into different chemicals. It is then impregnated (embedded) in paraffin, sectioned (cut) into thin slices, & is finally stained. The stains can be Hematoxylin/Eosin stain or special stains such as PAS, Immunohistochemistry, etc...The Hematoxylin/Eosin stain is usually abbreviated as H&E stain. The H&E stain is routinely used. It gives the nucleus a blue color & the cytoplasm & the extracellular matrix a pinkish color. Then the pathologist will look for abnormal structures in the tissue. And based on this abnormal morphology he/she will make the diagnosis. Histopathology is usually the gold standard for pathologic diagnosis.

B. Cytopathologic techniques

 This is the study of cells from various body sites to determine the cause or nature of disease.

Applications of cytopathology includes:

 The main applications of cytology include the following:

* Screening for the early detection of asymptomatic cancer: For example the examination of scrapings from cervix is used for early detection and prevention of cervical cancer.
* Diagnosis of symptomatic cancer: Cytopathology may be used alone or in conjunction with other modalities to diagnose tumors revealed by physical or radiological examinations. It can be used in the diagnosis of cysts, inflammatory conditions and infections of various organs.
* Surveillance of patients treated for cancer: For some types of cancers, cytology is the most feasible method of surveillance to detect recurrence. The best example is periodic urine cytology to monitor the recurrence of cancer of the urinary tract.

Advantages of cytologic examination

Compared to histopathological technique it is cheap, takes less time and needs no anesthesia to take specimens. Therefore, it is appropriate for developing countries with limited resources like Ethiopia. In addition, it is complementary to histopathological examination.

Cytopathologic methods

  There are different cytopathologic methods which includes:

* Fine-needle aspiration cytology (FNAC)

In FNAC, cells are obtained by aspirating the diseased organ using a very thin needle under negative pressure. Virtually any organ or tissue can be sampled by fine-needle aspiration. The aspirated cells are then stained & are studied under the microscope. Superficial organs (e.g. thyroid, breast, lymph nodes, skin and soft tissues) can be easily aspirated.  Deep organs, such as the lung, mediastinum, liver, pancreas, kidney, adrenal gland, and retroperitoneum are aspirated with guidance by fluoroscopy, ultrasound or CT scan. FNAC is cheap, fast, & accurate in diagnosing many diseases.

* Exfoliative cytology

This refers to the examination of cells that are shed spontaneously into body fluids or secretions. Examples include sputum, cerebrospinal fluid, urine, effusions in body cavities (pleura, pericardium, peritoneum), nipple discharge and vaginal discharge.

* Abrasive cytology

 Refers to methods by which cells are dislodged by various tools from body surfaces (skin, mucous membranes, and serous membranes). E.g. is the preparation of cervical smears with a spatula or a small brush to detect cancer of the uterine cervix at early stages. Such cervical smears, also called Pap smears, can significantly reduce the mortality from cervical cancer. Cervical cancer is the most common cancer in Ethiopian women.

C. Hematological Examinations:

This is a method by which abnormalities of the cells of the blood and their precursors in the bone marrow are invested to diagnose the different types of anemia and leukemia.

D. Immunohistochemistry: This method is used to detect specific antigen in the tissue in order to identify the type of disease.

E. Microbial Examination: This is a method by which body fluids, excised tissue, etc. are examined by microscopial, cultural and serological techniques to identify microorganisms responsible for many dieseases.

2. Cellular adaptation can be defined as changes made by a cell in response to adverse or varying environmental changes. Cell damage (which is also known as cell injury) is a variety of changes of stress that a cell suffers due to external as well as internal environmental changes. Amongst other causes, this can be due to physical, chemical, infectious, biological, nutritional or immunological factors. Cell damage can be reversible or irreversible. Depending on the extent of injury, the cellular response may be adaptive and where possible, homeostasis is restored. Cell death occurs when the severity of the injury exceeds the cell's ability to repair itself. Cell death is relative to both the length of exposure to a harmful stimulus and the severity of the damage caused. Cell death may also occur by necrosis or apoptosis.

