

MODULE

Histology and Cytology



Notes

28

CYTOMORPHOLOGY

28.1 INTRODUCTION

Light microscopic examination of stained cells in smears is the method of choice of diagnostic cytology. It allows classification of most normal cells as to type and tissue of origin. It also allows the recognition of cell changes caused by disease processes.



OBJECTIVES

After reading this lesson, you will be able to:

- recognize and classify cells
- identify features cell response to injury
- recognize features of tumors, especially malignancy.

28.2 GENERAL GUIDELINES

The study of cells in smears should take place at several levels:

- A rapid review of the smear with a 10× objective provides information on the makeup of the sample and its cell content. This preliminary review will tell the observer whether the smear is appropriately fixed and stained and will provide initial information on its composition. Smears containing only blood or no cells at all are usually considered inadequate, with some very rare exceptions.
- If the smear contains cells other than blood cells, it should be examined with care. A careful review of the material or screening of smears with a 10× objective is usually required to identify abnormal cells that may be few

in number. Screening is mandatory in cancer detection samples from “well” patients. A microscope stage should be utilized.

- The screening of the smear should lead to the preliminary assessment of the sample and answer the following questions: (1) Does the cell population correspond to the organ of origin? (2) If the answer is positive, the next question pertains to the status of the cell population: (a) is it normal? (b) does it show nonspecific abnormalities of little consequence to the patient? or (c) Does it show abnormalities pertaining to a recognizable disease state that can be identified.

28.3 CELL CLASSIFICATION

In general, the derivation, type of cells, and sometimes their function, are reflected in the cytoplasm, whereas the nucleus offers information on the status of the DNA, which is of particular value in the diagnosis of cancer. Some cells that lack distinct cytoplasmic or nuclear features may be very difficult to classify. For all practical purposes, the cells encountered in cytologic samples are of epithelial and nonepithelial origin. In tissue sections, the cells are often cut “on edge” and are seen in profiles. In cytologic preparations, the cells are whole and are generally flattened on a glass slide, usually affording a much better analysis of the cell components.

Epithelial Cells

An epithelium (plural: epithelia) is a tissue lining the surfaces of organs or forming glands and gland-like structures. Similar epithelia may occur in various organs and organ systems. There are four principal groups of epithelia: (1) squamous epithelia, synonymous with protective function; (2) glandular epithelia with secretory functions; (3) ciliated epithelia; and (4) the mesothelia.

Squamous Epithelium

The squamous epithelium is a multilayered epithelium that lines the surfaces of organs that are in direct contact with the external environment. The growth of the squamous epithelium is in the direction of the surface, that is, the cells move from the basal layer, to parabasal layers, to intermediate layers, to superficial layers. The most superficial cells are cast off. As the cells transit from the basal to the more superficial layers, they are programmed to gradually increase the size of their cytoplasm. The process of cytoplasmic maturation is accompanied by nuclear changes. The nuclei of the basal, parabasal, and intermediate layers of squamous cells appears as spherical, open (vesicular) structures, measuring approximately 8 μm in diameter. As the cells transit from the intermediate to





Notes

superficial layers, their nuclei shrink and become condensed (nuclear pyknosis). In cytology, these cells tend to be flat, polygonal, and sharply demarcated, and they vary in size according to the layer of origin. The smallest cells, measuring about 10 μm in diameter, are the basal cells, which are very rarely seen in normal states. Parabasal cells, derived from the parabasal layers, are somewhat larger, measuring from 10 to 15 μm in diameter. Intermediate cells, derived from the intermediate layers, are still larger, measuring from 15 to 40 μm in diameter. The superficial cells are the largest, measuring from 40 to 60 μm in diameter.

Epithelia with Secretory Function

These epithelia are found mainly in organs with secretory functions and exchanges with the external environment, such as food intake, principally in the digestive tract and associated glands. On cytology, the secretory cells are cuboidal or columnar in shape, averaging from 10 to 20 μm in length and 10 μm in width. Their cytoplasm is transparent because of accumulation of products of secretion, usually mucus. Secretory cells are often polarized, that is, they display one flat surface facing the lumen of the organ.

Mesothelia

Organs contained within body cavities, such as the lung, the heart, and the intestine, are all enclosed within protective sacs lined by specialized epithelia of mesodermal origin. These sacs, known as the pericardium for the heart, pleural cavity for the lungs, and peritoneal cavity for the intestine, are lined by an epithelium composed of a single layer of flat cells, known as mesothelial cells. Under normal circumstances, the sacs are filled with only a thin layer of fluid that facilitates the gliding of the two surfaces of mesothelial cells against each other. On cytology, mesothelial cells may form sheets or clusters, in which the adjacent, flattened surfaces of the cells are separated from each other by clear gaps (“windows”) filled by microvilli.

Nonepithelial Cells

Endothelial Cells: they line the intima of blood vessels and have many similarities with mesothelial cells but are very rarely observed in diagnostic cytology.

The Immune Cell System: Consist of T & B Lymphocytes, macrophages and plasma cells. Many benign and malignant conditions involving proliferation of these cells can present for cytological evaluation. (Leukemias, lymphomas, multiple myeloma).

**INTEXT QUESTIONS 28.1**

1. is a tissue lining the surfaces of organs or forming glands and gland-like structures
2. is a multilayered epithelium that lines the surfaces of organs that are in direct contact with the external environment
3. are found mainly in organs of the digestive tract and associated glands
4. The pericardium, pleural cavity and peritoneal cavity, are lined by
5. Cells line the intima of blood vessels

**WHAT HAVE YOU LEARNT**

- An epithelium is a tissue lining the surfaces of organs or forming glands and gland-like structures
- There are four principal groups of epithelia: (1) squamous epithelia (2) glandular epithelia with secretory functions; (3) ciliated epithelia; and (4) the mesothelia
- The squamous epithelium is a multilayered epithelium that lines the surfaces of organs that are in direct contact with the external environment
- The nuclei of the basal, parabasal, and intermediate layers of squamous cells appears as spherical, open structures, measuring approximately 8 μm in diameter
- The smallest cells, measuring about 10 μm in diameter, are the basal cells, which are very rarely seen in normal states
- Parabasal cells, derived from the parabasal layers, measure from 10 to 15 μm in diameter
- Intermediate cells, derived from the intermediate layers, measure 15 to 40 μm in diameter.
- The superficial cells are the largest, measuring from 40 to 60 μm in diameter
- Epithelia are found mainly in organs with secretory functions and exchanges with the external environment, such as food intake, principally in the digestive tract and associated glands

**Notes**

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Cytomorphology

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Notes

- On cytology, the secretory cells are cuboidal or columnar in shape, averaging from 10 to 20 μm in length and 10 μm in width. Their cytoplasm is transparent because of accumulation of products of secretion, usually mucus.
- The pericardium, pleural and peritoneal cavity, are lined by an epithelium composed of a single layer of flat cells, known as mesothelial cells
- In cytology, mesothelial cells form sheets or clusters, in which the adjacent, flattened surfaces of the cells are separated from each other by clear gaps (“windows”) filled by microvilli
- Endothelial Cells line the intima of blood vessels



TERMINAL QUESTIONS

1. What are the general guidelines while assessing a cytological smear?
2. Enumerate the different types of cells which can be encountered while examining a cytologic smear.
3. What are the different forms of squamous cells seen in cytology?



ANSWERS TO INTEXT QUESTIONS

28.1

1. Epithelium
2. Squamous epithelium
3. Epithelia
4. Mesothelial cells
5. Endothelial