GENERAL PATHOLOGY

NEOPLASIA

Lec17

Oncology: Is the study of tumor or neoplasm.

Neoplasia: Is the process of the formation of new tissue and it is literally means "new growth" and the new growth is called neoplasm.

Neoplasm (tumor or tumour): is an abnormal mass of tissue, the growth of which exceeds and is uncoordinated with that of the normal tissues, and persists in the same excessive manner cessation of the stimuli which evoked the change.

The term neoplasia therefore describes a state of autonomous cell division and the abnormal mass of the cells results is termed a neoplasm.

The state of neoplastic growth differs from hyperplasia in the following:
1. Neoplasia usually appears to arise spontaneously, but in those cases where the stimulus is known, it is not physiological.

2. The growth in hyperplasia is directly related to the degree of stimulation, while neoplasia, once it starts, proceeds irrespective of the stimulus.

3. Once the stimulus is removed, hyperplasia regresses. Neoplasia, on the other hand, proceeds unabated.

Causes of neoplasia:

Recent advance in molecular biology have demonstrated that many tumors arise as a consequence of alteration in the genetic material of cells

(e.g., mutation), where the cells escape permanently from normal growth regulatory mechanisms.

Tumors can result from the neoplastic transformation of any nucleated cell in the body, the transformed cells are called neoplastic cells.

Several factors are known to induce neoplastic transformation of cells including: physical agents (e.g., irradiation), chemical agents (e.g. tar), some chronic diseases (e.g. ulcerative colitis) and certain viruses (e.g. HIV).

Tumor shape (Gross appearance):

The gross appearance of a tumor on the surface may be described as sessile, pedunculated, papillary, polypoid, fungating, ulcerated, or annular.

Structure of tumors:

All tumors have two basic components:

1. Proliferating neoplastic cells that constitute their parenchyma.
2. Supportive stroma made up of connective tissue and blood vessels. Stroma provides mechanical support and nutrition to the parenchymal neoplastic cells.

Classification of tumors:

Tumors are classified according to:

1. Behavior.

2. Histogenesis (cells of origin).

Behavioral classification:

The behavioral classification divided tumors into:

- Benign

- Malignant.

Characteristic of benign and malignant neoplasms:

1. Differentiation, anaplasia and cellular atypia: Differentiation and anaplasia apply to the parenchymal cells of neoplasm. Differentiation: means the degree or extent to which the tumor parenchymal cells resemble comparable normal cells both morphologically and functionally.
•Well differentiated tumors are composed of cells resembling the mature normal cells of the tissue of origin of the neoplasm.

 •Poorly differentiated tumors have primitive-appearing unspecialized cells

•Moderately differentiated tumors are intermediate between the two extremes.

Anaplasia and cellular atypia: these terms refer to the luck of differentiated features of in a malignant tumor cell.

In general the degree of anaplasia correlates with degree of anaplasia correlates with the aggressiveness of the tumor.

 Evidence of anaplasia includes:

1. Variation in the size and shape of the cells and nuclei (pleomorphism). The nuclei are disproportionally large for the cell and the nuclear-cytoplasmic ratio may approach 1:1.

2. Enlarged and hyperchromic nuclei with coarsely clumped chromatin and prominent nucleoli.

3. Atypical mitosis.

4. Bizarre cells, including tumor giant cells.

In general, benign tumors are well differentiated, while malignant neoplasms, in contrast, range from well differentiated to poorly differentiated.

Malignant neoplasms composed of undifferentiated cells are said to be anaplastic.

Differentiation in case of malignant tumors determines the tumor grade.

Grading and staging of tumors:

Grading is an attempt to assign a rough numerical value to the extent of histological division from normal.

Malignant tumors are usually graded either as well, moderate, or poorly differentiated or numerically as grade 1, grade 2, grade 3.

Thus, a grade 1 tumor would show less cytological abnormality (aggressiveness) than a tumor of grade 3.

Staging is an exercise in which clinical and histological information is combined to describe the extent of tumor spread. The most widely applied staging system is (TNM) system.

2. Rate of growth: Most of benign tumors grow slowly over a period of years, whereas most malignant tumors grow rapidly.

The growth rate of tumors correlates with their level of differentiation, and thus most malignant tumors grow more rapidly than do benign tumors.

3. Local invasion: Nearly all benign tumors grow as cohesive expansile masses that remain localized to their site of origin and don't have the ability to infiltrate, invade, or metastasize to distant sites, because they

grow and expand slowly, they usually develop a rim of compressed connective tissue called fibrous capsule. Malignant tumors grow by local infiltration destroying the adjacent tissues through which they invade.

4. Metastasis: Metastases are tumor implants discontinuous with the primary tumor. Metastasis marks a tumor as malignant because benign neoplasms do not metastasis.

The invasiveness of malignant tumors permits them to penetrate into blood vessels, lymphatics, and body cavities, providing the opportunity for spread. Pathways of spread: through one of three pathways:

 1. Direct seeding of body cavities or surfaces

2. Lymphatic spread.

3. Hematogenous spread.

 5. Necrosis: Malignant tumors often show central necrosis because of defective vascular perfusion.

 Histogenetic classification:

Histogenetic classification includes numerous subdivisions, but the major categories of origin are:

 • From epithelial cells.

 • From connective tissues.

 • From lymphoid and heamopietic organs.

Nomenclature of tumors:

Tumor nomenclature usually has a histogenetic and behavioral component.

The histogenetic component gives information about the type of the cell from which the tumor has arisen, or at any rate the predominant cell type of which it is presently constituted.

The behavioral component tells whether the tumor is benign or malignant.

Clinical effects of tumors:

Tumors can produce a wide range of clinical effects, and these are important partly because their recognition leads to diagnosis and treatment.

Benign tumors:

Although benign tumors are confined to their site of origin, they may cause clinical problems due to:

1. Pressure on the adjacent tissues (e.g. benign meningeal tumor causing epilepsy)

2. Obstruction to the flow of fluid (e.g. benign epithelial tumor blocking a duct)

3. Production of hormone (e.g. benign thyroid tumor causing thyrotoxicosis).

4. Transformation into malignant neoplasm (e.g. adenomatous polyp progressing to an adenocarcinoma).

5. Anxiety (because the patient fears that the lesion may be sometimes more sinister).

Malignant tumors:

The considerable morbidity and mortality associated with malignant tumors may be due to:

1. Pressure on and destruction of adjacent tissue.

2. Formation of secondary tumors (metastasis).

3. Blood loss from ulcerated surfaces>

4. Obstructions of flow (e.g. malignant tumors of the colon causing intestinal obstruction).