Classification of tumors

Any tissue taken from the patient's body that is suspected of a tumor process should be delivered to an institute or department of pathology (pathological anatomy) and properly evaluated there by an experienced pathologist.

The task of the pathologist is to **morphologically** (possibly cytologically, immunohistochemically or molecularly-genetically) examine the given tissue and determine the typing, grading and staging of the tumor.

Typing

Typing is the microscopic determination of the type of tumor.

- In terms of biological behavior, tumors can be divided into two main groups. They are:

1. **benign tumors** ;
2. **malignant tumors** .

This is a nomenclature division, often unrelated to prognosis (some malignant tumors can be fully cured; on the other hand, some benign tumors can threaten the patient's life).

- From the histogenetic point of view, we distinguish:

1. **Mesenchymal tumors** (originating from the connective tissue; generally referred to as **sarcomas** ; e.g. fibrosarcoma, hemangiosarcoma).
2. **Epithelial tumors** (originating from the epithelium; generally referred to as **carcinomas** ; e.g. basal cell carcinoma, squamous cell carcinoma, adenocarcinoma).
3. **Neuroectoderm tumors** (arising from neuroectoderm cells; e.g. malignant melanoma).
4. **Germinal tumors** (originating from germ cells; mainly affect the gonads, but can also occur extragonadally, e.g. in the mediastinum ; e.g. seminoma, yolk-sac tumor, embryonal carcinoma, teratoma).
5. **Choriocarcinoma** (arises from the trophoblast, is often part of mixed tumors).
6. **Mesothelioma** (arises from the mesothelium; affects the pleura, pericardium, peritoneum and tunica vaginalis testis).

According to the WHO classification, the pathologist assigns an eight-digit numerical code to each tumor, which is divided by the number 1-3 (1 indicates a benign tumor, 2 a borderline tumor, 3 a malignant tumor).

The full code could look like this, for example: 4357-8907/1.

Grading

Grading is a microscopic determination of the **degree of differentiation** (maturity) of the tumor. It is denoted by the letter ***G.*** This is an important prognostic and predictive data. Usually, the less differentiated a tumor is, the more aggressive it is, but at the same time more sensitive to treatment.

1. **G_x** (degree of differentiation cannot be determined)
2. **G_1** (well differentiated tumor)
3. **G_2** (moderately differentiated tumor)
4. **G_3** (poorly differentiated tumor)
5. **G_4** (undifferentiated tumor)

Staging

Staging is determination **of the extent of the tumor**. A number of systems are used for staging. The most common is the **TNM** system.

	TNM
pTNM	postoperative, pathological classification
yTNM	posttherapeutic classification
rTNM	recurrence classification

- **T (tumor; indicates tumor size)**

1. T_x (size cannot be determined)
2. T_0 (none)
3. T_1

4. T_2
5. T_3
6. T_4 (growing into surrounding tissues - skin etc.)
7. T_{is} (carcinoma in situ)

- **N (nodes; tells us if regional lymph nodes)** are affected

1. N_x (cannot be determined)
2. N_0 (regional lymph node are not affected)
3. N_1
4. N_2
5. N_3

- **M (Metastases; tells, if distant metastases have been established)**

1. M_x (cannot be determined)
2. M_0 (no metastases presented)
3. M_1 (metastases present)

In the final analysis **5 stages with different prognosis** are created:

- **St.0** – carcinoma in situ; without metastases
- **St.1** – small, invasive carcinoma; without metastases
- **St.2** – larger invasive carcinoma; there may be minor lymph node involvement
- **St.3** – extensive invasive carcinoma; extensive lymph node involvement
- **St.4** – distant metastases in any extent of primary tumour

from other *staging systems* should be mentioned:

- **Dukes system** (I–III): is used for staging **colorectal cancer .**
- **FIGO system** (International Federation of Gynecology and Obstetrics) (I–IV): is used for staging **malignant cervical cancer**.
- **Clark and Breslow classification**: is used for staging **Malignant melanoma**.

Rating

The rating is a summary designation for determining the expression of important proteins and receptors in tumor cells. For example, the following markers are determined immunohistochemically:

- markers of proliferation and its regulation: Ki-67, p53
- hormone receptors: estrogen and progesterone receptors (breast cancer), androgen receptors (prostate cancer)
- receptors important for therapy: HER-2/neu (breast cancer)

Links

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