Precancerous condition

Definition

A precancerous condition or lesion precedes the development of a malignant tumor. It appears as a typical morphological tissue alteration, in which the risk of cancer development is significantly more than in healthy tissue of the same histogenetic origin and anatomical location.

A common feature of precancerous conditions is the acceleration of cell proliferation, which brings about a greater likelihood of genetic errors during cell division. Thus, proliferation becomes precancerous in:

1. Metaplasia (caused by prolonged inflammatory irritation) - e.g., Barrett's esophagus, squamous metaplasia of the bronchial epithelium, leukoplakia in the oral cavity, intestinal metaplasia of the gastric mucosa
2. **Inflammation** - e.g. pseudoepitheliomatous hyperplasia, formation of inflammatory hyperplastic polyps in the intestines in ulcerative colitis, HPV infection of the cervix
3. **Hyperplasia of hormone-dependent organs** - endometrium, prostate, mammary gland

Some precancerous lesions also arise as a result of **congenital developmental abnormalities** (e.g., various hamartia, familial adenomatous polyposis, cryptorchidism - undescended testes - in 90% of cases spermatogonia atrophy occurs, in the remaining cases atypical cells can appear and can malignantly transform)

Classification

1. **Static**- low risk of malignant transformation, may not have special microscopy or proliferative character from the beginning. This includes pseudoepitheliomatous hyperplasia around chronic skin ulcers, cryptorchidism at the beginning, Paget's disease
2. **Progressive** - higher to high risk of malignant transformation, microscopic tissue, and cell atypia, increased proliferation. This includes further malignant development in cryptorchidism, cervical dysplasia, mammary glands, colon polyposis, bone marrow myelodysplastic syndrome.
3. **Preinvasive** - the highest degree of risk of malignant transformation (carcinoma in situ) - tissue and cellular atypia are identical to the malignant tumor, but the basement membrane is preserved, invasion of surrounding structures and metastasis are missing. This includes carcinoma in situ in cervical, ductal, or lobular epithelium or mammary glands, etc.

Precancerous changes can develop in any tissue. They are best characterized in epithelial tissue, where progressive and static precancerous lesions are referred to as **dysplasia** (loss of cell uniformity and oriented tissue arrangement - cells have different shape and size, more basophilic nuclei, shift of nucleocytoplasmic ratio in favor nuclei, more frequent mitoses. The degree of cellular atypia and the risk of transition to invasive carcinoma are divided into mild, moderate, and severe cases). Dysplasia is also divided into three stages: I, II, III

Intraepithelial neoplasia can be:

- **Cervical** (CIN)
- **Vaginal** (VAIN)
- **Vulvar** (VIN)
- **Oral** (OIN)
- **Prostate** (PIN)

Tissue changes around malignant tumors

Changes in the environment of a growing tumor, which are the same as in a precancerous lesion, can lead to successive primary tumors, even after the first tumor has healed.

Examples

Cervical intraepithelial neoplasia (CIN)

It is the **dysplasia of the stratified squamous non-corneal epithelium** (stratum basale, spinosum et superficiale) **of the cervix** (portio vaginalis cervicis uteri)

Microscopically, starting from deeper layers to the surface, the regularly stratified squamous epithelium is gradually replaced by undifferentiated cells resembling the epithelium of the basal layers.

According to the severity of the disease, dysplasia is divided into **mild** (CIN I - affects less than 1/3 of the thickness), **medium** (CIN II - 2/3 of the thickness), and **severe** (CIN IIIa - almost the entire epithelium except the superficial flattened layer is affected). When the entirety of the epithelium has been replaced by atypical cells, the condition has already become **carcinoma in situ** (CIN IIIb)

Cervical CINs are often associated with **HPV** (human papillomavirus) infection. This virus attacks the skin and cells of mucous membranes and undergoes either a lytic (non-transforming HPV) or lysogenic (transforming HPV) cycle:

LSIL (Low-grade Squamous Intraepithelial Lesions)

- Benign HPV cluster (verruca vulgaris, condyloma accuminatum, laryngeal papillomatosis) + CIN I
- This corresponds to the lytic cycle.
- Koilocytes (halo cells: large cells with pyknotic hyperchromic nucleus and perinuclear clearing) are characteristic.

HSIL (High-grade)

- CIN II + CIN III + carcinoma in situ
- This corresponds to the lysogenic cycle in which the viral genome integrates into the genome of the host cell.
- This can progress to the stage of invasive carcinoma.

Barret's esophagus

It is the metaplasia of the distal esophageal mucosa (non-corneal layered squamous epithelium) into a **single-layered columnar epithelium resembling the gastric mucosa** (it could resemble a normal cardiac mucosa or mucosa in the fundus and body of the stomach) or intestinal mucosa with goblet cells.

The cause is long-term irritation of the mucosa due to gastroesophageal reflux (reflux esophagitis - in slippery hiatal hernia, weakness of the lower esophageal sphincter, increased intraabdominal pressure) or decreased resistance of the gastric mucosa (smoking, alcohol).

Inflammation (basal cell hyperplasia, stromal papillae elongation, inflammatory infiltration) and ulcer formation occur initially. Eventually, dysplasia and then metaplasia (which arises from pluripotent undifferentiated cells of the original esophageal glands) occur. This is a typical precancerous lesion that can lead to **adenocarcinoma**.

Intestinal metaplasia of the gastric mucosa

In chronic atrophic gastritis (with the disappearance of the gastric glands), the normal epithelium of the gastric mucosa (single-layered columnar epithelium) can be replaced by the **epithelium of the intestinal type:**

- Complete intestinal metaplasia - goblet cells, resorption cells (enterocytes), Paneth cells
- Incomplete intestinal metaplasia - instead of cells specialized at resorption, the cells are mucus-forming, which increases the risk of gastric adenocarcinoma

Links

Related articles

- Verruca vulgaris (preparation)

References

- STŘÍTESKÝ, Jan. *Patologie.* 1. vydání. 2001. https://www.wikiskripta.eu/w/Speci%C3%A1ln%C3%AD:Zdroje_knih/80-86297-06-3