General Pathology 8　January 26, Wednesday, 2005　Masashi Fukayama

Basics of tumor pathology

I. Molecular pathology of tumors

A. Biology of tumors

classical definition: lesions generated by "autonomic" proliferation of a cell, the proliferation continues after the removal of a stimulus

basic nature of tumors: tumors are monoclonal.

biological features of tumor cells: transplantable / infinite proliferation ability, immortalization / loss of contact inhibition / loss of anchorage dependency /deterioration of cellular adhesiveness / cell membrane alteration / tumor antigen (carcinoembryonic antigen, carbohydrate tumor antigen)

B. Multistage carcinogenesis

C. Oncogene and tumor suppressor gene: the history of their discovery

1) carcinogenesis and gene variation, gene defects: radiation, carcinogen / cancer virus (Rous sarcoma virus)

2) oncogene, unified theory of carcinogenesis

DNA-mediated transfer of cancer character: Weinberg

mechanism of oncogene activation: translocation / amplification (double minute chromosomes, homogeneous chromodomain or homogenously staining region)

3) functions of oncogene: growth factors / tyrosine kinase / signal transduction / nuclear transcription factor

4) discovery of tumor suppressor gene:

cell fusion of cancer cells and normal cells / hereditary cancers under single gene control, retinoblastoma (Knudson's hypothesis)

5) functions of tumor suppressor gene: cell cycle and tumor suppressor gene / cell adhesion molecules, intercellular adhesion apparatus

D. Acceleration of multistage carcinogenesis, aberration of DNA repair enzyme

E. Biology of cancer development, invasion, metastasis

II. Carcinogenic factors and human cancer

A. Carcinogen and mutagenicity

1) occupational cancers, increase in the number of cancers due to aging

chemicals: soot and coal tar / aromatic amine / benzene and leukemia / asbestos / chromium / mustard gas / nitroso compound / hormone drug and carcinogenesis

physical factors: X-ray / radioactive substances / light

2) carcinogenic research: initiation, promotion (complete carcinogen, incomplete carcinogen) / role of TPA free radical (generation of free radical)

3) detection of carcinogen: the rate of mutagenesis and carcinogenicity / improved Ames test (histidine-requiring Salmonella)

tobacco smoke / burnt fish, burnt meat / N nitroso compound / aflatoxin B1: fungus (aspergillus flavus)

B. Radiation

C. Cancer as a hereditary disease

D. Hereditary background: sensitivity and resistance against carcinogenesis in experimental animals / enzymic polymorphism

Introduction to Tumor Pathology

1. Tumor pathology

A. Basic terminology

1) autonomic proliferation / dedifferentiation, disdifferentiation / atypia / anaplasia

2) benign tumors and malignant tumors: classification based on clinical prognosis of the lesion / borderline lesion

3) origin of tumor: the cell and tissue from which a tumor is derived

4) nomenclature of tumors: Japanese word *gan* (meaning "rock"), cancer (coming from the Latin word, *cancer* meaning "crab") / the names of benign tumors ending in "-oma"

5) tissue types of cancer: squamous cell carcinoma/ adenocarcinoma / transitional cell carcinoma

6) degree of differentiation/ dedifferentiation

7) multiple cancer / double cancer, synchronous / metachronous

B. Expansion of cancer

1) lymphatic metastasis: sentinel / Virchow nodule / thoracic duct

2) hematogenous metastasis: tumor embolism / favorite sites for metastasis

3) dissemination: peritoneal carcinomatosis / Schnitzler metastasis

C. Morphology of tumor

1) gross properties: protruded tumor / ulcer formation, hemorrhage, necrosis, cavity

contracting cancer: depressed lesion / scirrhous carcinoma / scar formation of pulmonary adenocarcinoma, anthracosis

2) histological structure: parenchyma / interstitium

3) morphology of tumor cells: atypia

II. Natural history and clinical features of cancer

A. Precancerous conditions

1) high risk group/ hereditary cancer

2) precancerous lesion: dysplasia / concomitant lesion (intestinal metaplasia of the gastric mucosa, squamous metaplasia

3) high risk lesion: chronic hepatitis, cirrhosis / burn scar / pulmonary fibrosis / chronic empyema / ulcerative colitis / chronic gastritis / chronic thyroiditis / undescended testis

B. Clinical cancer

1) stages of cancer progression: TMN classification

2) early cancer: non-invasive carcinoma, carcinoma in situ

3) occult carcinoma (or cancer) / accidental cancer / latent cancer

4) advanced cancer / terminal cancer

C. Relation of a tumor to the host

paraneoplastic syndrome / cahexia / the host's response to the tumor (involution of the tumor)

D. Strategies taken against cancer

E. Cancers of Japanese, epidemiological facts