10.7.5 Pain

Pain is unusal symptom in the early stages of malignant disease, but pain does affect 60-80 % patients with advanced cancer. Pain may be enhanced by anxiety, sleep loss, fatigue etc. Mechanisms causing pain in cancer patients are shown on Fig. 10.11.

Serious complications induced by nephrotoxic, myelotoxic, cardiotoxic, neurotoxic chemoterapy and radiotherapy are also of considerable importance in oncologic patients.

10.8 Immune surveillance and cancer

Immune system plays an important role in **immunologic surveillance** for the emergence of cancer cells. A normal immunologic surveillance recognizes altered cell surface (specific and non-specific) tumor antigens and reacts against them. Up to 10 million malignant cells can be destroyed by immune system. (Tumor 1 cm in diameter contains approximately 10^9 cells after 30 doubling-times.)

A wide range of cell mediated and humoral immune responses can protect the host against cancer cells – cytotoxic T lymphocytes (Tc cells), natural killer (NK) cells, macrophages, helper T lymphocytes, B lymphocytes, cytotoxic antibodies and complement system.

However, cancer cells are capable to escape immunologic surveillance. Escape mechanisms include:

1. antigenic modulation (by capping with antibodies, masking by glycocalyx coat, shedding)
2. non-antigenic subclone of cells (which may arise during tumor progression)
3. suboptimal number of Tc cells (tumor grows at increased rate)
4. stimulation of supressor T lymphocytes (blocking immune response)
5. immunosupressive substance prostaglandin E is produced by some tumors (PgE acts by increasing c AMP levels in lymphocytes and thus blocks their proliferation)
6. B-lymphocytes may transfer antibodies blocking T lymphocyte receptors on malignant cells, therefore T lymphocytes cannot destroy these cancer cells (Fig. 10.12)
7. cachexia
8. immunosupressive therapy

There is an increased cancer risk in individuals with immunodeficiency (inherited or acquired). Such individuals have 14-fold increased risk of developing lymphomas, 4-21-fold increased risk of skin cancer, 11-fold increased risk of stomach cancer, 13-fold increased risk of uterine cervix cancer, 2-fold increased risk of urinary bladder cancer.

Of particular interest in cancer research and clinical practice are mind-body relationships studied in **psychoneuroimmunology**.

Stressors may supress the immune system through several mechanisms (release of catecholamines and corticosteroids, central mechanisms etc.). Immunosupression results in increased susceptibility to malignancy with negative influence on incidence and mortality from malignant disease.

However, ability to cope with stressors plays also an important role. Several studies demonstrated that "fighting" and denial patients are associated with longer survival than non-fighting and depressed patients.