

Review Notes in Pharmacology: Drugs Used in Chemotherapy (Antineoplastic Drugs)

General Characteristics

- Destroy malignant cells by interfering with cell replication, with the supply and uptake of nutrients, or with the DNA or RNA inside the nucleus.
- Affects both normal and malignant cells
- Commonly affected cells are the rapidly-dividing cells of the bone marrow, the gastrointestinal tract, and the hair follicles.
- Potential teratogens (substances which can affect normal fetal growth resulting in physical defects in the fetus)
- Side effects: Nausea, vomiting, diarrhea, constipation, stomatitis, alopecia, bone marrow, depression, fatigue, increased uric acid levels, and hepatic toxicity (**important:** administer antiemetics as indicated, monitor CBC, I&O, liver and renal function studies, and inspect oral cavity)
- Potentially mutagenic and carcinogenic (**important:** should be handled using gloves, goggles, long-sleeved gown, mask; used equipment is considered hazardous waste, monitor IV site for extravasation)

Indications

- Used to cure malignant neoplasms, relieve symptoms, or maintain remissions
- Chemotherapy is the treatment of choice for conditions such as Hodgkin's disease and Wilms' tumor
- Some antineoplastic drugs such as Methotrexate (MTX) are used for nonmalignant conditions such as arthritis and psoriasis

Classifications

alkylating agents- damages DNA and interferes with cell replication; includes nitrogen mustard derivatives nitrosoureas, and platinum compounds

Some Alkylating Drugs	Uses	Adverse Effects
Cyclophosphamide (Cytoxan)	Hodgkin's disease, non-Hodgkin's lymphomas, leukemias, cancer of breast, lung or ovary, multiple myeloma, neuroblastoma	Bone marrow depression, nausea, vomiting, alopecia, hemorrhagic cystitis, hypersensitivity reactions, secondary leukemia or bladder cancer
Cisplatin (Platinol)	Advanced carcinomas of testes, bladder, ovary	Nausea, vomiting, anaphylaxis, nephrotoxicity, bone marrow depression, ototoxicity
Chlorambucil (Leukeran)	Chronic lymphocytic leukemia, Hodgkin's and non-Hodgkin's lymphomas	Bone marrow depression, hepatotoxicity, secondary leukemia
Melphalan (Alkeran)	Multiple myeloma, ovarian cancer	Bone marrow depression, nausea and vomiting, hypersensitivity reactions

antimetabolites- deprive cells of substances needed for formation of cell DNA or cause formation of abnormal DNA by competing with, replacing, or antagonizing normal metabolites; includes folic acid antagonists such as methotrexate, purine antagonists like mercaptopurine, and pyrimidine antagonists such as fluorouracil.

Some Antimetabolites	Uses	Adverse Effects
Capecitabine (Xeloda)	Metastatic breast cancer, colorectal cancer	Bone marrow depression, nausea, vomiting, diarrhea, mucositis
Fluorouracil (5-FU) (Aducil, Efudex, Fluoroplex)	Carcinomas of the breast, colon, stomach, and pancreas Solar keratoses, basal cell carcinoma	Bone marrow depression, nausea, vomiting, mucositis Pain, pruritus, burning at site of application
Mercaptopurine (Purinethol)	Acute and chronic leukemias	Bone marrow depression, nausea, vomiting, mucositis
Methotrexate (MTX) (Rheumatrex)	Leukemias, non-Hodgkin's lymphomas, osteosarcoma, choriocarcinoma of testes, cancers of breast, lung, head, and neck	Bone marrow depression, nausea, vomiting, mucositis, diarrhea, fever, alopecia

antibiotic antineoplastic agents- antitumor antibiotics have effects similar to those of alkylating agents as they bind with DNA and RNA transcription; includes drugs such as Doxorubicin (has a high potential for cardiotoxicity and tissue necrosis) and Bleomycin (can cause pulmonary toxicity)

Some Antitumor Antibiotics	Uses	Adverse Effects
Bleomycin (Blenoxane)	Squamous cell carcinoma, Hodgkin's and non-Hodgkin's lymphomas, testicular carcinoma	Pulmonary toxicity, mucositis, alopecia, nausea, vomiting, hypersensitivity reactions
Dactinomycin (Actinomycin D)	Rhabdomyosarcoma, Wilms' tumor, choriocarcinoma, testicular carcinoma, Ewing's sarcoma	Bone marrow depression, nausea, Vomiting, extravasation may lead to tissue necrosis
Daunorubicin (Daunomycin)	Acute leukemias, lymphomas	Bone marrow depression, alopecia, mucositis, GI upset, cardiomyopathy, extravasation may lead to tissue necrosis
Mitomycin (Mutamycin)	Metastatic carcinomas of stomach and pancreas	Bone marrow depression, nausea, Vomiting, extravasation may lead to tissue necrosis.

antineoplastic agents affecting hormonal balance- includes hormones that interfere with tumor growth and are useful in the palliative treatment of some cancers, adrenal corticosteroids used in the treatment of leukemia, and lymphoma, and certain hormone inhibitors like Tamoxifen

Some Hormones and Hormone Inhibitors	Uses	Adverse Effects
Diethylstilbestrol (DES)	Breast and prostate cancer	Headache, vertigo, insomnia, nausea, weight changes, phlebitis, edema, uterine bleeding, feminization in males, changes in calcium and folic acid metabolism
Fluoxymesterone (Halotestin)	Breast and renal cancer	Nausea, vomiting, weight gain, edema, fluid retention, vaginal dryness and itching, fluid retention, hypercalcemia if with bone cancer, masculinization of females
Tamoxifen (Nolvadex)	Breast cancer: after surgery or radiation; prophylaxis in high-risk women; and treatment of metastatic disease	Hot flashes, nausea, vomiting, vaginal discharge, risk of endometrial cancer in nonhysterectomized women

mitotic inhibitors- cell-cycle specific agents that stop mitosis; includes plant alkaloids such as taxanes, vinca alkaloids, camptothecins, and podophyllotoxins

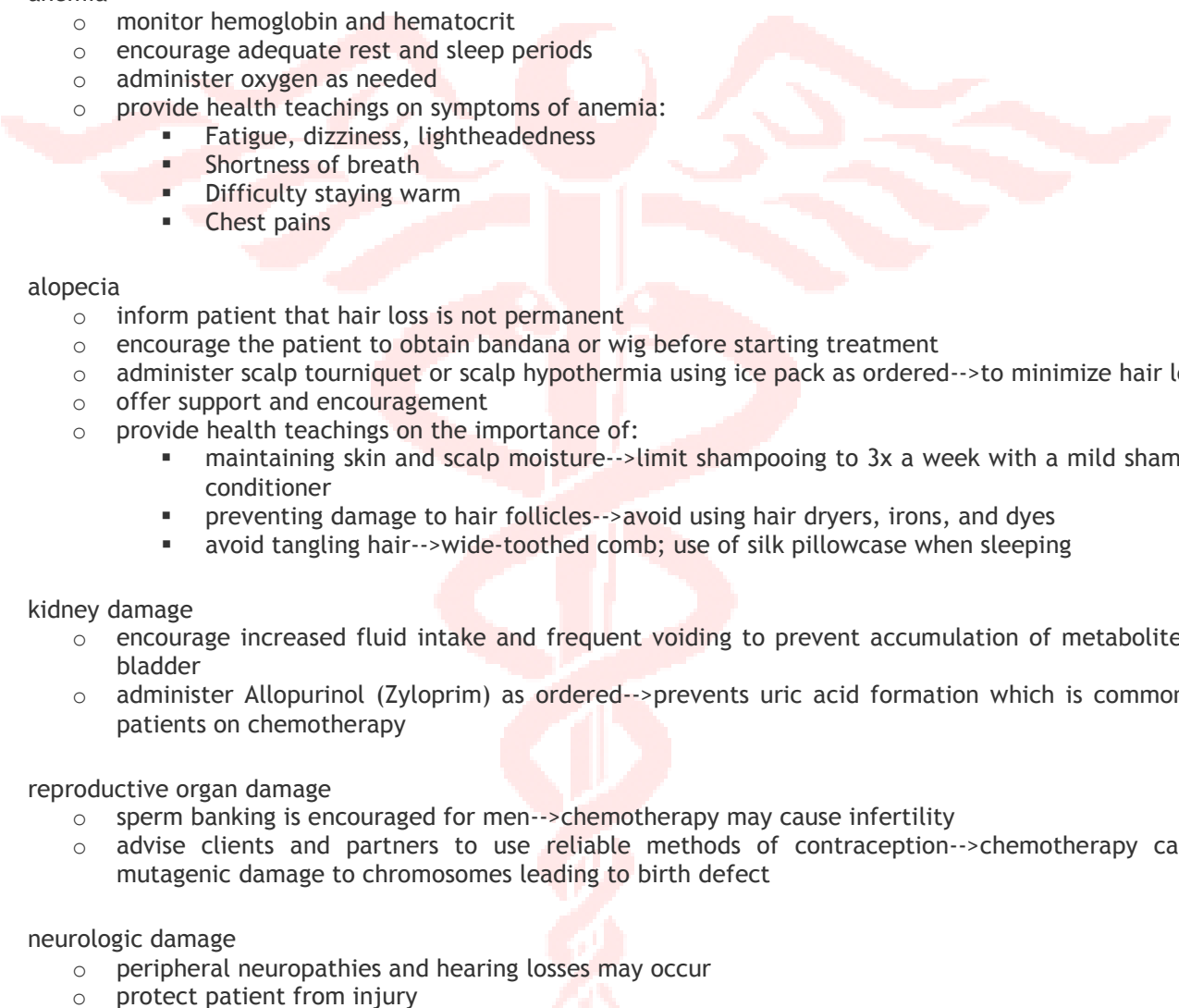
Some Mitotic Inhibitors	Uses	Adverse Effects
Vincristine (Oncovin)	Hodgkin's and other lymphomas, acute leukemia, neuroblastoma, Wilms' tumor	Peripheral neuropathy, extravasation may lead to tissue necrosis
Etoposide (VePesid)	Testicular cancer, small-cell lung cancer	Bone marrow depression, allergic reactions, nausea, vomiting, alopecia
Vinblastine (Velban)	Metastatic testicular carcinoma, Hodgkin's disease	Bone marrow depression, nausea, vomiting., extravasation may lead to tissue necrosis
Paclitaxel (Taxol)	Advanced ovarian cancer, advanced breast cancer, non-small cell lung cancer, AIDS-related Kaposi's sarcoma	Bone marrow depression, allergic reactions, hypotension, bradycardia, nausea, vomiting

miscellaneous antineoplastic agents- Miscellaneous agents vary in their sources, mechanisms of action, indications for use, and toxic effects; includes L- Asparaginase, Hydroxyurea, and Procarbazine

Miscellaneous Antineoplastic Agents	Uses	Adverse Effects
L-Asparaginase (Elspar)	Non-small cell lung cancer	Bone marrow depression, peripheral Neuropathy, extravasation may lead to tissue necrosis
Hydroxyurea (Hydrea)	Chronic myelocytic leukemia, melanoma, ovarian cancer, head and neck cancer	Bone marrow depression, nausea, vomiting, peripheral neuritis
Procarbazine (Matulane)	Hodgkin's disease	Bone marrow depression, mucositis, CNS depression

Major Side Effects and Nursing Interventions

- nausea and vomiting
 - administer antiemetics (e.g. Plasil) routinely every 4-6 hours after as well as before chemotherapy is started
 - withhold food and fluids 4-6 hours before chemotherapy-->a light, dry snack may be allowed
 - improve patient's appetite and minimize food aversion by:
 - providing 5-6 small meals per day
 - provide bland, non-greasy foods-->crackers, toast
 - serving foods at room temperature or slightly cooler-->less odor
- diarrhea
 - administer antidiarrheals as ordered
 - maintain perineal care-->to prevent infection and minimize discomfort; medicated creams may be prescribed
 - give clear liquids as tolerated-->apple juice, ginger ale, jello, broth
 - instruct patient to avoid milk products, spicy foods, and hard to digest foods temporarily-->to rest the bowel
 - monitor potassium, sodium, and chloride levels
 - measure I&O regularly
- stomatitis
 - provide and instruct patient on good oral hygiene-->inspect mouth regularly, use non-alcoholic mouthwash (e.g.)diluted hydrogen peroxide),removal of ill-fitting dentures, use of soft-bristled toothbrush
 - provide health teachings on the importance of:
 - keeping mucous membranes moist-->let patients suck on popsicle
 - avoidance of hot and spicy foods-->pasta and tacos
 - avoidance of acidic and/or carbonated food and drinks-->cola, orange juice, grapefruit juice
 - keeping food at room temperature or slightly cool
 - apply water-soluble lubricant such as KY jelly to dry, cracked lips
 - offer viscous lidocaine before meals to minimize discomfort
- thrombocytopenia (low platelet count)
 - monitor blood count
 - observe for epistaxis, petechiae, and ecchymosis
 - protect clients from injury-->no flossing, use of razor
 - instruct clients to avoid bumping or bruising the skin
 - avoid giving IM injections
- leukopenia (decrease in number of circulating WBCs)
 - implement careful handwashing technique
 - maintain reverse isolation as ordered
 - monitor for signs of respiratory and other infections
 - instruct patient to avoid crowds/person with infections
 - provide patient teachings on the early signs of infection:

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- Fever above 100.4° F (37.8° C)
 - Chills
 - New cough or production of sputum
 - Sore throat
 - More than three loose stools in a day
 - Pain or burning upon urination
- anemia
 - monitor hemoglobin and hematocrit
 - encourage adequate rest and sleep periods
 - administer oxygen as needed
 - provide health teachings on symptoms of anemia:
 - Fatigue, dizziness, lightheadedness
 - Shortness of breath
 - Difficulty staying warm
 - Chest pains
 - alopecia
 - inform patient that hair loss is not permanent
 - encourage the patient to obtain bandana or wig before starting treatment
 - administer scalp tourniquet or scalp hypothermia using ice pack as ordered-->to minimize hair loss
 - offer support and encouragement
 - provide health teachings on the importance of:
 - maintaining skin and scalp moisture-->limit shampooing to 3x a week with a mild shampoo and conditioner
 - preventing damage to hair follicles-->avoid using hair dryers, irons, and dyes
 - avoid tangling hair-->wide-toothed comb; use of silk pillowcase when sleeping
 - kidney damage
 - encourage increased fluid intake and frequent voiding to prevent accumulation of metabolites in the bladder
 - administer Allopurinol (Zyloprim) as ordered-->prevents uric acid formation which is common among patients on chemotherapy
 - reproductive organ damage
 - sperm banking is encouraged for men-->chemotherapy may cause infertility
 - advise clients and partners to use reliable methods of contraception-->chemotherapy can cause mutagenic damage to chromosomes leading to birth defect
 - neurologic damage
 - peripheral neuropathies and hearing losses may occur
 - protect patient from injury

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