Antineoplasic Agents

NAPNES Guidelines

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Cancer

- Cellular transformation
- Uncontrolled and rapid cellular growth
- Invasion into surrounding tissue
- Metastasis to other tissues or organs

Cancer (cont'd)

- Cancerous cells do not have:
  - Growth control mechanisms
  - Positive physiologic function
- Cancer cells either:
  - Grow and invade adjacent tissues
  - Break away from original tumor mass and travel by means of blood or lymphatic system to distant sites

Cancer (cont'd)

- Metastasis
  - Uncontrolled cell growth
- Neoplasm
  - Mass of new cells; tumor
- Tumor
  - Benign
  - Malignant (cancer)

TABLE 46-1

TUMOR CHARACTERISTICS: BENIGN AND MALIGNANT

Characteristics	Benign	Malignant
Potential to metastasize	No	Yes
Encapsulated	Yes	No
Similar to tissue of origin	Yes	No
Rate of growth	Slow	Unpredictable and unrestrained
Recurrence after surgical removal	Rare	Common

Table 46-1 Tumor characteristics: benign and malignant

Cancer: Tissues of Origin

- Carcinomas
- Sarcomas
- Lymphomas and leukemias

Table 46-2
Tumor classification based on tissue or origin

TABLE 46-2
TUMOR CLASSIFICATION BASED ON SPECIFIC TISSUE OF ORIGIN

Tissue of Origin	Malignant Tissue
EPITHELIAL CARCINOMAS	
Glands or ducts	Adenocarcinomas
Respiratory tract	Small- and large-cell carcinomas
Kidney	Renal cell carcinoma
Skin	Squamous cell, epidermoid, and basal cell carcinoma; melanoma
CONNECTIVE SARCOMAS	
Fibrous	Fibrosarcoma
Cartilage	Chondrosarcoma
Bone	Osteogenic sarcoma (Ewing's tumor)
Blood vessels	Kaposi's sarcoma
Synovia	Synoviosarcoma
Mesothelium	Mesothelioma
LYMPHATIC LYMPHOMAS	
Lymph tissue	Lymphomas (Hodgkin's disease and multiple myeloma)
NERVE	
Glial	Glioma
Adrenal medulla nerves	Pheochromocytoma
BLOOD	
White blood cells	Leukemia

Etiology of Cancer

- Age- and sex-related differences
- Genetic factors
- Ethnic factors
- Oncogenic factors (viruses)
- Occupational and environmental carcinogens
- Radiation
- Immunologic factors

Principles of Chemotherapy

- The goal is to eliminate **all** malignant cells without excessive destruction of normal cells
- Antineoplastic agents do not directly kill tumor cells
  - Act by interfering with cell reproduction or replication at some point in the cell cycle

Principles (con't)

- Chemo drugs are non-selective
  - Affect all cells in the body as they replicate,
    - Always some degree of injury to normal cells
- Cell particularly susceptible to chemo
  - Those with a high rate of growth
    - Bone marrow
    - GI track
    - Epithelium
    - Hair follicles

Chemotherapy

Therapeutic Uses

- Cure
- Control of tumor growth
- Palliation
- Adjuvant therapy

Chemotherapy

Drug Choice

- Depends upon
  - Site of cancer
  - Type of cancer
  - Stage of cancer
  - Cell-cycle activity of cancer
  - Prior treatment
  - Physical status of patient
  - Pharmacokinetics of drug

General Action of Chemotherapy

- Inhibit cell metabolism
- Inhibit cell division
- Goal is to kill every neoplastic cell
  - Not achieved in most cases
    - Drugs are cytotoxic – not tumoricidal
      - Only kill portion of cells of a tumor
        - » Those that are dividing
        - » Not all cells in the tumor

Alkylating Agents

- Action
  - Substitutes an alkyl chemical structure for a hydrogen atom in the DNA
  - Results in a cross-linking of each strand of DNA
    - Thus preventing cell division
- Example
  - Cisplatin (Platinol)
  - Mechlorethamine (Mustargen)
  - cyclophosphamide (Cytoxan)

Alkylating Agents (con't.)

- Uses
  - lymphomas, leukemias, myelomas
  - ovarian, testicular, breast, and pancreatic cancers
- Side Effects
  - bone marrow suppression
  - alteration in mucous membranes
  - severe N&V
  - alopecia

Antimetabolites

- Mechanism of Action
  - Structure similar to a necessary building block for the formation of DNA.
  - Accepted by the cell as the necessary ingredient for cell growth
  - Interferes with cell metabolism
    - Acts an imposter
      - Interferes with the production of DNA
    - Actually interferes with the synthesis of DNA and RNA

Antimetabolites (con’t.)

- Examples:
  - Fluorouracil (5-FU)
  - Methotrexate (MTX)
  - Cytarabine (ARA-C)
  - Mercaptopurine (6-MP)
- Side effects
  - bone marrow depression
  - alteration in mucous membranes
  - N&V, diarrhea
  - thrombocytopenia
  - alopecia

Antimetabolites (cont.)

- Nursing Implications
  - Be sure the patient has at least 3 liters/day of fluids to minimize nephrotoxicity
  - After Methotrexate administration
    - **chlorambucil (Leukovorin)** will be given
      - Form of folic acid
        - » Prevent severe anemia from developing

Antibiotic Antineoplastic Agents

- Mechanism of action
  - Bind DNA
    - inhibiting DNA and RNA synthesis
      - therefore inhibiting cell growth.
- Examples
  - Doxorubicin (Adriamycin)
  - Bleomycin sulfate (Blexoxane)
  - Mitomycin (Mutamycin)

Antibiotic Agents, con't

- Side effects
  - Adriamycin
    - Potent vessicant (will cause tissue necrosis if it infiltrates)
    - Decreased ejection fraction
      - Most dangerous side effect (normal is 70%)
      - Must do baseline CV assessment prior to beginning Adriamycin (EKG, echo, angiography).
        - » Must reduce the dose of chemo at the first sign of heart failure
  - Others
    - Stomatitis, alopecia, bone marrow suppression, hepatic impairment.

Mitotic Inhibitors

- Also called Vinca-Alkaloids
  - Inhibit mitosis during cell division
- Examples
  - Vinblastine (Velban)
  - Vincristine (Oncovin)
- Uses
  - ALL
  - Lymphomas
  - Rhabdomyosarcoma

Mitotic Inhibitors (con't)

- Side effects
  - **Neurotoxicity**
    - specific side effect for this classification of drugs
  - Peripheral neuropathy
  - Alteration in bowel and bladder tone (including paralytic ileus),
  - Headache,
  - Tingling of fingers/hands/toes,
  - Ataxia.
  - Constipation
    - Common due to effects on the autonomic nervous system

Other Drugs Used to Treat Cancer

Hormonal Agents

- Mechanism of Action
  - Action on neoplasms sensitive to hormonal growth controls of the body.
    - Interfere with growth-stimulating receptors on target tissues.

Hormonal Agents (con't)

Examples & Uses

- Corticosteroids
  - Retard lymphocytic proliferation,
    - Treatment of lymphocytic leukemias and lymphomas.
  - Decrease edema associated with tumor growth
    - Especially in or around the brain, spinal cord, and mediastinum
  - Decrease cerebral edema.
- Androgens (testosterone)
  - Used to treat advanced breast cancer

Hormonal Agents (con't)

Examples & Uses

- Anti-Estrogen drugs (Tamoxifen)
  - Block the uptake of estrogen
    - Effective for tumors that contain high concentrations of estrogen receptors
- Estrogen
  - Used to treat androgen-sensitive cancers
    - Prostate cancer
- Progestins (Depo-Provera and Megace)
  - Used to treat endometrial cancer

Administration of Chemo

- IV is the most common route
  - Peripheral administration
  - Risky
    - Many drugs are vesicants
      - Ports/central lines preferred)
- Oral
- Topical (some skin cancers)
- Intrathecal
- Intracavity (directly into the bladder)
- Intra-arterial (for hepatic lesions)

Allergic Reactions to Chemo

- STOP the infusion if any sign of allergic reaction develops
  - Dyspnea, wheezing, chest tightness
  - Pain, pruritis, urticaria
  - Tachycardia, dizziness
  - Sudden anxiety, inability to speak
  - Hypotension, decreased LOC, flushed skin

Safety Issues with Chemo

- Nurses must be chemotherapy certified prior to administration of any chemotherapy agents
- Double checking the chemo with another nurse is required
- Wear special protective gloves, aprons
- Special “spill precautions” are taken

Safety (con’t)

- Chemo bags, tubing, any chemo-soiled linens are discarded in special red “hazardous material” bags
- Chemo is excreted through urine, stool, and vomitus, so special precautions must be taken to avoid contact exposure
- Pregnant health care workers should not administer chemo

Special Nursing Care

- Patient teaching is a priority
- Anticipatory guidance concerning body changes and the expected treatment regimen
- Assure hydration to avoid nephrotoxic effects of chemo

Nursing Care (con’t)

- Teach about all side effects and how they can be managed (loss of appetite, mouth sores, fatigue and malaise, bleeding tendencies, constipation and diarrhea, susceptibility to infection)

Management of Nausea and Vomiting

- Antineoplastic drugs directly stimulate the chemo-receptor trigger zone (CTZ) in the medulla of the brain.
  - What causes the nausea and vomiting
- Cell death releases many toxins into the system which also stimulates the chemo-receptor trigger zone

N&V (con't)

- Can occur
  - **Just at the thought of chemo!**
    - Cancer patients expect and often experience N&V
      - Higher cortical centers of the brain can stimulate the CTZ to induce vomiting

Drugs that are Helpful for Chemo-Induced N&V

- Marinol is a synthetic derivative of marijuana
- Zofran and Kytril block serotonin receptors in the CTZ and are among the most effective antiemetics, especially if combined with a corticosteroid
- Xanax and Ativan (Benzodiazepines) directly block the CTZ

N&V Drugs, con't

- Reglan calms activity of the GI track and is especially helpful if combined with a corticosteroid, an antihistamine, or a centrally acting drug like Ativan or Haldol
- Compazine is a phenothiazine that has a strong antiemetic effect in the CNS
- Treat for N&V BEFORE it occurs!

Combination Chemotherapy

- "Combination chemo"
  - More effective
  - Decreases resistance
  - Decreases dosages for individual drugs
  - Each drug works best at a different point in the cell division cycle
  - Provides a better chance of cure
    - Gives longer remissions if cure not possible

Combination Chemotherapy (cont.)

- Examples
  - MOPP
    - Hodgkins Lymphoma
      - M = nitrogen **Mustard**
      - O = Oncovin
      - P = Procarbazine
      - P = Prednisone
  - BACOP
    - Non – Hodgkins Lymphoma
      - Bleomycin
      - Doxorubicin
      - Cyclophosphamide
      - Vincristine
      - prednisone

Extravasation

- Leaking of an antineoplastic drug into surrounding tissues during IV administration
- Can result in permanent damage to nerves, tendons, muscles, loss of limbs
- Skin grafting or amputations may be necessary

Extravasation (cont'd)

- Prevention is essential
- Continuous monitoring of the IV site is essential

Extravasation (cont'd)

- If suspected, stop the IV infusion immediately but do not remove the IV tube
- If possible, aspirate remaining drug or blood from the tube
- Follow instructions for giving the appropriate antidote through the existing IV tube, then remove the catheter
- Some antidotes are not given through the IV catheter

Extravasation (cont'd)

- Cover area with sterile, occlusive dressing
- Apply warm or cold compresses, depending on the extravasated agent
- Elevate the limb

Radioactive Agents

Radioactive agents

- Mechanism of action
  - Formation of free radicals
  - Ionization of tissue
    - Causes severe chemical instability and death
- Examples
  - Cobalt (60CO) gamma radiation
  - Phosphorus (32P)
    - Interferes with metabolism of cells
      - Particularly in cell division

Nursing Implications

- Assess baseline blood counts before giving any antineoplastic agents
- Follow specific administration guidelines for each antineoplastic agent

Nursing Implications

- Remember that all rapidly dividing cells (both normal and cancer cells) are affected
  - Mucous membranes
  - Hair follicles
  - Bone marrow component
- Monitor for effects on these tissues or complications

Nursing Implications

- Monitor for complications
  - GI mucous membranes: stomatitis, altered bowel function with high risk for poor appetite, nausea, vomiting, diarrhea, and inflammation and possible ulcerations of GI mucosa

Nursing Implications

- Monitor for complications
  - Hair follicles: loss of hair (alopecia)
  - Bone marrow components: dangerously low (life-threatening) blood cell counts
  - Possible stimulation of CTZ

Nursing Implications

- Monitor for side effects specific to the type of antineoplastic agent given

Nursing Implications

- Implement measures to monitor for and prevent infection in patients with neutropenia

Nursing Implications

- Implement measures to monitor for and prevent bleeding in patients with thrombocytopenia and anemia

Nursing Implications

- Keep in mind that anemia may result in severe fatigue

Nursing Implications

- Monitor for stomatitis (oral inflammation and ulcerations) and implement measures to reduce the effects if it occurs

Nursing Implications

- Anticipate nausea and vomiting and implement measures to reduce these effects

Nursing Implications

- Women of childbearing age will need to use a nondrug form of contraception during therapy

Nursing Implications

- In addition to physical measures, keep in mind the need for emotional support during this time for both the patient and family
- Monitor for therapeutic responses to antineoplastic therapies and the many possible side/adverse effects