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Complications of Cancer: Case Studies in Oncologic Emergencies

Cancer is the second leading cause of death in the United States. A series of cases will be used to describe the presentation of various oncologic emergencies, including both metabolic and mechanical disorders. Appropriate diagnostic techniques will be reviewed, and chemotherapeutic agents and their adverse effects will be described.

- Recognize the latest developments in the treatment of oncologic emergencies.
- Understand the appropriate urgency for the workup and treatment of fever and neutropenia.
- Identify the various ways in which tumors can impinge on vascular and neurologic structures.

TU-94
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FACULTY

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Complications of Cancer: Case Studies in Oncologic Emergencies

Patricia Lee MD FACEP

CASE ONE:
56 y/o female with known breast cancer- completed chemotherapy 10 days ago. Brought by family with c/o fever, cough - productive with yellow-greenish phlegm.
ROS: Denies dysuria, neck pain, confusion, abdominal pain, V/D, CP, or SOB
PMH: breast Ca; s/p L mastectomy 3 months ago.
SH: Denies ETOH, IVDA; + TOB 1 ppd/25 years - stopped 3 months ago.
PE: BP 104/68 T 102.5 HR 114 RR 32 POx 92%
Gen: thin female, weak appearance; **Chest:** occ rhonchi; L mastectomy scar
Lab: WBC 0.4 Hgb 9.5 Differential: 86 polys, 10 lymphs, 2 monos **UA:** negative
CXR: negative

CASE ONE: Fever and neutropenia

- Infection and sepsis are the most common cause of death
- Patients may look and feel well; nadir after chemo - around day 10
- Fever = infection (60%); may also be seen due to chemotherapeutic agents, tumor necrosis, transfusions or antibiotics
- Fever = 38.5°C (101.3°F) or 38°C (100.4°F) recurrent.
- Infection incidence increases if absolute neutrophil count (ANC) < 500/mm3
- **Risk factors:** Increased risk; deficient phagocytes due to cytotoxic therapy, the skin and mucosa breakdown chemotherapy, indwelling vascular access devices, and the high frequency of invasive procedures.
- Immunosuppression =>impaired inflammatory response - difficult to localize source
- **Physical exam**: also examine for infection at indwelling catheter, sinuses, ears, skin, dental abscesses, perirectal (do not perform rectal exam), meningismus, cellulitis
    - Blood cultures - 2-3 10 cc samples from different sites, include indwelling catheters
    - UA may be falsely negative for WBC's in neutropenia; Urine culture important.
    - CXR may be falsely negative in neutropenic patient
- **Pathogens**: 60% not identified; usually patient's "own" - GI tract e.g., E coli, Klebsiella, Pseudomonas, Enterobacter; if indwelling PICC line: S. epidermidis or S. aureus, streptococci; asplenic patient - increased risk of encapsulated organisms.
- **Treatment:** broad-spectrum bactericidal antibiotics to include coverage for gram-negative and gram-positive as well as Pseudomonas.
    - Aminoglycosides are ineffective monotherapy
    - Combo therapy best- e.g., ceftazidime or anti-pseudomonal penicillin plus aminoglycoside; Add vancomycin for MRSA , catheter infections, hypotension.
    - Anti-fungals if febrile despite antibiotics or neutropenic > 4 wks.
    - Granulocyte transfusions are useful in overwhelming sepsis and neutropenia
- Catheter infections:
    - Indwelling catheter: Vancomycin through the catheter is effective

- Catheter tunnel infections are resistant to treatment unless the catheter is removed.
- Yeast or mycobacteria infection - probably catheter associated

- Reverse isolation if ANC < 500/mm
- G-CSF and GM-CSF- decrease duration of chemo-induced neutropenia; expensive daily IM injections.

CASE TWO:

68 y/o male with known AML presents with painless hematuria X l day; recent OTC medication for "head cold"

ROS: Denies abd pain, F, N/V/D, back pain, SOB, CP, urgency, frequency or dysuria.

SH: Remote ETOH, TOB history - none for 6 months

PMH: AML; completed course of chemo 7/97

PE: BP 138/ 76 HR 88 RR 20 T 99.2
Gen: appears comfortable: **HEENT**: conjunctiva- pale, O/P- clear; **Abd**: soft, NT/ND, good BS; **Back**: No CVAT; **Ext**: multiple petechiae noted along pressure points; **GU**; normal male, no trauma, no discharge; **Rectal**: stool brown, moderate guaiac positive

Lab: WBC 8.7 Hgb 8.5 plt 9,000 PT 12.5 PTT 33 INR 1.2

UA: large blood, 30-50 rbcs, 1-3 wbcs, no bacteria seen

CASE TWO: **Thrombocytopenia**: most frequent cause of hemorrhage

- **Causes** of thrombocytopenia:
  - Abnormal production - e.g. aplasia, infiltrative, ineffective
  - Increased destruction- immune (ITP), non-immune (DIC, HUS)
  - Sequestration - hypersplenism, ETOH
- **Bleeding history**
  - comorbid factors- drugs (ASA, NSAIDS), pregnancy, HIV, previous transfusions
- **Physical exam** findings: petechiae = hallmark
  - increased mucosal bleeding, petechiae on lower extremity, pressure sites; splenomegaly, assoc. anemia
- **Diagnosis**: peripheral smear, CBC, BM aspiration, platelet antibody
- **Risk of bleeding**:
  - >100K small; 50-100K low; <20K moderate, < 5-10 high
  - Spontaneous bleeding occurs below 10,000/mm3.
- **Treatment:**
  - Treat cause. Remove offending agent
  - Avoid ASA, NSAID in chemotherapy patients
  - Platelet transfusion prn;
    - l unit random donor platelets raises platelet count 5-10K; Single-donor platelet transfusion best to reduce alloimmunization risk
- **Idiopathic Thrombocytopenic Purpura**
  - Corticosteroids stabilize vascular integrity
  - Splenectomy if immune destruction
  - IV IgG to block RES
  - Plasmapheresis to remove antibody

CASE THREE:
45 y/o female with recently diagnosed Burkitt's lymphoma presents with nausea, generalized weakness. Patient began chemotherapy 5 days ago.
ROS: Denies F, V/D, abdominal pain, SOB, cough, URI or UTI symptoms
PE: BP 118/74 HR 94 RR 20 T 97.6
Gen: appears comfortable, O/W unremarkable
LAB: WBC 8.9 Hgb 11.5; Na 145 K 6.5 BUN 90 Cr 11.4 Uric acid 10.7 Phos 10.4 Ca 6.2

CASE THREE: Tumor Lysis Syndrome

- Rapid release of intracellular contents and nucleic acids; 1-5 days post-chemo
- Most common in lymphoma, leukemia, occasionally in solid tumors
- **Risk factors**: large tumor burden, high growth fraction, increased LDH or uric acid pretreatment, or preexisting renal insufficiency
- **Presentation**: cell lysis results in
    - hyperuricemia - secondary to DNA breakdown -> renal failure
    - hyperkalemia - cytosol breakdown -> arrhythmia
    - hyperphosphatemia - protein breakdown -> renal failure and hyperkalemia
    - hypocalcemia - due to hyperphosphatemia, -> AMS, seizures, muscle cramps, tetany, arrhythmia
- **Treatment:**
    - Hydration and diuresis before, during and after treatment
    - Allopurinol pretreatment blocks conversion of hypoxanthine and xanthine to uric acid
    - Alkaline urine- pH > 7; controversial as it improves uric acid diuresis but may worsen hypocalcemic tetany
    - Treat life-threatening hyperkalemia - diuresis, Kayexalate, insulin, glucose
    - Calcium gluconate or chloride for either symptomatic hypocalcemia or EKG's associated with hypocalcemia.
    - Early dialysis - ***rule of tens***
        - **uric acid >10; phosphorus >10; creatinine > 10; K > 6.0**

CASE FOUR:
78 y/o female presents with generalized weakness, N/V, constipation - last BM 1 week ago; pt feels "bloated",
ROS: Denies F, chest pain, cough, URI or UTI symptoms, melena.
PE: BP 88/54 HR 44 RR 24 T 98.2
Gen: lethargic female; O/W unremarkable
LAB: WBC 11.2 Hgb 10.5 Ca 15.3 mg/dl
EKG: bradycardia, 1st degree AV block, shortened QT interval

CASE FOUR: Hypercalcemia of malignancy

- 10-20% patients with CA; ; seen in advanced disease- median survival < 30 d
- **Risks**: hematological malignancies, solid tumors with or without bone metastases - non-small cell lung cancer, breast cancer, head and neck cancer, small cell cancer,

myeloma, and T-cell lymphoma; bony metastases, and prolonged immobilization.

- **Pathophysiology:** tumor factors (PTH-related protein) are released which cause increased bone resorption and renal reabsorption of calcium; bony mets may release calcium
- **Symptoms:**
  - early: anorexia, nausea, constipation, fatigue, polydipsia, polyuria
  - late: coma, arrhythmia
- **Diagnosis:**
  - Calcium usually above 12 mg/dl - serious, **>15 mg/dl- emergency**
  - Calcium binds to albumin; low serum albumin = false low measured serum calcium
    - Corrected Ca mg/dl = measured Ca + (4-albumin g/dl X0.8)
- **Cardiac effects**:
  - enhanced contractility until calcium > 15, then myocardial depression
  - slowed conduction, AV Block, prolonged PR and QRS; **shortened QT most reliable**
  - bradycardia, bundle branch block, heart block
- **Treatment:**
  - Hydration - 0.9NS 500 cc/hr X 1-2 liters
  - Diuresis - furosemide (100-200 mg IVP) to promote calcium excretion; desired urine output - 500 cc/hr; AVOID thiazides as they decrease calcium excretion
  - Correct hypokalemia
  - Consider bisphosphonates that block bone resorption (etidronate, pamidronate) gallium, steroids, calcitonin, mithramycin, dialysis.
  - Mobilization of patient and initiate active treatment of the underlying malignancy

CASE FIVE:

64 y/o nursing home patient with known pancreatic cancer presents with acute abd pain, nausea, coffee ground emesis, black stools and generalized weakness.

ROS: Denies fever, chest pain, shortness of breath, URI or UTI symptoms

PE: BP 94/60 HR 125 RR 30 T 96.8
HEENT: sclera icteric, conjunctiva pale, O/P- mucus membranes dry
Abd: mild diffuse tenderness increased in midepigastric area, no rebound, rigidity or guarding; hypoactive bowel sounds. **Ext**: multiple petechiae - especially at pressure points; some oozing noted from around IV sites; **Rectal**: melena; **GU**: no masses

NGT: 300 cc coffee ground material

Lab: WBC 11.2 Hgb 8.3 Plt 75,000;
FBG decreased, FDP increased, D-dimer increased

CASE FIVE: Disseminated Intravascular Coagulopathy

- DIC results from control mechanisms being overwhelmed by
  - massive tissue damage with high levels of tissue factor released
  - shock and resultant low flow states with loss of hemodilution, and widespread consumption of coagulation factors and platelets
  - major alterations of endothelium
  - impaired liver function and removal of activated factors
- **Risk**: adenoCA (especially of pancreas or prostate) or promyelocytic leukemia; may be acute or chronic DIC
  - chronic: most patients have disseminated malignancy: present as DVT,

Trousseau's syndrome, nonbacterial thrombotic endocarditis, or embolism without bleeding;
  - acute: simultaneous blood oozing from three or more sites; increased FDP, increased D-dimer, decreased FBG, decreased platelets
- **Treatment:**
  - treat cause - eliminate infection or malignancy
  - supportive care: FFP, cryo, +/- platelets
  - heparin controversial - lowest dose to allow maintenance of platelet count > 50,000/mm3 and FBG > 150 mg/dl; PTT 1.5-2 times normal
  - Transretinoic acid used to stop secretion of DIC inducing factors in leukemia

CASE SIX:

63 y/o male brought from home by relatives. Complained earlier in the evening of SOB and chest pain, with visual disturbances. Per family, patient is confused.
ROS: Denies F, N/V/D, abdominal or back pain.
PMH: Denies
PE: **Gen**: stuporous; **HEENT**: fundoscopic exam - no papilledema, "boxcar" segmentation; **Chest**: lungs rales 1/3 up; **Neuro**- non-focal
Lab: Hematocrit- 28%; smear- rouleaux; chemistry lab reports unable to perform requested tests due to viscosity of blood

.

CASE SEVEN:

38 y/o male with h/o chronic myelogenous leukemia s/p chemo with remission 3 yrs ago presents with fatigue, headache, weakness, shortness of breath
ROS: Denies F, N/V, chest pain, abdominal pain, URI or UTI symptoms.
PE: BP 165/94 HR 135 RR 30 T 98.6 POx 92%
Gen: anxious, ill- appearing, answers questions appropriately; **HEENT**: fundoscope - bilateral retinal hemorrhages; **Chest**: bilateral rhonci; petechiae noted; **CV**: tachy; **Abd**: marked hepatosplenomegaly; **Ext**: scattered petechiae; **Neuro**: unremarkable
LAB: WBC 224, 000, many blasts; Hgb 6.5, plat 74, 000; K+ 11.0, Glc 15
EKG: normal

CASE SIX and CASE SEVEN: Hyperviscosity/Hyperleukocytosis

- **Signs and Symptoms:**
  - brain and lungs most vulnerable
  - visual problems, headache, seizures, lethargy, coma, CHF, MI, renal insufficiency, hypoxemia
  - retinopathy with "sausage-link" or boxcar" segmentation
  - mucosal bleeding due to abnormal platelet function
- **Waldenstrom's** -
  - increased plasma proteins, serum viscosity high;
  - Treatment: IVF, plasmapheresis; **avoid transfusion**,
- **Hyperleukocytosis**:
  - increased WBC seen with leukemia; WBC > 100K
  - high blood viscosity; excess WBC utilize glucose; increase K as they lyse - seen as **pseudohypoglycemia,**

pseudohyperkalemia, and pseudohypoxia.
    - Treatment: IVF, allopurinol followed by hydroxyurea, alkalinize urine, leukapheresis, CNS irradiation; **avoid diuretics**.
    - Treatment may precipitate Tumor Lysis Syndrome
- **Polycythemia**: Hct 60-80%;
    - Treatment- phlebotomy
- **Thrombocytosis**: Platelets > 1 million
    - Treatment: ASA, apheresis

CASE EIGHT:

52 y/o male presents with progressive SOB for 2 weeks. Occasional CP for hours.
ROS: Denies fever, nausea, vomiting, abdominal pain.
SH: Tobacco - 1 ppd X 30 years; ETOH- occasional
PE BP 90/54 HR 125 RR 28 T 99.0 POx 96%
Gen: mildly dyspneic; **Neck**: + JVD; **Chest**: CTA ; **CV**: RRR, no murmurs
CXR: Cardiomegaly "water bottle" heart
EKG: tachy, electrical alternans

CASE EIGHT: Malignant Pericardial Tamponade

- Pericardial effusion is common with metastatic cancers; primary disease rare
- Cancer is the most common cause of cardiac tamponade - direct extension or pericardial metastasis, post-irradiation or post chemo (anthracycline and cyclophosphamide)
    - **Misdiagnosed as CHF, pulmonary embolism or anxiety**
- Pericardial fluid compresses the heart - decreased diastolic filling and circulatory collapse
- **Symptoms and Signs**:
    - Progressive dyspnea, nonspecific chest pain, cough, hoarseness, anxiety
    - **Beck's triad** - JVD, distant heart tones and hypotension; diaphoresis, cyanosis, tachycardia, pulsus paradoxus (most specific), pericardial friction rub is rare.
- **Diagnosis**
    - Echo - diagnostic modality of choice. Effusion, collapse of the RA and RV during early diastole with resultant diastolic interventricular septal shift.
    - EKG- usually normal; diagnostic - low voltage, tachy, electrical alternans
    - CXR- water bottle heart or radiolucent fat lines; in acute disease, CXR may be normal - 200 cc can produce tamponade
    - CVP elevated >12-14 despite hypotension; equal diastolic pressures in all chambers
- **Treatment**
    - IVF, oxygen
    - Pericardiocentesis- reserve for hemodynamically unstable due to increased risk of PTX, coronary artery laceration.
    - Consult CV surgeon for subxiphoid pericardial window for catheter drainage and possible sclerotherapy (talc or bleomycin)
    - Possible radiation therapy or chemo

CASE NINE:
33 y/o male with headache, chest pain and SOB for 4 days. Thinks his face is "swollen".
ROS: Denies F, cough, abdominal pain.
SH: Tobacco- 1 ppd X 20 years
PE: BP 135/94 HR 96 RR 24 T 98.4
HEENT: NCAT - mild diffuse edema, facial plethora; **Neck**: supple, dilated neck veins; **Chest**: CTA + caput medusae
CXR: RUL mass

CASE NINE: Superior Vena Cava Syndrome

- SVCS once viewed as immediately life-threatening, but today carries a relative good short term prognosis - more than 50% curable. In past -TB etiology, now- neoplasm, occasionally due to thrombosis from indwelling catheters or pacemakers.
- Extrinsic compression or intrinsic obstruction of SVC results in elevated venous pressures in the upper extremities, head, and neck with secondary increased intracranial pressure, soft tissue edema, venous distention, and venous collateral formation.
- Malignant mediastinal mass most common cause- e.g., bronchogenic carcinoma (small cell then squamous cell) and non-Hodgkins lymphoma; also thrombosis.
- **Symptoms and signs:**
    - Headache, hoarseness, nausea, dyspnea, dysphagia, cough, nonspecific chest pain, visual and mental status changes
    - Facial plethora, facial fullness or swelling, chemosis, JVD, Stokes sign (increased neck collar size), caput medusae (dilated collateral veins over the trunk), unilateral or bilateral arm swelling.
- **Diagnosis:**
    - CXR - two thirds with superior mediastinal widening, right hilar or upper lobe mass, or pleural effusion; may be normal if thrombosis.
    - CT or MRI chest- most useful for confirmation, localization, identifies thrombosis.
    - Bronchoscopy with biopsy - high yield
- **Treatment:**
    - Oxygen, elevate head of bed to reduce or prevent facial and brain edema
    - Chemo - use a lower extremity or femoral vein to decrease risk of extravasation.
    - Mediastinal radiation therapy preferred therapy for bronchogenic cancer, and is usually delayed until after histologic diagnosis obtained. It is no longer felt to be emergent except in children or adults with AMS, papilledema, severe headaches or other life-threatening manifestations of increased intracranial pressure, CV collapse, or evidence of upper airway obstruction.
    - Consider diuretics, steroids for patient with airway compromise and anticoagulation or thrombolytic for patient with SVC thrombosis.

CASE TEN:
43 y/o male presents post-ictal after a 10 minute tonic-clonic seizure.
ROS: Denies F, N/V, trauma, toxic ingestion, weakness, numbness.
PMH: No previous seizures; frequent headaches upon arising in am.
ED course: Patient initially post-ictal but became more alert during ED course;
PE: BP 112/68 HR 84 RR 18 T 97.8
Neuro: A&OX4; Moves all extremities well, answers questions apropriately.
CT brain: hypodensity noted

CASE TEN: Parenchymal brain metastasis

- 20-30% of systemic cancer will develop brain mets; lung, breast, GI, GU, and melanoma are most common; may be single or mulitple; most common is cortico-medullary junction. Frequently first sign of cancer.
- **Symptoms and Signs:** due to surrounding edema
  - Headache - retro-orbital, nausea, vomiting, dysphasia, ataxia, and personality changes. Most severe upon waking and improves as day goes on.
- **Herniation syndromes**: as intracranial mass increases, the brain herniates in area of least resistance
  - Central herniation - downward displacement of the diencephalon and pons → slowly decreasing LOC
  - Uncal herniation - lateral mass compresses temporal lobe and upper brainstem -> ipsilateral pupillary dilatation, contralateral hemiparesis, and rapid LOC
  - Tonsillar herniation - posterior fossa mass compresses brainstem and medulla -> rapid LOC, meningismus and apnea
  - Treatment:
    - Intubation, hyperventilation, mannitol, dexamethasone.
    - Consider surgical decompression or radiation therapy
- **Diagnosis:**
  - CT or MRI: contrast is advisable; skull films - not useful
- **Treatment:**
  - Elevate head of bed
  - Dexamethasone - 100 mg bolus or 4 mg QID with taper; improves in hrs.
  - Consider intubation and hyperventilation for severely symptomatic patient
  - Control seizures with diazepam or lorazepam then use phenytoin. Note phenytoin has been linked to Stevens-Johnson syndrome if steroids and CNS irradiation also used. Diphenylhydatoin probably safer alternative.
  - Begin search for primary tumor
  - Solitary lesion - surgical resection followed by radiation therapy; multiple lesions - whole brain irradiation

CASE ELEVEN:
37 y/o female presents with severe low back pain for 3 months. Saw her PMD three times for same and was given NSAID without relief. She is unable to ambulate or perform her daily activities. Pain is worse with reclining; + stool incontinence.
ROS: Denies F, N/V, trauma, abdominal pain, numbness.
PE: BP 132/84 HR 98 RR 18 T 99.0
Back: tender L2-3 area; **Neuro**: positive straight leg raises; diminished rectal tone; sensory intact
LS spine: vertebral body collapse; osteolysis noted

CASE ELEVEN: Malignant spinal cord compression

- 5-10% malignancies; usually extradural source: breast, lung, prostate, kidney, lymphoma, multiple myeloma, and sarcoma. Frequently first sign of cancer.
- Thoracic spine 70%; lumbar 20%; cervical -10%
- Injury may be by direct mechanical distortion onto cord or by vascular compromise with edema, ischemia or infarction. Rarely due to intramedullary tumor (within cord)
- **Symptoms and Signs:**
  - Pain (96%)at level of the lesion - precedes neurologic deficit by ws to mos.
  - Weakness, sensory loss, ataxia, flexor spasms, herpes zoster, autonomic dysfunction are late findings
  - Initially hyperreflexic, later hyperreflexic with spasticity
- **Diagnosis**
  - Plain films - 85% are abnormal; bony erosion and vertebral body collapse.
  - MRI with contrast - best; CT with contrast - adequate
  - Other: myelography - sensitive but risk of neurological deterioration if the needle is inserted below the tumor; radionuclide bone scan - 90% sensitivity in all but multiple myeloma; many false- positive results.
  - Prognosis related to neurological status directly before treatment
- **Treatment: this a medical emergency**
  - Dexamethasone 100 mg bolus or 4-10 mg QID with taper
  - Radiation therapy is mainstay. Chemo and surgery as dictated by tumor.
  - Emergency surgery needed when acute worsening neurological symptoms

Other Problems Associated with Oncological Emergencies

- **Hematologic:**
  - **Hypercoagulability:**
    - DVT, PE may be presenting sign of hypercoagulability
    - Results from elevated platelet counts and increased levels of factor I, V, VIII, IX, and decreased levels of AT-III and Protein C and S.
    - Treatment: Heparin and warfarin may be ineffective or may cause complications of bleeding within tumors. Inferior vena caval filter best.
  - **Microangiopathic hemolytic anemia**
    - Rare condition seen in malignancy, uremia, and TTP; anemia and schistocytes in peripheral blood smear. Caused by fibrin formation in the microcirculature and resultant hemolysis.
    - Seen in malignancy with high tumor load uncontrollable by chemo; 50% gastric cancer, also breast and lung; can be the result of mitomycin.
    - Treatment:: red blood cell transfusion and heparin.
  - **Hemolytic uremic syndrome**:

- Microangiopathic hemolytic anemia, thrombocytopenia and uremia; associated with adenocarcinoma and squamous cell carcinomas.
- May occur in patient without evidence of active disease
- Common after chemo with mitomycin, also orouracil, lomustine, vinca, and high-dose chemo with autologous stem cell support.
- Treatment: high mortality; plasmapheresis, steroids.

- **Metabolic**
  - **SIADH**: 1-2% cancer patients
    - Seen with small-cell lung cancer but also with lung mets, prostate or pancreatic cancer, primary CNS and brain metastasis. Can be due to chemo agents – vincristine, cyclophosphamide, narcotics, phenothiazides, and antidepressants.
    - Presentation: N/V, anorexia and weakness, AMS, coma or seizures.
    - Diagnosis: hyponatremia and hypo-osmolality of serum but a high urine sodium with inappropriately high urine osmolality relative to serum
    - Treatment:
      - Na >120 - 0.9NS with furosemide diuresis and K supplements
      - Na < 120 - consider hypertonic saline; d/c when Na >120
      - Too rapid increase in serum sodium results in central pontine myelinolysis or hypervolemia; correct no higher than 1 mEq/L/hr.
      - Minor hyponatremia - fluid restriction to 1000 cc; use tetracycline demeclocycline to precipitate nephrogenic diabetes insipidus.
  - **Adrenal insufficiency**
    - Due to withdrawal of chronic steroid therapy or aminoglutethimides
    - Presents as early sepsis with hypotension, hypoglycemia, hyponatremia and hyperkalemia
    - Treatment: Corticosteroid bolus
  - **Hypoglycemia**
    - Tumors of secreting islet cell mesenchymal, and hepatoma.
    - Presentation: seizure, focal neuro deficits, or coma in CA patient
    - Treatment: dextrose, tumor resection, radiation and diet.
    - Consider diazoxide to patients with insulinoma.

- **Neurologic**
  - **Intramedullary metastasis**
    - Unusual; lung cancer, breast and colon cancer or lymphoma
    - **Presentation** - similar to epidural spinal cord compression except that motor weakness is usually unilateral
    - **Diagnosis:** CT or MRI with gadolinium.
    - **Treatment**: similar to epidural spinal cord compression
  - **Leptomeningeal metastasis**: poor prognosis
    - Rare; lung or breast CA, melanoma, or lymphoma
    - **Signs and symptoms**: referable to the brain, cranial nerves or spine: headache, AMS, ataxia, N/V, diplopia, facial or lower extremity weakness, paresthesia, reflex asymmetry, spinal pain.
    - **Diagnosis:** CSF: elevated protein, positive cytology, pleocytosis
      - **Treatment:** methotrexate, cytarabine, and thiotepa given intrathecal or intraventricular; subcutaneous reservoirs.

Complications of Chemotherapeutic agents

- Cyclophosphamide - BM suppression(BMS), hemorrhagic cystitis
- Methotrexate- renal failure, BMS
- 5-FU - ataxia, BMS
- Cisplatin - renal failure, ototoxicity
- Bleomycin - pulmonary fibrosis
- Adriamycin - cardiomyopathy
- Vincristine, vinblastine- peripheral neuropathy

Complications of Radiation Therapy

- Skin - erythema, desquamation, atrophy and fibrosis
- Lung -pneumonitis
- Cardiac - pericarditis, myocarditis
- GI - N/V, bleeding, adhesions, fistulas
- CNS- brain necrosis

Summary Questions:

1. When are emergent high dose steroids needed?
   Parenchymanl brain metastasis, SVC (airwary compromise), ITP, Hypercalcemia

2. When is reverse isolation required? What antibiotics are recommended?
   ANC < 500/mm3; –CIDAL not static; combo best

3. When is urine alkalination helpful?
   Tumor Lysis Syndrome, Hypercalcemia of malignancy, Hyperleukocytosis

4. When should diurectics be avoided? When should transfusion be avoided?
   Hyperleukocytosis. Waldestrom's macroglobulinemia

5. A medical emergency exists with a calcium level above what value?
   Ca above 12 mg/dl = serious, Ca above 15 mg/dl = medical emergency

Top Ten Things I Learned about Oncological Emergencies

10. Inability to find source of infection is common. Think gram negative
9. Spontaneous bleeding occurs below 10,000/mm3 platelets
8. Rule of tens for early dialysis: Ur acid >10, Phos >10, Cr > 10, K >6.0
7. Shortened QT
6. First treat cause of DIC; then add supportive measures
5. Coma, anemia, and rouleaux → apheresis
4. WBC > 100K; remember "pseudos"
3. IVF with hypotension for cardiac tamponade, then pericardiocentesis
2. HA with facial or UE swelling – look for RUL mass
1. Seizure and/or back pain – common 1st sign of CA

Bibliography

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