Anesthetic Considerations for the Oncology Patient

A. Zwerling,  DNP, DAAPM
a.to.z@comcast.net
NDANA 10-23-09
First Crass Commercial Interests

- Health Volunteers Overseas
- Peer Assistance and Wellness Initiatives of the AANA PAAC & Wellness Committees
AIR: 215-635-0183
a.to.z@comcast.net
Acknowledgements

Heather Wilson, CRNA, MS
Greg Stocks, CRNA, MS, EJD
Proposed Primary Clinical Site: Mbingo Baptist Hospital, Cameroon NW Territory

Cameroon Baptist Convention
P.O. Box 42 Via Bamenda
mbhcameroon@aol.com
John Mbah, Chief Nurse Anesthetist

Dr. John Eta, Resident Anesthesiology
Collins Mbah Invites You to MBH
Wednesday 9-19-07: MBH
A Commitment to an Evidence Based Anesthesia Practice

Systematic Reviews and Meta-analyses

Randomized Controlled Double Blind Studies

Cohort Studies

Case Control Studies

Case Series

Case Reports

Ideas, Editorials, Opinions

Animal research

In vitro ('test tube') research
Objectives

• Review the most common oncology related alterations in anatomy and physiology as related to anesthesia practice.

• Compare and contrast various anesthetic adjustments for the more common anesthetic and pain management issues in the oncology patient.

• Overview of some of the treatment related toxicities and physiologic alterations that affect anesthetic management of the oncology patient.
Systems Based Approach

• HEENT: AIRWAY…AIRWAY….AIRWAY…. RADS, Bleomycin Exposure, ARDS, friable and eroded mucosa
• Vascular: Angiogenesis inhibitors (Avastin) access issues.
• Cardiac: Adriamycin and other anthracycline antibiotics, mediastinal xrt, tamponade
• Pulmonary: Bleomycin, Post resection pulm edema, acute lung injury
Systems Based Approach

- GI: bleed, ischemia, obstruction, decreased GI transit, biliary obstruction
- Heme: Cytopenias and transfusion issues
- GU: Hematuria, ARF, CRF, hydronephrosis
- Skin: Dermatitis, xrt, burns, extravasations, pruritis, desquamation
Systems Based Approach

- **Neuro**: Pain Myoclonus, hand foot syndromes, neuropathies, seizures, ICP issues, SC Compression
- **Bone**: Mets/Pain, osteodystrophy, osteopenia, pathological fractures
- **Metabolic**: Hypercalcemia, SIADH, Eaton Lampert Syndrome, Carcinoid Syndrome, Pheochromocytoma, Cushingoid Syndrome, Addisonian Crisis,
When Airway & Pain Management Issues Converge

- Anesthesia Law One: AIR Goes in and Out!
- Law Two: Blood Goes Round and Round
- Law Three: Numb is Good!
- When law one conflicts with law three we have a real clinical conundrum:
Avoid Hypoxia and Hypotension
Hybrid Vigor

- Oncologic anesthetic practice is often complicated by complex pain management issues including: neuropathic pain syndromes, opioid tolerance, opioid induced hyperalgesia, neurotoxicity of pain management modalities and disturbing behavioral alterations.
- We often need to get fairly inventive in our approaches to provide multimodality preemptive analgesia.
Combined Interscalene and Thoracic Epidural Analgesia for Radical Scapulectomy

A. Zwerling, DNP, CRNA, DAAPM
Fox Chase Cancer Center
Phila., PA
Case Presentation

• 58 year old Hispanic male with recurrent chondosarcoma of left scapula post wide surgical resection and radiotherapy 7-00.
• ASA physical status 2. History of B.P.H. and HTN.
• Poor pain control with oxycodone and nortriptyline.
Anesthetic Considerations

• Intra-operative and post-operative pain management.
• Assessment of neurovascular function.
• Vascular viability and integrity of latissimus dorsi muscle flap.(2)
• Early mobilization.
• Improved respiratory physiology.
Radical Scapulectomy

- A limb and brachial plexus sparing alternative to forequarter amputation (1.)
- Involves total disarticulation of the scapula with humeral head resection/reconstruction and preservation of the neurovascular bundle.
Figure 1: Interscalene Approach to the Brachial Plexus (3)

- Interscalene surface anatomy
- 1. Clavicle.
- 2. Cricoid cartilage.
- 4. Post. (clavicular) head of scm.
- White arrows-ext. jugular v.
Figure 5: The Blood Brain Barrier: Functional Divisions
Orthopedic Oncology
Wasted Cefazolin
Oncologic Emergencies: Outline

- Demographics
- Definition of an “oncologic emergency”
- Categories (not all inclusive):
  - Metabolic
  - Hematologic
  - Structural
  - Treatment Related
- Highlights of evaluation and treatment
Oncologic Emergencies
Oncologic Emergencies: Defined

- Any clinical manifestation related to the treatment or presence of a patient’s cancer
- May actually herald a cancer diagnosis
- Onset can be insidious or develop rapidly
Demographics

- Cancer is the 2nd leading cause of death in the US
- 5 year cancer survival rates approaching 70%
- “Treatments” cause much of the morbidity seen
- Expansion of Outpatient Cancer Treatment Centers
- Follow up care is provided by Family Physicians
Oncologic emergencies: Clinical presentations

- Non-specific
  - Nausea
  - Pain
  - Headache
  - Fever

- Higher index of suspicion required with cancer patients
Four General Categories

- Metabolic
- Hematologic
- Structural
- Treatment related
Case Study #1

Mrs. X, a 75 year old female, presents to your clinic with non-specific symptoms of feeling tired, with loss of appetite, nausea, and constipation. Her daughter accompanying her states she has been sleepier than normal with lack of interest for her normal activities. On examination she has deep tendon hyporeflexia and decreased muscle strength in her upper and lower extremities. Other physical exam findings include a fixed 3 cm mass in the upper outer quadrant of her left breast.

Oncologic emergency??
Metabolic emergencies

- Hypercalcemia of Malignancy
- Tumor Lysis Syndrome
- SIADH
Hypercalcemia of malignancy

- Most common metabolic emergency in cancer patients (10-20%)
- Excess bone reabsorption, calcium release, and increased renal absorption of calcium
- Most common with lung cancer, breast cancer, and hematologic malignancies
Hypercalcemia of malignancy

- **Signs and Symptoms (acute and chronic)**
  - Nausea, Vomiting, or Constipation
  - Polyuria and polydipsia
  - Muscle weakness, hyporeflexia, mental status changes, kidney stones
  - Serum calcium levels often > 14 mg/dL
  - ECG changes: bradycardia, prolonged PR, shortened QT, wide T waves

- **Treatment**
  - Aggressive saline rehydration (5-8 liters in first 24 hours)
  - Diuresis with furosemide (after adequate hydration)
  - IV administration of Bisphosphonates (Pamidronate or zoledronic acid)
  - Calcitonin, Steroids, Dialysis
Tumor Lysis Syndrome

- Results from rapid necrosis of bulky tumors following chemo- and radiation therapy (1-2 days after)
- Acute cell destruction and release of intracellular products
- Uric acid, phosphates, calcium and potassium are released
- Most common with hematologic malignancies or high tumor burdens

**Signs and Symptoms**
- Electrolyte abnormalities (severe)
- **Azotemia, Hyperkalemia, Hyperphosphatemia, Hypocalcemia, Acidosis**
- Cardiac rhythm disturbances
- Altered levels of consciousness

**Treatment (can be used prophylactically)**
- IV fluids (5-8 liters first 24 hours)
- Allopurinol (600-900 mg/day)
- Close inpatient observation +/- hemodialysis
Syndrome of inappropriate Antidiuretic Hormone (SIADH)

- Suspect if hyponatremia in a euvolemic cancer patient
- Results from ectopic source of ADH secretion
- Most common with bronchogenic carcinoma (60%)

**Signs and Symptoms (depend on rapidity of development)**
- Altered levels of consciousness, sometimes coma
- Fatigue & anorexia
- Myalgias & headaches
- Neurologic symptoms usually if Na <115 mEq/L

**Treatment**
- Primary treatment is “treat the tumor”
- Fluid restriction (500-1000 mL/d)
- Demeclocycline (600-1200 mg/d)
- If severe neurologic symptoms consider hypertonic saline
Case Study # 2

- Mr Y, a 58 year old male, comes to the ER on Sunday afternoon and states he has low back pain that has been progressively increasing for 3 days. He reports the pain has been present for “a couple of weeks.” The pain is worse when he lies down, walks, or coughs. When questioned, Mr. Y states he notices relief when sitting. He also reports numbness, tingling, and a “cold” feeling in his legs. Additional medical history reveals a right upper lobe lobectomy and radiation therapy 2 years ago for lung cancer.

- Oncologic emergency??
Structural Oncologic Emergencies

- Epidural spinal cord compression (ESCC)
- Superior vena cava syndrome (SVCS)
- Malignant pericardial effusion
Epidural Spinal Cord Compression (ESCC)

- **TRUE** oncologic emergency
- Any cancer patient with “new” back pain should be assumed to have ESCC
- Even a few hours delay can result in permanent neurological deficits
- Most common with metastatic breast and lung cancer (25%)
- Thoracic (70%), Lumbosacral (20%), Cervical (10%)
- 90% of patients “walking” at the time of diagnosis maintain post-treatment
Epidural Spinal Cord Compression (ESCC)

- **Signs and Symptoms**
  - BACK PAIN, exacerbated by lying down, Valsalva maneuver, or percussion over vertebral bodies
  - Bladder dysfunction (urinary retention)
  - Loss of anal sphincter tone

- **Treatment**
  - plain films (diagnose 70-80%), MRI, CT Myelography,
  - Start treatment prior to radiographs if paraplegia present
  - IV Steroids (Dexamethasone 10-100 mg bolus then 10mg Q 4-6 hours)
  - Radiation therapy (up to 3000 Gy) - consider with asymptomatic patients
Superior vena cava syndrome (SVCS)

- Results from gradual compression of the superior vena cava leading to edema and retrograde flow
- Most common with
  - lung cancer (65%)
  - metastatic mediastinal tumors
  - indwelling venous catheters
- DDX: granulomatous disease, goiters and aneurysms
Superior vena cava syndrome (SVCS)

- **Signs and Symptoms**
  - Increase in CVP caused by obstruction
  - Cough, dyspnea, dysphagia
  - Swelling & discoloration of neck, face or upper extremities
  - Collateral circulation develops

- **Treatment**
  - Primary treatment is “treat the tumor”
  - Chest CT to diagnose
  - Elevate HOB, Diuretics
  - Corticosteroids
  - Chemotherapy and radiation
  - Intravenous stenting
  - Anticoagulation
Malignant Pericardial Effusion
Malignant Pericardial Effusion

- Most common with lung & breast cancer, lymphoma, and metastatic melanoma
- Found in 10-15% of autopsies (undiagnosed)
- DDX: CHF

**Signs and Symptoms**
- Often insidious, some patients without symptoms
- Dyspnea, orthopnea, cough, fatigue, palpitations, dizziness
- Kussmaul’s Sign, Paradoxical Pulse
- Water bottle heart (see above)
- Echocardiogram is the study of choice

**Treatment**
- Acute: pericardiocentesis or pericardial window
- Chronic:
  - Pericardiocentesis with sclerosing agent (consider life expectancy)
  - Chemotherapy and surgery
A 66-year-old male, Dr. Z, undergoes an annual physical examination. His past medical history is unremarkable except that he states that he has noted over the past several months a tendency to bleed and bruise more easily when his extremities are traumatized. Physical exam reveals ecchymosis on both shoulders, a liver span of 17cm, a palpable spleen 4cm below the left costal margin, and some palpable lymph nodes (1 1/2 to 2cm) noted in the cervical and axillary areas bilaterally.

The laboratory elected to refrigerate the patient's serum until the following morning in order to complete his chemistry profile. When the lab tech went to recover the serum to complete the requested testing, she could not perform the tests because of the formation of a gel in the test tube.

Oncologic Emergency?
Hematologic emergencies

- Hyperviscosity Syndrome
- Febrile neutropenia
Hyperviscosity Syndrome

- 85-90% of cases with Waldenstrom’s macroglobulinemia, multiple myeloma and acute/chronic leukemia
- Essentially, proteins coat all cells and components preventing normal function (sludging and decreased perfusion)

Signs and Symptoms
- Bleeding (epistaxis, ecchymoses, mucosal bleeding)
- Visual Signs (“sausage-like” retinal veins)
- Neurologic defects (peripheral neuropathies)
- Lab: Elevated monoclonal proteins, serum viscosity > 4 cP can cause symptoms (normal viscosity 1.4-1.8 cP)

Treatment
- Plasmapheresis (often multiple treatments)
- Chemotherapy
Febrile neutropenia

- **Most** common complication of chemotherapy
- Bacterial infections most common (fungal infections increasing)
- Gram - replaced by Gram + organisms (often methicillin resistant)

**Signs and Symptoms**
- Temp > 101 F (38.5 C)
- Absolute neutrophil count (ANC) of < 500

**Diagnosis and Treatment**
- Pan-culture (blood, urine, throat, stool, +/- CSF)
- CXR, CBC
- Determine high and low risk patients (see algorithm)
- Empiric antibiotic therapy until ANC > 500 for 72 hours
- Remember: infiltrates may not develop until ANC > 500
Febrile neutropenia

Calculation of the absolute neutrophil count (ANC)

\[ \text{ANC} = \text{Total WBCs} \times (\% \text{ segs} + \% \text{ bands}) \]

Sample calculation:

\[ \text{ANC} = 3.0 \text{ WBC} \times (25\% + 10\%) \]
\[ \text{ANC} = 3000 \times (35\%) \]
\[ \text{ANC} = 1050 \text{ neutrophils/ mm}^3 \]
Febrile neutropenia

- Low/High risk neutropenia algorithm
- Scores $\geq 21$ considered low risk
- Other algorithms available

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of illness$^a$</td>
<td></td>
</tr>
<tr>
<td>No symptoms</td>
<td>5</td>
</tr>
<tr>
<td>Mild symptoms</td>
<td>5</td>
</tr>
<tr>
<td>Moderate symptoms</td>
<td>3</td>
</tr>
<tr>
<td>No hypotension</td>
<td>5</td>
</tr>
<tr>
<td>No chronic obstructive pulmonary disease</td>
<td>4</td>
</tr>
<tr>
<td>Solid tumor or no fungal infection</td>
<td>4</td>
</tr>
<tr>
<td>No dehydration</td>
<td>3</td>
</tr>
<tr>
<td>Outpatient at onset of fever</td>
<td>3</td>
</tr>
<tr>
<td>Age $&lt;60$ years$^b$</td>
<td>2</td>
</tr>
</tbody>
</table>

NOTE: Highest theoretical score is 26. A risk index score of $\geq 21$ indicates that the patient is likely to be at low risk for complications and morbidity. The scoring system is derived from [50].

- Choose 1 item only.
- Does not apply to patients $\leq 16$ years of age. Initial monocyte count of $\geq 100$ cells/mm$^3$, no comorbidity, and normal chest radiograph findings indicate children at low risk for significant bacterial infections [46].
Febrile neutropenia

- Fever (temperature ≥38.3°C) + Neutropenia (<500 neutrophils/mm³)

### Low risk
- Oral
  - Ciprofloxacin + Amoxicillin-clavulanate (adults only)

### High risk
- iv
  - Vancomycin not needed
  - Vancomycin needed

#### Monotherapy
- Cefepime, Ceftazidime, or Carbapenem

#### Two Drugs
- Aminoglycoside +
  - Antipseudomonal penicillin, Cefepime, Ceftazidime, or Carbapenem

#### Vancomycin +
- Vancomycin + Cefepime, ceftazidime, or carbapenem + aminoglycoside

Reassess after 3–5 days

Outpatient   Inpatient
Treatment Related emergencies

• Extravasations
• Dehydration
Extravasations

- Leakage of chemotherapy agents into skin
- “Home infusion therapy” has increased incidence
- Most common with vesicants (doxorubicin, vincristine)

**Signs and Symptoms**
- Pain, erythema at site
- Swelling
- Necrosis
- Hours to days after chemotherapy

**Treatment**
- Stop infusion, avoid compression
- Heat, ice, or antidotes depending on the agent used
- If patient presents soon after injection with erythema, refer to the oncologist or plastic surgery
Dehydration

- Often missed
- Associated with delirium in 30% of CA patients
- Causes include emesis, diarrhea, mucositis
- 50% of colon CA patients
- Infusional 5FU is big offending agent

Signs and Symptoms
- Usual signs of dehydration

Treatment
- Acutely: IV fluid resuscitation
- Chronic: Anti-emetics, anti-diarrheals
- Consider change of treatment (with oncology input)
Take home points

- Always, always keep a high index of suspicion with cancer patients
- Diagnostic clues are subtle, but outcomes can be devastating
- Adopt a Patient focused approach:
  - Education
  - Cancer specific monitoring
  - Surveillance for anticipated sequelae of disease progression and treatment associated toxicities.
Post Excision
Thoracic Oncology: Pancoast Resection

- 37 year old woman s/p chemo xrt with pancoast tumor with impingement on brachial plexus and subclavian artery.
- Anterior placement of brachial plexus catheters for analgesia in addition to T6-7 Epidural
Thoracic Oncology: Pancoast Resection
Forequarter Amputation for Osteosarcoma 11-1-07
Questions???
Techniques

• Consider multimodality preemptive analgesia approach.
• Hybrid vigor in anesthesia with appropriate caveats.
• Critical physiologic derangements need your attention before induction rather than at the convenience of the surgical schedule.
• There are few oncologic emergencies that can’t be parlayed into disasters unless you proceed systematically.