Radiation Oncology Emergencies
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PGY-2
Learning Objectives

• Identify common emergencies that may require immediate radiation therapy, including malignant spinal cord compression, superior vena cava syndrome and brain metastases
• Discuss the inpatient management of patients experiencing oncologic emergencies requiring radiotherapy
Spinal Cord compression: Epidemiology

% patients with cancer
- 10% with cancer
- 90% without cancer

% cases of cord compression
- Lung: 20%
- Breast: 10%
- Prostate: 10%
- Renal Cell: 10%
- Lymphoma: 20%
- Multiple Myeloma: 20%
Patterns of spread to the spine
% site of origin

- epidural
- intradural, extramedullary
- intramedullary
• H&P
• DRE
• Evaluation of sensation to determine level of the lesion
• Pain
• Prior cancer management to include prior RT
• Screening MRI of the full cervical/thoracic/lumbar (C/T/L) spine
Retropulsed fragments
Treatment overview

• Modalities used to treat SC compression: steroids, Sg, and RT (in select cases chemo is used for chemosensitive tumors).

• For initial management of cord compression:
  – Dexamethasone
  – Pain control
  – Consult neurosurgery or orthopedics (spine)
  – Chemotherapy – sensitive tumors
• The two primary goals of surgery in patients with neoplastic epidural SCC are:
  ▪ Preservation or restoration of mechanical stability
  ▪ Circumferential decompression of the spinal cord
Surgical Management

• Corpectomy
• Laminectomy
• Separation Surgery
• Vertebroplasty
• Kyphoplasty
Surgery - Indications

Laminectomy

Corpectomy

Separation surgery
• MRI with cord compression in a single area and a life expectancy >3 mos
• Radioresistant tumor followed by → RT
• Additional indications for surgery:
  – previous RT
  – Dz progression despite RT
  – unknown primary tumor (therapeutic and diagnostic)
  – paraplegia <24 hrs (NCCN 2020 Guidelines, used to be <48 hrs)
• Cord compression pts who should be treated with RT alone:
  - Life expectancy <3 mos
  - No spinal instability or bony compression
  - Multilevel involvement
  - Radiosensitive tumor
    - Lymphomas
    - Leukemias
    - germ cell tumors
    - multiple myeloma
• Potential toxicities of RT for cord compression:
  – Odynophagia
  – Globus
  – Esophagitis
  – Nausea
  – Diarrhea
  – Myelosuppression
  – Rare SC injury
Superior Vena Cava Syndrome

- Cough.
- Face or neck swelling.
- Feeling of fullness in your upper body.
- Swelling in your arms and hands.
- Shortness of breath (dyspnea).
- Other signs sometimes include:
  - Blueish skin (cyanosis).
  - Chest pain.
  - Coughing up blood.
  - Faster breathing.
  - Hoarse voice or difficulty speaking.
  - Horner’s syndrome, symptoms on one side of your face (sagging eyelid, lack of sweat, one smaller pupil).
  - Trouble swallowing.
  - Visibly swollen veins in your upper body.
Anatomy (cont.)

• The collateral system of SVC is formed by:
  • Vertebral
  • Azygos
  • Mammary
  • Lat thoracic
  • Paraspinal
  • Esophageal vessels.
• The right subcostal and right ascending lumbar veins coalesce to form the azygos vein.
• Malignancy previously accounted for 90% of cases
  – with increased use of implantable intravenous devices (i.e., central venous catheters, pacemaker leads), this has decreased.

• Benign Causes of SVC Syndrome
  – 1. Catheter-induced thrombosis
  – 2. Chronic mediastinitis
  – 3. Retrosternal goiter
  – 4. CHF
  – 5. Aortic aneurysm

(McCurdy M et al., Crit Care Med 2012)
Cancer associated with SVC syndrome

- NSCLC: 22%
- Lymphoma: 12%
- SCLC: 3%
- Mets: 9%
- Other: 2%
• Pts with SVC syndrome may have Sx over days to wks but usually present within 1 mo of onset.
• Most pts presenting with SVC syndrome do not have a prior cancer Dx.
• SVC syndrome may cause airway obstruction and cerebral edema; however, severe Sx are uncommon, and life-threatening Sx are rare.
Symptoms

- 1. Face and neck swelling (The most common Sx of SVC syndrome is facial swelling)
- 2. Upper Extremity swelling
- 3. Cough/stridor
- 4. Dyspnea
- 5. Dilated chest veins (collateral blood flow)

(Rice T et al., Medicine 2006)
Physical Exam

Pemberton's Sign
Pilcz' Sign
Piskacek's Sign
Pastia's Sign
Workup

• H&P
• Assessment of respiratory status
• CXR and/or CT chest with contrast (best to visualize the extent of blockage)
• Determination of the best Bx route if Dx is unknown
  – Methods to obtain tissue Dx in SVC syndrome:
    • 1. Sputum cytology
    • 2. Bx of palpable LNs
    • 3. Bronchoscopy
    • 4. Mediastinoscopy
    • 5. Video-assisted thoracoscopic Sg (VATS)
• Labs (AFP, LDH, β-HCG)
• BM aspirate and Bx
Findings on imaging

- Chest wall veins
- SVC obstruction
- Azygos vein
• The prognosis in SVC syndrome depends on the underlying cause rather than the presence of the syndrome itself.
• MS is about 6 mos. for cancer-induced SVC syndrome.
• However, based on etiology, many will survive longer or even be cured.
RT prior to histologic diagnosis?

- RT may obscure the histologic Dx and should be deferred until diagnostic Bx is obtained in SVC syndrome.
- However, empiric Tx may be considered in the setting of airway obstruction or cerebral edema.
Treatment

• 1\textsuperscript{st} – obtain diagnosis
• Treatment options: RT, chemo, Sg, and stents
• Supportive measures:
  – Elevation of head of bed and supplemental oxygen.
  – Diuretics can be used for cerebral edema.
  – Remove indwelling catheter if SVC syndrome due to thrombosis.

(McCurdy M et al., Crit Care Med 2012)
<table>
<thead>
<tr>
<th>Radiation</th>
<th>Stent</th>
<th>Chemotherapy</th>
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<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td>Noninvasive intervention</td>
<td>Symptom relief in 7–15 d</td>
<td>Rapid relief of symptoms usually within 24–72 h</td>
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<tr>
<td>Treats underlying malignancy</td>
<td>May compromise a tissue diagnosis if not yet obtained</td>
<td>Does not compromise a tissue diagnosis</td>
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<td>May initially worsen symptoms due to inflammation</td>
<td>Allows option for further treatment with chemotherapy, radiation, or combined-modality therapy</td>
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<td>Does not treat the underlying malignancy</td>
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*Abbreviation: ICU, intensive care unit.*
Steroids, chemo and vascular stents

- Steroids
- Chemotherapy - is the Tx of choice in SVC syndrome caused by lymphoma, germ cell tumors, and SCLC.
- The most rapid method to manage SVC thrombosis is by intraluminal stenting.
- Vascular surgery
- Anticoagulation therapy used for pts with SVC syndrome presenting with thrombosis unless contraindications are present.
Radiation Therapy

• Dose
  – Urgent
    • 7.5 Gy in 3 fractions to 12 Gy in 3 fractions for symptom alleviation
    • Then, 1.8 – 2.0 Gy/fraction to definitive dose (if curable), based on histology
  – Palliation only
    • 10 Gy in 1 fraction
    • 30 Gy in 10 fractions

• Fields should include gross disease and adjacent lymph nodes, adjusting as symptoms improve
• Overall response rate ~60%
• Responses seen usually in 7-15 days, but as early as 72 hours
• 20% of patients have no response at all
When does SVC Syndrome require emergent treatment?
Endovascular stenting w/ angioplasty

Balloon angioplasty

SVC stent
Thank you