Incidental Pulmonary Embolism

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Objectives

• Describe the Presentation of a Patient with Incidental Pulmonary Embolism (PE)
• Emphasize the Significant Prevalence of Incidental PE within the Inpatient Population
• Present Imaging Modalities that assist in the Diagnosis of Incidental PE
• Discuss how Radiologist can Reduce the Morbidity and Mortality of Patients with Incidental PE
Our Patient LM

HPI:

- 38-year old gentleman presents to OSH with 4-week history of abdominal cramping and abdominal bloating
- Initially prescribed an antacid with no symptomatic relief
- Abdominal discomfort persisted, and patient noted an increase in abdominal girth
- 14-kg (30-lb) weight loss over 4 weeks
Our Patient LM

HPI:
- Patient admitted to OSH for workup of symptoms
- CT Scan of Abdomen showed Ascites and Omental Caking
- Multiple paracenteses performed for symptomatic relief
- Open biopsy revealed a large fixed tumor within the abdomen
- Cytology is consistent with Metastatic Mucinous Adenocarcinoma of Unknown Primary
- Transferred to Beth Israel Deaconess Medical Center for further workup of Metastatic Adenocarcinoma and Pain Management
Our Patient LM

Social Hx:
- Patient works as a Heating Technician
- Married with no children
- 20 pack-year history of smoking
- Smokes marijuana a few times per year

Family Hx:
- Mother and sister had Ovarian cancer
- Father passed away from Gastric Cancer
Our Patient LM

Physical Exam:
• VS: T: 97.1°F, BP: 120/70, P: 87, RR: 20, O2 S: 96% on RA
• General: Patient sitting comfortably in chair in NAD
• CV: RRR, Normal S1/S2, No M/R/G
• Lungs: CTAB, Good air entry
• Abd: Distended, +BS, Slightly Firm, Mild Tenderness Diffusely
Findings:
- Hypodensity within pancreatic tail and irregular mass-like contour of pancreas tail
- Extensive soft tissue density in omentum anteriorly c/w peritoneal carcinomatosis

These findings are suggestive of Pancreatic Tail Neoplasm as the Primary Site of the Metastatic Mucinous Adenocarcinoma
CT Chest with Contrast of Patient LM¹

Findings:

• Extensive bilateral pulmonary emboli from the level of bilateral main pulmonary arteries to subsegmental arteries
Background of Pulmonary Embolism (PE)²

• 500,000 cases of PE documented each year in United States

• Reported incidence likely lower than actual incidence due to asymptomatic or “silent” PE

• Prevalence of PE at autopsy in hospitalized patients is 14-26%, one third of cases were unsuspected
Risk Factors for Incidental PE$^{2,3}$

Risk Factors:
- Status post major surgery (e.g.: orthopedic surgery)
- Underlying Neoplasm
- Hypercoagulative disorders (e.g.: Factor V Leiden)
- Status post Trauma (e.g.: Femur fracture s/p MVA)
- Immobilization
- CHF
- Oral contraceptives
- Pregnancy
- Hormone Replacement Therapy
The Real Question

Why do we care about incidental PE if the patient is asymptomatic?
The Answer\textsuperscript{4-10}

Detection is important to prevent recurrence, which is associated with significant morbidity and mortality.

- Untreated PE associated with a mortality rate of 30%
- 10% of PEs are rapidly fatal
- Death rate decreases to 1-10% with institution of appropriate treatment
Prevalence Among Different Patient Populations\textsuperscript{2,11}

- Prevalence of Incidental PE among inpatient patient population: 2-5%
- Prevalence of Incidental PE among outpatient population: 0.4-0.6%

These percentages are significant!
Where do emboli come from?

- Majority from thrombi originating in deep venous system of lower extremities
- May originate in the pelvic, renal, or upper extremity veins and occasionally in the right heart
Diagnosis of Incidental PE: Imaging Menu

**Imaging Studies:**

- **Helical CT with Contrast**
  - Advantages: High Specificity (>90%), Safety, Relative Rapidity of Procedure
  - Limitations: Reader expertise required for high specificity, Poor visualization of certain regions (e.g.: subsegmental emboli)

- **CXR**
  - Nonspecific findings (e.g.: Cardiac enlargement, elevated diaphragm, atelectasis)

- **Radionuclide ventilation-perfusion scan**
  - Most frequently used test to aid the diagnosis of PE when careful PE and routine tests fail to reveal specific cause to explain patient’s symptoms

- **Pulmonary angiogram**
  - Definitive diagnostic technique for PE

- **MRA**
  - Like Helical CT, not as sensitive as Conventional Angiography in detecting subsegmental emboli
  - Offer promise with technological advances including respiratory gating, ultrafast techniques performed during breath holding.
Management of our Patient LM

- Surgical debulking procedure considered given the young age of the patient
- Pre-op CXR usually taken prior to surgery

What can the plain chest radiograph look like in the presence of PE?
Ideal Chest Radiograph Findings in Another Patient with PE\textsuperscript{13}

Findings:

- **Westermark’s Sign**
  - Focal Avascularity in right upper lung field

- **Hampton’s Hump**
  - Wedge-shaped opacification at left lung base
  - Representing pulmonary infarction

Treatment of PE

• Medically stable patients: Simultaneous initiation of Heparin (unfractionated or low-molecular weight) and oral Warfarin
• Unstable patients: thrombolysis or surgical intervention
Prevention of PE^{14}

Medications
- Low dose heparin
- Adjusted dose unfractionated heparin
- Low molecular weight heparin
- Oral anticoagulants (INR of 2.0-3.0)

Physical Approaches
- Intermittent leg compression
- Graduated compression stockings
Outcome of our Patient LM

- Surgical debulking option requested given the patient’s young age
- Patient considered a poor surgical candidate given the extent of the patient’s disease
- Patient started on Enoxaprin (low molecular weight heparin) and will remain on this therapy indefinitely
- Patient titrated to high levels of Fentanyl with Methadone added for pain management
- At patient’s request, oncologic care was transferred to OSH
Conclusion

Incidental PE:

• Significant prevalence within the inpatient population

• Thorough evaluation of pulmonary vasculature should be performed with all contrast-enhanced CT examinations, particularly in patients with known risk factors

• Detection of incidental PE is important owing to the high mortality rate of recurrent PE
References

1. BIDMC, PACS
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