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September 2004

# 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

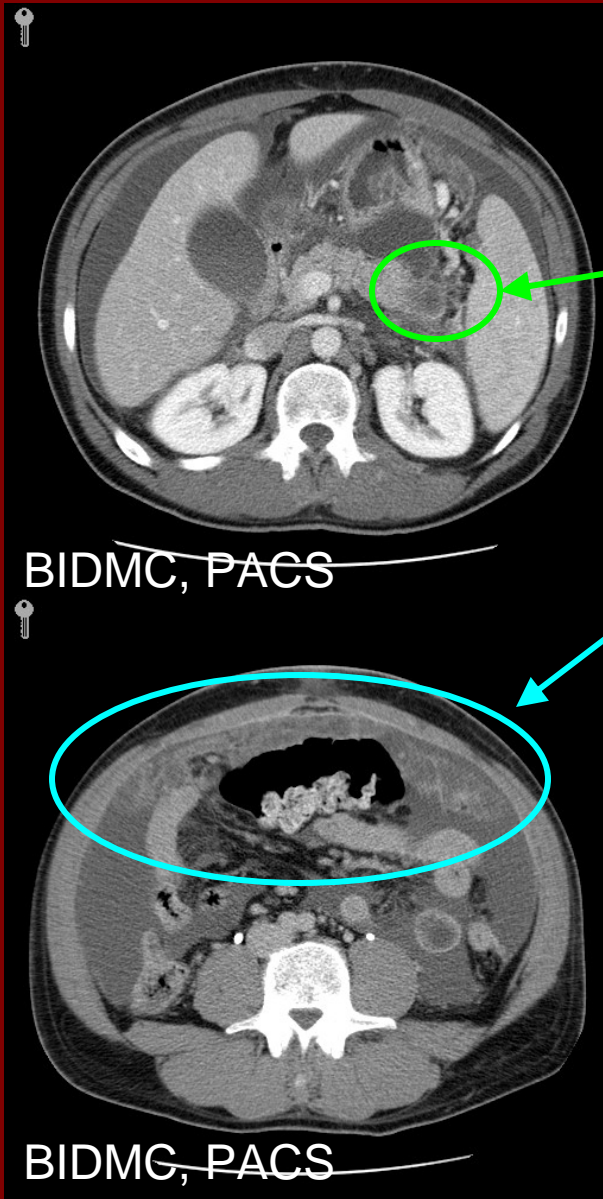


# Our Patient LM

## 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**

# CT Abdomen of Patient LM<sup>1</sup>

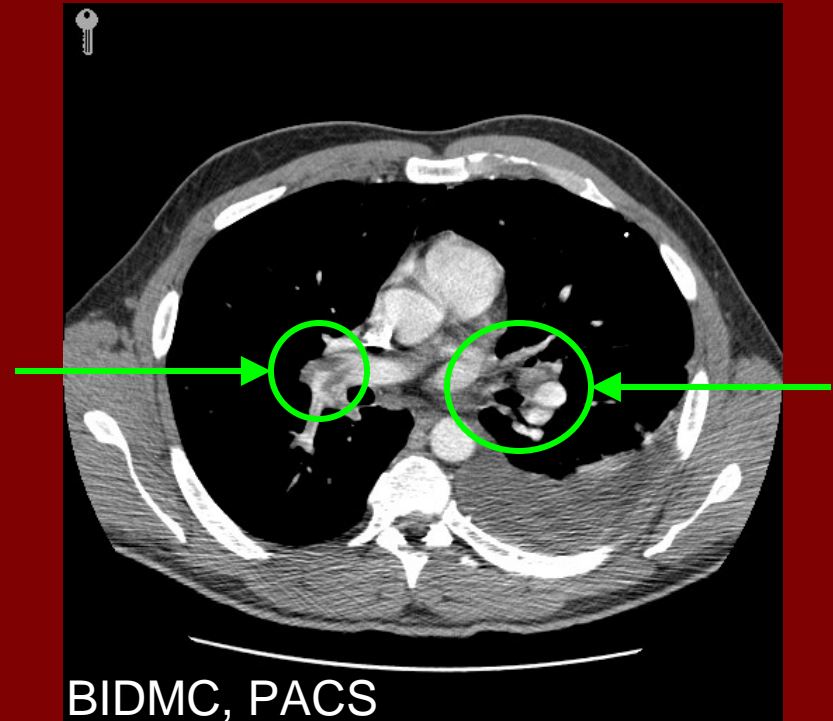
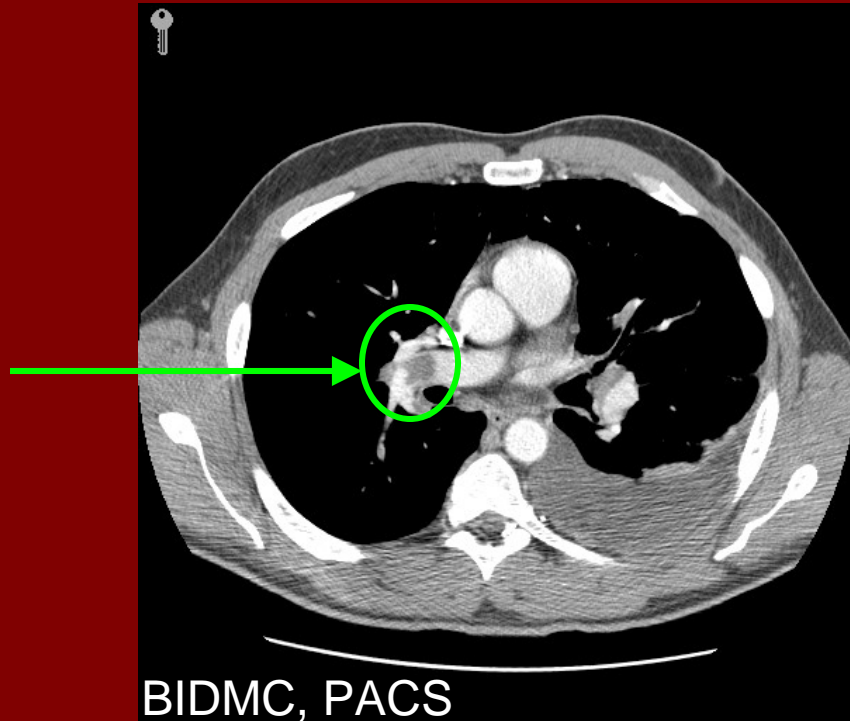


## Findings:

- 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 LM<sup>1</sup>



## Findings:

- Extensive bilateral pulmonary emboli from the level of bilateral main pulmonary arteries to subsegmental arteries





# Background of Pulmonary Embolism (PE)<sup>2</sup>

- 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<sup>2,3</sup>

## 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<sup>4-10</sup>

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<sup>2,11</sup>

- 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<sup>12</sup>

## 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

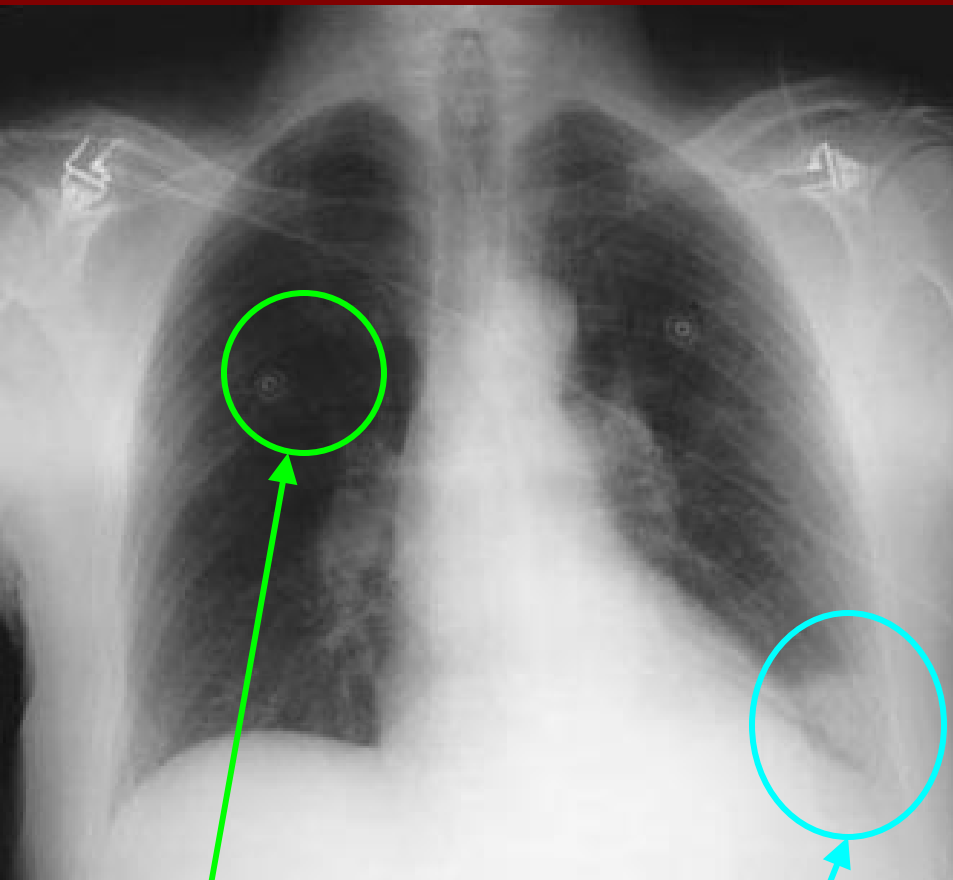
- Surgical debulking procedure considered given the young age of the patient
- Pre-op CXR usually taken prior to surgery

What can the plain chest radiograph look like in the presence of PE?





## Ideal Chest Radiograph Findings in Another Patient with PE<sup>13</sup>



Westermark's Sign

Hampton's Hump

### 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<sup>14</sup>

## 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 Enoxaparin (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



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# Acknowledgements

I would like to thank the following individuals:

- Dr. Mizuki Nishino for alerting me to the interesting case of Incidental PE.
- Dr. Joseph Barry for reviewing and selecting choice CT images of the abdomen with me.
- Dr. Gillian Lieberman for her dedication to teaching and support.
- Dr. Mara Barth for her teaching and sense of humor.
- Larry Barbaras, our webmaster, for his technical expertise.
- Pamela Lepkowski for her tireless effort in helping medical students with all issues including recommending fun places to visit in Boston.