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# Pulmonary Thromboembolism

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# Our Patient GK

40 yo F with sudden decrease in O<sub>2</sub> sat 4 hours after surgery

HR 168

BP 124/65

pH 7.2

PaCO<sub>2</sub> 66

PaO<sub>2</sub> 136 (100% O<sub>2</sub>)

HCO<sub>3</sub> 27



# Differential Diagnosis

Pulmonary embolism

Pneumothorax

Pneumonia

Airway obstruction

Increased abdominal pressure



# A little bit about PE

Thrombi usually from veins in the lower extremities

Estimated 300,000 cases per year

Mortality: untreated = 30%; treated < 10%

Clinical findings

dyspnea, (pleuritic) chest pain, tachypnea, R-sided HF,  
decreased pO<sub>2</sub> and pCO<sub>2</sub>, EKG changes

Risk factors

immobilization, recent surgery, stroke, hx of  
thromboembolic disease, malignancy



# The Imaging Menu

## CXR

- Lower extremity venous ultrasound
- Radionuclide Ventilation: Perfusion lung scan
- Contrast enhanced chest CT
- Chest MRI
- Pulmonary Angiography



# CXR with suspected PE

Main utility: exclusion of other diagnoses

May be normal (24%)

Abnormalities usually nonspecific

Common findings:

- cardiac enlargement

- pleural effusion

- pulmonary artery enlargement

- elevated hemidiaphragm

- atelectasis

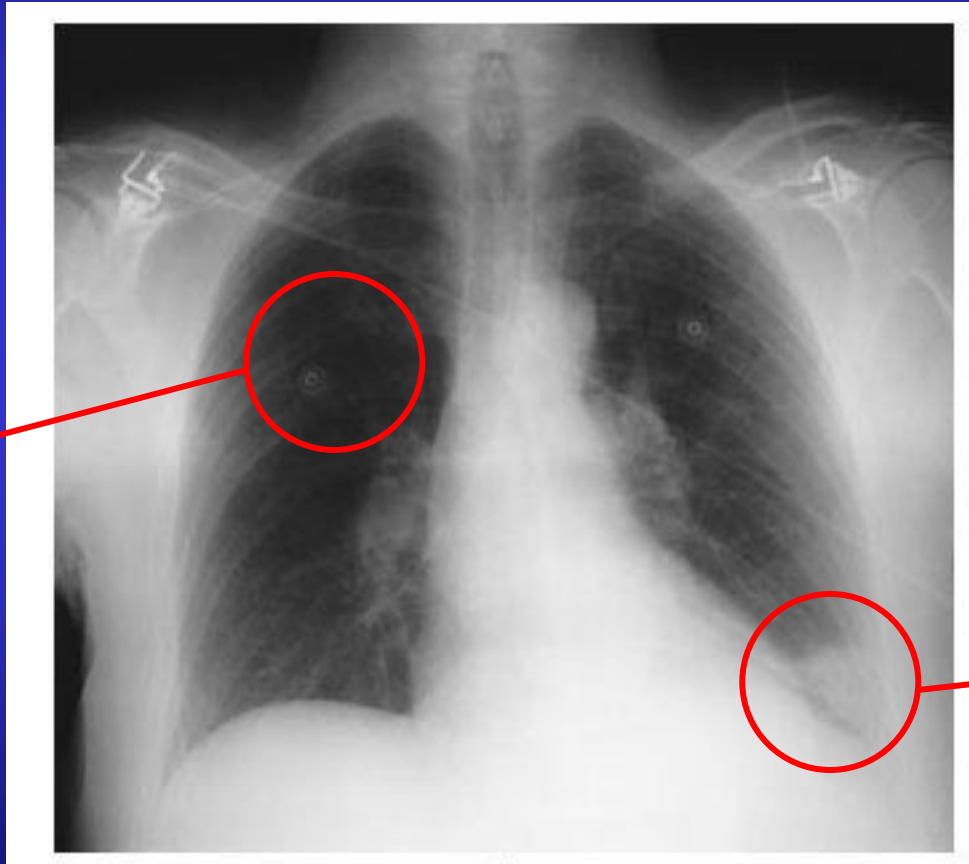
- parenchymal pulmonary infiltrates

2 Classic Signs.....



# Classic Signs on CXR: Westermark and Hampton

Westermark's  
Sign

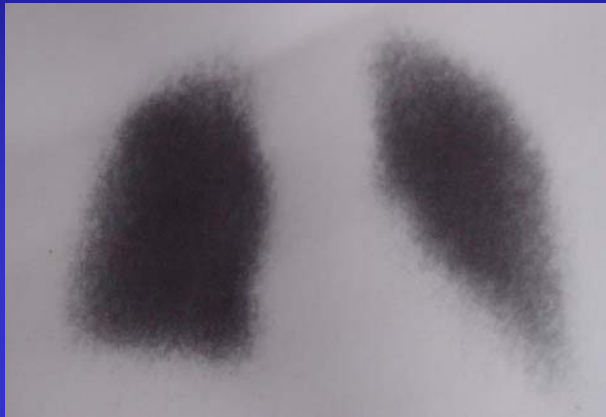


Hampton's hump

From Sokolove PE, Offerman,SR, "Pulmonary Embolism", **NEJM**, 2001



# V/Q scan: When it works



Normal

PE very unlikely  
(~2%)

From Novelline, RA, **Squire's Fundamentals of Radiology**, 1997



High probability

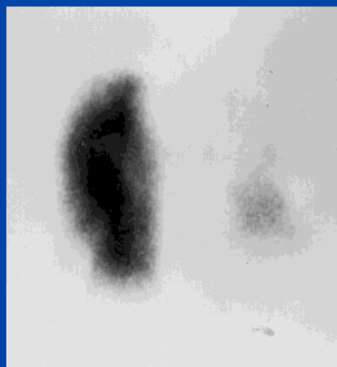
PE likely  
(specificity = 0.97)

From Sokolove PE, Offerman, SR, "Pulmonary Embolism", **NEJM**, 2001

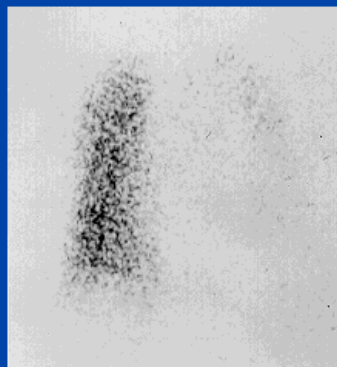




# The indeterminate VQ scan



Perfusion lung scan, posterior view

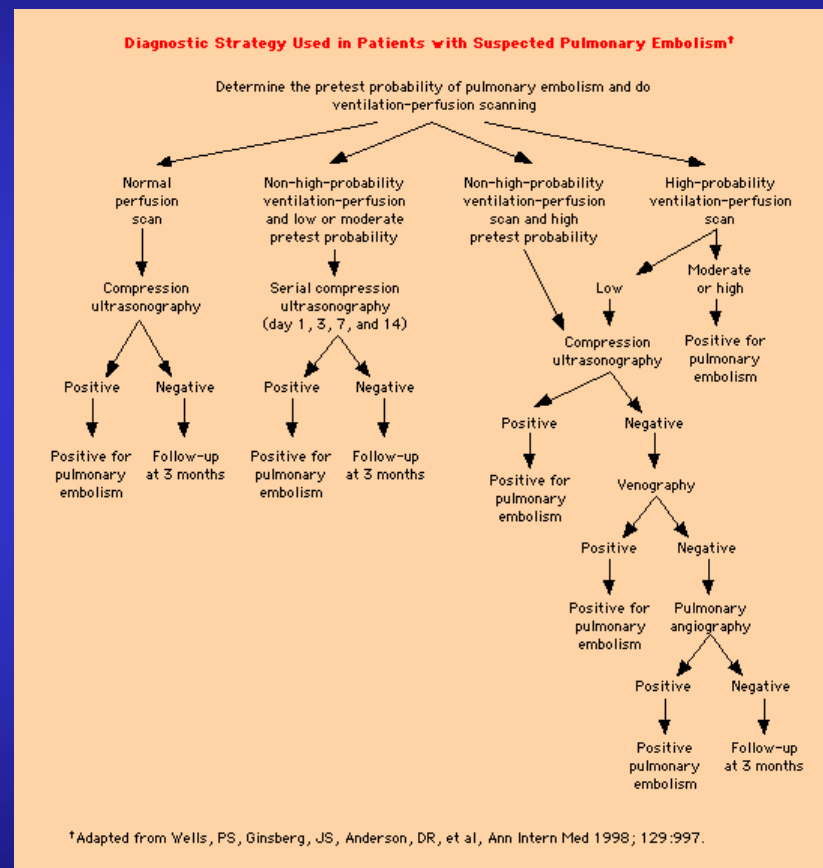


Ventilation lung scan, posterior view

Matched defects = indeterminate  
PIOPED study:

Only 40% of patients with PE  
have high probability scan

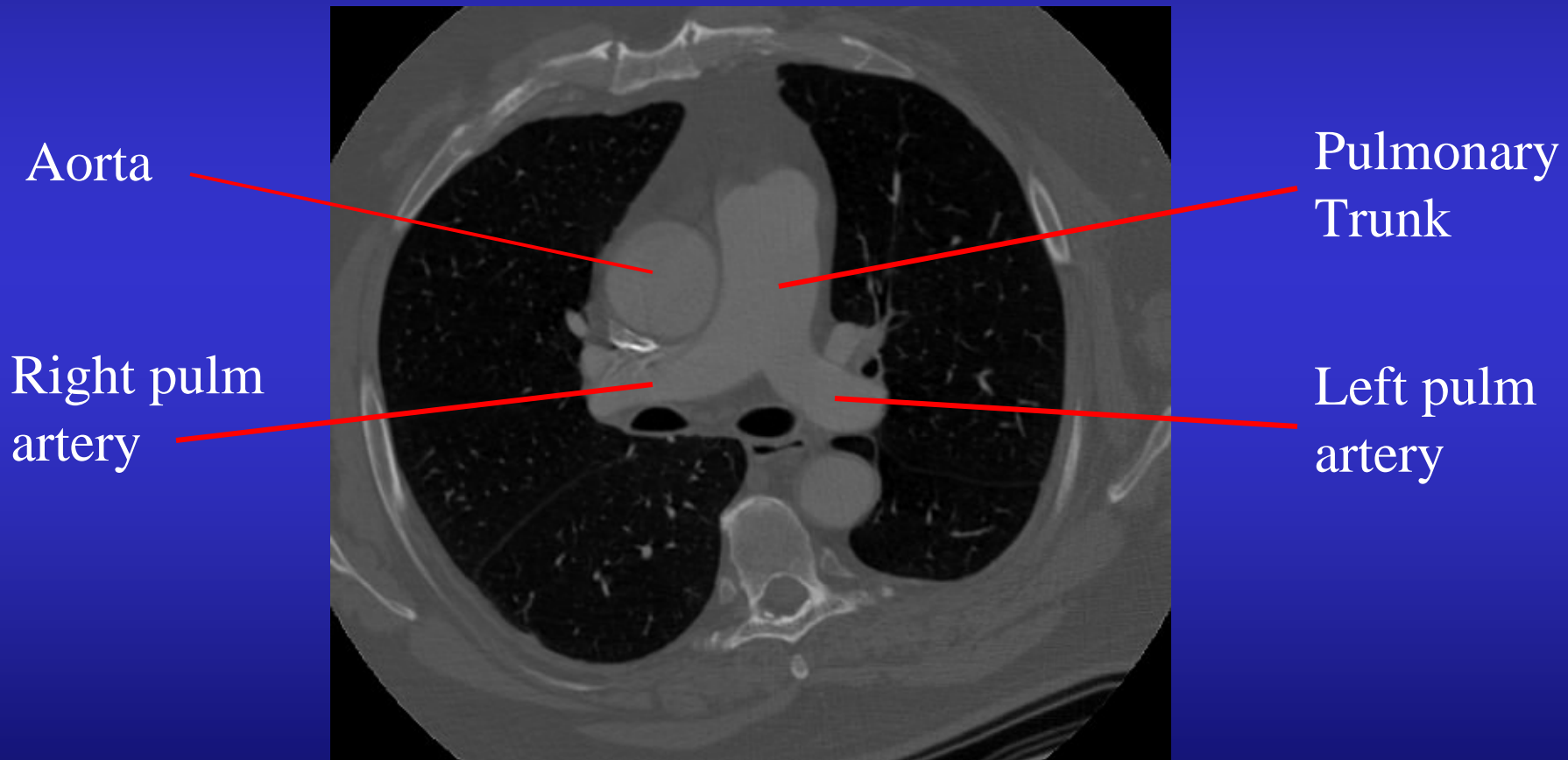
Algorithms to improve sensitivity  
incorporate clinical suspicion  
and venous U/S



From Thompson BT, Hales CA, **UTDOL 9.3**, 2001



# Normal Chest CT with contrast





# Spiral CT

## Benefits

fast

specific

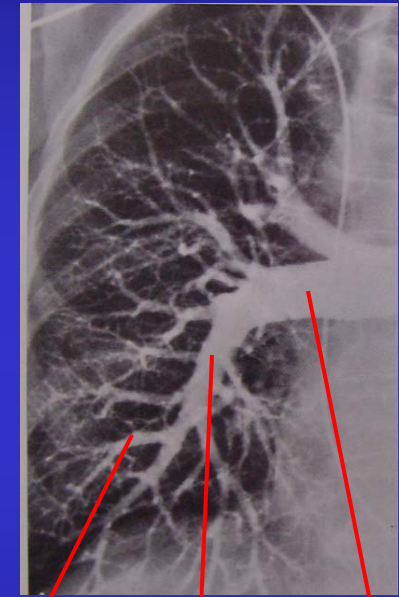
identify other causes of PE symptoms

## Poor sensitivity?

subsegmental emboli

R middle lobe and lingula

## Still improving



Segmental

Main

Lobar

From Matsumoto AH, Tegtmeyer CJ, **Rad Clin NA**, 2001



# Angiography

## Why it's done

Diagnostic gold standard

Therapeutic

## Why it's not done first

Expensive

Requires expertise

Invasive



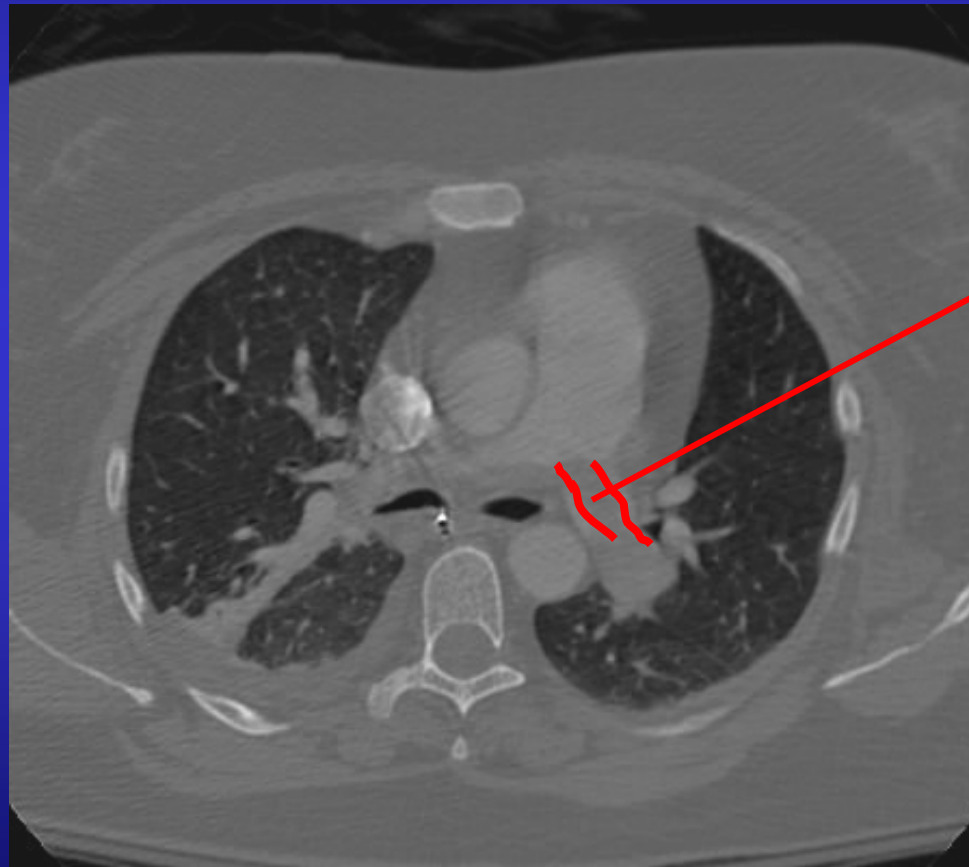
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# Our Patient GK: CXR





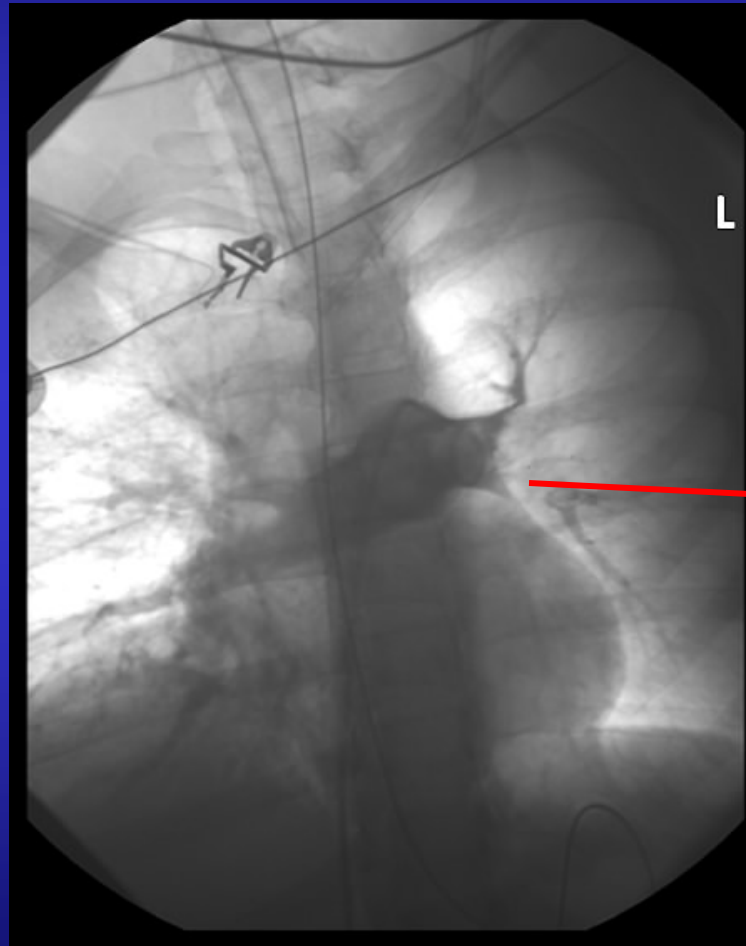
# Our Patient GK: CT with contrast



Left pulm  
artery



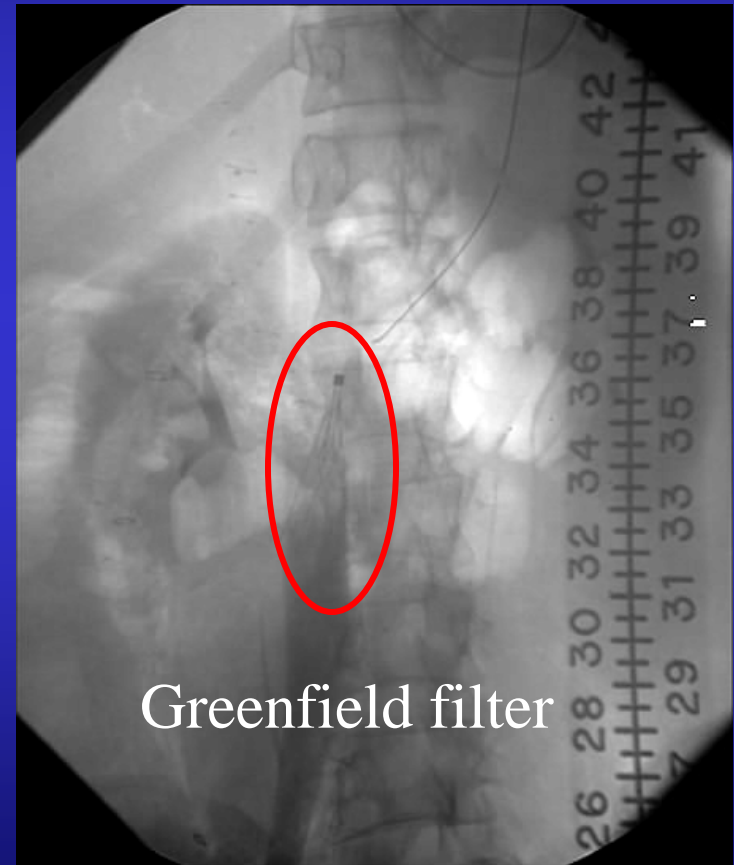
# Our Patient GK: Angiography



Filling defect



# Our Patient GK: Outcome



Greenfield filter





# Summary: PE

Clinically, must look to find it

CXR mainly for exclusion of other diagnoses

VQ scan interpretation can be complicated

CT specific but may not be sensitive

Angiography not risk-free; gold standard for  
diagnosis + therapeutic



# References

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