



# Renal-Pulmonary Syndrome: Clinical Diagnosis and Thorax imaging

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# Presentation overview

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- Patient presentation
  - Differential diagnosis
  - Discussion
  - Imaging of microscopic polyangiitis patient & follow-up
  - Review renal-pulmonary syndrome
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# Our Patient: First admission

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- ❑ 62 year old female with past medical history positive for Hepatitis C, asthma, lobular breast cancer transferred from OSH with hemoptysis, dyspnea, acute renal failure (creatinine of 12), and severe anemia (Hg 5).
  - ❑ During admission, she remained intubated requiring PEEPs as high as 12, with worsening hypoxemia (  $PO_2$  40 on 100% $FiO_2$ ).
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# Our Patient: Physical exam

- ❑ VS: Afebrile - BP 118-140/50-60 - HR 40-80- O<sub>2</sub> sat 94% (intubated)
- ❑ Gen: Intubated, sedated.
- ❑ Neck: Supple. No cervical LAP.
- ❑ HEENT: PERRL, EOMI, MMM, OP pink w/o ulcers injection or exudates.
- ❑ Chest: CTA w/o W/R/R. Cardiac: RRR, S<sub>1</sub>S<sub>2</sub>, No MRG.
- ❑ Abd: S/ND/NT, no HSM.
- ❑ Extrem: Warm, 2+ radial and pedal pulses, no C/C/E.
- ❑ Musc Skel: Muscle strength 5/5 in all extremities. No sensory deficits. Reflexes intact.  
Limited movement of R shoulder
- ❑ Neuro: Good comprehension/cognition. CN 2-12 intact.
- ❑ Skin: No alopecia, nail change, rash, bruising, petechiae, telangiectasia, icterus, tophi, or nodules.



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# Differential Diagnosis

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□ Rapidly progressive  
acute renal failure

□ Hemoptysis &  
dyspnea

- Goodpasture Syndrome
  - Granulomatosis  
Polyangiitis
  - Churg-Strauss Syndrome
  - Hepatitis C associated  
cryoglobulinemia
  - Lupus associated lung-  
renal disease.
  - Microscopic Polyangiitis
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# Our Patient: Relevant laboratory findings

- WBC 17.5 (96% PMN)
- HCT 25.4
- Hem 5.0
- Plt 148
- Cr 11.7
- ESR >140
- ABG: pH 7.33 pCO<sub>2</sub> 45 pO<sub>2</sub> 84 on FiO<sub>2</sub> of 60  
Lactate 1.9
- UA 3+ blood, trace WBC, trace glucose, 1+ albumin positive eos
- BAL: 79% polys, 3% bands, 6% lympho, 10% eos, 2% macrophages
- AST 16
- ALT 15
- Tbil 1.6
- P-ANCA (+)
- MPO Ab (+)
- Anti-GBM (-)
- ANA (-)
- C<sub>3</sub> 68 (low)
- C<sub>4</sub> 19 (low-normal)



# Our Patient: Renal Biopsy

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- Light Microscopy
    - There is moderate interstitial fibrosis and tubular atrophy. Focally intense chronic inflammation accompanies the scarring.
    - Intact tubulo-interstitium shows mononuclear inflammation, and red cell casts. Foci of granulomatous inflammation are seen.
  - Immunofluorescence:
    - 1+C<sub>3</sub> is seen along tubular basement membranes and in vessels.
  - Electron Microscopy
    - Sclerosing pauci-immune crescentic glomerulonephritis in the setting of p-ANCA positivity.
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# Discussion

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- Regarding patient clinical outcome in an acute setting. The organ systems more affected are the lungs and the kidneys.
  - In the spectrum of diseases that can potentially cause lung and renal disease are infectious, inflammatory, and an acute insult damaging these end organs.
  - There is high suspicion for an inflammatory process causing rapidly progressive renal failure and hemoptysis.
  - Since the patient is not developing SIRS (tachycardia, fever, hypotension) or an acute exacerbation of a chronic process, an acute insult or infection are less likely.
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# Discussion

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- In the differential diagnosis of inflammatory diseases are two main pathologic processes: Primary vasculitis and Immune-complex associated vasculitis.
- In the prior differential diagnosis hepatitis C cryoglobulinemia was included regarding patient medical history. Clinically, patient does not have signs of skin abnormalities which makes this entity less likely.
- Despite lupus is also a possibility, patient has negative ANA and low complements, which lowers yield for this disease.



# Discussion

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- Perinuclear ANCA is neither specific nor sensitive for a single disease. It can be positive in inflammatory processes such as IBD, vasculitis, Goodpasture syndrome, collagen vascular diseases, and infection.
- Now, the main differential is between Goodpasture syndrome and ANCA associated vasculitis. Since renal biopsy does not show findings for linear IgG deposits along basement membrane, ANCA associated vasculitis is the most likely diagnosis.



# Diagnosis conclusion

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- ❑ Based on Modified Chapel Hill classification of pulmonary vasculitis.
- ❑ The Chapel Hill Conference in 1992 just included large-vessel vasculitis, small-vessel vasculitis, and some immune-complex vasculitis.
- ❑ The modified Chapel Hill classification of pulmonary vasculitis added Behçet disease, collagen vascular diseases, drugs and foreign body related, as well as Goodpasture Syndrome and IgA Syndrome

Clinical findings + laboratory tests + histologic findings + imaging

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# Diagnosis conclusion

- ANCA- associated vasculitis
  - Granulomatosis polyangiitis (GPA)
  - Churg-Strauss syndrome (CSS)
  - Microscopic Polyangiitis (MPA)
- Other causes were excluded after laboratory findings

## Frequency (%) of ANCA-associated vasculitis

	cANCA or PR <sub>3</sub> -ANCA	pANCA or MPO-ANCA
GPA	15-45%	45-60%
CSS	85%	10%
MPA	10%	40-75%

*Hansell, et al. Imaging of Diseases of the Chest*



# Diagnosis conclusion

- Patient has history positive for asthma and eosinophils on BAL, which are two important considerations for Churg-Strauss vasculitis, this entity does not progress so rapidly in renal failure and dyspnea as our patient.
- The two most likely diagnosis that can provoke the symptoms with the intensity and speed as in this patient are GPA and MPA.
- Granulomatosis polyangiitis (GPA previously known as Wegener Granulomatosis) fits with the progression of lung and renal damage. However, it is more associated with c-ANCA vasculitis.
- **Microscopic Polyangiitis (MPA) is the most likely diagnosis regarding rapid progression clinical findings, laboratories, and biopsy (pauci-immune).**



# Caveats for diagnosis

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- When a patient has c-ANCA associated vasculitis, c-ANCA antibody is enough to make diagnosis and treatment for GPA.
- When a patient has p-ANCA associated vasculitis, MPO antibody is required to improve sensitivity for MPA.
- Patient with MPA sometimes has a history of fever and prodromic symptoms.
- Lung biopsy in this patient could help to identify granulomatous disease.
- In the acute setting, expeditious diagnosis is needed to proceed to correct therapeutic decision.





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Beth Israel Deaconess  
Medical Center

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Gillian Lieberman, MD

# Our patient: Imaging of microscopic polyangiitis & follow-up



# Our patient: 1<sup>st</sup> Admission

- Intubated
- Diffuse bilateral hazy areas of opacity and multiple foci of consolidation
- In this setting, most likely to be diffuse alveolar hemorrhage
- Other possibilities are pulmonary edema and ARDS

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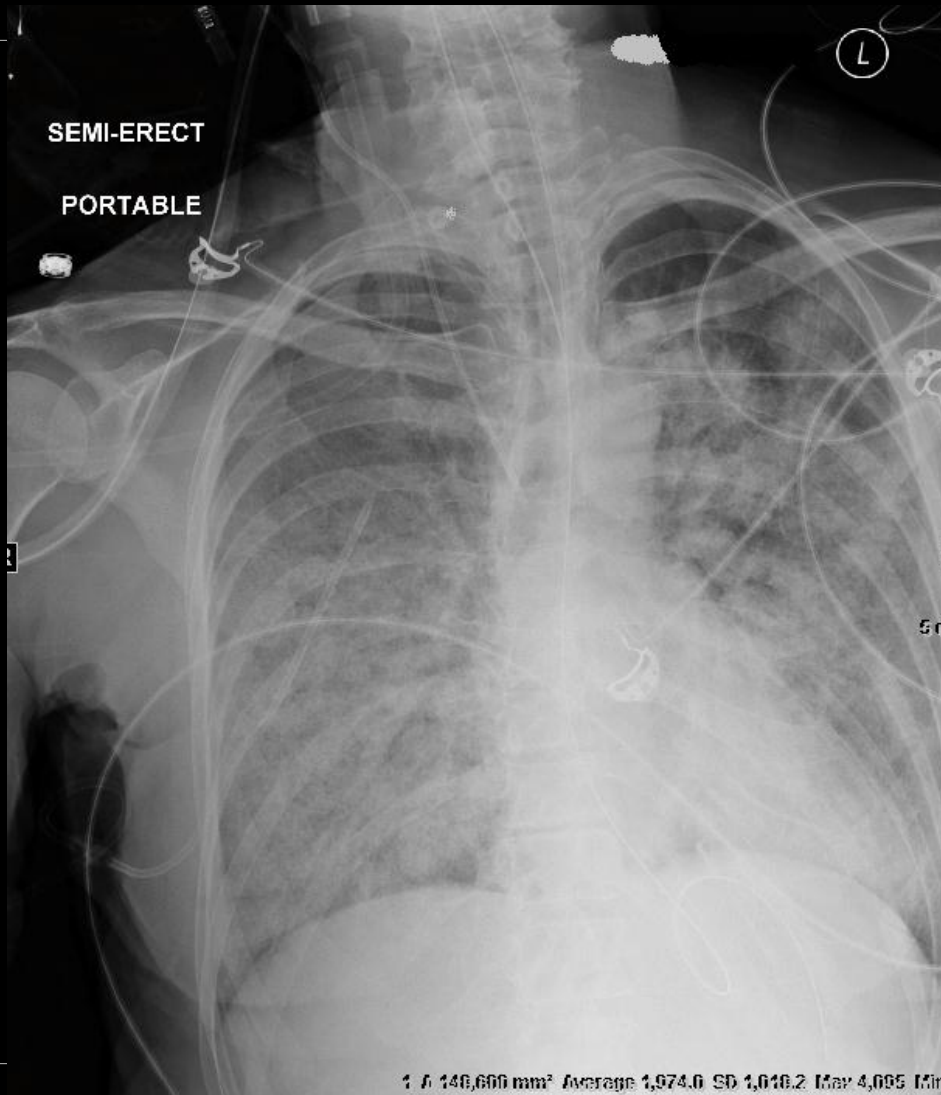


# Our patient: Therapy In-patient

- ❑ Patient was admitted for several sessions of plasmapheresis
- ❑ Steroids and chemotherapy were started.
- ❑ Patient was stabilized and discharged



# Our patient: Before discharge imaging



- Still diffuse bilateral opacification, but improvement
- Patient needs follow-up and therapy for complete remission



# Out patient: Disease progression

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- ❑ Patient was stable for an interval of approximately 2 years.
  - ❑ Rheumatology service was tapering down steroids in patient's therapy.
  - ❑ Patient was free of steroids for 2 weeks before developing progressive dyspnea, which was worsened the last two days.
  - ❑ Patient came to ED and admitted for microscopic polyangitis flare, complaining of dyspnea at rest.
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Medical Center

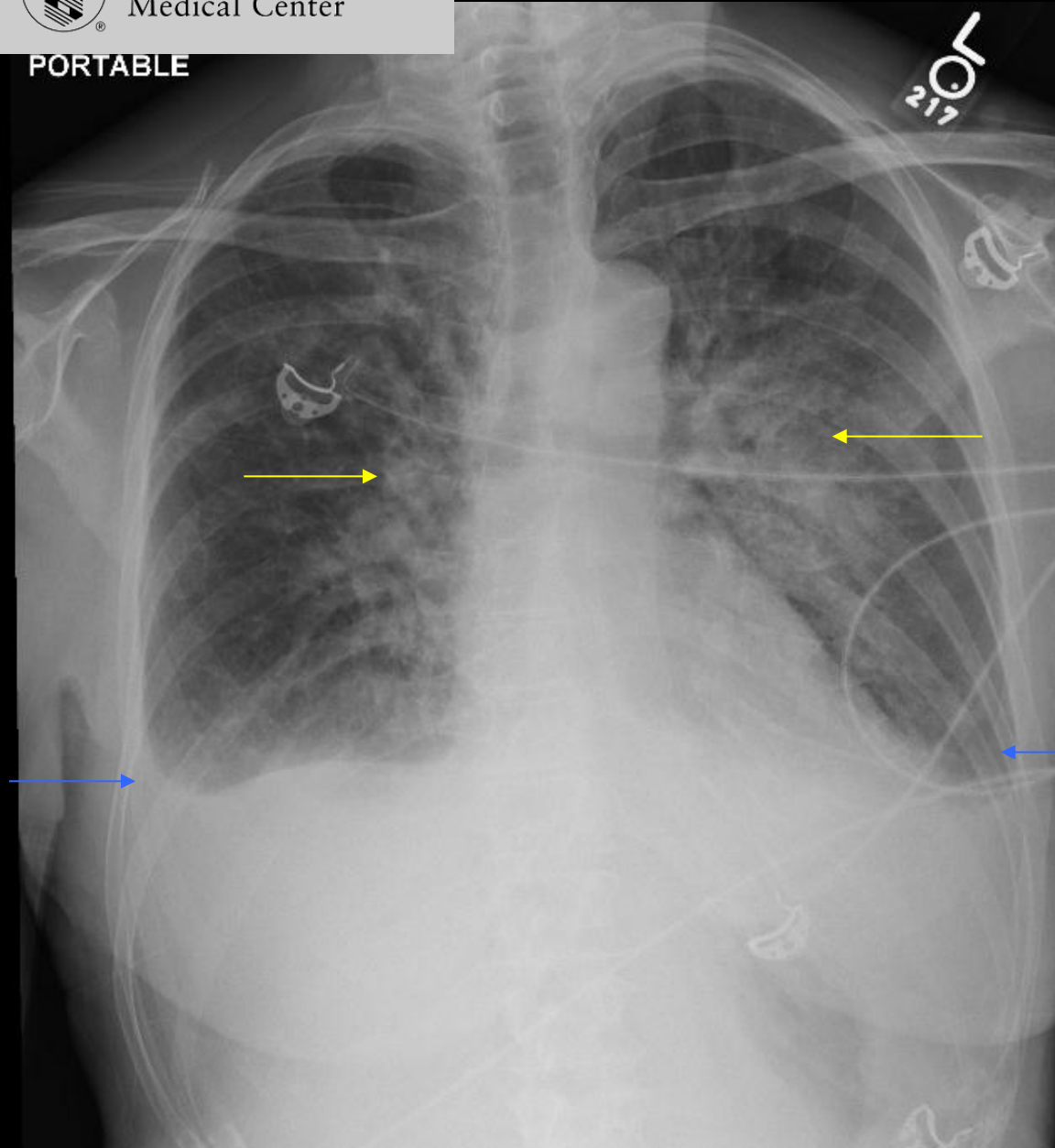
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# Our patient: Lung imaging

SECOND ADMISSION



PORTABLE



# Our patient: 2<sup>nd</sup> Admission

- Bilateral pleural effusion
- Perihilar opacities.





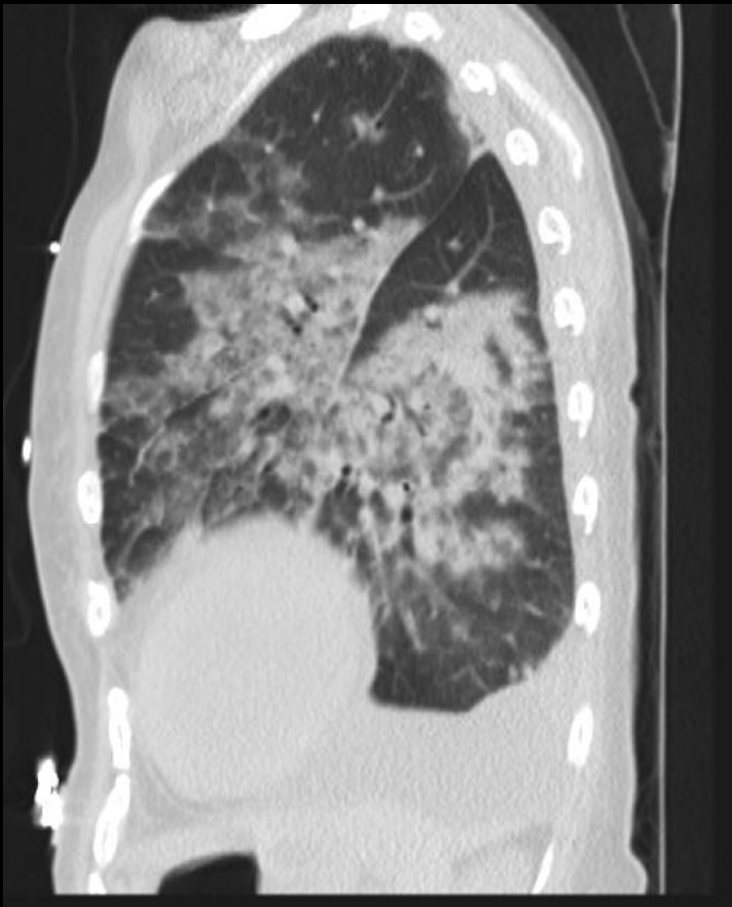
# CT findings

- Focal ground-glass opacities in upper and lower lobes with perihilar predominance
- Consolidation predominant perihilar distribution
- Pleural effusion.

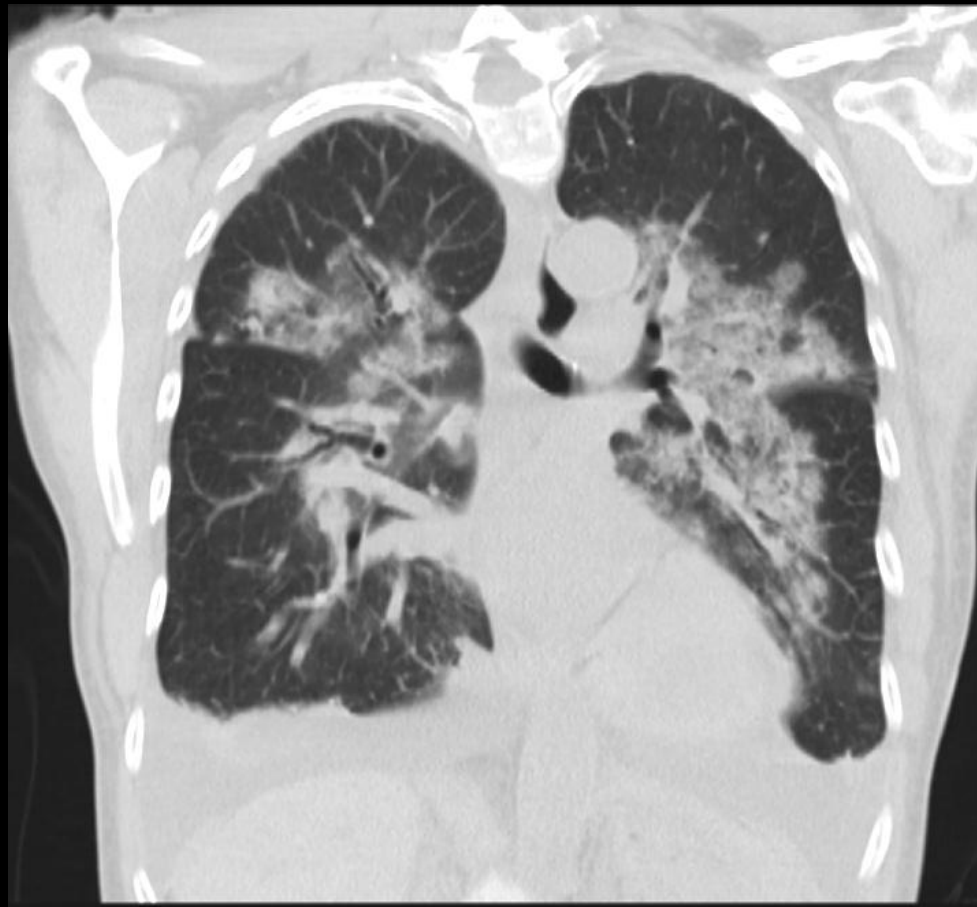




# Our patient: CT chest



Sagittal



Coronal

Continue to view findings next slide:

From PACS System



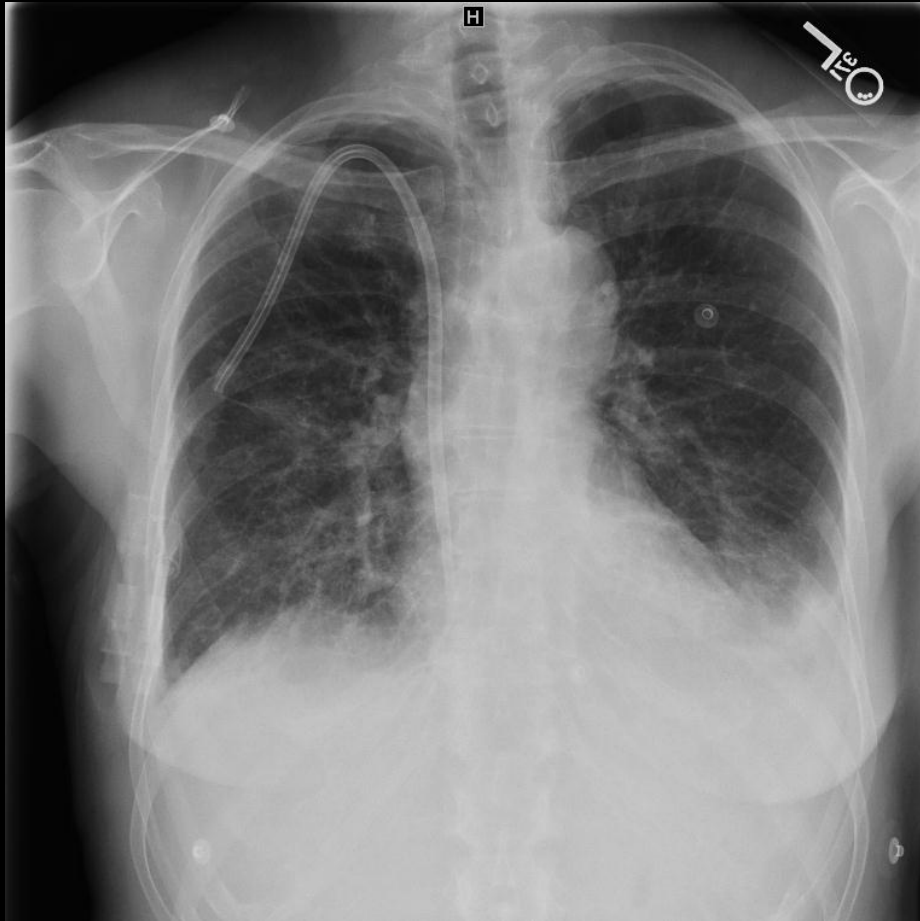
# Interpretation of prior slide

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- Findings:
    - Rapid development pulmonary edema and ground-glass opacities
    - Peribronchovascular central infiltration
  - Differential diagnosis:
    - Infection
    - Inflammation:
      - Autoimmune diseases as vasculitis, LES, RA, sarcoidosis.
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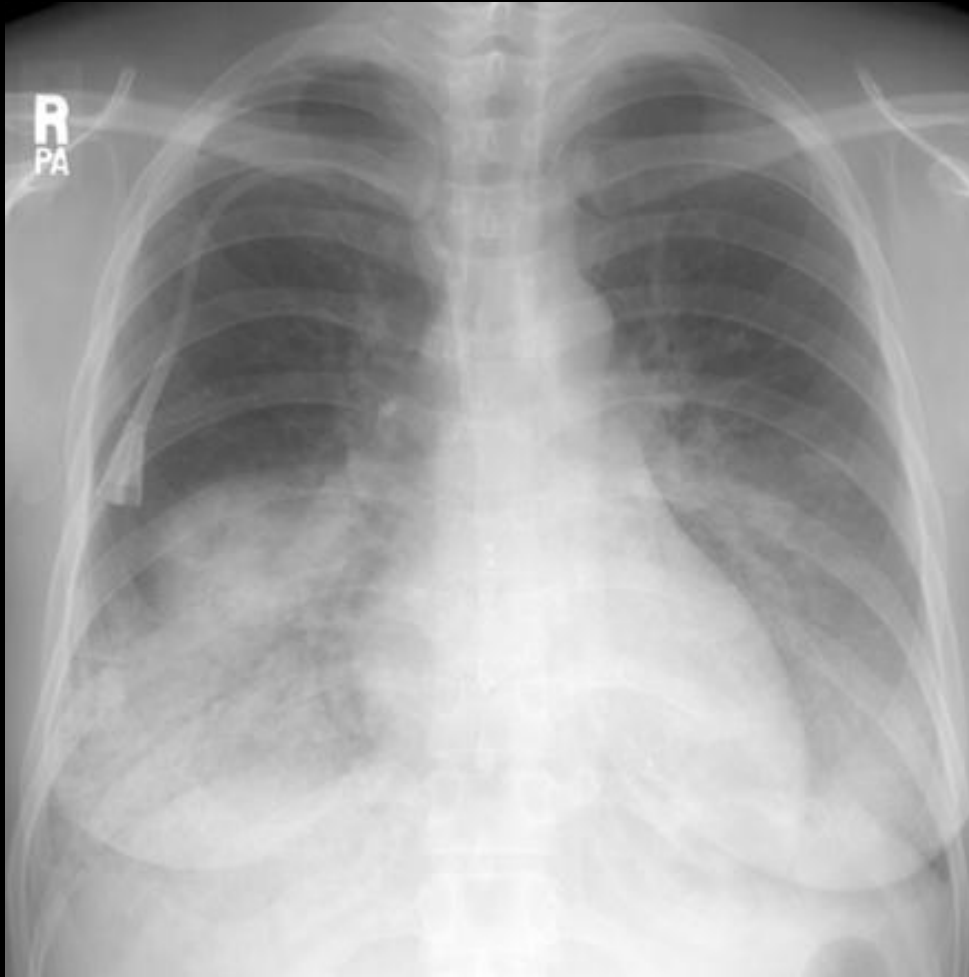
# Our Patient: Discharge plain film



- Given rapid clearing of chest X-ray 5 days after admission, the most likely etiology of haziness in 2<sup>nd</sup> admission is pulmonary edema.
- In this setting, it is important to not disregard the possibility of diffuse alveolar hemorrhage.
- Patient was treated for the MPA flare with steroids, also with empiric antibiotic for an occult infection, and diuretics for fluid overload.



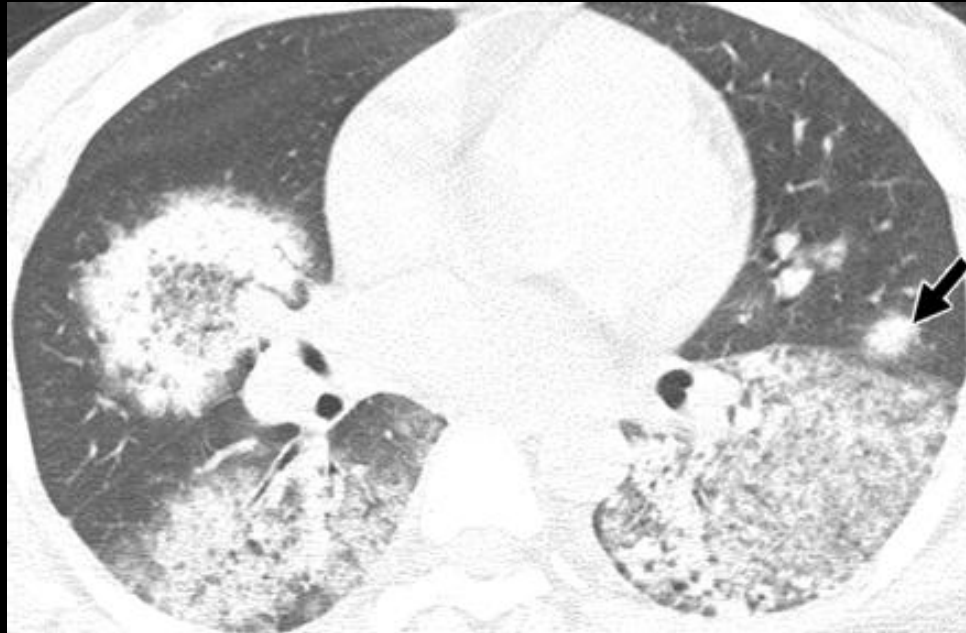
# X-ray Imaging MPA



- Extensive consolidation in middle and lower lung fields.
- Pattern: Most predominant in middle and lower, sparing apical fields.



# CT Imaging MPA



- Lung parenchymal opacities in left upper lobe.
- Ground-glass opacities
- Centrilobular nodules (arrow).

*Chung, Man, et al. Imaging of Pulmonary Vasculitis.*



# Our patient: Outcome

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- Patient was discharged with steroids, planning start rituximab.
  - Follow-up with Heme/Onc concerning bone marrow issues for unknown anemia and thrombocytopenia.
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# Summary review

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- Renal-pulmonary is a diagnosis that should be done expedite, since the prognosis rely on acute adequate treatment.
  - The differential diagnosis of renal-pulmonary syndrome is broad in the beginning.
  - Laboratory findings, renal and lung biopsy, as well as, the imaging can provide insightful progression of the disease.
  - ANCA associated vasculitis diagnosis is based on Modified Chapel Hill classification. Possibilities are primary and secondary vasculitis.
  - There are two ANCA associated vasculitis that have more commonly an acute progression which are GPA and MPA.
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# Bibliography

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# Thank you

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- Dr. Paul Spirn
  - Dr. Gillian Lieberman
  - Claire Odom
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