

## Introduction

- Pneumothorax (PTX) has been reported with the use of positive pressure ventilation in Novel Coronavirus Disease 2019 (COVID-19) pneumonia
- Spontaneous PTX is accumulation of air in the pleural space that occurs in the absence of any external insults like trauma and may happen with (secondary) or without (primary) underlying lung disease[1]
- In the past, viruses including SARS-CoV-1 and influenza have been associated with spontaneous pneumothorax[2,3]
- Literature on spontaneous pneumothorax in COVID-19 patients is scant
- We present a case series of 8 patients with COVID-19 pneumonia, who developed spontaneous pneumothorax without positive pressure ventilation

## Methods

- We performed a retrospective chart review of eight cases from two different US hospitals among patients admitted with COVID-19 pneumonia during April to July, 2020
- **Inclusion criteria:** Hospitalized patients with confirmed SARS-CoV-2 by nasopharyngeal RT-PCR and who developed spontaneous pneumothorax
- **Collected data:** Demographics, co-morbidities, inflammatory biomarkers, chest imaging and management strategies
- **Outcomes:** Length of stay, transfer to intensive care unit, death
- A descriptive analysis was performed

**Figure 1. Progression to pneumothorax and pneumomediastinum (Red arrows) in our COVID-19 pneumonia patient**

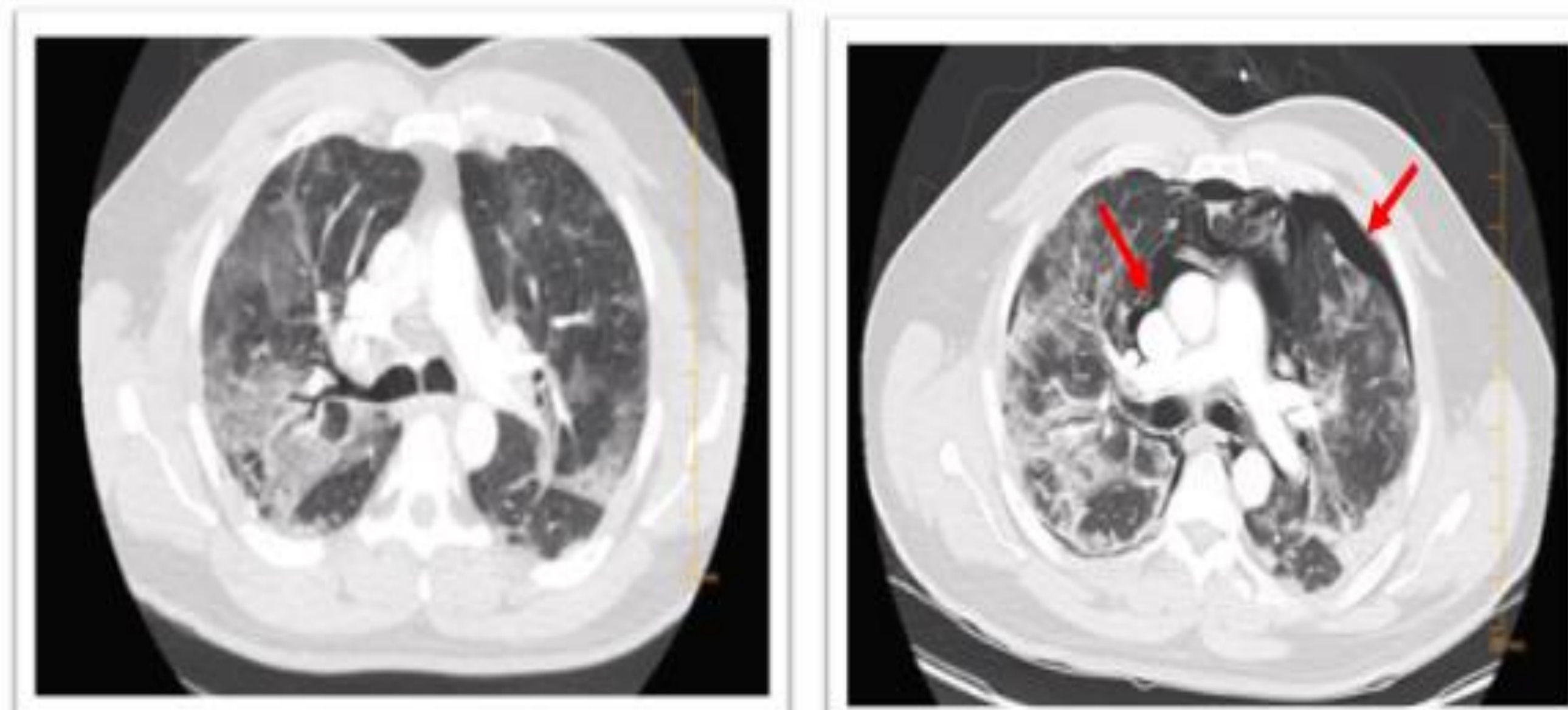


Figure 1. Progression to pneumothorax and pneumomediastinum (Red arrows) in our COVID-19 pneumonia patient

**Table 1: Spontaneous pneumothorax in COVID-19 pneumonia: Clinical summary of characteristics, comorbidities, and management of patients**

Patient No.	1	2	3	4	5	6	7	8
<b>Baseline Characteristics</b>								
Age (years)	55	76	54	64	80	85	75	43
Race	Black	White	Hispanic	White	White	Black	White	Arabic
Gender	Male	Male	Male	Male	Male	Female	Male	Male
BMI (kg/m <sup>2</sup> )	33	27	27.4	24	22	30.9	25.8	33.5
<b>Comorbidities</b>								
Tobacco use	Former	Former	Never	Former	Never	Never	Never	Former
Prior pulmonary disease	No	Yes, COPD	No	No	No	No	No	No
<b>Clinical Characteristics</b>								
Days from COVID-19 diagnosis to PTX	12	9	12	10	40	1	28	9
Days from symptom onset to PTX	18	15	16	17	41	4	31	10
O2 requirement at admission	15L NC	5L NC	4L NC	RA	3L NC	3L NC	2L NC	2L NC
Ferritin at time of diagnosis of PTX (ng/mL)	1266.0	199.0	575.0	862.0	341.0	768.0	97.0	969.0
CRP at time of diagnosis of PTX (mg/dL)	7.3	N/A	3.9	5.6	8.8	20.5	0.8	2.6
D-Dimer at time of diagnosis of PTX (ug/mL)	2.2	0.98	2.05	0.73	2.73	3.8	9	0.5
Type of imaging	CXR	CXR	CXR	CXR	CT	CT	CT	CT
Laterality of PTX	Unilateral	Bilateral	Bilateral	Unilateral	Unilateral	Unilateral	Unilateral	Unilateral
Type of PTX	Tension	Simple	Simple	Simple	Simple	Simple	Simple	Simple
Presence of blebs	No	No	No	No	No	No	No	No
Presence of pneumomediastinum	No	Yes	Yes	No	No	No	Yes	Yes
Alternate cause of hypoxia	No	No	No	No	Loculated PTX	Hydro PTX	PE	No
Chest tube inserted	Yes	Yes	Yes	Yes	No	No	No	No
<b>Outcomes</b>								
Length of stay (days)	22	13	29	14	11	5	7	33
Highest O2 requirement in hospitalization	MV	MV	6L NC	HFNC	6L NC	4L NC	5L NC	HFNC
Required ICU	Yes	Yes	Yes	No	No	Yes	No	Yes
In-hospital mortality	Yes	Yes	No	No	No	No	No	No
O2 requirement at discharge	N/A	N/A	N/A	2L NC	RA	RA	RA	2-10L

Abbreviations: BMI, body mass index; PTX, pneumothorax; O2, oxygen; NC, nasal canula; CRP, C-reactive protein, CXR, chest X-ray; CT, chest computerized tomography; ICU, intensive care unit; N/A, not available; PE, pulmonary embolism; RA, room air; HFNC, high flow nasal canula; MV mechanical ventilation.

## Results

- Four out of eight patients were from Henry Ford Health System, Michigan and the remainder were from Silver Cross Hospital, Illinois
- Median age was 69.5 years and 7/8 (87.5 %) were male
- There were no pulmonary co-morbidities associated with spontaneous pneumothorax except for one patient with COPD
- The median time from symptom onset of COVID-19 to diagnosis of spontaneous pneumothorax was 16.5 (range 4-41[IQR 16.5]) days
- Median of known CRP for 7/8 patients was elevated at 5.6 mg/dL at the time of spontaneous pneumothorax
- Four patients required chest tube placement in which three required ICU transfer. Two of the patients progressively worsened requiring mechanical ventilation and subsequently died
- Median length of stay was 13.5 (5-33[IQR 19.25]) days

## Conclusion

- Spontaneous pneumothorax may be an unrecognized late complication of COVID-19 pneumonia
- In hospitalized patients with acute respiratory decompensation, spontaneous pneumothorax should be considered as part of the differential diagnosis. Repeat chest imaging should be considered in such cases
- C-reactive protein was elevated at the time of spontaneous pneumothorax and may indicate ongoing inflammation and parenchymal breakdown at time of pneumothorax

## References

- 1) Sahn SA, Heffner JE. Spontaneous Pneumothorax. New England Journal of Medicine March 23, 2000 342(12):868. DOI: 10.1056/NEJM200003233421207. PMID - 10727592
- 2) Sihoe AD, Wong RH, Lee AT, Lau LS, Leung NY, Law KI, and Yim AP. Severe Acute Respiratory Syndrome Complicated by Spontaneous Pneumothorax. Chest. 2004 Jun; 125(6): 2345-2351. Published online 2016 Sep 9. doi: 10.1378/chest.125.6.2345
- 3) Chaturvedi A, Kumar A. Spontaneous Pneumothorax in H1N1 Infection. J Assoc Physicians India 2017 May;65(5):97-98