

#### 402. Spontaneous pneumothorax in COVID-19

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** Pneumothorax has been reported with the use of positive pressure ventilation in COVID-19 pneumonia. Literature on spontaneous pneumothorax (PTX) in COVID-19 patients is scant. We present a case series of 7 patients with COVID-19 pneumonia, who developed spontaneous pneumothorax without prior mechanical ventilation.

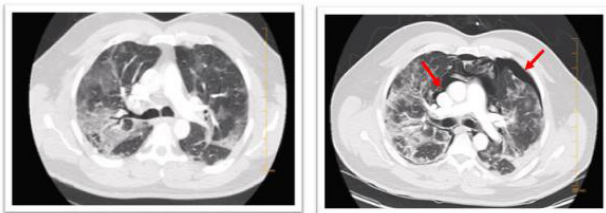
**Methods:** A retrospective chart review of 7 cases was performed from two different hospitals in the US between 4/6/2020–5/15/2020. Hospitalized patients with confirmed COVID-19 by nasopharyngeal RT-PCR who developed spontaneous pneumothorax were included. Collected data included demographics, co-morbidities, inflammatory biomarkers, chest imaging and management strategies. Length of stay, transfer to intensive care unit and death were the assessed outcomes. A descriptive analysis was done.

**Results:** There were 3 patients from Henry Ford Health System, Michigan and 4 patients from Silver Cross Hospital, Illinois. Median age was 75 years and 6 out of 7 (85.7%) were males (Table 1). There were no co-morbidities associated with spontaneous pneumothorax except for one patient with COPD. None of the patients' imaging prior to diagnosis of pneumothorax revealed any underlying blebs. Median time from symptom onset to diagnosis of pneumothorax was 17 days. One of the patients had tension pneumothorax, two had bilateral pneumothorax and three had pneumomediastinum (Figure 1). Four patients required chest tube placement, three required escalation to ICU, of which two died.

Table 1. Demographics and Clinical Characteristics of Patients with Spontaneous Pneumothorax

Patient No.	1	2	3	4	5	6	7
<b>Baseline Characteristics</b>							
Age (years)	55	76	54	64	80	85	75
Race	Black	White	Hispanic	White	White	Black	White
Gender	Male	Male	Male	Male	Male	Female	Male
BMI (kg/m <sup>2</sup> )	33	27	27.4	24	22	30.9	25.8
<b>Comorbidities</b>							
Tobacco use	Former	Former	Never	Former	Never	Never	Never
Prior pulmonary disease	No	Yes, COPD	No	No	No	No	No
<b>Clinical Characteristics</b>							
Days from COVID-19 diagnosis to PTX	12	9	12	10	40	1	28
Days from symptom onset to PTX	18	15	16	17	41	4	31
O2 requirement at admission	15L NC	5L NC	4L NC	RA	3L NC	3L NC	2L NC
Ferritin at time of diagnosis of PTX (ng/mL)	N/A	N/A	N/A	N/A	341	768	97
CRP at time of diagnosis of PTX (mg/dL)	N/A	N/A	N/A	N/A	8.8	20.5	0.8
D-Dimer at time of diagnosis of PTX (ug/mL)	N/A	N/A	N/A	N/A	2.73	3.8	9
<b>Type of imaging</b>							
Laterality of PTX	Unilateral	Bilateral	Bilateral	Unilateral	Unilateral	Unilateral	Unilateral
Type of PTX	Tension	Simple	Simple	Simple	Simple	Simple	Simple
Presence of blebs	No	No	No	No	No	No	No
Presence of pneumomediastinum	No	Yes	Yes	No	No	No	Yes
Alternate cause of hypoxia	N/A	N/A	N/A	N/A	Loculated PTX	Hydro PTX	PE
Chest tube inserted	Yes	Yes	Yes	Yes	No	No	No
<b>Outcomes</b>							
Length of stay (days)	22	13	25	14	11	5	7
Highest O2 requirement in hospitalization (post PTX)	MV	MV	6L NC	HFNC	6L NC	4L NC	5L NC
Required ICU	Yes	Yes	Yes	No	No	No	No
In-hospital mortality	Yes	Yes	Still admitted	No	No	No	No
O2 requirement at discharge	N/A	N/A	N/A	2L NC	RA	RA	RA

Figure 1. CT imaging before (left) and after (right) Spontaneous Pneumothorax



**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 these cases.

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#### 403. Study of early and late readmissions with COVID-19: A retrospective analysis

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**Session:** P-12. COVID-19 Complications, Co-infections, and Clinical Outcomes

**Background:** Michigan was one of the severely impacted regions during the initial COVID-19 surge. An institutional protocol with early methylprednisolone (MP)

to treat COVID-19 patients requiring supplemental oxygen was implemented. We sought to study characteristics of these patients who were readmitted with infectious and non-infectious diagnoses.

**Methods:** A retrospective analysis of 21 COVID-19 readmitted patients initially admitted between 3/10/2020 and 4/20/2020 (early 0–7, late 8–30 days) was done. Total of 455 COVID-19 patients, confirmed by a positive nasopharyngeal RT-PCR were admitted during this time period. Demographic data, clinical characteristics, laboratory and radiographic results and treatments were compared among the early and late readmission groups. Univariate and logistic regression analysis were performed to study the risk factors associated with early readmission and worsening of COVID-19 pneumonia. Secondary analyses were performed comparing worsening COVID-19 pneumonia with other readmission diagnoses.

**Results:** 4.6% (21/455) were readmitted, 14 early vs 7 late (median age 75 vs 65 yrs). Most early readmissions were COVID-19 related and 8 out of 14 had worsening COVID-19 pneumonia based on clinical picture, laboratory and imaging findings. Readmitted patients with worsening COVID-19 related pneumonia had significantly elevated CRP and lower ALC compared to last discharge value (Table 1). None of the late readmissions required MP. A total of 8 readmissions had bacterial coinfections (1/8 COVID-19 related) (Table 2). Bacterial infections unrelated to COVID-19 were aspiration pneumonia (2), urinary tract infection (2), enterococcal bacteremia from stercoral colitis (1), sacral osteomyelitis (1), and infected BKA stump (1). Each increasing day of MP duration during the first admission reduced the likelihood of early readmission by approximately 10% (OR 0.90, 95% CI 0.63–1.2, p=0.56) (Table 3). 1/14 and 0/7 patients died amongst early and late readmissions respectively.

Table 1: Characteristics of early and late readmissions in COVID-19 patients

Characteristics	Early Readmits N = 14	Late Readmits N = 7	P Value
Median Age (IQR)	75 (59-81)	65 (49-86)	0.9404
Male Gender N (%)	8 (57)	5 (71)	0.6557
<b>Race - N (%)</b>			
White	6 (42.9)	5 (71.4)	0.5828
Black	7 (50)	2 (28.6)	
Arabic	1 (7.1)	0 (0)	
Median BMI (IQR)	28.6 (25-32.4)	26 (23-32.6)	0.3509
Median Days of symptom onset prior to First Admission (IQR)	6.5 (3-8)	7 (3-7)	0.7027
Median length of stay (days) for first Admission (IQR)	6.5 (3-9)	6 (5-7)	0.9699
<b>Median Days to Readmission (IQR)</b>	<b>5 (3-6)</b>	<b>15 (11-19)</b>	<b>0.0001</b>
<b>Readmission Symptoms - N (%)</b>			
Fever	3 (21.4)	0 (0)	0.5211
Cough	8 (57.1)	2 (28.6)	0.3615
Shortness of Breath	10 (71.4)	3 (42.9)	0.3458
Worsening O2 Requirement	9 (64.3)	6 (85.7)	0.6126
Peak FIO2 delivery Greater than 40%	5 (35.7)	2 (28.6)	1
<b>Labs</b>			
<b>D-Dimer at Discharge (Median, IQR)</b>	<b>1.14 (0.57-1.68)</b>	<b>2.95 (1.34-8.6)</b>	<b>0.0305</b>
D-Dimer Readmit (Median, IQR)	1.2 (1.07-2.26)	3 (1.44-3.40)	0.3429
<b>D-Dimer Change (Median, IQR)</b>	<b>0.52 (0.13-1.22)</b>	<b>-1.58 (-5.4-0.47)</b>	<b>0.0288</b>
CRP Discharge (Median, IQR)	2.15 (0.5-4.3)	1.4 (0.7-4.4)	0.8805
CRP Readmit (Median, IQR)	7 (1.4-16.6)	3.7 (1.2-6.6)	0.2035
CRP Change (Median, IQR)	3 (0.3-12.7)	1.3 (0.2-2.1)	0.2729
Ferritin Discharge (Median, IQR)	417.5 (219-895)	503 (52-678)	0.9109
Ferritin Readmit (Median, IQR)	572 (330-827)	341 (111-547)	0.2035
Ferritin Change (Median, IQR)	66 (85-150)	16.5 (-142-46)	0.3132
Procalcitonin First Admit (Median, IQR)	0.135 (0.1-0.32)	0.13 (0.11-0.52)	0.3471
Procalcitonin Second Admit (Median, IQR)	0.10 (0.1-0.25)	0.27 (0.1-0.39)	0.5467
Procalcitonin Change (Median, IQR)	0 (-0.1-0.1)	-0.005 (-0.13-0.07)	0.6923
ALC Discharge (Median, IQR)	0.85 (0.5-1.67)	0.5 (0.2-1.1)	0.2458
ALC Readmit (Median, IQR)	0.75 (0.6-1.6)	0.7 (0.5-1.2)	0.7649
ALC Change Median (IQR)	0.05 (-0.1-0.4)	0.3 (0.1-0.3)	0.4327
<b>Initial Therapies</b>			
Methylprednisolone Given n (%)	12 (85.7)	6 (85.7)	1
Methylprednisolone Dose (total daily dose mg) Median, IQR	80 (64-112)	80 (48-80)	0.1856
Hours to Methylprednisolone Administration (Median, IQR)	13.5 (4-19)	22.5 (6-32.3)	0.2919
Methylprednisolone Duration (days) (Median, IQR)	4.5 (3-6)	6 (5-7)	0.4297
Tocilizumab Given - n(%)	3 (21.4)	0 (0)	0.5211
DVT Prophylaxis Given n (%)	10 (71.4)	3 (42.9)	0.3458
Lovenox Agent n (%)	9 (90)	2 (66.7)	0.4231
Prophylactic Duration (days) median/IQR	3.5 (3-9)	2 (1-3)	0.1679
Discharged on O2 L/min - N (%)	2 (14.29)	1 (14.29)	1
Readmitted requiring NC - N (%)	7 (50)	6 (85.7)	0.5265
Readmit Requiring HFNC - N (%)	1 (7.14)	0 (0)	
Readmitted and Intubated - N (%)	1 (7.14)	0 (0)	
<b>Therapeutic Anticoagulation Initial</b>			
Given - N (%)	5 (35.7)	4 (57.1)	0.3972
Duration - Median Days (IQR)	0 (0-3)	5 (0-7)	0.1989
Discharged on Anticoagulation N (%)	4 (28.6)	4 (57.1)	0.3458
<b>Readmission Treatment</b>			
Readmission Pulmonary Related - N (%)	10 (71.4)	2 (28.6)	0.1588
<b>Diagnosis Worsening COVID N (%)</b>	<b>7 (50)</b>	<b>0 (0)</b>	<b>0.0468</b>
<b>Second Round Steroids - N (%)</b>	<b>14 (100)</b>	<b>0 (0)</b>	<b>&lt;0.0001</b>
<b>Worsening COVID Patients</b>			
<b>D-Dimer Discharge (Median, IQR)</b>	<b>0.63 (0.56-1.04)</b>	<b>2.21 (1.34-5.56)</b>	<b>0.0032</b>
D-Dimer Readmit (Median, IQR)	1.22 (1.07-1.79)	2.82 (1.11-3.40)	0.3416
D-Dimer Change (Median, IQR)	0.56 (0.17-1.12)	-0.14 (-1.78-0.85)	0.2048
CRP Discharge (Median, IQR)	3.1 (0.6-5.5)	1.2 (0.5-4.3)	0.4301
CRP Readmit Median (IQR)	13.2 (7.19-5.7)	1.7 (1.05-5.7)	0.006
CRP Change Median (IQR)	9.5 (2.1-4.6)	0.95 (0.15-2.55)	0.0312
Ferritin Discharge Median (IQR)	244 (219-429)	588 (155-895)	0.4785
Ferritin Readmit Median (IQR)	495 (330-936)	454 (99-734)	0.422
Ferritin Change Median (IQR)	99 (85-331)	-11 (-160-55.5)	0.1632
Procalcitonin First Admit Median (IQR)	0.11 (0.10-0.19)	0.18 (0.11-0.38)	0.1058
Procalcitonin Second Admit - Median (IQR)	0.19 (0.1-0.55)	0.14 (0.1-0.36)	0.7545
Procalcitonin Change Median (IQR)	0.06 (-0.01-0.45)	-0.03 (-0.17-0.04)	0.1621
ALC Discharge Median (IQR)	0.58 (0.5-0.8)	1 (0.4-1.67)	0.5492
ALC Readmit Median (IQR)	0.6 (0.4-0.7)	1.05 (0.5-1.79)	0.1348
ALC Change Median (IQR)	-0.1 (-0.18-0.1)	0.3 (0.1-0.4)	0.0275

Notes: Ferritin Expressed in ng/mL, CRP (C-Reactive Protein) Expressed in mg/dL, ALC (Absolute Lymphocyte Count) Expressed in K/uL, and D-Dimer expressed in ug/mL FEU.