CASE SERIES

Case series of COVID-19 with spontaneous pneumomediastinum

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SUMMARY

Spontaneous pneumomediastinum is a rare condition in viral pneumonia. However, it can arise spontaneously in COVID-19 patients with no other risk factors. Here we present four cases of spontaneous pneumomediastinum in patients with COVID-19 pneumonia with no other precipitating factors.

INTRODUCTION

Pneumomediastinum describes the presence of free air in the mediastinum. They usually occur due to presence of underlying risk factors such as direct trauma, airway mucosal disruption or use of positive pressure ventilatory support. In COVID-19 pneumonitis they can arise without any underlying risk factors. Most of the time they resolve with conservative management. Rarely, propagation and accumulation of air within the enclosed mediastinum, can progress to tension pneumomediastinum, with cardiorespiratory compromise. In COVID-19, presence of pneumomediastinum may signify worsening of disease and indicates closer monitoring of the patients.

CASE REPORTS

Case 1

A 45-year-old male non-smoker with underlying hypertension and obesity (BMI 34.3) presented with fever, dry cough and anosmia. At day 5 of illness his COVID-19 PCR turns positive. Due to increasing cough and shortness of breath he presented to the covid-19 assessment centre and was noted to have respiratory rate of 26 with oxygen saturation of 90% at rest, saturation improved to 98% on facemask oxygen 5L/min which then reduced further to nasal prongs oxygen 3Lmin upon admission to ward. His CXR showed infiltrates at peripheral of the lungs and CRP was 7 mg/dL. He was started on steroids and thromboprophylaxis and remained stable on oxygen supplementation. On day 6 of admission patient remained comfortable on nasal prongs oxygen 2L/min but complained of tightness over his neck upon coughing. On examination there was crepitus over bilateral supraclavicular regions. Repeated CXR showed surgical emphysema above the clavicles, however, the view was limited. It also showed worsening ground glass opacities at peripheral and basal regions of the lungs and D-dimer was markedly raised. CT pulmonary angiogram (CTPA) done showed right segmental pulmonary embolism, ground-glass opacities predominantly in peripheral distribution and perilobular densities of both lungs. There was also pneumomediastinum and pneumopericardium which extended into soft tissue of the anterior neck region. Linear lucency was seen at the posterior wall of the trachea at T1/T2 vertebral level, suspicious of tracheal wall defect.

A cardiothoracic specialist was consulted, in view of patient was not in respiratory distress and saturating well on nasal prongs oxygen, conservative treatment with oxygen supplementation and observation was suggested. Antibiotics was commenced in view of rising CRP and NLR ratio, treatment dose of anticoagulants for pulmonary embolism given and steroids were continued. Patient was observed for another 5 days in ward. Surgical emphysema over neck reduced, inflammatory markers came down and patient remained comfortable. He was then discharged with oral anticoagulants to complete for 3 months. Repeat CT Thorax one week after discharge showed healing tracheal defect with resolved pneumomediastinum and pneumopericardium.

Case 2

A 38-year-old man, non-smoker with BMI of 30 presented on day 9 of illness with fever and cough. His COVID-19 PCR was positive on day 2 of symptoms. On admission he was noted to have oxygen saturation of 93% under room air which picked up to 98% under nasal prongs oxygen 3L/min. CXR on admission shows minimal left basal ground glass opacities and CRP was 8.3 mg/dL. He was started on steroids and thromboprophylaxis. On day 4 of admission he deteriorated needing facemask oxygen 10L/min. Repeated CXR showed worsening opacities especially over right basal region. CTPA done showed extensive surgical emphysema involving the subcutaneous and intermuscular layer of the anterior and posterior chest wall and presence of pneumomediastinum and pneumopericardium. Scattered ground glass densities with peripheral and basal predominance seen and perilobular densities with arch-like patterns was noted in both lungs. There was no pulmonary embolism or pneumothorax seen.

During the next 5 days in the ward, patient improved with medical treatment: steroids, anticoagulations and oxygen support. There was reducing oxygen requirement, reducing inflammatory markers and improving chest radiograph. No repeat CT thorax done prior to discharge and the patient was seen in clinic 3 weeks later feeling better with improving CXR.

Case 3

A 33-year-old man with no known co-morbidities came in at day 7 of illness with fever, cough and shortness of breath. His COVID-PCR turns positive at day 3 of illness. He is a non-smoker and had a BMI of 27.4. Upon assessment his

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Table I: Blood parameters and oxygen requirements of case 1 according to day of admission

DOA	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Date	10/6/21	11/6/21	12/6/21	13/6/21	14/6/21	15/6/21	16/6/21	17/6/21	18/6/21	19/6/21
CRP (mg/dL)	7	6.8	4.4	3.9	3.8	8.1	19.0	12.7	7.1	3.6
Ferritin (ng/mL)							1210	1278		
D-dimer (ng/mL)							21213			
PCT(ng/mL)							0.18			
WCC	3.97	3.69	4.28	6.94	6.6	5.4	4.97	7.13	11.46	7.35
ALC	0.7	0.72	0.91	0.86	0.69	0.79	0.53	0.64	0.93	0.87
NLR	4.5	3.7	3.2	6.4	8.1	5.5	7.5	9.2	10.6	6.9
*O2	FM 5L	NP 3L	NP 3L	NP 3L	NP 3L	NP 3L	NP 3L	NP 3L	NP 3L	NP 3L

*Oxygen requirement: NP: Nasal prongs, FM: Facemask, RA: Room air
DOA: Day of admission, CRP: C-reactive protein, PCT: Procalcitonin, ALC: Absolute Lymphocyte counts, NLR: Neutrophils to Lymphocyte ratio, WCC: White Cell Counts

Table II: Blood parameters and oxygen requirements of case 2 according to day of admission

DOA	Day 1	Day 3	Day 4	Day 5	Day 6	Day 7
Date	14/6/21	16/6/21	17/6/21	18/6/21	19/6/21	20/6/21
CRP (mg/dL)	8.3	3.8	6.0	3.2	1.3	1.0
Ferritin (ng/mL)		1441				
D-dimer (ng/mL)						561
PCT (ng/mL)		0.12				
WCC	4.73	12.9	16.73	17.3	17	17.49
ALC	0.57	0.75	0.81	1.07	1.23	0.99
NLR	7	15.4	18.9	14.5	12.3	15.7
*O2	NP	NP	FM 10L	FM 10L	FM 8L	FM 8L

*Oxygen requirement: NP: Nasal prongs, FM: Facemask, RA: Room air
DOA: Day of admission, CRP: C-reactive protein, PCT: Procalcitonin, ALC: Absolute Lymphocyte counts, NLR: Neutrophils to Lymphocyte ratio, WCC: White Cell Counts

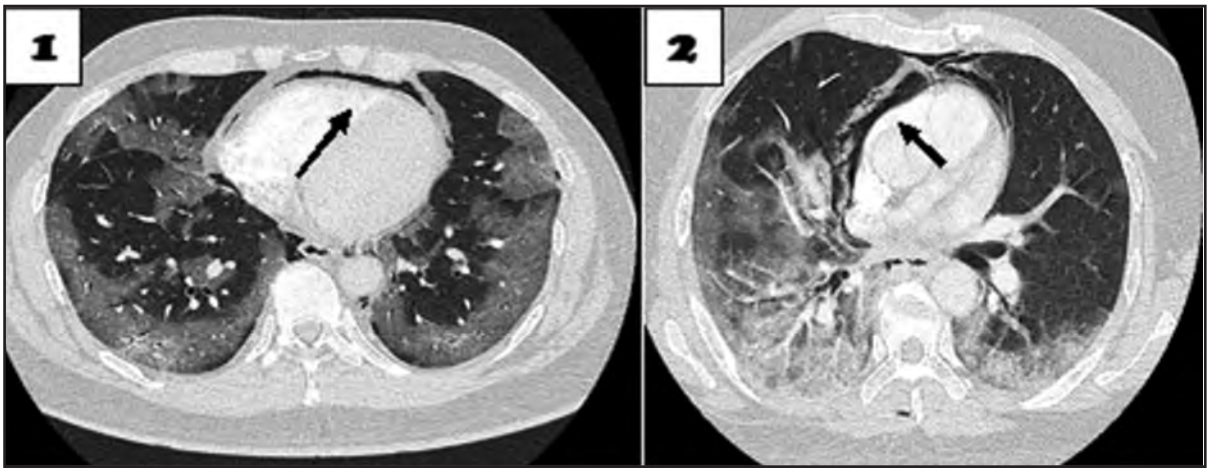

Fig. 1&2: CT pulmonary angiogram of case 1 and 2 respectively showing pneumomediastinum and pneumopericardium.

respiratory rate was 28/min and saturation under room air was 88% which picked up to 95% under nasal prongs oxygen 3L/min. In the ward he was started on steroids and anticoagulants and stable on oxygen supplementation.

On day 6 of admission, patient was getting slightly more tachypnoiec, increasing oxygen requirement with worsening inflammatory markers and CXR. High resolution CT thorax (HRCT) was done and it showed diffused ground glass opacities in central and peripheral distribution bilaterally, scattered consolidation in bilateral lower lobes and minimal perilobular densities with arch like pattern in bilateral lower lobes. Antibiotic was started, steroids was continued and thromboprophylaxis was increased to treatment dose. Supportive treatment with oxygen was continued. Patient subsequently improved clinically with reducing oxygen

requirement over the next few days. However, after 12 days of admission, although clinically improving, the patient had difficulty weaning off oxygen and d-dimer noted be raised. CTPA was done to rule out pulmonary embolism, which was reported as patchy ground glass opacities in central and peripheral in distribution in both lungs, patchy consolidation in both lungs mainly at the peripheries and a few perilobular densities with arch like pattern seen in both lung peripheries. Pneumomediastinum was seen extending to the superior, anterior and posterior mediastinum. No tracheal defect was seen. Bilateral subsegmental pulmonary embolism seen.

Although ground opacities on CT thorax was worsening with presence of pulmonary embolism and pneumomediastinum, patient was clinically stable with low oxygen requirement. Anticoagulant and conservative supplemental oxygen continued. Patient eventually was able to saturate under room air and was discharged home with oral anticoagulant. He was seen in clinic 2 weeks later feeling better with improving chest x-ray.

Case 4

A 33-year-old gentleman, non-smoker with BMI of 29 presented with fever, cough, diarrhoea and anosmia started 12 days before admission. His COVID-19 PCR was positive on day 6 of symptoms. Upon assessment, his respiratory rate was 27/min, saturation of 89% on room air, picked up to 98% on facemask oxygen 5L/min. His initial CXR shows peripheral and basal opacities especially over left lung and CRP was 10 mg/dL. He was started on steroids and thromboprophylaxis and only required nasal prongs oxygen 2L/min in the ward. On day 5 of admission patient continued to cough and noticed crepitus over his neck and chest region. Upon examination he was noted to have respiratory rate of 32 with saturation of 89% on NPO2 3L. He was then supplemented with high flow mask 15L/min and upon examination he had surgical emphysema over neck extending to bilateral jaws. Repeated CXR shows emphysema over his neck and worsening chest infiltrates. CTPA done showed pneumomediastinum and subcutaneous emphysema at the anterior chest wall extending up to bilateral axilla. There were minimal air pockets at the upper back. Scattered ground glass densities seen in confluence and consolidation in bilateral lungs in central and peripheral distribution with minimal perilobular densities in bilateral lungs. There was no pneumothorax, no obvious tracheal defects and no pulmonary embolism seen on the CTPA. He was commenced on antibiotics. Steroids and thromboprophylaxis were continued, oxygen requirement subsequently reduced to 10L/min. Four days later patient got more tachypnoiec with desaturations, a repeat CTPA shows worsening bilateral ground glass densities and consolidations in both central and peripheral distribution. There were more conspicuous perilobular densities in periphery of bilateral lungs. Previously seen subcutaneous emphysema had resolved. Minimal residual pneumomediastinum up to lower cervical region present. No pneumothorax, no obvious tracheal defects and no pulmonary embolism were seen in the CTPA. Immunomodulators and steroids were given for worsening inflammatory changes in the lungs with increasing oxygen requirement. Antibiotics to cover for hospital acquired infection was given. Patient was eventually intubated and ventilated and sent to Intensive Care Unit (ICU) for care. In ICU his CXR was worsening with infiltrates and fungal cover was initiated. His tracheal aspirate and blood cultures for bacterial and fungal had no growth and MTB gene expert for tuberculosis was negative.

Unfortunately, 5 days later while in ICU the patient eventually died due to worsening of the pneumonia with multiorgan failures.

DISCUSSION

In pneumomediastinum, there is unusual presence of air in the mediastinum. It is usually seen in mechanical or barotrauma that leads to air escape from the lungs, airways or esophagus into the chest cavity. Symptoms are usually chest pain, shortness of breath and subcutaneous emphysema. The diagnosis can usually be confirmed by CXR or CT of the thorax.

Respiratory diseases, tobacco smoking, use of recreational drugs and vigorous Valsalva manoeuvre have been associated to pneumomediastinum.[1] In all our four patients, there were no history of pulmonary disease, pneumothorax, or tobacco use. They developed spontaneous surgical emphysema and pneumomediastinum without any history of intubation or invasive medical procedures.

It was noted in all our patients that the presence of surgical emphysema and pneumomediastinum are accompanied with worsening COVID-19 disease as evidenced by worsening symptoms as well as worsening chest infiltrates due to COVID-19 pneumonitis. One of the possible mechanisms could be a result of diffuse alveolar injury in severe COVID-19 disease, in which the alveoli may be prone to rupture followed by air dissection through the bronchovascular sheath into the mediastinum.[2,3] Worsening cough, may also contribute to alveolar rupture. In all the cases pneumomediastinum resolved spontaneously without any intervention. However, in all the four cases presence of pneumomediastinum resulted in longer hospital stay, which may eventually increase the overall morbidity and mortality.

CONCLUSION

Pneumomediastinum in COVID-19 is not uncommon and its presence in COVID-19 patients should alert clinicians regarding possibilities of worsening of COVID-19 disease. It may lead to prolonged hospital stay and increased morbidity and mortality in COVID-19 patients.

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