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PNEUMOMEDIASTINUM IN COVID-19 PATIENTS: A CASE SERIES

Critical Care Medicine

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ABSTRACT

Pneumomediastinum is defined as the presence of free air contained within the mediastinum. It has multifactorial etiology. Pneumomediastinum often occurs secondary to traumatic injury, mechanical ventilation or surgical procedure. Spontaneous pneumomediastinum is a form of pneumomediastinum which doesn't have an obvious cause. In this case series, we present patients with COVID-19 pneumonia without underlying lung disease or usual risk factors for pneumomediastinum but who developed pneumomediastinum during their course of hospitalization.

KEYWORDS

pneumomediastinum, COVID 19 pneumonia

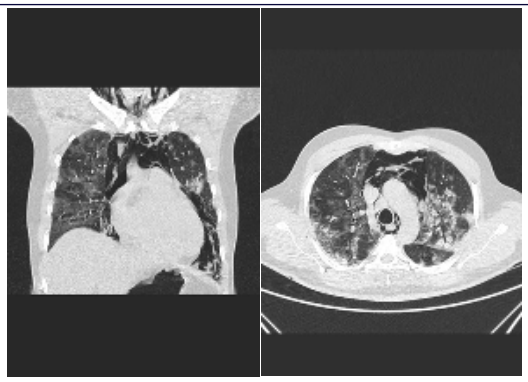

Figure 1: Imaging highlighting pneumomediastinum. Coronal and transverse CT slices

INTRODUCTION

Pneumomediastinum is defined as the presence of free air contained within the mediastinum. It was first described by Laennec in 1819 which occurred following traumatic injury. Spontaneous pneumomediastinum (SPM),which occur without an obvious cause, was reported by Hamman in 1939 During the COVID 19 pandemic, we have observed an increased number of patients with pneumomediastinum, which suggests that there may be an association with either the viral infection, or the ventilation required to manage these patients.

CASE SERIES

PATIENT 1

A 37 year-old male with a past medical history of type 2 diabetes detected 1 yrs back on oral hypoglycemic agent, presented with history of fever , myalgia and COVID positive which was managed at a local hospital and was referred in view of worsening dyspnoea, fever and desaturation. Blood gas levels on admission revealed type-1 respiratory failure and he was placed initially on NRBM mask. Initial CT chest showed a CT severity index 19/25. In view of worsening oxygenation on NRBM mask initiated on non-invasive ventilation (with Pressure support-5 & PEEP of 5 and FiO2 0.5). Repeat CT chest done showed CT severity index 23/25 with extensive pneumomediastinum, compressing the adjacent lung tissue, subcutaneous emphysema over the lower neck and upper chest but no pneumothorax. Esophageal ruptue was ruled out. Patient received treatment in compliance with the COVID-19 therapeutic protocol as per state treatment guidelines. His ventilatory requirements gradually increased over 24hrs and in view of clinical deterioration patient was intubated and mechanically ventilated after explaining the possibility of worsening pneumomediastinum with positive pressure ventilation & hemodynamic instability. While on mechanical ventilator support, patient developed hemodynamic instability –managed with inotropic supports, acute kidney injury which was managed conservatively . Endotracheal culture grew stenotrophomonas and hence antibiotics changed to septran and levofloxacin as per ID advice. Prone ventilation sessions given and we were able to gradually taper ventilator support. Patient improved symptomatically requiring no surgical intervention. Repeat CT on day 5 of intubation showed resolving pneumomediastinum. Patient was extubated after 8 days of mechanical ventilation to non-invasive ventilation . Continued with supplemental oxygen and oxygen was tapered off as saturation maintained in room air. Antifibrotic was started and continued for 2 weeks. COVID antigen testing done on 14th day since test positivity was negative and was discharged home after completing reverse quarantine.

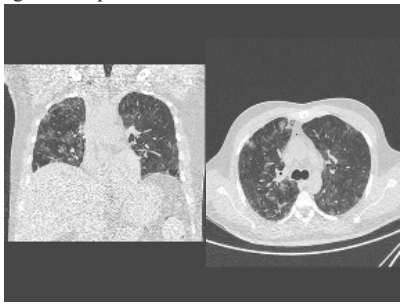

Figure 2: Imaging highlighting resolution of pneumomedias tinum. Coronal and transverse CT slices

PATIENT 2

A 53-year-old male with no known co-morbidities , was admitted with a history of dyspnoea, myalgia and cough of 10 days duration , COVID antigen positive was being managed in local hospital as category C COVID pneumonia. In view of type1 respiratory failure, BiPAP was initiated and was referred due to clinical deterioration. A CT chest done showed CT severity index 23/25 with pneumomediastinum, which was managed conservatively. Continued with O2 via non-rebreathing face mask and management of category C COVID pneumonia continued including inj tocilizumab was given. Patient improved symptomatically without surgical intervention. Repeat CT showed complete resolution of pneumomediastinum with bilateral fibrotic changes . Antifibrotic was started and discharged with supplemental oxygen at 1 L/min.

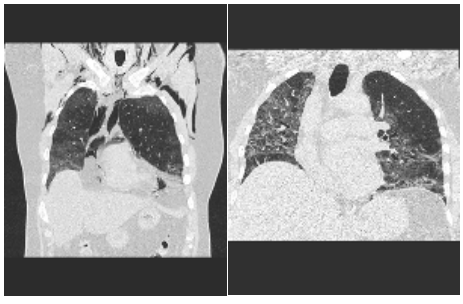

Figure 3: Imaging showing pneumomediastinum and its resolution. Coronal CT

PATIENT 3

A 65-year-old female with a past medical history of diabetes, hypertension and bronchial asthma, was admitted with a history of cough and worsening dyspnoea. The diagnosis of COVID-19 was confirmed by RT-PCR .In view of type1 respiratory failure initiated on oxygen via non-rebreathing face mask and later initiated on Bipap

due to desaturation despite on NRBM. Patient received treatment in compliance with the COVID-19 therapeutic protocol as per state treatment guidelines . Patient had persistent cough, antitussive and steroid inhaler added. Inj tocilizumab was given and continued with Bipap support (IPAP-10 & EPEP-6) as saturation was maintaining. 3 days after initiation of Bipap patient developed chest discomfort and crepitus along neck. CT chest confirmed pneumomediastinum.

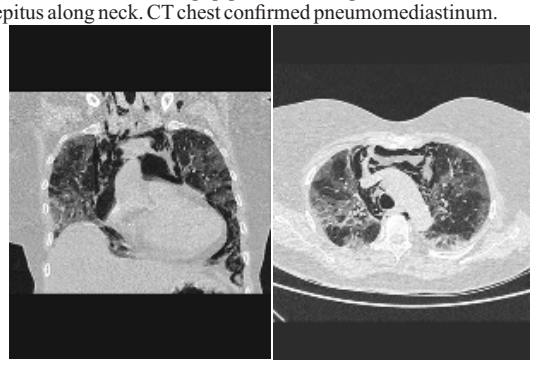

Figure 4: Pneumomediastinum in a non-intubated patient with COVID-19-related pneumonitis

Bipap was discontinued ,continued with supplemental oxygen via NRBM , titrated according to maintain saturation between 90-94%. Patient improved symptomatically with conservative management . Repeat CT scan showed complete resolution of pneumomediastinum

The patient clinically improved and was discharged with supplemental oxygen at 2 L/min.

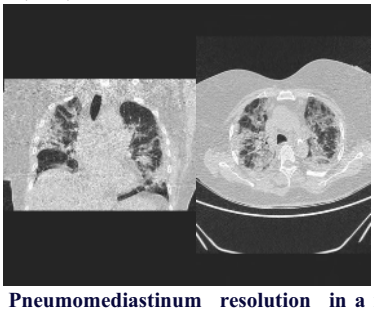

Figure 5: Pneumomediastinum resolution in a non-intubated patient with COVID-19-related pneumonitis

DISCUSSION

These case reports highlight the possibility of late onset severe life-threatening complication resulting from extensive COVID-19 pneumonia in an otherwise clinically improving patient which need the treating physicians to be very vigilant.

Though COVID-19 pneumonia is now known to commonly cause pulmonary complications such as ARDS, acute respiratory failure, superimposed bacterial infection, pulmonary thrombo-embolism and lung fibrosis but spontaneous pneumomediastinum is not a commonly seen phenomenon and therefore not usually suspected. From our experience, conservative management is usually all that is required, with gradual resorption of the air from the tissues [1]. However, it is important to continue to monitor with serial imaging for the development of pneumothorax, which can lead to cardiorespiratory compromise, and also other signs of clinical deterioration.

In patients with an accompanying pneumothorax, chest drainage is indicated and if there is ongoing air leakage, thoracic surgery is indicated.

The exact mechanism of spontaneous pneumomediastinum even in non-ventilated patients remains unknown. However, the Macklin effect has been proposed as a possible etiology [2] due to the propensity of SARS-CoV-2 to damage type 2 pneumocytes [3]. In the setting of COVID-19 pneumonia, pneumomediastinum is thought to be precipitated by sub-pleural alveolar rupture [4]. Free air dissects the peribronchovascular sheath and leaks proximally to reach the mediastinum; the so-called Macklin effect [5]. This leaking of air can be aggravated by intense coughing leading to a sudden increase in distal airway pressure and ultimately alveolar rupture [6]. The air-leak can also spread to the fascial planes of the neck and chest resulting in subcutaneous emphysema. The most common symptom of pneumomediastinum is acute onset retrosternal chest pain [7] which warrant early alert to rule out this dreaded complication in patients with suspected or confirmed COVID-19. The treatment for spontaneous pneumomediastinum is usually symptomatic and conservative. Oxygen therapy could possibly lead to faster recovery [8].

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