Secondary Pneumomediastinum in Patients with Covid-19 —A Case Series

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Secondary pneumomediastinum in patients with ARDS is often related to invasive mechanical ventilation due to high airway pressures leading to alveolar rupture.[1] The pathophysiologic mechanism through which this occurs is known as the Macklin effect which describes the idea that alveolar rupture causes a leakage of air along the bronchovascular bundle whereby it extends into the mediastinum.[2] Another contributing factor to alveolar rupture is the diffuse alveolar damage seen in patients with severe ARDS.[3] Here we present a case series from a major New York City academic hospital of 18 patients with Covid-19 complicated by pneumomediastinum in the setting of both invasive and noninvasive ventilation.

The data collected was obtained on April 19th during which 130 Covid-19 infected patients were intubated and in the intensive care unit since March 26th 2020. Four patients were excluded from analysis due to inability to exclude pneumomediastinum as a line-associated complication. All intubations were done by the most senior clinician available. The median age of the patients was 60 years and 55.6% were men. The most common comorbidities were hypertension (38.9%) and diabetes mellitus (33.3%). Most pneumomediastinum cases (83.3%) were in association with invasive mechanical ventilation and 46.7% occurred within the first day of intubation. An additional 40% of pneumomediastinum cases occurred between day 1 and day 6. Those intubated were placed on an average of 6.58 cc/kg of tidal volume. Only 20% of patients experienced peak inspiratory pressures greater than 35 mm Hg and 13.3% had plateau pressures greater than 30 mm Hg. High PEEP strategy defined as greater than 12 mm Hg was used in 40% of patients. The most frequent concurrent complications observed were subcutaneous emphysema (72.2%) and pneumothorax (55.6%). Figure 1 shows a single axial cut of a CT scan of the Chest of one patient who experienced severe subcutaneous emphysema, pneumomediastinum and diffuse bilateral lung infiltrates due to Covid-19. The in hospital mortality rate at the time of publication is 44.4%.

The prevalence of pneumomediastinum cases due to COVID-19 in this study was 13.8%. This is significantly more frequent than that observed with protective ventilation strategy which was as low as 7%.[4] Interestingly, a previous study of SARS-Cov1 estimated a total incidence of 12% of patients with pneumomediastum.[5]

The large number of pneumomediastinum cases observed in this case series seems to be unexplained solely by barotrauma from mechanical ventilation in these patients treated with protective lung strategy and may be specific to the underlying pathology of Covid-19. Of note, three patients who developed this complication were receiving noninvasive ventilation further supporting this hypothesis.

Conflict of Interest: None

References:

1. Ioannidis G, Lazaridis G, Baka S, et al. Barotrauma and pneumothorax. J Thorac DIs. 2015;7(Suppl 1):S38-S43

2. Jacobi A, Chung M, Bernheim A, Eber C. Portable chest X-ray in coronavirus disease-19 (COVID-19): A pictorial review. Clinical Imaging. 2020;64:35–42.

3. Murayama S. Spontaneous pneumomediastinum and Macklin effect: Overview and appearance on computed tomography. World Journal of Radiology. 2014;6(11):850.

4. Passos Amato M, Valente Barbas C, Medeiros D, et al. Effect of a Protective-Ventilation Strategy on Mortality in the Acute Respiratory Distress Syndrome. New England Journal of Medicine. 1998;338:347-354

5. Peiris J, Chu C, Cheng V, et al. Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study. Lancet. 2003;361(9371):1767–72.

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