



Tracheal laceration causing important post-intubation delayed subcutaneous emphysema and ventilatory deterioration in a COVID-19 patient with severe rheumatoid arthritis: a case report

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Abstract: A 68-year-old man with a background of severe active rheumatoid arthritis (RA) was admitted to Intensive Care Unit (ICU) for respiratory support due to COVID-19 infection. Two days after an elective and uneventful intubation he developed severe and worsening surgical emphysema affecting his face, neck and both upper limbs. Ventilation was difficult to be achieved. Based on a negative chest X-ray, a CT scan of the chest was organized which showed extensive pneumomediastinum with no obvious cause. Therefore, urgent bronchoscopy was performed which showed a glassy lesion/laceration measuring 2 cm × 2 cm at the level of mid-trachea but no other signs of penetration through the airways were noted. Since events appeared 2 days after intubation, this was perceived as secondary to trauma during intubation on an inflammatory process background from RA and COVID-19 in the airways. The endotracheal tube was progressed beyond the site of laceration and bilateral pectoral fasciotomies were performed with negative suction vacuum dressings, which was successful in decreasing the surgical emphysema and achieving decreased ventilation requirements. Despite multi-organ support the patient continued to deteriorate and unfortunately passed away a week following admission. This scenario highlighted that endotracheal sequelae should be suspected in patients with similar background and presentation.

Keywords: COVID-19; rheumatoid arthritis; tracheal; subcutaneous emphysema; case report

Received: 17 February 2021; Accepted: 04 June 2021; Published: 25 September 2021.

doi: 10.21037/med-21-12

View this article at: <https://dx.doi.org/10.21037/med-21-12>

Introduction

The etiology of COVID-19 infection-associated pneumomediastinum and surgical emphysema have been widely reported and discussed in the literature (1,2).

In addition to the well-known iatrogenic causes such as instrumentation and barotrauma, alternative contributing factors should be investigated in the presence of systemic inflammatory diseases, which constitute airways vulnerable to inflammatory manifestations (3-5).

We report the case of COVID-19 patient with underlying severe rheumatoid arthritis who developed delayed surgical emphysema secondary to a tracheal laceration in a context of underlying active and severe

rheumatoid arthritis. This case highlights the diagnostic and therapeutic challenges of patients who develop unexplained surgical emphysema and ventilatory deterioration with complicated COVID-19 infection and additional systemic inflammatory co-morbidities. We present the following article in accordance with the CARE reporting checklist (available at <https://dx.doi.org/10.21037/med-21-12>).

Case presentation

A 68-year-old male with past medical history significant of RA (on Methotrexate and Sulfasalazine), polycythaemia, high BMI with performance status of 1, presented with



Figure 1 Chest X-ray on admission to ICU showing bilateral COVID-19 infiltrations.

one week history of fever and cough, lymphopenia and raised C-reactive protein (CRP) accompanied by bilateral peripherally-dominant opacities on chest X-ray (*Figure 1*).

He subsequently tested positive for COVID-19 and was admitted to ICU two days later with type 1 respiratory failure. Initially he was treated with Non-invasive ventilation (NIV) but due to further deterioration, he required intubation and ventilation for adequate respiratory support and mild inotropic support. Hence, the intubation was carried out as planned by an expert physician without any immediate complications and he was ventilated on SIMV mode with PEEP of 12, FiO₂ of 60% on which he was able to maintain his PaO₂ of at least 8. Otherwise his cardiovascular and renal function were stable requiring only minimal vasopressor support. There was also acceptable inflammatory response to pre-emptive broad-spectrum antibiotics cover.

Subsequently, and nearly 2 days later it became apparent that he developed a substantial surgical emphysema over the face, front of upper chest and back, shoulder and upper arms which was progressive. Additionally, oxygen and ventilator requirements were increased needing FiO₂ of 100% and PEEP 16 to maintain previously described respiratory parameters. Clinical examination and urgent chest X-ray did not support any deterioration from the COVID-19 previously noted infiltrates neither provided a plausible cause for the surgical emphysema (*Figure 2A*). Therefore, an urgent CT thorax was carried out which demonstrated significant pneumomediastinum

and subcutaneous emphysema with air under diaphragm. There was no suspicion to suggest gastrointestinal tract perforation. Additionally, no pneumothorax was diagnosed and the previously noted COVID-19 infiltrates were stable (*Figure 2B*).

In view of increased respiratory requirements and lack of imaging evidence of any cause for the surgical emphysema and the clinical deterioration, a flexible bronchoscopy was performed, at high suspicion, which exhibited glassy like residue/laceration at 5 o'clock position approximately at 6th tracheal ring measuring 2 cm × 2 cm, possibly from previous clot or laceration. No other signs of penetration through the airways were noted (*Figure 3*).

The most probable cause of his deterioration initially was thought to be secondary to trauma because of his previous intubation but based on its delayed presentation, the fact that the intubation was uneventful and that it was performed by a specialist, a ulcerative lesion related to the active disease process (COVID-19 and/or RA) could not be overlooked, although biopsies were not performed because of the deteriorated condition of the patient and hence no direct evidence of this could be provided. It seems more probable however, that a trauma to the trachea was caused during intubation which was sealed by the endotracheal tube balloon which got moved later on, despite the fact that the patient was not turned to prone position as he has been unwell for this.

Next, the endotracheal tube position was adjusted (i.e., positioned more peripherally inside the trachea closer to the carina past the laceration under direct vision) and bilateral pectoral fasciotomies were performed with application of two negative suction dressings pumps (Vacuum Assisted Closure – VAC), which helped improve the extent of surgical emphysema. His O₂ requirements and ventilation improved importantly and a conservative treatment for his tracheal laceration was decided based on the situation and his clinical condition.

The requisite thus far had been a single organ support. However, a few days later, patient's clinical condition deteriorated again by developing atrial fibrillation (AF) and acute kidney and liver injury with hemodynamic compromise. He required increased vasopressor support with moderate doses of noradrenaline, pharmacological cardioversion of AF and hemofiltration was also performed. Despite multi-organ support and accepted management of COVID-19 pneumonitis at the time, his respiratory function deteriorated with increasing oxygen requirements, an increased alveolar to arterial oxygen gradient and

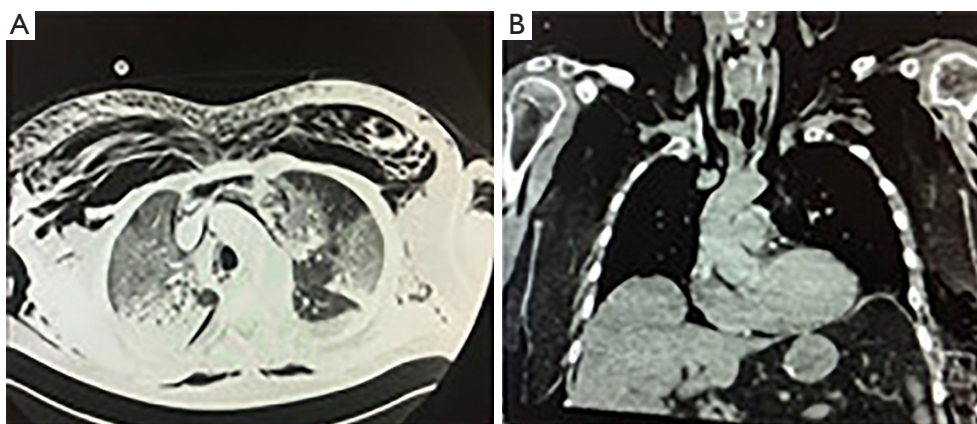


Figure 2 Urgent CT scan on day 2 post intubation and during acute deterioration (A) sagittal plane showing stable lung infiltrates and significant subcutaneous emphysema, (B) coronal plan showing an intact airway.

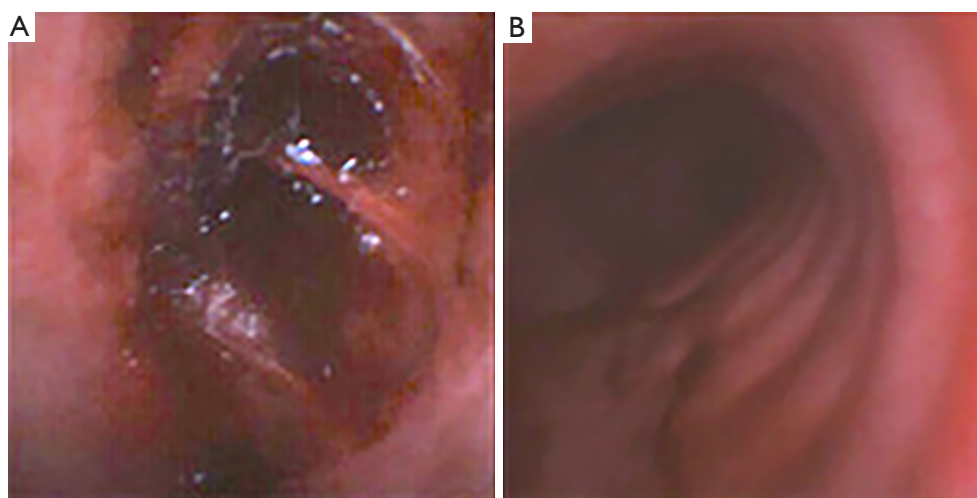


Figure 3 Bronchoscopy images showing (A) the laceration at 5 o'clock mid trachea, (B) normal rest of bronchial tree.

worsening of radiological findings of acute respiratory distress syndrome (ARDS) secondary to COVID-19 pneumonitis.

Unfortunately, the patient did not recover from multi-organ failure and subsequent to multidisciplinary discussion and family involvement, the difficult decision was made to withdraw organ support on the tenth day of critical care admission in the context of worsening multi-organ failure (lung, cardiovascular and renal) caused by COVID-19 infection in a immunosuppressed state.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013).

Written informed consent was obtained from the patient's next of kin.

Discussion

We herein present a case of a middle-aged man with a background of severe RA who was admitted to ICU for respiratory support due to COVID-19 infection and then developed delayed surgical emphysema and significant ventilation deterioration due to a tracheal laceration rather than lung collapse/pneumothorax. This complication should be suspected by physicians treating respiratory deterioration with surgical emphysema in patients with important underlying disease in this newly emerged viral

infection.

COVID-19 infection is recognized as a causing factor of central and upper airway inflammation and oedema leaving patients potentially vulnerable to trachea-bronchial injury from intubation particularly in emergency settings (1).

A common cause of pneumomediastinum/subcutaneous emphysema in intubated patients is increased airway pressures because of mechanical ventilation although underlying diseases such as infection, sarcoidosis or rheumatoid arthritis can rarely also cause it (2). However in our case, in context of underlying rheumatoid arthritis, absence of apparent intubation difficulty and lack of pneumothoraces has led to the assumption that an overall inflammatory state of the airways along with increased pressures to achieve ventilation in this Covid-19 situation could have caused this delayed ventilatory deterioration and surgical emphysema, although a direct trauma from intubation seems could have preceded this setting.

The bronchoscopy findings of tracheal lacerations raises the question for the inflammation of upper airway secondary to underlying rheumatoid arthritis which is supported by the laryngoscopic findings (4). Up to 75% of a range of laryngeal manifestations can be found which included mucosal odema, inflammation of arytenoids, presence of rheumatoid nodules in larynx and pharynx (3). A case of rheumatoid arthritis associated with scattered lesions in the trachea with intact intraluminal membranes was also reported and the findings were thought to be consistent with early tracheal manifestation of necrotising tracheo-bronchitis (4).

In terms of the management of pneumomediastinum and subcutaneous emphysema in our case, conservative approach was utilized in context of the clinical status of the patient. A few cases of COVID -19 infection complicated with subcutaneous emphysema and managed conservatively with positive outlook have been reported (5,6). Use of negative pressure wound dressings for subcutaneous emphysema has had favorable outcomes and should be considered in similar cases (7,8).

Conclusions

This is a case of a COVID 19 patient with a background of severe active RA who developed delayed surgical emphysema and respiratory deterioration 2 days after an uneventful and elective intubation. Lack of clinical and imaging findings triggered a bronchoscopy during which a tracheal laceration was identified. Conservative management with endotracheal tube repositioning and negative pressure drainage proved adequate to treat the

issue. Delayed eroding processes because of inflammation within the airways should be highly suspected when treating COVID-19 patients with underlying inflammatory comorbidities.

Acknowledgments

Funding : None.

Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://dx.doi.org/10.21037/med-21-12>

Peer Review File: Available at <https://dx.doi.org/10.21037/med-21-12>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://dx.doi.org/10.21037/med-21-12>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient's next of kin. A copy of the written consent is available for review by the editorial office of this journal.

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doi: 10.21037/med-21-12

Cite this article as: Nyi T, Chrastek D, Shah S, Kouritas V. Tracheal laceration causing important post-intubation delayed subcutaneous emphysema and ventilatory deterioration in a COVID-19 patient with severe rheumatoid arthritis: a case report. *Mediastinum* 2021;5:30.