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Iatrogenic Bilateral Pneumothorax And Massive Subcutaneous Emphysema During Tracheostomy Cannula Exchange

KEYWORDS: Pneumothorax, tracheostomy, tube thoracostomy

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ABSTRACT *Tracheostomy is one of the commonly performed surgical procedures in intensive care units (ICUs) and it has numerous complications such as bleeding, airway loss, failure of the successful airway placement, damage to adjacent structures and pneumothorax. Although pneumothorax is a known complication of tracheostomy, bilateral pneumothorax along with subcutaneous emphysema (SE) is quite rare in the literature. Therefore, we described a case of bilateral pneumothorax and massive SE due to traumatic tracheostomy.*

1. INTRODUCTION:

Traumatic tracheostomy can cause iatrogenic pneumothorax, which is collection of air in the pleural cavity and the subsequent collapse of the lungs. Although pneumothorax is a known complication of tracheostomy, bilateral pneumothorax is comparatively rare. [1,2] For this reason we reported a case of bilateral pneumotorax and SE which developed during tracheostomy cannula exchange.

2. CASE REPORT:

A 51-year-old man with a diagnosis of Amyotrophic lateral sclerosis (ALS) and Type 2 Respiratory Failure was admitted to ICU. On clinical follow-up, the patient was intubated totally three times but couldn't tolerate extubation. Attempts of weaning have failed and noninvasive positive pressure ventilation (NIPPV) was no longer effective. So tracheostomy was planned for long-term follow up of the patient. Tracheostomy was performed and one week later at the time of tracheostomy cannula exchange desaturations occurred and the patient's general condition deteriorated. Arterial blood gas analysis showed pH: 7.21, PO_2: 73 mmHg, PCO_2: 89 mmHg, HCO_3: 34.3 mmol/L, SO_2: %89.5. Patient was intubated and invasive mechanical ventilation (IMV) support was given. Saturation was above %90 after IMV so we decided to extubate the patient for a second attempt to change the cannula. But at the time of exchange respiratory arrest occured following desaturation of the patient. Although intubation and IMV support desaturations went on. In physical examination patients eyes, head and neck began to swell and crepitation was detected with palpation of the skin. Auscultation of the chest revealed absence of breath sounds bilaterally. So Chest X-ray and Thorax CT were immediately performed with a prediagnosis of pneumothorax and SE. X-ray (Figure 1) and CT (Figure 2) showed right-sided total, left-sided partial pneumothorax and massive SE. Bilateral tube thoracostomy, initially in the right and then in the left lung, were performed. Two pieces of skin incisions were made and also two cannulas were placed bilaterally in both subclavicular regions for the resolution of subcutaneous air. After clinical stabilization arterial blood gas was analyzed and the values were as follows; pH: 7.53, PO_2: 99 mmHg, PCO_2: 40 mmHg, HCO_3: 33.3 mmol/L, SO_2: % 98.4. On daily Chest X-ray follow-up reexpansion of both lungs and resolution of SE was observed (Figure 3), and the patient's clinical condition improved rapidly by this treatment.

3. DISCUSSION:

ALS is a fatal, progressive, neurodegenerative disease and ventilator assistance is required with the progression of the disease. In the end stages of ALS, patients suffer from respiratory failure and may become ventilator-dependent. [3] In our patient the cause of respiratory failure was ALS and he was suffering from respiratory failure.

NIPPV has been associated with improved survival in ALS patients and has been widely recommended because it can improve patient symptoms and health-related quality of life. [4] Despite the reported benefits of noninvasive ventilation (NIV) in neuromuscular diseases, there is no consensus about its use as an alternative to invasive ventilation. Although the increasing use of NIPPV appears to have reduced the use of tracheostomy mechanical ventilation (TMV), there is no question that tracheostomies continue to play an extremely important role in the management of respiratory complications of neuromuscular diseases.

In recent years, TMV is increasingly performed in ALS patients and may be preferred in patients who are unable to protect their airways or ventilator dependent for most of the day and when the NIV is no longer effective in such patients. In a study by Spataro et al. it has shown that survival after tracheostomy is generally increased in ALS patients, with the stronger effect in patients younger than 60 years old. Unfortunately, this survival advantage is apparently lost when TMV is performed in patients older than 60. [5-7] In our case, we primarily used NIPPV after weaning but unfortunately the patient became ventilator dependent so we preferred tracheostomy for long-term follow up. The patient was 51 years old and our approach was consistent with the literature.

Tracheostomy is one of the most frequently performed surgical procedures on critically ill patients in ICU and it has not changed substantially since it was first described by Jackson in 1909. It is indicated when prolonged airway protection or mechanical ventilation is required. [8-10] Our indication for tracheostomy was the need for prolonged mechanical ventilation.

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Although tracheostomy is a common procedure in ICU, its complications are numerous. [11] Common complications of tracheostomy include bleeding, airway loss, damage to adjacent structures, and failure of the chosen technique to achieve successful airway placement. [12] One of the less common complications is injury to the pleural dome or perforation of the posterior tracheal wall. Anatomically the dome of the pleura rises into the neck on both sides of the trachea in close relationship to the area that is exposed to tracheostomy. Although laceration and perforation of the membranous trachea are uncommon, they have been described after tracheostomy. By disruption of these fascial planes in the neck pneumothorax may occur following traumatic tracheostomy. [11,13] Although pneumothorax is a known complication of tracheostomy, bilateral pneumothorax is comparatively rare. [1] Iatrogenic injury to the posterior wall of trachea was the most likely reason for bilateral pneumothorax during tracheostomy. [11] Also all of the described mechanisms may lead to air leakage into the subcutaneous tissue so this results in SE. SE usually occurs on the chest, neck and face and can spread along fascial planes. In physical examination, there is a characteristic crackling sensation, named as subcutaneous crepitation, which is palpable beneath the surface of the skin. Mild form of SE is common and generally resolves within 1 to 2 days, however massive SE is rare and clinically significant because it may be coincident with life-threatening situations such as pneumothorax, pneumomediastinum and pneumopericardium. [14]

Pneumothorax is suspected when the patient's dyspnea does not improve after tracheostomy and PaO_2 remains low. Auscultation of the chest reveals an absence of breath sounds and percussion of the chest reveals a resonant sound over the pneumothorax area. Chest X-Ray or CT scan confirms the diagnosis. Treatment of pneumothorax following tracheostomy must be accomplished as soon as diagnosis is made and it must be relieved by the insertion of chest tubes and application of suction or water seal drainage. [1,13]

Several methods of treatment for severe SE have been described such as pleural drainage, subcutaneous insertion of pig-tail or large bore drains and cannulas.[15] In our case respiratory arrest occured during tracheostomy cannula exchange and although intubation and IMV support desaturations went on. Physical and radiological examination of chest confirmed the prediagnosis of pneumothorax and SE. After detection of bilateral pneumothorax and SE bilateral tube thoracostomy to both lungs and two pieces of skin incisions and also cannulas were performed in both subclavicular regions so the patient made a full recovery by this treatment.

4. CONCLUSION:

We reported this case for the rarity and critical importance of bilateral pneumothorax and SE following tracheostomy. In any case of sudden deterioration of a newly tracheotomized patient, pneumothorax should be suspected and following immediate intubation Chest X-ray and if necessary CT should be performed.

Figure 1: Chest X-ray showed right-sided total and left-sided suspicious pneumothorax

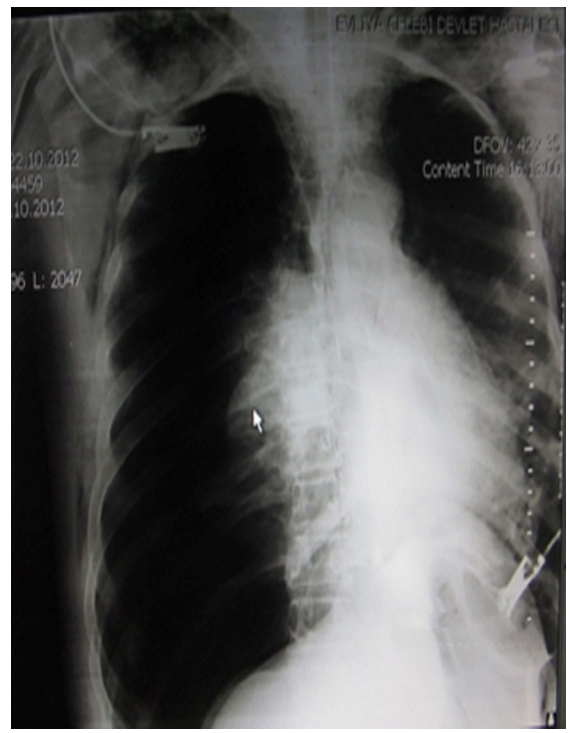

Figure 2: Thorax CT confirmed right-sided total, left-sided partial pneumothorax and massive SE. Tube thoracostomy was performed initially in the right lung.

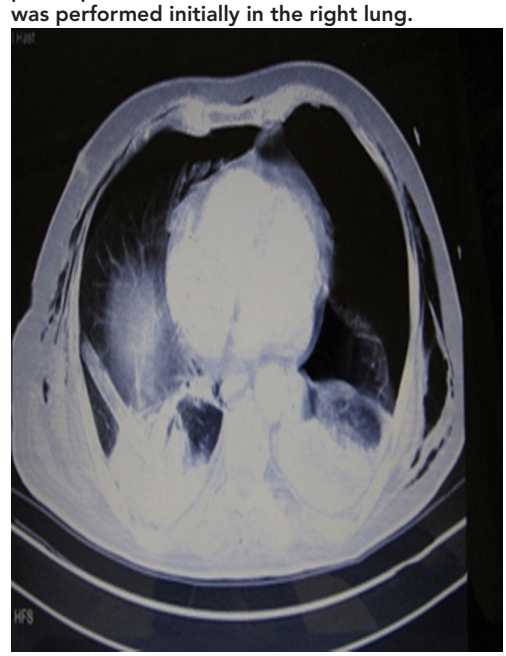

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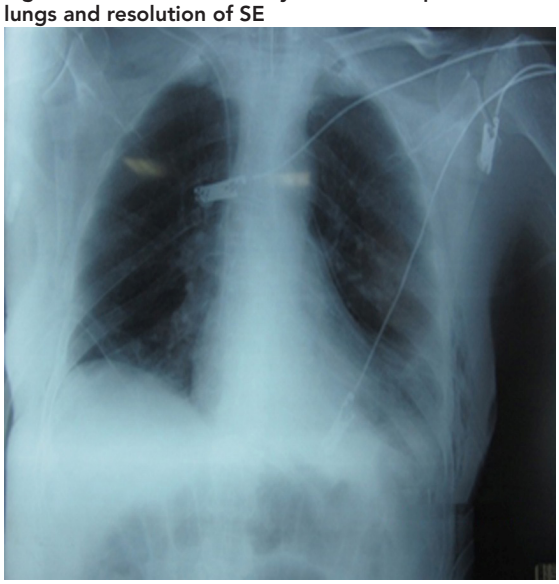
Figure 3: Control Chest X-ray showed reexpansion of both lungs and resolution of SE



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