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Managing a case of subcutaneous emphysema following thoracotomy: A Case Report

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Abstract

Subcutaneous emphysema is a known complication occurring in various surgeries. Following thoracotomy, the incidence is reported to be around six percent. Though if carries minimal risk of mortality, but prompt recognition is essential for successful management and to decrease patient distress.

We report a case of subcutaneous emphysema following thoracotomy for cavity marsupialization in a young patient and its subsequent management. We will be discussing the literature review of such cases.

Keywords: subcutaneous emphysema, thoracotomy, air leak

Introduction

Postoperative air leak following a thoracic procedure is not uncommon, with a reported incidence ranging from 8% up to 26%.[1]

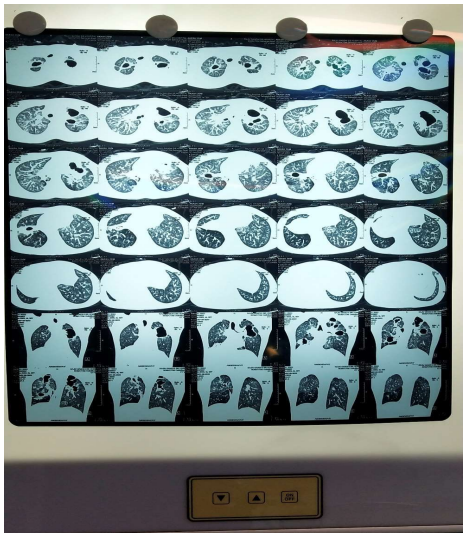
Early recognition is the key to prevent complication and mortality.

We report a case of patient with fibro-cavitatory lung disease, who developed subcutaneous emphysema in the immediate postoperative post-operative period and the subsequent events which happened.

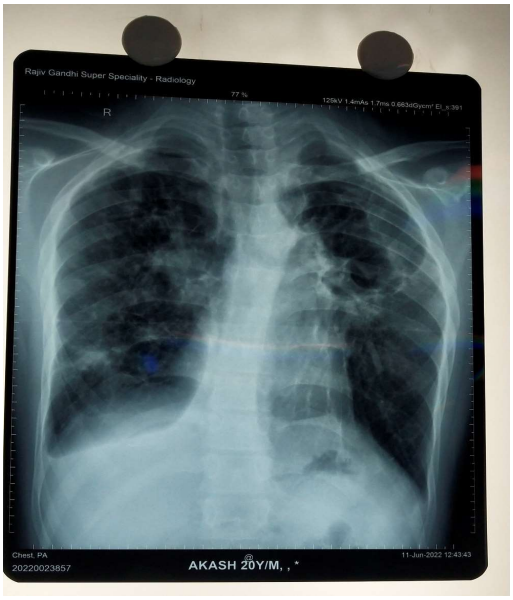
Case Report

20 years old patient, weighing 40kg, came to our PAC clinic with the complaints of frequent hemoptysis (approximately 200ml/episode. One episode 10 days back and another 7 days back.). Patient is a known case of old treated pulmonary tuberculosis. On examination, patient had bilateral decreased air entry. Rest of the systemic examination was normal. His blood and urine investigations were also within normal limits, except for decreased hemoglobin levels, for which he was transfused two units of blood. His electrocardiogram showed atrial tachycardia and non-specific ST-T wave changes.

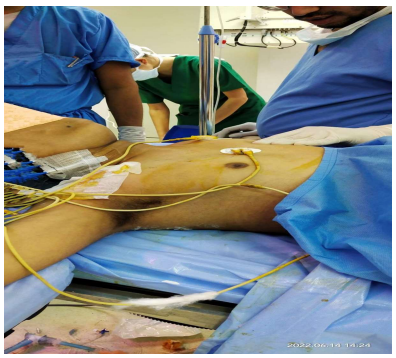
His CT Pulmonary Angiography using IV contrast showed main pulmonary artery to be 28.7mm. Pulmonary artery to aorta ratio >1. Right main pulmonary artery – 14mm and left main pulmonary artery – 12 mm. Right and left bronchial arteries are prominent and have a tortuous course. Fibrocavitatory and fibrobronchiectic changes were seen in bilateral lungs, predominantly bilateral upper lobes. The cavities showed thick walls at few places. Largest cavity measures 5.6 x 3 x 5.6cm in left upper lobe. Fibrocalcific collapse are seen in anterior and lingular segments of left upper lobe, right middle lobe, superior and posterior basal segments of right lower lobe. Few centrilobular nodules with few of them in tree bud pattern are seen scattered in both the lungs with few ill-defined patchy area of consolidation (Figure 1).



His X-ray chest showed fibro-cavitatory changes in bilateral lung fields. His routine blood investigations were all within normal limits (Figure 2).



Patient was planned for left thoracotomy and cavity marsupialization under general anaesthesia. On the day of operation, patient was placed on continuous epidural infusion with 0.125% bupivacaine injection intraoperatively, via thoracic epidural route. In the operation theater, patient was intubated with right sided double lumen tube after induction with injection fentanyl, propofol and rocuronium. There was a continuous increase in peak airway pressures and decrease in tidal volume during one lung ventilation in right lateral position. There was a repeated fall in saturation, which was managed by various recommended ventilator strategies, including occasional commissioning of bilateral lung ventilation. Surgery lasted two and a half hours. Patient was extubated after a long trail of extubation in the operation theater itself. However, within minutes of extubation, patient started developing subcutaneous emphysema (Figure 3).



Since the emphysema was continuously increasing in size even after increasing the negative pressure, it was decided to re-explore the surgical field, so as to close any rent connecting to the subcutaneous space, from where the air was leaking out. Patient was reintubated with single lumen endotracheal tube (number 8.0mm). The leaks found were closed. Patient was again extubated and shifted to ICU. On second day, patient again developed subcutaneous emphysema following a brief bout of cough and was managed conservatively. Patient was discharged on 10th postoperative day.

Discussion

Subcutaneous emphysema (SE) is the clinical condition where air is present in the subcutaneous tissues. The classic clinical sign is a crackling sensation upon touch, resembling that of touching a sponge beneath the fingers, and swelling.

A study by Cerfolio et al, in 4023 post-thoracotomy patients showed the incidence of subcutaneous emphysema following thoracotomy to be 6.3%. They enumerated the predictors for developing subcutaneous emphysema. These included forced expiratory volume in 1 second (FEV1%) lesser than 50% in PAC, presence of air leak, and history of previous thoracotomy. Un-resolving SE emphysema (SE that persists despite increasing chest tube suction) is more common in patients operated for lobectomy. Even though it may not be fatal, it adds significant morbidity and prolongs hospital stay. [2]

In general, subcutaneous emphysema is self-limited, but respiratory and circulatory difficulties can occur due to compression of the trachea and great vessels at the thoracic inlet.

Lateral thoracotomy by itself, even without surgical manipulation can produce changes in lung physiology such as reduction of forced vital capacity (FVC) and functional residual capacity (FRC). Patients with chronic obstructive pulmonary disease (COPD) have respiratory blebs, which might rupture causing air leaks. Another cause of air leak is inadequate seal at the skin site from where the chest tubes exits. Air tracks back to the pleural space from that site that then communicates with the drainage system. A large air leak, especially in a patient who has undergone pneumonectomy may indicate

rupture of a bronchopleural stump and creation of a bronchopleural fistula (BPF). This leads to significant mediastinal shift to the other side and subcutaneous emphysema.[3]

Spontaneous pneumothorax can also present as subcutaneous emphysema. “Hamman's syndrome” by Louis Hamman was the first to report case series of this entity. Under increased intrathoracic pressure (as it happens when a Valsalva manoeuvre is performed) alveolar rupture can happen and air dissects to the interstitial space and bronchovascular sheaths and to mediastinum and subcutaneous tissues [4]

SE occurred in our case due to leak from the airways resected during the surgical procedure. It decreased when this leak was repaired. The clipped airways may have again opened and resurgence of SE occurred following the bout of cough. However, it sealed again in course of time with lung expansion during spontaneous ventilation.

Air leak syndromes commonly occurs from alverolar rupture with air leaking into surrounding area. Pulmonary interstitial emphysema occurs when air dissects through perivascular sheaths and reaches the hilum (pneumomediastinum) or pleural space (pneumothorax). Further air escape leads to subcutaneous or retroperitoneal emphysema, pneumoperitoneum, pneumoscrotum or air embolism; with the latter occurring when alveoli rupture directly into the pulmonary vasculature.[5]
Approximately 95% of patients require a non-operative management, often only requiring intercostal drains connected to an underwater seal or suction. Other minimally invasive methods include infraclavicular incisions, the use of a 14G fenestrated subcutaneous catheter, subcutaneous drains and subcutaneous chest tubes. Once the residual lung has expanded, chemical pleurodesis with talc, doxycycline or tetracycline could be used to promote pleural symphysis. There are reports in the literature of respiratory arrest and subsequent death in patients with subcutaneous emphysema. [1]

Conclusion

Subcutaneous Emphysema (SE) is a known complication following thoracic surgeries. However, air leaks leading to subsequent SE can also occur in various conditions, apart from surgeries. A vigilant approach, prompt diagnosis and optimal management are key in determining patient outcome.

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