

# Extensive subcutaneous emphysema following lobectomy

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## Abstract

We present a case report of extensive subcutaneous emphysema secondary to an elective left upper lobectomy. A 65-year-old gentleman was brought into a London teaching hospital's Accident and Emergency department following report of severe swelling. He was mistakenly treated by the paramedics as an allergic reaction and given hydrocortisone and salbutamol nebulisers with no effect. Upon arrival, the patient had widespread crepitus extending from his peri-orbital muscles down to mid-torso. A computer tomography scan revealed a pleuro-cutaneous fistula at the site of a recently sited chest drain, with extensive emphysema and a pneumothorax. A Seldinger chest drain was successfully inserted under blind technique following two attempts. This case highlights the risk of subcutaneous emphysema following thoracic surgery, the importance of correct diagnosis and the difficulties of left-sided intercostal drains in patients with subcutaneous emphysema.

## Keywords

Surgery, radiology, critical care/emergency medicine, cardiothoracic, subcutaneous emphysema

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## Introduction

Postoperative air leak leading to subcutaneous emphysema and pneumothoraces following a thoracic procedure is not uncommon, with a reported incidence ranging from 8% up to 26%.<sup>1</sup> A delay in instigating treatment could lead to respiratory arrest and subsequent death; thus, early recognition is important. This case highlights the risk of subcutaneous emphysema following thoracic surgery, the importance of correct diagnosis and the difficulties of left-sided intercostal drains in patients with subcutaneous emphysema.

## Case presentation

A 65-year-old gentleman was brought in via ambulance as a resuscitation call through the Accident and Emergency (A&E) department. He reported symptoms of difficulty breathing, facial swelling (Figure 1), and voice of a nasal quality. He was discharged 3 days prior from a Cardiothoracic Unit of another hospital following an elective left upper lobectomy for a suspicious lesion. He was sent home with dihydrocodeine, having never taken any opioid-based medications prior to this. He suffered from hypertension and took amlodipine. He was a non-smoker and had not had any lung problems prior to this. There was no significant family history of note.

The paramedics initially treated him as an allergic reaction to dihydrocodeine. He was given 200 mg of hydrocortisone

and 10 mg of chlorphenamine with no effect. However, on arrival to A&E, he was noticed to have widespread crepitus extending from his peri-orbital muscles down to mid-torso. His airway was patent with a high-pitched voice. He was tachypnoeic at 30 breaths per minute and was saturating at 86% on room air (94% on 15 L of oxygen). He was tachycardic at 130 and hypertensive at 168/72. Lung and heart sounds were inaudible due to background crepitus. He was otherwise afebrile and not complaining of any pain.

Routine blood tests (full blood count, liver function tests, urea and electrolytes and clotting) were normal in A&E and prior to discharge from the Cardiothoracic Unit. CT scan revealed a pleuro-cutaneous fistula at the site of a recently sited chest drain, with extensive emphysema and a pneumothorax, maximum distance of 7 cm from mediastinum to chest wall (Figures 2 and 3).

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Due to respiratory compromise, the patient required urgent draining prior to transfer to a Cardiothoracic Unit. We had deliberated the use of surgical thoracostomy but due to the long distance between skin and chest wall (10 cm) as well as underlying distorted anatomy, it was felt that an ultrasound-guided intercostal Seldinger drain would be safer. The range of ultrasound imaging was, however, limited due to interference from the subcutaneous emphysema. Discussions were held with Consultant Radiologists and Consultant Cardiothoracic Surgeons, and it was felt that the procedure could not be delayed due to potential risks to the patient. The two options available were opening up the old drain site or placement of a new drain (blindly) into the safe triangle. We opted for the latter after discussions with the

patient and secured the drain after two attempts. The patient was admitted to the Intensive Care Unit and managed conservatively. He was seen by a Cardiothoracic Surgeon and was transferred the following day for ongoing management. He remains an inpatient and continued to be managed conservatively.

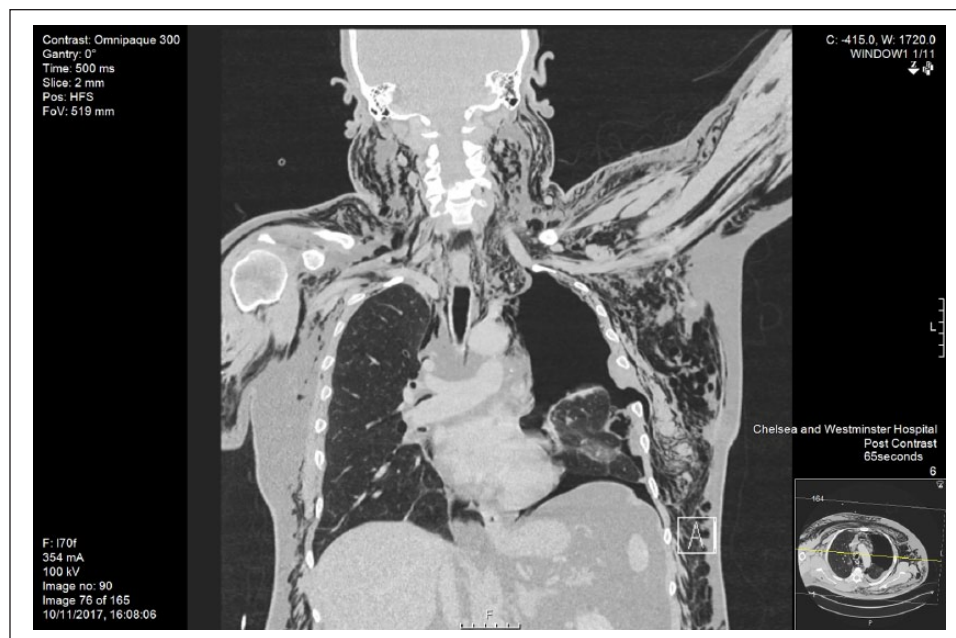
## Discussion

Risk factors for postoperative air leak following thoracic procedures include poor pulmonary function, steroid use and the presence of pleural adhesions.<sup>1,2</sup> Approximately 95% of patients presenting with an air leak require a non-operative management, often only requiring intercostal drains connected to an underwater seal or suction.<sup>1,3</sup> Other minimally invasive methods include infraclavicular incisions,<sup>4</sup> the use of a 14G fenestrated subcutaneous catheter,<sup>5</sup> subcutaneous drains<sup>6</sup> and subcutaneous chest tubes.<sup>7</sup> Once the residual lung has expanded, chemical pleurodesis with talc, doxycycline or tetracycline could be used to promote pleural symphysis.<sup>8</sup>

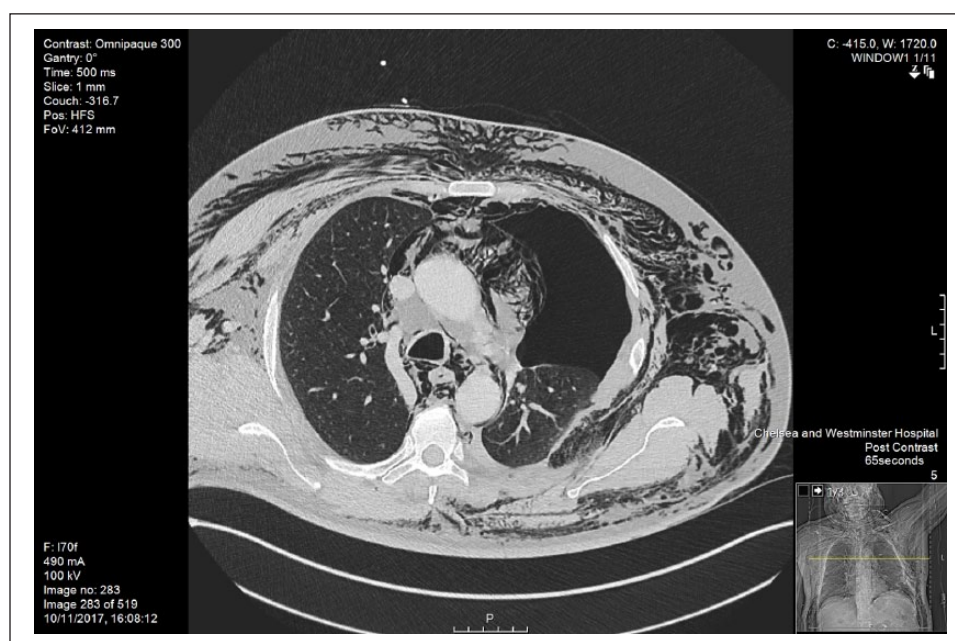
In the acute setting, early placement of a chest drain is important to prevent respiratory compromise. There are reports in the literature of respiratory arrest and subsequent death in patients with subcutaneous emphysema.<sup>9–11</sup> Several theories exist behind the deterioration, including restricted thoracic expansion from air in the respiratory muscles and cranial migration of air into the cervical visceral space, which hosts the trachea and recurrent laryngeal nerve. Cranial migration of air would manifest as a high-pitched voice or of a nasal quality, secondary to laryngeal disruption.<sup>9</sup> There is, however, considerable



**Figure 1.** Patient on initial presentation to the department.



**Figure 2.** CT coronal view of patient, demonstrating extensive subcutaneous emphysema.



**Figure 3.** CT transverse view of the patient's thorax.

anatomical consideration when placing a chest drain. In 1936, Rienhoff<sup>12</sup> showed that there was hyperinflation of the remaining lung and elevation of the diaphragm; Biondetti et al.<sup>13</sup> further showing a degree of rotation to mediastinal structures. Blind placement of drains in post pneumonectomy and lobectomy patients have resulted in complications. Kopec et al.<sup>14</sup> reporting the drain piercing the right ventricle from a left-sided chest drain. To avoid this, it was suggested that physicians perform a finger exploration of the pleural space and use ultrasound for guidance, neither of which were possible in this patient's case. The distance from the skin to the chest wall was 10 cm, longer than an average finger, in addition to intercostal space narrowing commonly seen after thoracic surgical procedures.<sup>14</sup> Furthermore, the tissue–air interface in subcutaneous emphysema acts as a barrier to ultrasound due to the large difference in acoustic impedance, preventing bedside ultrasound use.<sup>15</sup> We avoided the use of trocar-type chest tubes due to reported complications<sup>16,17</sup> and inserted a Seldinger drain into the triangle of safety, bordered by the lateral border of pectoralis major, anterior border of latissimus dorsi apex of the axilla and a horizontal line extending from the nipple.<sup>18</sup> The CT provided assurance of the puncture site showing no internal structures nearby.

## Conclusion

In summary, patients should be adequately counselled on the potential complication of developing subcutaneous emphysema following thoracic surgical procedures. Patients often require non-operative management of

subcutaneous emphysema, although clinical deterioration would necessitate urgent intervention. This case highlights the difficult scenario we were in when confronted with a patient with post-operative subcutaneous emphysema. Our options were limited due to the urgency of the scenario, size of the subcutaneous emphysema, recent postoperative thoracic procedure and a left-sided pneumothorax.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

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## Informed consent

Written informed consent was obtained from the patient(s) for their anonymised information and unaltered image to be published in this article.

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