Reminder of important clinical lesson

Managing iatrogenic subcutaneous emphysema on a background of COPD while treating persistent secondary pneumothorax

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Summary

This is a case of a 77-year-old gentleman with severe smoking related chronic obstructive airways disease (COPD) who presented with a secondary pneumothorax. Attempts to treat a persistent air leak using (IC) drains of increasing size led to sudden worsening of iatrogenic subcutaneous emphysema. A CT scan performed confirmed the presence of a pneumomediastinum and florid subcutaneous emphysema in the face and torso. Although the patient reported a change in voice with hoarseness there was no evidence of airway compromise. The patient was conservatively managed in the high-dependency unit. He was not considered fit enough to undergo general anaesthesia and surgery; therefore, a pleurodesis using sterile talc was undertaken. The IC drain was successfully removed, following resolution of the air leak, and the lung remained re-inflated. His subcutaneous emphysema gradually spontaneously resolved with no further complications.

BACKGROUND

This was a dramatic presentation of a usually self-limiting complication (subcutaneous emphysema) following management of a relatively common problem (chest drain for secondary pneumothorax related to smoking-related severe COPD).

For educational purposes, clinicians need to be aware of potentially serious consequences and rapid development of situation and need to know how to manage situation.

Efforts must be made to raise awareness of management of pneumothoraces in difficult cases, that is, unresolving secondary pneumothoraces in unfavourable surgical patients; advances in symptomatic and practical management of subcutaneous emphysema if necessary; and potentially fatal developments.

CASE PRESENTATION

A 77-year-old man with a background of severe, smoking-related COPD admitted acutely with a right-sided pneumothorax following recent infective exacerbation. He was initially stabilised with the insertion of a 12 French Gauge Seldinger-type intercostal (IC) drain. A post-drain chest radiograph demonstrated good resolution of the pneumothorax as well as mild subcutaneous emphysema.

Three days after presentation, a persistent air leak was demonstrated by a drain that continued to bubble despite applying negative pressure with suction. This prompted the insertion of a 28 French Gauge IC drain which was used with continued suction. A repeat chest radiograph demonstrated a reduction in the extent of the subcutaneous emphysema with a resolving pneumothorax.

The second IC drain continued to bubble for a further 3 days. However, the drain then stopped swinging, and a repeat chest radiograph raised concerns that the drain had become displaced with its tip in the chest-wall tissues. It was removed and replaced with the third IC drain.

One hour post-chest-drain insertion the medical team were alerted by the nursing staff to a sudden worsening of his subcutaneous emphysema associated with development of a change in his voice (figures 1 and 2). The patient's vital signs were normal, other than the development of a higher-pitched voice. There was no clinical evidence of stridor. The patient's only complaint was that he could not see due to involuntary eye closure as a result of grossly swollen eyelids. A CT scan was undertaken to assess the position of the drain, lung architecture and extent of air within the tissue planes of the mediastinum and neck. This demonstrated an adequately positioned drain and a partially re-expanded lung with residual, right-sided pneumothorax at the apex, base and in the fissure. Gas was seen tracking the mediastinum, central airways and in all planes in the neck, including the prevertebral, retropharyngeal space and larynx which was narrowed but not occluded (figures 3 and 4). The patient was transferred to the high-dependency unit for close observation.

The patient's subcutaneous emphysema began to resolve over the following 2 days. He returned to the respiratory ward with his bubbling IC drain in-situ. The case was discussed with the thoracic surgical team who, in view of his severe COPD, felt that general anaesthesia and surgery posed an unacceptable risk. Hence, chemical pleurodesis using 4 g of sterile talc was undertaken. The IC drain was successfully removed following resolution of the air leak 2 days later, and the lung remained re-inflated. His subcutaneous emphysema gradually, spontaneously resolved, with no further complications. The patient was discharged 12 days post-admission.

INVESTIGATIONS

Multiple chest radiographs to assess the success of pneumothorax resolution.

Figure 1 Sudden worsening of subcutaneous emphysema.

CT chest to assess the extent of subcutaneous emphysema.

DIFFERENTIAL DIAGNOSIS

Angioedema of unknown cause.

TREATMENT

Intercostal drainage of pneumothorax.

OUTCOME AND FOLLOW-UP

Patient discharged 12 days post-treatment, with the decision to further review the patient at a 6-week clinical follow-up.

DISCUSSION

Subcutaneous emphysema is a well-recognised complication of intercostal (IC) drainage of pneumothoraces; moreover, pneumothoraces secondary to COPD are at greater risk of being complicated by subcutaneous emphysema. In our case, the acute worsening of subcutaneous emphysema occurred immediately after the insertion of the third IC drain, thereby suggesting that this was a complication of the IC drainage. Though found to be deeply positioned on the chest radiograph and on CT imaging, the drain was

functioning adequately and hence not repositioned as recommended by the British Thoracic Society guidelines. Up to 9% of chest drains associated with complications are incorrectly placed as assessed on CT imaging.¹ Little is known about the impact of the size of IC drains on the incidence of surgical emphysema.²

The feel of crepitus on palpation over the supraclavicular fossa and thoracic wall was found on examination, and our patient had extensive subcutaneous emphysema as evidenced by peri-orbital and neck swelling as well as a change in the quality of his voice. These features raised a concern that air was present in the fascial planes within the neck and larynx which formed the rationale for CT imaging his neck and thorax.³

Over the subsequent 48 h, he remained stable and gradually improved. In the interim, he was referred to the thoracic surgeons but was deemed unfit for a surgical procedure that would have potentially allowed both the management of the pneumothorax as well as any underlying lung abnormalities, that is, bullae resection.¹ He was hence treated using talc pleurodesis because up to 40–50% of such patients will experience recurrent pneumothoraces if they do not undergo pleurodesis.⁴

The pleurodesis was successful as demonstrated by the 6-week follow-up radiological imaging which excluded recurrence of the pneumothorax and confirmed resolution

Figure 2 Sudden worsening of subcutaneous emphysema.

of the surgical emphysema. Indeed both the parietal and visceral pleura remained opposed.

Although subcutaneous emphysema is usually benign, it is noted that complications can occur in severe cases. These include anxiety and discomfort,⁵ dysphagia and visual disturbance⁶ and other adverse effects such as respiratory failure, airway compromise, systemic air embolism, cardiac compromise and pacemaker dysfunction.^{1 5 7–9} In previous case reports where life-threatening complications of subcutaneous emphysema have been described (cardiorespiratory arrest), more number of alternative approaches to management have been described, and one of them is the insertion of multiple subcutaneous drains or modified fenestrated catheters.^{7 9}

It has been suggested that subcutaneous emphysema in the presence of a pneumothorax may be related to underlying a new communication between the pneumothorax and the chest wall with its subcutaneous tissue.^{1 10} It is also suggested that bullous disease and hyper-distension of alveoli increases the risk of alveolar-interstitial membrane rupture that may cause a leakage of alveolar air into the pulmonary interstitium⁶ which in turn tracks up the bronchovascular sheath towards the hilum, where it passes superficially to the endotracheal fascia, creating subcutaneous emphysema.^{5 7}

Subcutaneous emphysema can worsen respiratory failure by a sudden decline in chest-wall compliance secondary to subcutaneous air, leading to further restriction of lung expansion over and above the static hyperinflated lungs in patients with underlying COPD.⁹ Approximately 70–90% of cases of subcutaneous emphysema are complicated by pneumomediastinum, another potentially life-threatening complication.¹¹

Secondary pneumothoraces are a serious complication with patients with COPD raising mortality by fourfold.^{4 12} Large numbers of chest drains are inserted in the UK during a year for a variety of indications. This article was written to highlight some important aspects of the use of IC drains in the management of secondary pneumothoraces.

SIMILAR CASE REPORTS

- ▶ Oct 2008 Cases Journal: Pneumothorax, pneumomediastinum and subcutaneous emphysema following closed percutaneous pleural biopsy: a case report
- ▶ July 2008 CJEM: Traumatic occurrence of chest wall tamponade secondary to subcutaneous emphysema
- ▶ 2007 Singapore Med J: Management of extensive subcutaneous emphysema and pneumomediastinum by micro-drainage: time for a re-think

Figure 3 Narrowed larynx secondary to pneumomediastinum.

- ▶ Feb 2007 Respiratory Care: Tracheal Rupture resulting in Life-Threatening Subcutaneous Emphysema
- ▶ Feb 2002 JRSM: Progressive subcutaneous emphysema and respiratory arrest
- ▶ 2002 CHEST: Simple Construction of Subcutaneous Catheter for Treatment of Severe Subcutaneous emphysema
- ▶ 1984 Intensive Care Medicine: Upper airway obstruction caused by massive subcutaneous emphysema

Learning points

- ▶ Self-limiting complications have potential to develop rapidly and unexpectedly and the importance of dealing with the basics and assessing change systematically
- ▶ To promote knowledge management of pneumothoraces and the potential complications which may need to be managed by respiratory physicians or cardio-thoracic surgeons.
- ▶ Subcutaneous emphysema can be potentially serious, and patients should be stabilised and managed as appropriate.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. **Henry M**, Arnold T, Harvey J. BTS guideline for the management of spontaneous pneumothorax. http://thorax.bmj.com/cgi/content/full/58/suppl_2/ii39 (accessed 29 Jan 2009).
2. **Laws D**, Neville E, Duffy J. BTS guidelines for the insertion of a chest drain. *Thorax* 2003;**58**(Suppl II):ii53–ii59.
3. **Gibney RT**, Finnegan B, FitzGerald MX, *et al*. Upper airway obstruction caused by massive subcutaneous emphysema. *Intensive Care Med* 1984;**10**:43–4.
4. **Videm V**, Pillgram-Larsen J, Ellingsen O, *et al*. Spontaneous pneumothorax in chronic obstructive pulmonary disease: complications, treatment and recurrences. *Eur J Respir Dis* 1987;**71**:365–71.
5. **Srinivas R**, Singh N, Agarwal R, *et al*. Management of extensive subcutaneous emphysema and pneumomediastinum by micro-drainage: time for a re-think? *Singapore Med J* 2007;**48**(12):e232.
6. **Perraut M**, Gilday D, Reed G. Traumatic occurrence of chest wall tamponade secondary to subcutaneous emphysema. *CJEM* 2008;**10**:387–91.
7. **Abu-Omar Y**, Catarino P. Progressive subcutaneous emphysema and respiratory arrest. *J R Soc Med* 2002;**95**:90–1.
8. **Beck P**, Steven JH, Mody C. Simple Construction of a Subcutaneous Catheter for Treatment of Severe Subcutaneous Emphysema. <http://www.chestjournal.org/content/121/2/647.full.html> (accessed 29 Jan 2009).
9. **Gries CJ**, Pierson DJ. Tracheal rupture resulting in life-threatening subcutaneous emphysema. *Respir Care* 2007;**52**:191–5.

Figure 4 Narrowed larynx secondary to pneumomediastinum.

10. **Light RW.** *Pneumothorax*. In: *Pleural diseases*. 3rd ed. Baltimore: Williams and Wilkins, 1995:242–77.
11. **López-Peláez MF,** Roldán J, Mateo S. Cervical emphysema, pneumomediastinum, and pneumothorax following self-induced oral injury: report of four cases and review of the literature. *Chest* 2001;**120**:306–9.
12. **Heffner JE,** Huggins JT. Management of Secondary Spontaneous Pneumothorax. <http://www.chestjournal.org/content/125/4/1190.full.htmlref-list-1> (accessed 3 Feb 2009).

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