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Visual Diagnosis in Emergency Medicine

MASSIVE SUBCUTANEOUS EMPHYSEMA LEADING TO AIRWAY DISTORTION

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INTRODUCTION

Subcutaneous emphysema is an uncommon complication of conditions commonly encountered in emergency medicine, including pneumothoraces, respiratory system trauma, and soft tissue infections. We present a case of a patient with massive subcutaneous emphysema leading to neck and facial swelling, with airway compromise and loss of anatomic landmarks for airway management.

CASE REPORT

A 52-year-old woman with a history of obesity and a seizure disorder presented by emergency medicine services (EMS) to a local emergency department (ED) with status epilepticus, refractory to diazepam. She arrived to the closest ED actively seizing and with blood in the oropharynx from bite lacerations to her tongue. In the ED, the team administered multiple doses of benzodiazepines, 1 g phenobarbital, and 1 g levetiracetam with no effect. She was given 10 mg vecuronium intravenously with complete relaxation to facilitate intubation. Numerous direct laryngoscopy and videolaryngoscopy attempts were unsuccessful due to ongoing tongue bleeding and swelling. A King LT supraglottic device (SGD; Ambu Inc., Columbia, MD) was then placed, with initial adequate oxygenation and ventilation, and the decision was made to transfer her to a tertiary care center.

On the critical care transport team's arrival, she was being bag-ventilated via the SGD, which was repeatedly filling with blood, requiring constant suctioning. Ventilation was difficult, requiring 2-hand bagging and extremely high pressures to achieve chest rise, but her SpO_2 was maintained at > 95%. She was noted to have palpable crepitus throughout her neck and chest that progressed to massive subcutaneous emphysema, advancing across both breasts and down to her abdomen. The clinicians agreed that she could not be transported without a secured airway in light of the rapidly worsening crepitus so the emergency physician consulted an anesthesiologist and a surgeon. The team performed bilateral chest decompressions using 14-gauge angiocatheters, with a audible rush of air bilaterally. The surgeon then performed two 3-inch incisions to left and right anterior chest walls to evacuate the subcutaneous air with direct pressure to the chest. The anesthesiologist attempted endotracheal intubation three times with videolaryngoscopy, which was unsuccessful. The surgeon then attempted an emergent tracheostomy. Although able to expose the trachea, landmarks were unrecognizable, so the attempt was aborted. At this point, the patient had a pulseless electrical activity arrest. After 6 min of cardiopulmonary resuscitation, return of spontaneous circulation was achieved. Further efforts were made to expel subcutaneous air via the superficial skin incisions, and one additional attempt at intubation was then successful. After

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confirming appropriate endotracheal tube position with a radiograph (Figure 1), the patient was transferred to the tertiary care center.

At the tertiary care center, the patient was found to have subtherapeutic phenytoin levels as the likely cause of her status epilepticus. She underwent computed tomography scan of the chest, which showed persistent massive subcutaneous emphysema despite prior expulsion of air (Figure 2), but minimal pneumothoraces. The airway was grossly displaced by the emphysema (Figure 3), likely contributing to the difficulty in finding recognizable landmarks in later laryngoscopy and cricothyrotomy attempts.

The origin of the subcutaneous emphysema was thought to be the high pressures from ventilation with the SGD. With the substantial airway bleeding, high pressures were used to overcome blood in the airway, but with transmission to the respiratory system. While the subcutaneous emphysema could have arisen from an oropharyngeal or tracheal injury from the intubation attempts or SGD placement, the crepitus developed only after the device's placement. Additionally, no culprit injury was ever found by scanning, bronchoscopy, or on examination by otolaryngology. She underwent a tracheostomy for airway protection, and she has had full recovery of her neurologic status.

DISCUSSION

Although SGDs are lifesaving, they can rarely be associated with complications, especially in patients older than age 46 years and with higher body mass index (1). This patient had both factors, placing her at higher risk. Clinicians should be aware that vigorous bagging attempts via an SGD can lead to pneumothoraces, pneumomediastinum, and subcutaneous emphysema, with subsequent airway distortion. In this case, the patient had pneumomediastinum as well as the subcutaneous emphysema.

While this has been reported from pharyngeal injury previously, this can also develop from very high pressures alone (2). Once massive subcutaneous emphysema develops, endotracheal intubation is paramount, as continued distortion may prohibit future success (3).

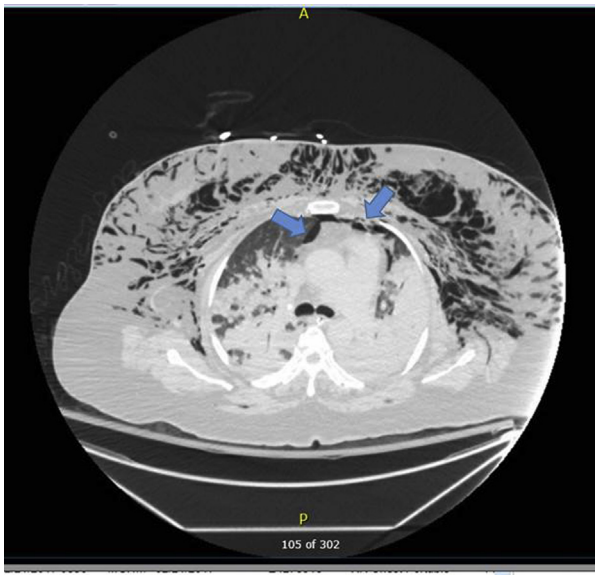

Figure 2. Computed tomography of the chest highlighting pneumomediastinum (arrows) in addition to the massive subcutaneous air.

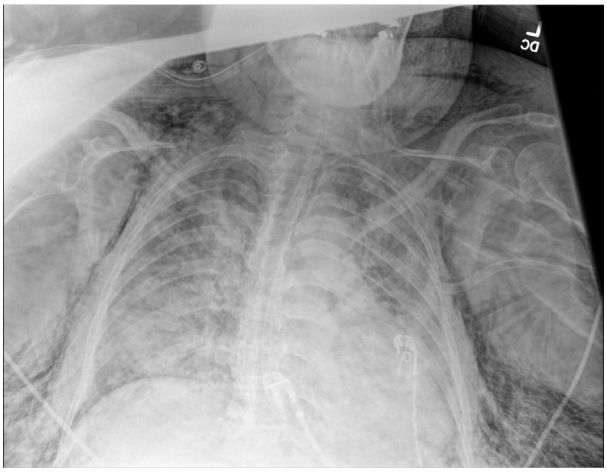

Figure 1. Chest radiograph demonstrating extensive subcutaneous air.

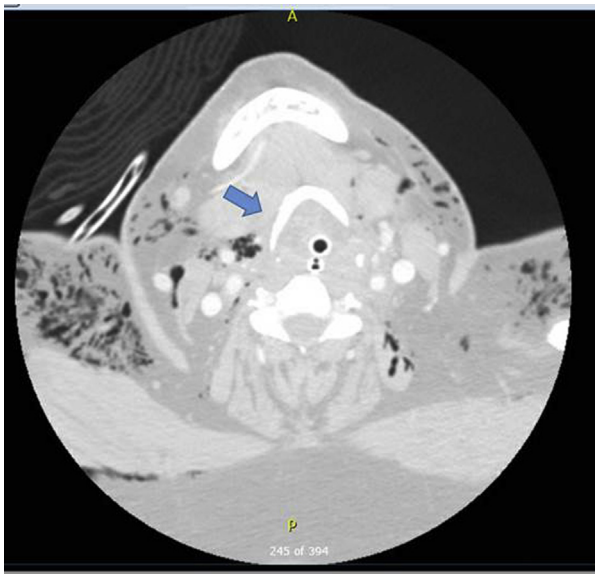

Figure 3. Computed tomography of the neck, demonstrating deviation of the airway to the left with asymmetric emphysema, despite prior decompression before transfer.

Although an uncommon procedure, small, superficial infraclavicular incisions or the insertion of angiocatheters into the skin can release trapped air in extreme cases and may facilitate return of anatomic landmarks (4,5).

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