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IMAGES IN EMERGENCY MEDICINE

Airway

Elderly woman with shortness of breath

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1 | PATIENT PRESENTATION

Emergency medical services (EMS) personnel responded to the report of a medical alert alarm activation, finding an elderly woman prone on the ground with a bloodied face, presumptively subsequent to a fall. She was tachycardic, exhibited shallow gasping respirations, and had a Glasgow coma scale of 5. Ground EMS personnel attempted rapid sequence intubation using ketamine and succinylcholine, making 3 attempts before inserting a rescue i-gel. The intubation attempts included 1 inadvertent tube dislodgement and 1 recognized esophageal placement, with intervening use of bag-valve-mask ventilation to restore oxygen saturation. Air medical EMS personnel arrived on scene and were able to perform intubation via direct laryngoscopy with a single attempt. On arrival at the emergency department (ED), physical examination revealed diffuse crepitus across the patient's face, neck, and chest. The ED and trauma team ordered computed tomography scans of the brain, cervical spine, chest, abdomen, and pelvis.

2 | DISCUSSION

Computed tomography imaging indicated extensive subcutaneous emphysema to the neck and chest wall, bilateral pneumothoraces, pneumomediastinum, pneumopericardium, and pneumoperitoneum (Figures 1, 2, 3, and 4). Pulmonary barotrauma can result in the extra-alveolar extravasation of air, which may dissect along the perivascular sheaths toward the pleural space, mediastinum, peritoneum, and/or skin, leading to pneumothorax, pneumomediastinum, pneumoperitoneum, and/or subcutaneous emphysema.[1–3] In addition to barotrauma, potential causes of pneumomediastinum include esophageal perforation, mediastinitis, cocaine use, and asthma or chronic obstruction pulmonary disease.[4] Likewise, additional potential causes of pneumoperitoneum include perforated bowel, paracentesis, percutaneous gastric tube placement, bacterial peritonitis, and peritoneal dialysis.[5]

We suspect that this presentation may have resulted from EMS airway management efforts. Excessive ventilation through an endotracheal tube or by bag-valve-mask ventilation can potentially result in pulmonary barotruama. Similarly, excessive ventilation through bag-valve-mask ventilation or an esophageally placed endotracheal tube can potentially result in esophageal or visceral injury. Hypopharyngeal or tracheal perforation from laryngoscopy can provide an additional conduit for subcutaneous or mediastinal insufflation. In this case, bronchoscopy performed in the ED by the trauma surgery service did not indicate tracheal perforation or other injuries. With the absence of tracheal perforation, empiric antibiotics were not given, because mediastinitis was less likely on differential. During observation in the ICU, the air throughout the patient's body continued to resolve spontaneously without invasive intervention, and a post-extubation esophageal study showed no evidence of esophageal perforation or injury.

This case underscores important principles for safe out-of-hospital airway management. EMS personnel should strive for first-pass intubation success, with early use of rescue supraglottic airway devices.[6] Esophageal intubation should be recognized quickly, and ventilations through an inadvertent esophageal tube should be minimized. Ventilations through bag-valve-mask, endotracheal tube or supraglottic

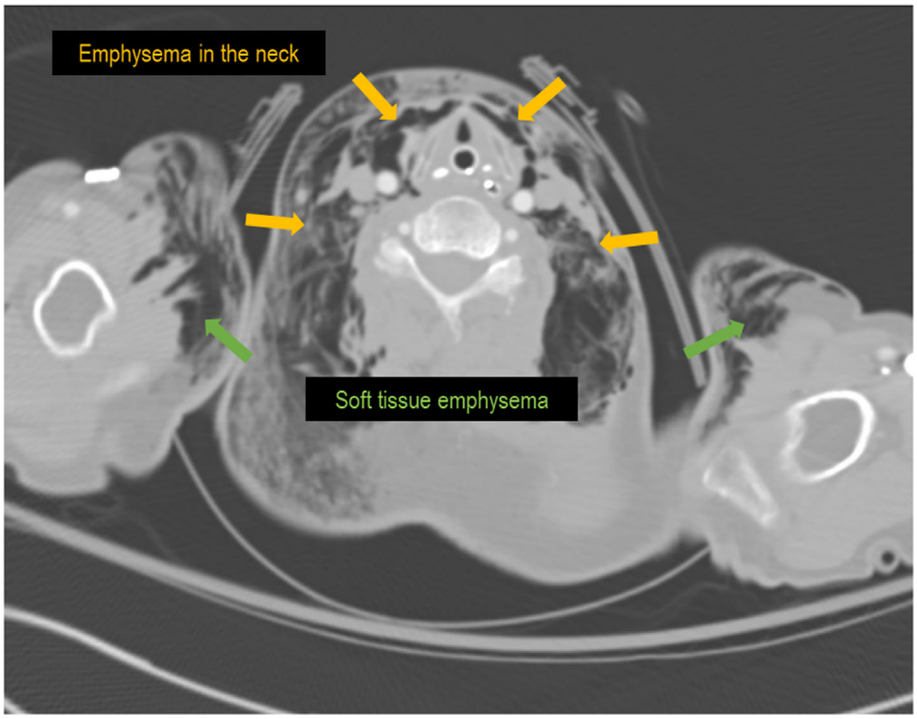

FIGURE 1 Computed tomography scan of upper chest and neck indicating extensive subcutaneous emphysema

FIGURE 2 Computed tomography scan of upper chest and neck showing extensive subcutaneous emphysema and pneumomediastinum

airway device should be delivered with controlled tidal volume and rate. Care must be taken to avoid injuring the hypopharyngeal, glottic or subglottic structures during intubation or airway placement efforts. In the ED, when caring for a patient with barotruama after out-of-hospital airway management, initial attention should focus on the relief of immediate life threats (tension pneumothroax and tension pneumoperitoneum) and exclusion of hypopharyngeal, tracheobronchial, esophageal, or visceral injury.

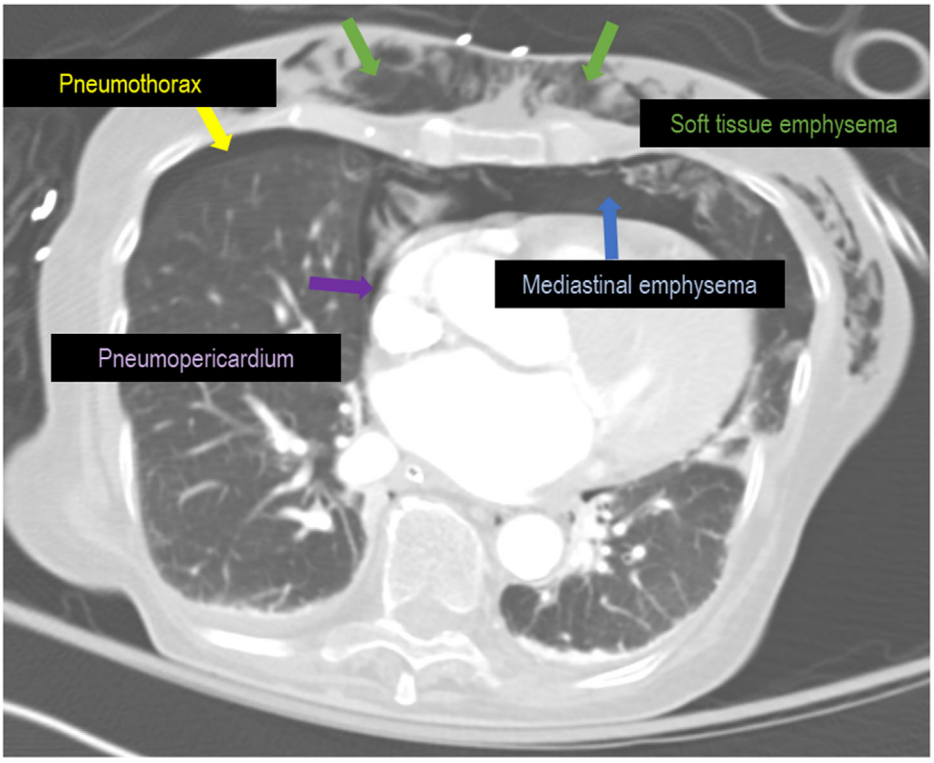

FIGURE 3 Computed tomography scan of upper chest and neck showing pneumomediastinum, pneumopericardium, and pneumothorax

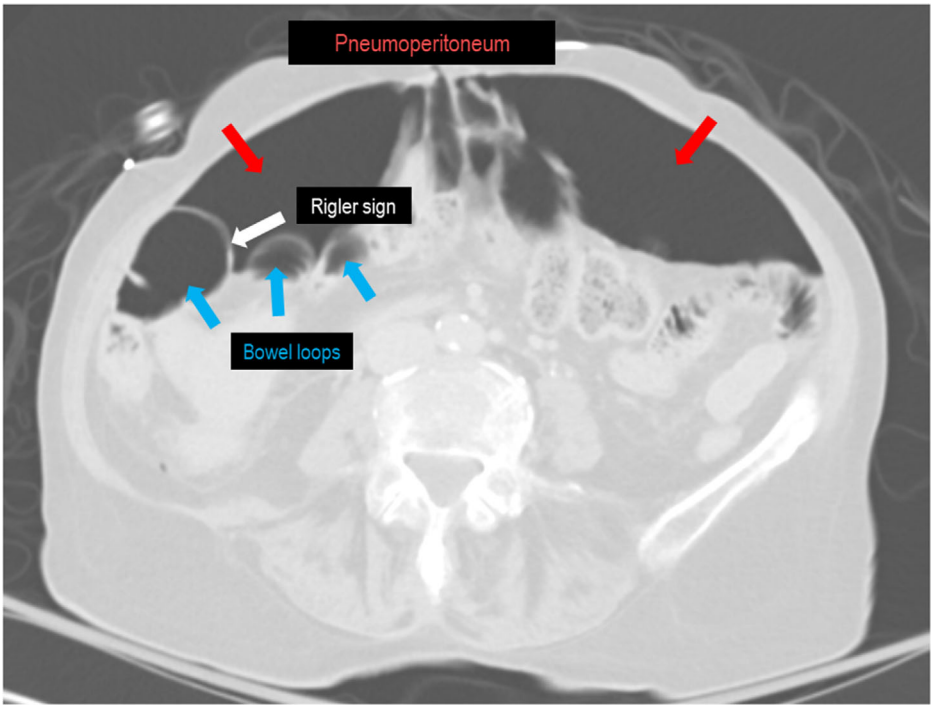

FIGURE 4 Computed tomography scan of abdomen showing pneumoperitoneum and Rigler sign (gas within bowel lumen and outside bowel wall)

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