Letter to editor with

Managing Progressive Subcutaneous Emphysema in Patient on Invasive Positive Pressure Ventilation

*Jafra A[1], Kapoor D[2]

Abstract

Subcutaneous emphysema (SE) results from air leak from lung parenchyma into the least resistance subcutaneous tissues. Mostly a self limiting condition but extensive subcutaneous emphysema (ESE) may lead to anxiety, disfigurement, discomfort, respiratory embarrassment, upper airway obstruction and systemic air embolism and requires active management. We report successful management of progressive SE in a patient on invasive positive pressure mechanical ventilation using a newer approach and also discuss the role of surgical tracheostomy as a rescue measure.

Key words: Subcutaneous emphysema; Positive pressure ventilation; Cannula.

To the Editor,

Subcutaneous emphysema (SE) may spread to face, arms, thorax, abdomen and lower limbs. SE may develop spontaneously or following trauma, pneumothorax, infections, malignancies, positive pressure ventilation (PPV) and thoracic surgical procedures.[1] Mostly a self limiting condition but Extensive Subcutaneous Emphysema (ESE) may lead to anxiety, disfigurement, discomfort, respiratory embarrassment, upper airway obstruction, pacemaker dysfunction and systemic air embolism and requires active management.[1] We discuss the troubleshooting technique and role of surgical tracheostomy for progressive SE in a patient on invasive PPV for management of Acute Respiratory Distress Syndrome (ARDS).

A 15 year old boy was kept on invasive PPV in our intensive care unit (ICU) for management of ARDS. He was managed on low tidal volume with high positive end expiratory pressures (PEEP) of 18 cm of H2O (keeping plateau pressures≤ 30 cmH2O). Two days later, patient developed ESE on neck, chest and abdomen, causing rise in peak and plateau airway pressures (≥ 44cmH2O and≥ 40 cmH2O respectively). After ruling out the possibility of pneumothorax, we decided to drain SE with improvised fenestrated cannula.

The fenestrated cannula was constructed by creating circumferential, equidistant, punched-out holes in a 16G intravenous cannula by surgical blade under strict asepsis.(Figure 1A). These cannulas were inserted in subcutaneous plane at fourth intercostal space in the mid-clavicular plane bilaterally and connected to underwater seal. Thereafter, active compressive massage was done with direction of force pointing towards the catheter tip to vent-out the entrapped air. (Figure1B). However, due to the continuous positive pressure ventilation with high PEEP, we were not able to vent the entrapped air effectively. Meanwhile, we decided for surgical tracheostomy in view of the anticipated prolonged ventilation and ICU stay. Surprisingly, following surgical tracheostomy we observe rapid resolution of subcutaneous emphysema. There was dramatic fall in peak and plateau airway pressures with improvement in lung compliance. No further incidence of ESE observed during the stay of patient in ICU.

During PPV, there is one-way valve mechanism leading to progressive accumulation of air in tissues with each successive breath which leads to rapid and progressive SE. The incidence of barotrauma and development of SE in patients on PPV is 4-15%, whereas in patients with ARDS, it may further increase to a nearly 50%.[2] Specific measures includes high flow oxygen therapy and surgical procedures such as subcutaneous chest drains, infraclavicular "blow holes", pigtail drains, cervical mediastinotomy, trochar-type drains with suction and Jackson pratt drain.[3,4] Micro-drainage techniques such as fenestrated angiocatheters are minimally invasive and may reduce morbidity [(5)]. We observe that for effective management of progressive ESE during PPV, requires a more definitive method for vent of entrapped air. Surgical tracheostomy may act as an effective rescue procedure in this subset of patients as there maybe continuous vent of entrapped air from the stoma site. In addition, the aforesaid procedure may further minimise spread of Subcutaneous Emphysema (SE) to deeper tissue and therefore preventing the resultant thoracic inlet compression and chest wall restriction, which may lead to ventilation failure.

1. *Anudeep Jafra, MD, DNB (Anaesthesia), Assistant Professor, Post Graduate Institute of Medical Education and Research, Chandigarh, India.
E-mail: anu_gmch@yahoo.co.in
2. Dheeraj Kapoor, MD (Anaesthesia), FCCP, FACEE, FCCS, Associate Professor, Department of Anaesthesia and Intensive Care, Govt. Medical College and Hospital, Chandigarh, India.

*For Correspondence

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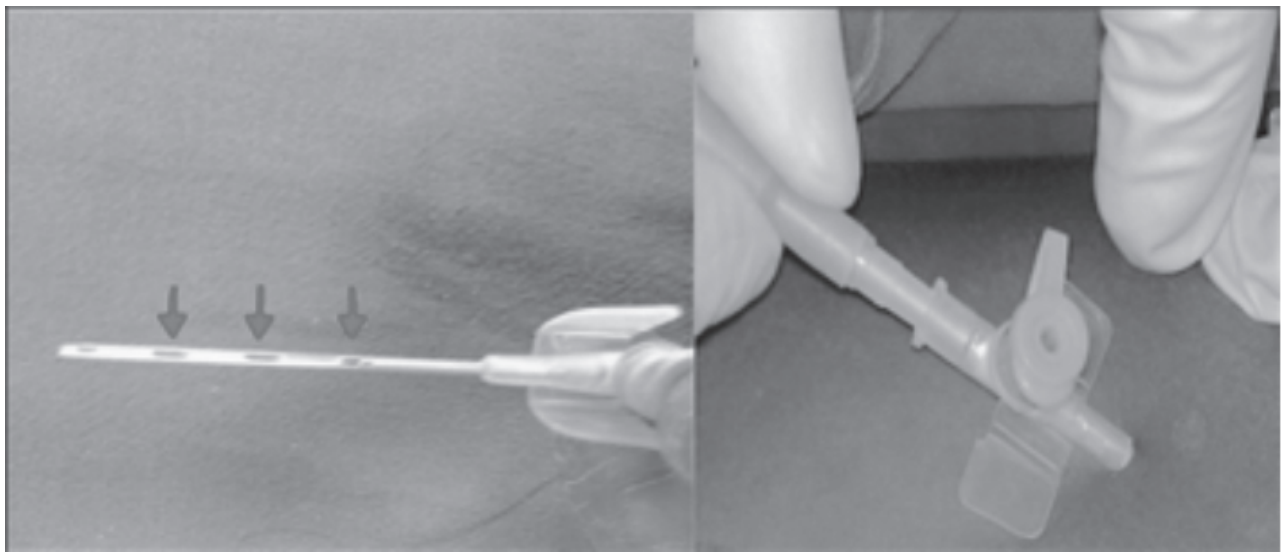

Figure 1A. Improvised Fenestrated Cannula. (Black arrows indicating punched-out holes)

Figure 1B. Subcutaneous Insertion of Cannula.